Studies of high or moderate quality used for results and conclusions in the present report

First author Pub. Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Exposure	Outcome	Association between occupational factor and osteoarthritis; least adjusted model	Association between occupational factor and osteoarthritis; most adjusted model
Allen et al 2010 [1] USA	Cohort with exposure data collected retrospectively Description of exposure at jobs held 1-year or longer General working population 1999–2004	Participants were individuals enrolled in a community-based study of the occurrence of knee and hip osteoarthritis in a rural region of the state of North Carolina, USA. The study involved civilian, non-institutionalized adults age 45 years and older (mean age 70 years) n=2 729 1 796 women and 933 men	**Several factors** Physical factors were assessed by questions developed by the authors	**Knee and hip osteoarthritis** ***Radiographic*** All radiographs were read for Kellgren-Lawrence grade by a single bone and joint radiologist without regard of the participant's clinical status or occupational activates. Radiographic knee and hip osteoarthritis were defined as a Kellgren-Lawrence grade of at least two in at least one knee or hip, respectively ***Symptomatic*** Symptomatic knee and hip osteoarthritis is defined as the presence of both radiographic osteoarthritis	Associations of occupational tasks with radiographic and symptomatic osteoarthritis. OR (95% CI) adjusted for age, gender, race, body mass index, smoking, prior knee injury and household tasks **Knee** ***Radiographic*** *Task performed at longest job* Walk: 1.01 (0.80; 1.27) Lift>10 lbs: 1.06 (0.86; 1.31) Sit: 0.86 (0.70; 1.05) Stand: 1.00 (0.81; 1.23) Bend, twist, reach: 0.91 (0.74; 1.12) Squat: 1.13 (0.88; 1.45) Climb stairs: 0.80 (0.63; 1.03) Crawl: 1.15 (0.78; 1.71) Crouch or kneel: 0.81 (0.59; 1.11) Heavy work, standing: 1.11 (0.81; 1.51) *Lifetime exposure* Light work while standing: 0.97 (0.78; 1.21) Heavy work while standing: 1.13 (0.88; 1.44) Sitting: 0.86 (0.71; 1.05) Kneeling: 0.98 (0.73; 1.33) Walking: 1.00 (0.82; 1.23) Lifting 10 kg ≥10 ×/week: 1.18 (0.95; 1.46) Lifting 20 kg ≥10 ×/week: 0.94 (0.73; 1.22) Lifting 50 kg ≥10 ×/week: 0.82 (0.58; 1.15) ***Symptomatic*** *Task performed at longest job* Walk: 1.46 (1.12; 1.90) Lift>10 lbs: 1.42 (1.13; 1.80) Sit: 0.72 (0.57; 0.90) Stand: 1.38 (1.08; 1.77) Bend, twist, reach: 1.26 (0.99; 1.60)	–

				and symptoms in the same joint. To assess joint symptoms, participants were asked questions, which are stated in the article. Note that symptomatic OA also include radiographic defined OA	Squat: 1.27 (0.97; 1.68) Climb stairs: 0.96 (0.73; 1.26) Crawl: 1.59 (1.05; 2.41) Crouch or kneel: 0.95 (0.67; 1.36) Heavy work, standing: 1.44 (1.03; 2.02) *Lifetime exposure* Light work while standing: 1.06 (0.83; 1.35) Heavy work while standing: 1.32 (1.02; 1.72) Sitting: 0.73 (0.59; 0.92) Kneeling: 1.03 (0.74; 1.44) Walking: 1.24 (0.99; 1.55) Lifting 10 kg ≥10 ×/week: 1.13 (0.89; 1.44) Lifting 20 kg ≥10 ×/week: 1.05 (0.79; 1.39) Lifting 50 kg ≥10 ×/week: 0.98 (0.67; 1.43) **Hip** ***Radiographic*** *Task performed at longest job* Walk: 1.15 (0.92; 1.43) Lift>10 lbs: 1.20 (0.98; 1.46) Sit: 0.94 (0.77; 1.14) Stand: 1.15 (0.94; 1.42) Bend, twist, reach: 1.21 (0.98; 1.48) Squat: 1.03 (0.81; 1.30) Climb stairs: 1.01 (0.80; 1.28) Crawl: 1.35 (0.93; 2.00) Crouch or kneel: 1.15 (0.84; 1.56) Heavy work, standing: 1.20 (0.88; 1.63) *Lifetime exposure* Light work while standing: 1.05 (0.85; 1.29) Heavy work while standing: 1.04 (0.82; 1.32) Sitting: 0.96 (0.79; 1.16) Kneeling: 0.84 (0.62; 1.14) Walking: 1.15 (0.95; 1.40) Lifting 10 kg ≥10 ×/week: 1.10 (0.90; 1.36) Lifting 20 kg ≥10 ×/week: 1.03 (0.80; 1.32) Lifting 50 kg ≥10 ×/week: 1.02 (0.73; 1.43)	

					Symptomatic *Task performed at longest job* Walk: 1.38 (1.00; 1.91) Lift>10 lbs: 1.67 (1.26; 2.23) Sit: 0.81 (0.61; 1.07) Stand: 1.30 (0.97; 1.75) Bend, twist, reach: 1.60 (1.18; 2.17) Squat: 1.11 (0.79; 1.57) Climb stairs: 1.17 (0.84; 1.62) Crawl: 2.28 (1.43; 3.65) Crouch or kneel: 1.45 (0.95; 2.21) Heavy work, standing: 1.75 (1.17; 2.61) *Lifetime exposure* Light work standing: 0.74 (0.54; 1.01) Heavy work while standing: 1.39 (1.01; 1.91) Sitting: 0.80 (0.61; 1.04) Kneeling: 1.15 (0.76; 1.73) Walking: 1.19 (0.90; 1.56) Lifting 10 kg ≥10 ×/week: 1.71 (1.28; 2.29) Lifting 20 kg ≥10 ×/week: 1.63 (1.15; 2.30) Lifting 50 kg ≥10 ×/week): 1.88 (1.20; 2.92)	
Amin et al 2008 [2] USA	Cohort with exposure data collected retrospectively Description of exposure of past employment activity Patients with arthritis Time when study was performed not stated	Participants were men with symptomatic knee osteoarthritis from the Boston Osteoarthritis of the Knee Study. Mean age: 69 years old n=192 All participants were men	**Manual handling and posture** Physical factors were assessed by questions developed by the authors. Questions are stated in the article Heavy lifting was defined as lifting and moving objects weighing 25 lbs (11.36 kg) or	**Knee osteoarthritis** Cartilage morphology scoring at the tibiofermoral and patella-fermoral joint was assessed using the Whole Organ MRI Score, semi-quantitative method for knee osteo-arthritis (Peterfy et al., 2004)	Risk for worse cartilage morphology scores at the medial and lateral tibiofemoral joint and the patellofemoral joint in men with knee osteoarthritis by occupational exposure. Crude OR (95% CI) **Medial tibiofemoral joint** Heavy lifting: 1.2 (0.6; 2.3) Squatting, kneeling, heavy lifting: 1.2 (0.7; 2.2) **Lateral tibiofemoral joint** Heavy lifting: 1.2 (0.5; 2.8) Squatting, kneeling, heavy lifting: 0.8 (0.4; 1.7) **Patellofemoral joint** Heavy lifting: 1.5 (0.8; 2.6) Squatting, kneeling, heavy lifting: 1.6 (1.0; 2.7)	Risk for worse cartilage morphology scores at the medial and lateral tibiofemoral joint and the patellofemoral joint in men with knee osteoarthritis by occupational exposure. OR (95% CI) adjusted for age, body mass index and history or surgery to the imaged knee **Medial tibiofemoral joint** Heavy lifting: 1.4 (0.7; 2.6) Squatting, kneeling, heavy lifting: 1.6 (0.9; 3.0) **Lateral tibiofemoral joint** Heavy lifting: 1.2 (0.5; 2.7) Squatting, kneeling, heavy lifting: 0.8 (0.4; 1.8)

			more every day at work Squatting and kneeling was registered if it was performed for 30 min or more nearly every day at work Data was collected for the job or the occupation the participants did for the longest time	The three trained readers who scored all magnetic resonance imaging (MRI) data were blinded to occupational status of subjects		**Patellofemoral joint** Heavy lifting: 1.5 (0.8; 2.7) Squatting, kneeling, heavy lifting: 1.8 (1.1; 3.2)
Apold et al 2014 [3] Norway	Prospective cohort 12 years General population 1985–1994 1994–2006	Participants were living in 19 counties of Norway. They were listed in the arthroplasty registry. The mean age was 43 years n=315 495 161 700 women and 153 795 men	**Work load** The questions used to evaluate physical activity were first introduced in Sweden (Saltin et al., 1968), and similar questions have been used by the World Health Organization	**Knee osteoarthritis** Data on joint replacement due to primary osteoarthritis was collected from a national registry	Multivariate adjusted relative risk of knee replacement due to primary osteoarthritis. RR (95% CI) adjusted for age at screening, height, smoking, habits, body mass index and physical activity at work and at leisure time **Women** ***Physical activity at work*** Sedentary: 1 Moderate: 1.18 (1.00; 1.40) Intermediate: 1.30 (1.05; 1.61) Intensive: 2.29 (1.65; 3.18) **Men** ***Physical activity at work*** Sedentary: 1 Moderate: 1.51 (1.18; 1.95) Intermediate: 1.64 (1.24; 2.17) Intensive: 2.41 (1.83; 3.18)	–
Coggon et al 2000 [4]	Case-control study General population	Participants were persons living in three English health	**Several factors** Data were collected by interviews,	**Knee osteoarthritis** The clinical records and	Association of knee osteoarthritis with duration of exposure to selected occupational activities. OR (95% CI) adjusted for body mass	–

United Kingdom	Time when study was performed not stated	districts placed on a waiting list for knee surgery because of osteoarthritis during a 2-year period. They were identified by orthopedic surgeons and their staffs Patients who had injured their knee within the previous year or fulfilled diagnostic criteria for rheumatoid arthritis or ankylosing spondylitis were excluded For each case a control of the same sex and date of birth who was registered with the same general practitioner was chosen. Controls had not undergone previous knee surgery for osteoarthritis	using a structured questionnaire For each job information was collected about the weekly frequency of different levels of lifting. Data was also collected on whether an average working day involved any of 8 specified occupational activities including kneeling and squatting	radiographs of each patient were reviewed. The radiographic severity of osteoarthritis in the tibiofemoral compartment of the knee listed for surgery was graded according to the Kellgren-Lawrence grade	index, Heberden's nodes, and previous knee injury **Both sexes** ***Lifting ≥25 kg ≥10 times/week*** <1.0 year: 1.00 1.0–9.9 years: 1.7 (1.0; 2.9) 10.0–19.9 years: 1.4 (0.7; 2.8) ≥20.0 years: 1.9 (1.1; 3.5) ***Kneeling or squatting>1 hour/day*** <1.0 year: 1.00 1.0–9.9 years: 2.6 (1.6; 4.2) 10.0–19.9 years: 1.1 (0.6; 2.1) ≥20.0 years: 1.7 (0.9; 3.4) ***Getting up from kneeling or squatting>30 times/day*** <1.0 year: 1.00 1.0–9.9 years: 1.8 (1.1; 3.0) 10.0–19.9 years: 1.2 (0.6; 2.3) ≥20.0 years: 2.3 (1.2; 4.6) ***Walking>2 miles/day*** <1.0 year:1.00 1.0–9.9 years: 1.9 (1.2; 2.9) 10.0–19.9 years: 1.9 (1.2; 3.1) ≥20.0 years: 2.0 (1.3; 3.0) ***Climbing ladder or stairs>30 times/day*** <1.0 year: 1.00 1.0–9.9 years: 1.2 (0.7; 2.2) 10.0–19.9 years: 1.7 (0.8; 3.8) ≥20.0 years: 1.8 (1.0; 3.2) ***Combination of exposures (defined above)*** No kneeling/squatting or heavy lifting: 1.00 Kneeling/squatting but no heavy lifting: 1.7 (1.1; 2.7) Heavy lifting but no kneeling/squatting: 1.5 (0.9; 2.4)	

		n=1 036 518 cases (313 women and 205 men) and 518 controls (313 women and 205 men) 626 women and 410 men			Both kneeling/squatting and heavy lifting: 3.0 (1.7; 5.4) **Women** ***Lifting ≥25 kg ≥10 times/week*** <1.0 year: 1.00 1.0–9.9 years: 2.4 (1.1; 5.0) 10.0–19.9 years: 0.7 (0.3; 1.8) ≥20.0 years: 3.1 (0.8; 12.4) ***Standing or walking>2 hours/day*** <1.0 year: 1.00 1.0–9.9 years: 0.9 (0.4; 1.9) 10.0–19.9 years: 1.7 (0.8; 3.7) ≥20.0 years: 1.7 (0.9; 3.6) ***Kneeling or squatting>1 hour/day*** <1.0 year: 1.00 1.0–9.9 years: 2.8 (1.4; 5.5) 10.0–19.9 years: 0.8 (0.3; 2.0) ≥20.0 years: 3.2 (0.8; 13.0) ***Getting up from kneeling or squatting>30 times/day*** <1.0 year: 1.00 1.0–9.9 years: 2.00 (1.0; 3.9) 10.0–19.9 years: 0.9 (0.3; 2.6) ≥20.0 years: 3.9 (0.8; 18.8) ***Walking>2 miles/day*** <1.0 year:1.00 1.0–9.9 years: 2.3 (1.3; 3.9) 10.0–19.9 years: 1.7 (0.9; 3.0) ≥20.0 years: 2.2 (1.3; 4.0) ***Climbing ladder stairs>30 times/day*** <1.0 year: 1.00 1.0–9.9 years: 0.7 (0.3; 1.7) 10.0–19.9 years: 0.7 (0.1; 3.9) ≥20.0 years: 1.0 (0.2; 6.1)	

					Combination of exposures (defined above) No kneeling/squatting or heavy lifting: 1.00 Kneeling/squatting but no heavy lifting: 1.6 (0.9; 3.0) Heavy lifting but no kneeling/squatting: 1.2 (0.6; 2.3) Both kneeling/squatting and heavy lifting: 4.2 (1.5; 12.1) **Men** ***Lifting ≥25 kg ≥10 times/week*** <1.0 year: 1.00 1.0–9.9 years: 1.2 (0.6; 2.7) 10.0–19.9 years: 2.6 (0.9; 7.5) ≥20.0 years: 1.8 (0.9; 3.7) ***Standing or walking>2 hours/day*** <1.0 year: 1.00 1.0–9.9 years: 3.8 (0.2; 83.6) 10.0–19.9 years: 5.7 (0.3; 107.3) ≥20.0 years: 4.1 (0.3; 65.6) ***Kneeling or squatting>1 hour/day*** <1.0 year: 1.00 1.0–9.9 years: 3.0 (1.4; 6.1) 10.0–19.9 years: 1.3 (0.5; 3.2) ≥20.0 years: 1.7 (0.7; 4.0) ***Getting up from kneeling or squatting>30 times/day*** <1.0 year: 1.00 1.0–9.9 years: 2.1 (1.0; 4.3) 10.0–19.9 years: 1.3 (0.6; 3.2) ≥20.0 years: 2.3 (1.0; 5.3) ***Walking>2 miles/day*** <1.0 year:1.00 1.0–9.9 years: 1.4 (0.6; 3.3) 10.0–19.9 years: 2.9 (1.1; 7.7) ≥20.0 years 1.7 (0.8; 3.8)	

					Climbing a ladder or flight of stairs >30 times/day <1.0 year: 1.00 1.0–9.9 years: 2.1 (0.9; 5.0) 10.0–19.9 years: 2.5 (1.0; 6.4) ≥20.0 years: 2.2 (1.1; 4.5) ***Combination of exposures (defined above)*** No kneeling/squatting or heavy lifting: 1.00 Kneeling/squatting but no heavy lifting: 2.0 (0.9; 4.4) Heavy lifting but no kneeling/squatting: 1.6 (0.8; 3.5) Both kneeling/squatting and heavy lifting: 2.9 (1.3; 6.6)	
Coggon et al 1998 [5] United Kingdom	Case-control study General population 1993–1995	Participants were patients listed for hip replacement because of osteoarthritis over an 18–month period (cases) and an equal number of controls selected from the general population Cases did not have a history of lower limb fracture in the past year, rheumatoid arthritis, ankylosing spondylitis, or other documented	**Several factors** Information about suspected risk factors was obtained by a questionnaire developed by the authors	**Hip osteoarthritis** The cases comprises patients who were placed on the waiting list for total hip replacement for osteoarthritis over an 18-month period and who did not have a history of lower limb fracture in the past year, rheumatoid arthritis, ankylosing spondylitis, or other documented causes of secondary osteoarthritis	Association of hip osteoarthritis with occupational exposure. OR (95% CI) adjusted for body mass index, the presence of Heberden's nodes and history of hip injury **Both sexes** ***Lifting-Duration (≥10 kg)*** *Up to age 30 years (ref: 0 years)* 0.1–4.9: 0.8 (0.5; 1.3) 5.0–9.9: 1.0 (0.6; 1.7) ≥10.0: 1.9 (1.2; 3.0) *Up to 10 years before entry into study (ref: 0 years)* 0.1–9.9: 0.9 (0.6; 1.4) 10.0–19.9: 1.2 (0.7; 2.2) ≥20.0: 1.5 (1.0; 2.3) ***Lifting-Prolonged (max level of lifting (kg) for at least 10 years)*** *Up to age 30 years (ref: <10 years)* 10–24: 1.2 (0.8; 1.9) 25–49: 1.9 (1.1; 3.4) ≥50: 2.1 (1.1; 3.9) *Up to 10 years before entry*	–

		causes of secondary osteoarthritis Controls were individually matched to cases (patients) for age, sex, and general practice. Controls who had undergone previous hip surgery for osteoarthritis were excluded, as were those who declined to participate in the study The mean age was 70 years old n=1 222 611 cases (401 women and 210 men) and 611 controls (401 women and 210 men) 802 women and 420 men			*into study (ref: <10 years)* 10–24: 1.0 (0.7; 1.4) 25–49: 1.1 (0.7; 1.8) ≥50: 1.8 (1.1; 2.9) ***Other exposures*** *Sitting-Duration of exposure (ref: 0 years)* Up to 10 years: 1.0 (0.7; 1.4) 10–20: 1.2 (0.9; 1.8) >20: 0.9 (0.6; 1.2) *Standing-Duration of exposure (ref: 0 years)* Up to 10 years: 1.0 (0.6; 1.7) 10–20: 1.0 (0.6; 1.7) >20: 1.2 (0.7; 1.9) *Kneeling-Duration of exposure (ref: 0 years)* Up to 10 years: 0.9 (0.6; 1.2) 10–20: 1.0 (0.6; 1.7) >20: 1.1 (0.7; 1.7) *Squatting-Duration of exposure (ref: 0 years)* Up to 10 years: 1.0 (0.7; 1.5) 10–20: 1.5 (0.8; 2.7) >20: 0.9 (0.6; 1.4) *Driving-Duration of exposure (ref: 0 years)* Up to 10 years: 1.8 (1.0; 3.1) 10–20: 0.7 (0.3; 1.5) >20: 1.0 (0.5; 1.9) *Walking-Duration of exposure (ref: 0 years)* Up to 10 years: 1.3 (0.9; 1.9) 10–20: 1.4 (0.9; 2.0) >20: 1.3 (0.9; 1.8) *Climbing-Duration of exposure (ref: 0 years)* Up to 10 years: 1.3 (0.9; 1.9) 10–20: 1.7 (1.0; 3.1) >20: 1.7 (1.0; 2.8)	

					Women ***Lifting-Duration (≥10 kg)*** *Up to age 30 years (ref: 0 years)* 0.1–4.9: 1.0 (0.5; 2.0) 5.0–9.9: 0.8 (0.4; 1.7) ≥10.0: 1.2 (0.5; 2.6) *Up to 10 years before entry into study (ref: 0 years)* 0.1–9.9: 1.1 (0.6; 1.7) 10.0–19.9: 1.4 (0.7; 2.9) ≥20.0: 0.8 (0.4; 1.5) ***Lifting-Prolonged (max level of lifting (kg) for at least 10 years)*** *Up to age 30 years* <10: 1.0 10–24: 1.0 (0.6; 1.8) 25–49: 0.8 (0.3; 2.5) ≥50: 1.7 (0.5; 6.1) *Up to 10 years before entry into study* <10: 1.0 10–24: 0.9 (0.6; 1.3) 25–49: 0.9 (0.5; 1.7) ≥50: 1.1 (0.5; 2.5) ***Other exposure*** *Sitting-Duration of exposure (ref: 0 years)* Up to 10 years: 0.9 (0.6; 1.3) 10–20: 1.2 (0.8; 1.8) >20: 0.9 (0.6; 1.3) *Standing-Duration of exposure (ref: 0 years)* Up to 10 years: 1.1 (0.6; 2.0) 10–20: 1.1 (0.6; 1.9) >20: 1.3 (0.7; 2.1) *Kneeling-Duration of exposure (ref: 0 years)* Up to 10 years: 0.9 (0.6; 1.4) 10–20: 0.7 (0.4; 1.3)	

					>20: 1.2 (0.5; 3.0) *Squatting-Duration of exposure (ref: 0 years)* Up to 10 years: 1.1 (0.6; 1.9) 10–20: 1.5 (0.6; 3.4) >20: 0.7 (0.3; 1.8) *Driving-Duration of exposure (ref: 0 years)* Up to 10 years: 4.0 (1.2; 13.7) 10–20: 2.7 (0.3; 26.5) >20: – *Walking-Duration of exposure (ref: 0 years)* Up to 10 years: 1.5 (1.0; 2.3) 10–20: 1.5 (1.0; 2.3) >20: 1.3 (0.8; 2.0) *Climbing-Duration of exposure (ref: 0 years)* Up to 10 years: 1.4 (0.8; 2.2) 10–20: 1.3 (0.4; 4.0) >20: 2.3 (0.8; 6.3) **Men** ***Lifting-Duration (≥10 kg)*** *Up to age 30 years (ref: 0 years)* 0.1–4.9: 0.6 (0.2; 1.3) 5.0–9.9: 1.6 (0.7; 3.7) ≥10.0: 2.7 (1.4; 5.1) *Up to 10 years before entry into study (ref: 0 years)* 0.1–9.9: 0.8 (0.4; 1.7) 10.0–19.9: 1.5 (0.6; 3.8) ≥20.0: 2.3 (1.3; 4.4) ***Lifting-Prolonged (max level of lifting (kg) for at least 10 years)*** *Up to age 30 years* <10: 1.0 10–24: 1.7 (0.9; 3.4) 25–49: 3.0 (1.5; 6.3)	

					≥50: 2.9 (1.3; 6.4) *Up to 10 years before entry into study* <10: 1.0 10–24: 1.4 (0.7; 3.0) 25–49: 1.9 (0.9; 3.9) ≥50: 3.2 (1.6; 6.5) ***Other exposure*** *Sitting-Duration of exposure (ref: 0 years)* Up to 10 years: 1.8 (0.9; 3.7) 10–20: 1.7 (0.7; 3.9) >20: 1.0 (0.6; 1.7) *Standing-Duration of exposure (ref: 0 years)* Up to 10 years: 0.2 (0.0; 1.4) 10–20: 0.4 (0.1; 2.4) >20: 0.5 (0.1; 2.3) *Kneeling-Duration of exposure (ref: 0 years)* Up to 10 years: 0.8 (0.4; 1.4) 10–20: 2.0 (0.8; 4.7) >20: 1.0 (0.6; 1.7) *Squatting-Duration of exposure (ref: 0 years)* Up to 10 years: 0.9 (0.5; 1.6) 10–20: 1.4 (0.5; 3.6) >20: 0.9 (0.5; 1.6) *Driving-Duration of exposure (ref: 0 years)* Up to 10 years: 1.3 (0.7; 2.6) 10–20: 0.5 (0.2; 1.3) >20: 0.9 (0.4; 1.8) *Walking-Duration of exposure (ref: 0 years)* Up to 10 years: 0.8 (0.4; 1.9) 10–20: 1.1 (0.4; 2.5) >20: 1.2 (0.6; 2.5) *Climbing-Duration of exposure (ref: 0 years)* Up to 10 years: 1.3 (0.7; 2.5)	

					10–20: 2.3 (1.1; 4.9) >20: 1.8 (0.9; 3.4)	
Cooper et al 1994 [6] United Kingdom	Case-control study General population Time when study was performed not stated	Participants were men and women aged 55 years and over who were registered with a large general practice in Bristol. Each member of the study population was sent a postal questionnaire asking about knee pain Cases had radiographic evidence of moderate or severe osteoarthritis. This was defined as changes in a tibiofemoral compartment graded 3 or 4 on the Kellgren and Lawrence scale or a grade of 3 for both joint space narrowing and osteophyte formation in a patellofemoral joint according	**Several factors** Data were collected by interviewers who were blind to case-control status. The information sought included a lifetime occupational history with details of whether the main job entailed eight specific physical activities: squatting, kneeling, stair-climbing, heavy lifting, walking, standing, sitting, and driving	**Knee osteoarthritis** Interview and knee radio-graphy were assessed to confirm knee osteoarthritis. Moderate or severe osteo-arthritis was defined as changes in a tibiofemoral compartment graded 3 or 4 on the Kellgren and Lawrence scale or a grade of 3 for both joint space narrowing and osteophyte formation in a patella-femoral joint according to the Radiographic Atlas of Knee Osteoarthritis	Associations between knee osteoarthritis and reported occupational activities in main job. OR (95% CI) adjusted for body mass index and the presence or absence of Heberden's nodes. Squatting (>30 min/day): 6.9 (1.8; 26.4) Kneeling (>30 min/day): 3.4 (1.3; 9.1) Climbing stairs (>10 flights/day): 2.7 (1.2; 6.1) Lifting>25 kg in average working day): 1.4 (0.5; 3.7) Walking (>2 miles/day): 0.9 (0.5; 1.5) Standing (>2 hours/day): 0.8 (0.4; 1.4) Sitting (>2 hours/day): 1.2 (0.7; 2.1) Driving (>4 hours/day): 1.4 (0.3; 5.8)	–

		to the Radiographic Atlas of Knee Osteoarthritis. These 109 individuals (30 men and 79 women) were classed as cases Controls were selected from questionnaire respondents who reported no knee pain, and who had minimal or no features of osteoarthritis in either knee on X-ray. Two controls were selected for each case, individually matched by sex and age to within two years n=327 109 cases and 218 control 237 women and 90 men				
Croft et al 1992 [7]	Case-control study	Participants were 60–75 years old men	**Several factors** Data were collected by	**Hip osteoarthritis**	Associations between hip osteoarthritis and lifetime duration of exposure to occupational	–

United Kingdom Information on severe cases are included in the table. Note that that severe cases include few participants	General population Time when study was performed not stated	who had undergone intravenous urography of the North Staffordshire and Shrewsbury hospitals during 1982–1987 The cases and referents were approached through their general practitioners to exclude those who had died since radiograph examination and those who were too ill to be seen n=539 245 cases and 294 control All participants were men	interviewers who were blind to case-control status. The subjects' occupations were coded according to the 1970 classification of the Office of Population Censuses and Surveys	The cases comprises patients who had a hip replacement for osteoarthritis or a joint space of ≤2.5 mm at least one hip Control subjects had a joint space ≥3.5 mm in both hips and who showed no other radiographic evidence of osteoarthritis (no osteophytes, no cysts, and no subchondral sclerosis of more than 5 mm in thickness)	activities. OR (95% CI) adjusted for age and hospital group **Sitting for>2h/day** ***All cases*** <1 year: 1.0 1–19 years: 1.1 (0.7; 1.7) ≥20 years: 1.2 (0.8; 1.8) ***Severe cases (n=14; 16; 18)*** <1 year: 1.0 1–19 years: 1.0 (0.4; 2.2) ≥20 years: 0.8 (0.3; 1.7) **Standing for>2h/day** ***All cases*** <20 year: 1.0 20–39 years: 1.8 (1.0; 3.1) ≥40 years: 1.7 (1.0; 2.8) ***Severe cases*** <20 year: 1.0 20–39 years: 1.5 (0.5; 4.8) ≥40 years: 2.7 (1.0; 7.3) **Bending for>2h/day** ***All cases*** <1 year: 1.0 1–19 years: 0.7 (0.4; 1.1) ≥20 years: 1.2 (0.7; 1.9) ***Severe cases*** <1 year: 1.0 1–19 years: 0.8 (0.3; 2.0) ≥20 years: 1.9 (0.8; 4.5) **Kneeling for>2h/day** ***All cases*** <1 year: 1.0 1–19 years: 0.6 (0.4; 1.0) ≥20 years: 0.7 (0.4; 1.3) ***Severe cases*** <1 year: 1.0 1–19 years: 0.5 (0.2; 1.4)	

					≥20 years: 1.0 (0.3; 3.2) **Squatting for>30 min/day** ***All cases*** <1 year: 1.0 ≥1 years: 0.7 (0.4; 1.4) ***Severe cases*** <1 year: 1.0 ≥1 years: 1.3 (0.4; 3.6) **Walking for>3.2 km/day** ***All cases*** <1 year: 1.0 1–19 years: 0.8 (0.5; 1.5) ≥20 years: 0.8 (0.5; 1.5) ***Severe cases*** <1 year: 1.0 1–19 years: 1.4 (0.4; 4.6) ≥20 years: 1.6 (0.5; 5.1) **Climbing ladders** ***All cases*** <1 year: 1.0 1–19 years: 0.9 (0.6; 1.4) ≥20 years: 0.8 (0.5; 1.5) ***Severe cases*** <1 year: 1.0 1–19 years: 0.8 (0.3; 1.8) ≥20 years: 1.6 (0.7; 3.8) **Climbing>30 flights of stairs/day** ***All cases*** <1 year: 1.0 ≥1 years: 1.0 (0.6; 1.5) ***Severe cases*** <1 year: 1.0 ≥1 years: 1.2 (0.6; 2.5) **Lifting or moving weights>25.4 kg by hand** ***All cases*** <1 year: 1.0	

					1–19 years: 0.9 (0.6; 1.4) ≥20 years: 1.2 (0.7; 1.9) ***Severe cases (n=14; 16; 18)*** <1 year: 1.0 1–19 years: 1.2 (0.5; 2.9) ≥20 years: 2.5 (1.1; 5.7) **Driving for>4 h/day** ***All cases*** <1 year: 1.0 ≥1 years: 0.8 (0.5; 1.2) ***Severe cases*** <1 year: 1.0 ≥1 years: 0.9 (0.4; 1.8)	
D'Souza et al 2008 [8] USA	Cohort with exposure data collected retrospectively Description of exposure in each subjects longest held job (in average 26 years) General population Time when study was performed not stated	Participants were civilian, non-institutionalized persons who had knee X-rays The analysis was restricted to subjects who were in their longest held job for at least five years. Persons who reported physician-diagnosed rheumatoid arthritis, had a Kellgren and Lawrence grade in at least one knee, or knee replacement surgery were excluded. Only exposures from	**Several factors** Occupational physical exposures were assessed using expert consensus ratings. Five ergonomic experts were invited to rate job categories with regards to the percent of the work day spent in different activities. The experts rated these activities on an 11-point scale ranging from 0–100, with 10 unit intervals. Each unit represented	**Knee osteoarthritis** Symptomatic knee osteoarthritis was defined as Kellgren Lawrence grade ≥2 in at least one knee and self-reported knee symptom(s) in the corresponding knee; or knee replacement surgery Severe symptomatic knee osteo-arthritis was defined as: Kellgren Lawrence grade ≥3 in at least	Association of mean occupational ratings and knee osteoarthritis. Unadjusted analyses of OR (95% CI) **Both sexes** Sitting: 0.83 (0.75; 0.92) Standing: 1.34 (1.10; 1.63) Walking: 1.43 (1.15; 1.77) Kneeling: 1.29 (1.10; 1.51) Heavy lifting: 1.25 (1.12; 1.39) Working in a cramped space: 1.21 (0.99; 1.48)	Adjusted OR of knee osteoarthritis associated with occupational activity (Exposure Quartiles). OR (95% CI) adjusted for age, gender, body mass index, smoking, Heberden's nodes, current sports/activities, occupational activities **Both sexes** ***Symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 0.68 (0.39; 1.18) 32<–≤54: 0.74 (0.34; 1.60) 54<: 0.50 (0.20; 1.25) *Standing (% of work day)* <26: 1.0 26≤–≤30: 1.42 (0.88; 2.31) 30<–≤36: 1.92 (1.06; 3.46) 36<: 1.36 (0.73; 2.54) *Walking (% of work day)* <16: 1.0 16≤–≤20: 1.41 (0.74; 2.71) 20<–≤30: 1.49 (0.67; 3.29) 30<: 1.83 (0.83; 4.07)

		the subjects' longest held job were considered The mean age was 70 years n=1 970 916 women and 1 054 men	10% of the work day Two ergonomic experts rated the job titles using a reduced rating scale (5-point scale) that could be cross-walked to the 11-point scale	one knee and self-reported knee symptom(s) in the corresponding knee; or knee replacement surgery		*Kneeling (% of work day)* <4: 1.0 4≤–≤8: 1.09 (0.58; 2.06) 8<–≤14: 1.23 (0.81; 1.87) 14<: 2.37 (1.27; 4.45) *Heavy lifting (% of work day)* <4: 1.0 4≤–≤8: 1.30 (0.73; 2.29) 8<–≤14: 1.45 (0.87; 2.43) 14<: 2.00 (1.02; 3.93) *Working in a cramped space (% of work day)* 0: 1.0 0<–<6: 0.84(0.46; 1.55) 6<–≤16: 1.19 (0.64; 2.23) 16<: 1.41 (0.72; 2.74) ***Severe symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 0.69 (0.36; 1.33) 32<–≤54: 0.75 (0.25; 2.22) 54<: 0.51 (0.17; 1.58) *Standing (% of work day)* <26: 1.0 26≤–≤30: 1.68 (0.81; 3.52) 30<–≤36: 2.08 (0.94; 4.58) 36<: 0.89 (0.31; 2.55) *Walking (% of work day)* <16: 1.0 16≤–≤20: 0.99 (0.46; 2.12) 20<–≤30: 1.02 (0.37; 2.81) 30<: 1.42 (0.48; 4.20) *Kneeling (% of work day)*

						<4: 1.0 4≤–≤8: 0.61 (0.28; 1.33) 8<–≤14: 1.32 (0.74; 2.34) 14<: 2.34 (1.07; 5.12) *Heavy lifting (% of work day)* <4: 1.0 4≤–≤8: 2.04 (1.04; 3.99) 8<–≤14: 2.03 (1.06; 3.91) 14<: 2.45 (1.17; 5.16) Working in a cramped space *(% of work day)* 0: 1.0 0<–<6: 1.41(0.57; 3.49) 6<–≤16: 1.89 (0.79; 4.52) 16<: 2.21 (1.08; 4.51) **Women** ***Symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 1.10 (0.46; 2.59) 32<–≤54: 1.11 (0.46; 3.04) 54<: 0.60 (0.19; 1.93) *Standing (% of work day)* <26: 1.0 26≤–≤30: 1.78 (0.99; 3.19) 30<–≤36: 2.28 (1.09; 4.77) 36<: 1.44 (0.66; 3.14) *Walking (% of work day)* <16: 1.0 16≤–≤20: 1.52 (0.64; 3.61) 20<–≤30: 1.42 (0.57; 3.52) 30<: 2.00 (0.84; 4.75) *Kneeling (% of work day)* <4: 1.0 4≤–≤8: 0.99 (0.50; 1.96)

						8<–≤14: 1.15 (0.69; 1.90) 14<: 1.31 (0.56; 3.07) *Heavy lifting (% of work day)* <4: 1.0 4≤–≤8: 1.14 (0.63; 2.07) 8<–≤14: 1.57 (0.77; 3.21) 14<: 1.40 (0.51; 3.82) *Working in a cramped* space *(% of work day)* 0: 1.0 0<–<6: 0.86(0.49; 1.89) 6<–≤16: 1.19 (0.52; 2.69) 16<: 1.01 (0.42; 2.43) ***Severe symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 1.24 (0.67; 2.32) 32<–≤54: 1.13 (0.36; 3.52) 54<: 0.52 (0.17; 1.59) *Standing (% of work day)* <26: 1.0 26≤–≤30: 2.84 (1.35; 5.95) 30<–≤36: 3.33 (1.51; 7.36) 36<: 1.44 (0.52; 3.88) *Walking (% of work day)* <16: 1.0 16≤–≤20: 1.79 (0.86; 3.74) 20<–≤30: 1.86 (0.59; 5.81) 30<: 2.72 (0.91; 8.16) Kneeling *(% of work day)* <4: 1.0 4≤–≤8: 0.67 (0.25; 1.82) 8<–≤14: 1.18 (0.64; 2.18) 14<: 1.30 (0.46; 3.68)

						Heavy lifting (% of work day) <4: 1.0 4≤–≤8: 1.84(1.03; 3.20) 8<–≤14: 2.06 (1.05; 4.06) 14<: 1.18 (0.54; 2.59) *Working in a cramped space (% of work day)* 0: 1.0 0<–<6: 1.34(0.44; 4.06) 6<–≤16: 1.72 (0.74; 3.99) 16<: 2.46 (1.16; 5.21) **Men** ***Symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 0.42 (0.18; 0.96) 32<–≤54: 0.50 (0.16; 1.54) 54<: 0.46 (0.17; 1.22) *Standing (% of work day)* <26: 1.0 26≤–≤30: 1.15 (0.49; 2.71) 30<–≤36: 1.53 (0.66; 3.55) 36<: 1.37 (0.68; 2.77) *Walking (% of work day)* <16: 1.0 16≤–≤20: 1.19 (0.55; 2.58) 20<–≤30: 1.56 (0.58; 4.19) 30<: 1.59 (0.48; 5.23) Kneeling *(% of work day)* <4: 1.0 4≤–≤8: 1.37 (0.39; 4.87) 8<–≤14: 1.47 (0.80; 2.73) 14<: 3.08 (1.31; 7.21) *Heavy lifting (% of work day)* <4: 1.0

						4≤–≤8: 1.78(0.54; 5.87) 8<–≤14: 1.50 (0.57; 3.93) 14<: 2.72 (1.14; 6.50) *Working in a cramped space (% of work day)* 0: 1.0 0<–<6: 0.86(0.26; 2.87) 6<–≤16: 1.34 (0.42; 4.24) 16<: 1.79 (0.64; 5.01) ***Severe symptomatic knee osteoarthritis*** *Sitting (% of work day)* <22: 1.0 22≤–≤32: 0.25 (0.08; 0.72) 32<–≤54: 0.41 (0.09; 2.53) 54<: 0.56 (0.19; 1.64) *Standing (% of work day)* <26: 1.0 26≤–≤30: 0.95 (0.30; 3.01) 30<–≤36: 1.01 (0.35; 2.91) 36<: 0.43 (0.09; 1.96) *Walking (% of work day)* <16: 1.0 16≤–≤20: 0.35 (0.13; 0.91) 20<–≤30: 0.50 (0.16; 1.61) 30<: 0.50 (1.12; 2.18) *Kneeling (% of work day)* <4: 1.0 4≤–≤8: 0.42 (0.03; 6.38) 8<–≤14: 1.72 (0.6; 4.92) 14<: 3.04 (0.94; 9.87) *Heavy lifting (% of work day)* <4: 1.0 4≤–≤8: 3.47(0.52; 23.07) 8<–≤14: 2.46 (0.52; 11.66)

						14<: 4.94 (0.99; 24.48) *Working in a cramped space (% of work day)* 0: 1.0 0<–<6: 1.54(0.34; 7.0) 6<–≤16: 2.57 (0.50; 13.19) 16<: 2.15 (0.55; 8.32)
Ezzat et al 2013 [9] Canada	Cohort with exposure data collected retrospectively General population Description of exposer in each subjects longest held job (in average 26 years) 2002–2009	The participants were from two different cohorts, recruited from the greater Vancouver area, Canada The first population-based cohort tries to identify early knee osteoarthritis using a combination of clinical tests, imaging techniques, and biomarkers. The second cohort consisted of a population-based sample of people without knee pain Age: 40–79 years old n=328	**Work load** Exposure data was collected with a standardized questionnaire Cumulative occupational physical load was categorized into quarters Data was listed on occupations held for at least 12 months after age 18 years, including occupations such as homemaker, student, or retiree	**Knee osteoarthritis** Three definitions of osteoarthritis were applied Radiographic osteoarthritis was chosen if the knee radiograph received a Kellgren/Lawrence grade ≥2 Symptomatic osteoarthritis was defined as having a Kellgren/Lawrence grade ≥2 in addition to knee pain Magnetic resonance imaging-osteoarthritis was based on the definition by Hunter et al., 2011, excluding	Multivariable logistic regression models for radiographic osteoarthritis, symptomatic osteoarthritis and magnetic resonance imaging-osteoarthritis. Crude OR (95% CI) **Radiographic osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 2.43 (0.93; 6.35) 3rd quartile: 5.47 (2.17; 13.81) 4th quartile: 3.80 (1.34; 10.79) **Symptomatic osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 3.16 (0.74; 13.52) 3rd quartile:: 7.12 (1.78; 24.44) 4th quartile: 10.56 (2.58; 43.21) **Magnetic resonance imaging-osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 7.49 (2.29; 24.49) 3rd quartile: 10.88 (3.30; 35.88) 4th quartile: 12.01 (3.46; 41.71)	Multivariable logistic regression models for radiographic osteoarthritis, symptomatic osteoarthritis and magnetic resonance imaging-osteoarthritis. OR (95% CI) adjusted for age, sex, and body mass index **Radiographic osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 2.35 (0.86; 6.36) 3rd quartile: 4.19 (1.55; 11.34) 4th quartile: 3.15 (1.02; 9.70) **Symptomatic osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 3.06 (0.70; 13.39) 3rd quartile: 5.73 (1.36; 24.12) 4th quartile: 8.16 (1.89; 35.27) **Magnetic resonance imaging-osteoarthritis** ***Cumulative occupational physical load*** 2nd quartile: 7.18 (2.17; 23.70) 3rd quartile: 9.04 (2.65; 30.88) 4th quartile: 9.54 (2.65; 34.27)

		167 women and 161 men		the bone attrition criterion		
Flugsrud et al 2008 [10] Norway	Prospective cohort Average of 9 years General population 1977–1998	Participants were persons born between 1925 and 1942, in the county of Finnmark Those who did not attend the screening; died or emigrated before the start of follow-up or already had a total hip replacement at the start of follow-up according to the Norwegian arthroplasty register were excluded from the analysis The median age at screening was 47 years (range 34–59 years) n=50 034 25 037 women and 24 997 men	**Work load** Exposure data was collected with a standardized questionnaire The question concerning physical activity during work has been validated against a 7-day diary (Stender et al., 1991)	**Total hip replacement due to primary osteoarthritis** The data on hip replacements due to osteoarthritis were collected from the Norwegian arthroplasty register For every total hip replacement (and hip implant revision) done in Norwegian hospitals, a form was completed to record previous hip surgery in either hip, the indication for surgery, the implants used, and other parameters related to the operation	Relative risks for total hip replacement due to primary osteoarthritis in a middle-age population attending a cardiovascular screening in three Norwegian counties. RR (95% CI) adjusted for age at screening, body height, body mass index (not for body weight), physical activity at work, physical activity in leisure, marital status, and smoking habits **Women** Sedentary: 1.0 Moderate physical activity: 1.1 (0.8; 1.6) Intermediate physical activity: 1.4 (0.9; 2.0) Intense physical activity: 2.1 (1.3; 3.3) ***Men*** Sedentary: 1.0 Moderate physical activity: 1.5 (1.0; 2.2) Intermediate physical activity: 1.7 (1.1; 2.4) Intense physical activity: 2.1 (1.5; 3.0)	Relative risks for total hip replacement due to primary osteoarthritis at different levels of body mass index and physical activity at work in a middle-age population attending a cardiovascular screening in three Norwegian counties. RR (95% CI) adjusted for age at screening, body height, physical activity in leisure, marital status and smoking habits **Women** ***Sedentary*** *Body mass index* ≤22.2: 1.0 22.3–24.2: 1.4 (0.5; 3.7) 24.3–27.0: 1.3 (0.5; 3.5) ≥27.1: 2.6 (1.0; 6.6) ***Moderate physical activity*** *Body mass index* ≤22.2: 1.0 (0.4; 2.3) 22.3–24.2: 1.1 (0.5; 2.6) 24.3–27.0: 1.8 (0.8; 3.9) ≥27.1: 3.1 (1.4; 6.8) ***Intermediate physical activity*** *Body mass index* ≤22.2: 1.2 (0.4; 3.1) 22.3–24.2: 1.7 (0.7; 4.2) 24.3–27.0: 2.2 (0.9; 5.0) ≥27.1: 3.6 (1.6; 8.1) ***Intense physical activity*** *Body mass index* ≤22.2: 1.6 (0.4; 6.4) 22.3–24.2: 2.2 (0.7; 6.6) 24.3–27.0: 4.8 (1.9; 11.8)

						≥27.1: 4.6 (1.1; 11.2) ***Men*** ***Sedentary*** *Body mass index* ≤23.4: 1.0 23.5–25.2: 1.4(0.5; 3.7) 25.3–27.3: 1.3 (0.5; 3.5) ≥27.4: 2.6 (1.0; 6.6) ***Moderate physical activity*** *Body mass index* ≤23.4: 1.1 (0.5; 2.7) 23.5–25.2: 0.9(0.4; 2.1) 25.3–27.3: 1.3 (0.6; 2.9) ≥27.4: 2.7 (1.3; 0.6)* ***Intermediate physical activity*** *Body mass index* ≤23.4: 1.2 (0.5; 2.8) 23.5–25.2: 2.0(0.9; 4.3) 25.3–27.3: 1.4 (0.6; 3.1) ≥27.4: 2.0 (1.0; 4.3) ***Intensive physical activity*** *Body mass index* ≤23.4: 1.0 (0.4; 2.4) 23.5–25.2: 2.3(1.1; 4.9) 25.3–27.3: 2.5 (1.2; 5.2) ≥27.4: 2.5 (1.2; 5.1) *Data appears to be mistyped in article
Fontana et al 2007 [11] France	Case-control study Patients with and without carpo-metacarpal osteoarthritis	Participants were patients with and without carpo-metacarpal osteoarthritis from two institutions located in the	**Time for rest** A questionnaire developed by the author was used to collect information about all occupations held for at least	**Carpo-metacarpal osteoarthritis** Medical history data were collected for the case subjects up to the date of the first	Association of occupational factors carpo-metacarpal osteoarthritis. Unadjusted analyses of OR (95% CI) **Repetitive thumb use** 11.91 (3.65; 38.86)	–

	Time when study was performed not stated	same urban area, and case and control subjects were drawn from the same district area in France The case subjects were 61 white women who were surgically treated for advanced primary carpo-metacarpal osteoarthritis in a specialty hand surgery center. Control subjects were matched by ethnicity and 5-year age interval and were consecutively recruited in a department of orthopedic surgery None of the control subjects had a history or showed features of carpo-metacarpal osteoarthritis	6 months since leaving school. The questions are stated in the article All case and control subjects were interviewed face to face by the same interviewer using a detailed structured and standardized interview	diagnosis with special emphasis on factors known or supposed to contribute to the development of hand osteoarthritis or carpo-metacarpal osteoarthritis, assessed as yes/no, such as family history of carpo-metacarpal osteoarthritis or at least one relative with carpo-metacarpal osteoarthritis or thumb trauma history	**Jobs perceived by subjects as having "Not enough rest breaks during a day"** 5.95 (1.66; 21.28) Data on repetitive thumb use is based on 26 cases and 10 control subjects Data on rests is based on 50 cases and 70 control subjects	

		Mean age: 64±9 years old (cases) and 60±10 years old (controls) n=61 cases (5 who never had worked) n=120 controls (14 subjects who never worked) All participants were women				
Haara et al 2003 [12] Finland	Prospective cohort General population 15–17 years follow-up 1978–1994	Participants were a two stage stratified cluster sample drawn from the population register to represent Finnish adults aged 30 years or over. In the first stage, 40 representative areas were selected. In the second stage, a systematic sample of inhabitants was drawn from each area n=5 844	**Work load** A basic questionnaire was used to collect information about occupations involving exposure to lifting or carrying heavy objects, awkward work postures, vibration, continuously repeated series of movement and paced work If the participant was exposed to one of the above	**Osteoarthritis in finger joints** Osteoarthritis was diagnosed on the basis of medical history and symptoms and physical examination and then further divide into different diagnostic subcategories Radiographs were read by radiologist who was un unaware of the clinical findings. Kellergren-Lawrence grade was used to	Odds ratio (95% CI) for osteoarthritis of Kellgren-Lawrence grades 2 to 4 in any finger joint and its subcategory, osteoarthritis in at least two distal interphalangeal joints symmetrically, according to age, sex, educational level, body mass index, history of workload and history of smoking **Women** ***Osteoarthritis in any finger joint*** *History of workload* 0: 1.00 1: 0.97 (0.68; 1.38) 2: 1.54 (1.12; 2.10) 3: 1.63 (1.03; 2.59) 4: 1.21 (0.66; 2.22) 5: 10.97 (1.25; 95.90) ***Osteoarthritis symmetrically in at least two distal interphalangeal joints*** *History of workload* 0: 1.00 1: 1.10 (0.76; 1.61) 2: 1.45 (1.06; 2.00) 3: 1.37 (0,84; 2.22)	–

		3 509 women and 2 335 men	mentioned exposures they answered yes (dichotomous answer yes or no). The total number of these risk factors was designated "the sum index of physical stress at work"	classify the osteoarthritis	4: 1.81 (0.90; 3.62) 5: 1.46 (0.33; 6.51) **Men** **Osteoarthritis in any finger joint** *History of workload* 0: 1.00 1: 1.30 (0.87; 1.96) 2: 1.18 (0.81; 1.72) 3: 1.23 (0.82; 1.84) 4: 1.41 (0.81; 2.46) 5: 1.75 (0.78; 3.91) ***Osteoarthritis symmetrically in at least two distal interphalangeal joints*** *History of workload* 0: 1.00 1: 1.53 (0.82; 2.84) 2: 0.95 (0.51; 1.76) 3: 1.40 (0.73; 2.70) 4: 1.71 (0.68; 4.33) 5: 2.72 (0.86; 8.58)	
Jarvholm et al 2004 [13] Sweden	Case-control study Construction workers 1987–1988	Participants were workers in the Swedish construction industry who participated in health checks on regular basis, from the late 1960s until 1993 in a nationwide occupational health project (Bygghälsan) The analysis was restricted to men with a	**Vibration** Exposure data on whole-body vibration was estimated and classified into four grades (none or very low, low, medium and high) by an experienced occupational hygienist The classification of whole-body vibration was	**Joint replacement due to osteoarthritis in the hip** The data on joint replacements due to osteoarthritis in the hip were collected from the Swedish Hospital Discharge Register To be classified as a case the	Risk of joint replacement due to osteoarthritis in the hip among operators of heavy vehicles with high or moderate whole-body vibration. RR (95% CI) adjusted for age, smoking and body mass index **Construction workers vs office workers** Vibration: 0.82 (0.51; 1.24) **Construction workers vs painters and electricians** Vibration: 0.84 (0.53; 1.28)	–

		body mass index between 17 and 35 kg/m^2 and known smoking habits Construction workers were exposed to whole-body vibration from heavy vehicles Office workers, painters and electricians were selected as reference groups. They had no or non-significant exposure to whole-body vibration and, on average, a low physical load compared to construction workers Persons with unknown or unclassified occupations were excluded from the analysis Age:20–84 years old	done before the outcome was known	person should have a diagnosis of osteoarthritis (ICD 9: 71.5B; ICD 10: M16.0, M16.1) and a hip replacement (register codes 1987–1996: 8410, 8414; codes 1997–1998: NFB29, NFB39, NFB49, NFB99) Patients classified with traumatic or osteoarthritis secondary to other diseases such as rheumatoid arthritis and patients treated for a secondary hip replacement were excluded		

		n=69 868 All participants were men				
Jensen et al 2012 [14] Denmark	Cohort with exposure data collected retrospectively Floor layers and graphic designers Duration of employment year were approximately 20–40 years 1994–2004	Participants were floor layers and graphic designers who were randomly selected among participants from a clinical and radiographic study population of 156 floor layers and 152 graphic designers who were living in the geographical area of Copenhagen or Aarhus. Variations in the degree of knee straining work activities among the different tasks in floor layers had been published earlier (Jensen et al., 2010; Jensen et al., 2000). Graphic designers, all	**Posture** Duration of employment for floor layers has been used as a proxy for the exposure to knee straining work positions in the analyses of the study and categorized into three groups (≤20, 21–30, ≥30 years). Results for each of the three groups were compared with the group of graphic designers in total with no exposure to kneeling work activities	**Knee osteoarthritis** Radiologically assessment was done to detected tibiofemoral osteoarthritis. Knee osteoarthritis was defined as joint space narrowing ≥25% in at least one knee and patterns of involvement categorized into medial or lateral tibiofemoral osteoarthritis	Risk of radiographic tibiofemoral knee osteoarthritis by year in the trade. OR (95% CI) adjusted for body mass index, previous knee traumas, knee straining sports activities and age ***≤20 years of exposure*** 0.70 (0.07; 7.42) **21–30 years of exposure** 1.89 (0.29; 12.3) **>30 years of exposure** 4.82 (1.38; 17.0)	–

		from Copenhagen, were included as a group of non-exposed, controls. Their work tasks involved no knee demands Aged: 42–70 years n=141 (92 floor layers and 49 graphic designers) All participants were men				
Juhakoski et al 2009 [15] Finland	Prospective cohort 22 years General population 1978−2001	Participants were representative of the Finnish population aged 30 years or over at baseline. Participants were drawn from a national population register and invited to participate in a health survey The mean age was 42 years Persons with osteoarthritis at	**Manual handling and posture** Exposure data was collected with questionnaires and interviews conducted by trained nurses Physical workload was classified into six categories: Group 1: light sedentary work Group 2: mainly sedentary, but involves	**Hip osteoarthritis** Subjects were asked to attend a clinical examination if they had experienced any difficulties in walking due to hip pain during the previous month, or if they had difficulty in performing function tests Specially trained	Adjusted odds ratios for risk factors of hip osteoarthritis. OR (95% CI) adjusted separately for age and sex **Physical work load** Light sedentary: 1.0 Other sedentary: 0.9 (0.1; 7.2) Light standing/movement: 1.0 (0.3; 2.7) Fairly light/medium heavy: 2.4 (1.0; 5.7) Heavy manual: 4.6 (1.8; 11.5) Very heavy manual: no data	Adjusted odds ratios for risk factors of hip osteoarthritis. OR (95% CI) adjusted separately for age and sex, and for all covariates (education, smoking, alcohol intake, leisure time physical activity, injury) **Physical work load** Light sedentary: 1.0 Other sedentary: 1.1 (0.1; 10.0) Light standing/movement: 1.2 (0.4; 3.4) Fairly light/medium heavy: 3.1 (1.2; 8.0) Heavy manual: 6.7 (2.3; 19.5) Very heavy manual: no data

		baseline were excluded from the analysis in the follow-up study n=909 523 women and 386 men	handling fairly heavy objects Group 3: physically light standing work or light work involving movement Group 4: fairly light or medium heavy work involving movement Group 5: heavy manual work Group 6: very heavy manual work	physicians carried out clinical examinations and diagnosed hip osteo-arthritis according to a standardized written protocol		
Kaila-Kangas et al 2011 [16] Finland	Retrospective cohort General population Duration of employment year were 0 to more than 24 years 2000–2001	Participants were a nationally representative population sample. Finland was stratified into 20 sections consisting of the 15 largest cities and five university hospital districts to achieve an overall view of the population's health	**Manual handling** The history of work-related physical loading was assessed through interviews. The interviewers asked the respondents whether they had been exposed daily to different work-related factors either in their current job or in their five	**Hip osteoarthritis** Diagnosis of hip osteoarthritis was based on standardized clinical examination (disease history, symptoms and clinical findings) by trained physicians. The examining physicians categorized the diagnosis as either probable or definite. Only	Associations of manual handling of loads>20 kg according to years of exposure, with clinically verified hip osteoarthritis. OR (95% CI) adjusted for age, body mass index, smoking and traumatic fractures **All** ***Manual handling of loads >20 kg, overall*** No: 1.00 Yes: 1.8 (1.2; 2.7) ***Manual handling of loads >20 kg, in years*** 0: 1.00 1–12: 1.4 (0.7; 2.6) 13–24:2.8 (1.5; 5.0) >24: 1.8 (1.1; 2.4) **Women** ***Manual handling of loads >20 kg, overall***	–

		Age: 30–97 (mean age 53 years) n=6 556 3 446 women and 3 110 men	longest lasting previous jobs. They also enquired about job duration (in years) Information on manual handling of heavy loads was elicited by asking: "Did your work involve the manual handling of heavy objects, such as lifting, carrying or pushing loads over 20 kg an average of at least 10 times per working day?"	definite cases were included in the present study	No: 1.00 Yes: 1.8 (1.1; 2.8) ***Manual handling of loads >20 kg, in years*** 0: 1.00 1–12: 1.6 (0.7; 3.5) 13–24: 3.8 (1.7; 8.1) >24: 1.2 (0.7; 2.1) **Men** ***Manual handling of loads >20 kg, overall*** No: 1.00 Yes: 2.0 (1.0; 4.0) ***Manual handling of loads >20 kg, in years*** 0: 1.00 1–12: 1.1 (0.4; 3.2) 13–24: 2.2 (0.8; 5.9) >24: 2.3 (1.2; 4.3)	
Klussmann et al 2010 [17] Germany	Case-control General population Time when the study was performed not stated	Participants were 25–75 years old and resided in the vicinity of a number of university teaching hospitals, chosen to include a balanced and representative town-country relationship.	**Several factors** Data on exposure was assessed by a standardized questionnaire developed by the authors A partially standardized telephone interview assessed the frequency and	**Knee osteo-arthritis** Osteoarthritis was confirmed by either radiological diagnostics (≥grade II on the Kellgren and Lawrence scale) or findings from arthroscopy or open surgery (≥grade III on	Conditional logistic regression model: most parsimonious model. A description of the analysis procedure, including how adjustment for confounders were made in steps, is presented in the article. OR (95% CI) **Occupational kneeling or squatting** ***Women*** <3 542 hours/life: 1.50 (0.83; 2.69) 3 542–8 934 hours/life: 1.36 (0.78; 2.37) >8 934 hours/life: 2.52 (1.35; 4.68) ***Men*** <3 574 hours/life: 1.70 (0.96; 3.00) 3 574–12 244 hours/life: 2.16 (1.24; 3.77)	–

		Participants were eg. industrial workers, craftspeople, office workers, managers and farmers Cases were recruited from the surgical-orthopedic wards and from outpatient clinics; controls were recruited from the accident surgery services and were matched according to age and place of residence Cases were diagnosed with knee osteo-arthritis for no longer than 10 years, had no previous fractures involving knee joints or injuries of the knee and no inflammatory or reactive knee joint illnesses	duration of lifting and carrying for every occupational employment	the Outerbridge scale) The patients' history and a physicians' findings were documented in a patient record including information on general health status, as well as the condition of knee cartilage, meniscus, and ligaments (according to the Inter-national Cartilage Repair Society standard). The patient record was filled out by the orthopaedic surgeon treating the patient (cases only)	>12 244 hours/life: 2.47 (1.41; 4.32) **Occupational sitting** ***Women*** <16 032 hours/life: 0.72 (0.37; 1.40) 16 032–33 119 hours/life: 0.51 (0.26; 0.99) >33 119 hours/life: 0.39 (0.20; 0.76) ***Men*** No data **Occupation lifting and carrying** ***Women*** Sometimes: 0.88 (0.44; 1.77) <1 088 tons/life: 0.69 (0.38; 1.24) ≥1 088 tons/life: 2.13 (1.14; 3.98) ***Men*** No data	

		Controls had treatment for an accident due to an external (not work-related) cause, and no diagnosis of knee osteo-arthritis n=1 310 (739 cases and 571 controls) 741 women and 569 men				
Lau et al 2000 [18] China	Case-control General population 1998	Participants were recruited from orthopedic clinics at hospitals in Hong Kong. The age of the participants is not stated in the article, but cases and controls were matched for age Cases had primary osteo-arthritis grade 3 or 4 of the hip or knee Controls were consecutive	**Several factors** Data on exposure was assessed by interviews, using a standardized questionnaire In defining the main job, only paid employment was considered, excluding unpaid housework For cases, the main job was defined as the occupation that had been held	**Knee and hip osteoarthritis** The medical records of all subjects were reviewed. Patients were excluded if they had sustained a hip fracture; fulfilled criteria for rheumatoid arthritis, ankylosing spondylitis or secondary osteoarthritis The orthopedic surgeons in charge of the patients graded the osteo-	Association of various factors (occupational exposures in longest occupation) with the risk of osteoarthritis of the hip and knee. OR (95% CI) by conditional logistic regression, without adjustment **Osteoarthritis of the knee (with knee-injury in both patient and control group)** ***Women and men*** Climbing stairs ≥15 flights/d: 34.0 (4.7; 248.4) Lifting ≥10 kg ≤10 times/week: 25.9 (8.1; 82.4) Lifting ≥10 kg >10 times/week: 8.9 (2.6; 30.1) **Osteoarthritis of the knee (no injury)** ***Women*** Walking ≥2 hours/day: 1.4 (1.1; 1.8) Squatting ≥1 hour/day: 1.1 (0.8; 1.5) Kneeling ≥1 hour/day: 0.9 (0.6; 1.3) Climbing stairs ≥15 flights/day: 6.1 (3.5; 10.8) Digging ≥1 hour/day: 0.9 (0.5; 1.3) Driving ≥4 hours/day: no data Lifting ≥10 kg 1–10 times/week: 1.5 (1.0: 2.2) Lifting ≥10 kg >10 times/week: 3.0 (2.2; 4.1)	Association of various factors (occupational exposures in longest occupation) with the risk of osteoarthritis of the hip and knee. OR (95% CI) by conditional logistic regression; only variables that were found to be significantly associated with osteoarthritis in univariate analysis were included in each model **Osteoarthritis of the knee** ***Women*** Walking ≥2 hours/day: 0.8 (0.5; 1.1) Stairs ≥15 flights/day: 5.1 (2.5; 10.2) Lifting ≥10 kg ≤10/week: 1.2 (0.7; 2.0) Lifting ≥10 kg >10/week: 2.0 (1.2; 3.1) Use of vibration tools: 3.7 (0.7; 20.1) ***Men*** Walking ≥2 hours/day: 1.0 (0.5; 2.1) Stairs ≥15 flights/day: 2.5 (1.0; 6.4) Lifting ≥10 kg ≤10/week: 1.5 (0.6; 3.5)

		subjects without osteoarthritis who attended general practice clinics located in the same regions as the study hospital during the study period. Controls were individually matched to cases by sex and age. Matches were made one to one for osteo-arthritis of the knee, and three to one for osteoarthritis of the hip Subjects who had musculo-skeletal disorders were excluded n=1 778 participants. 796 cases (138 hip and 658 knee osteo-arthritis) and 982 controls 1 326 women and 452 men	for the longest time before the onset of symptoms. For controls, it was the job that had been held for the longest period up to the date of interview Only data relating to the main job are presented	arthritis patients according to the Kellgren and Lawrence scale, using radiographs of the hip or knee	Lifting ≥50 kg 1–10 times/week: 0.9 (0.5; 1.7) Lifting ≥50 kg >10 times/week: 2.9 (1.9; 4.5) Use of vibration tools: 5.3 (1.6; 18.3) ***Men*** Walking ≥2 hours/day: 2.2 (1.4; 3.5) Squatting ≥1 hour/day: 1.2 (0.7; 2.0) Kneeling ≥1 hour/day: 1.4 (0.7; 3.0) Climbing stairs ≥15 flights/day: 4.1 (2.1: 8.2) Digging ≥1 hour/day: 0.9 (0.3; 2.6) Driving ≥4 hours/day: 0.5 (0.2; 1.4) Lifting ≥10 kg 1–10 times/week: 1.7 (0.9; 3.2) Lifting ≥10 kg >10 times/week: 5.8 (3.1; 10.8) Lifting ≥50 kg 1–10 times/week: 3.5 (1.4; 8.8) Lifting ≥50 kg >10 times/week: 7.1 (3.1; 16.2) Use of vibration tools: 3.3 (1.3; 8.3) **Osteoarthritis of the hip** ***Women*** Walking ≥2 hours/day: 1.4 (0.9; 2.3) Squatting ≥1 hour/day: 1.6 (1.0; 2.8) Kneeling ≥1 hour/day: 1.3 (0.7; 2.5) Climbing stairs ≥15 flights/day: 2.5 (1.0; 5.9) Digging ≥1 hour/day: 2.7 (1.4; 5.2) Driving ≥4 hours/day: no data Lifting ≥10 kg 1–10 times/week: 0.7 (0.4; 1.5) Lifting ≥10 kg >10 times/week: 3.0 (1.8; 5.1) Lifting ≥50 kg 1–10 times/week: 2.0 (0.9; 4.6) Lifting ≥50 kg >10 times/week: 2.9 (1.5; 5.6) Use of vibration tools: 5.0 (1.2; 20.9) ***Men*** Walking ≥2 hours/day: 3.9 (1.3; 12.1) Squatting ≥1 hour/day: 1.3 (0.5; 3.2) Kneeling ≥1 hour/day: 3.9 (1.1; 14.2) Climbing stairs ≥15 flights/day: 8.7 (1.8; 42.7) Digging ≥1 hour/day: 2.0 (1.3; 12.0) Driving ≥4 hours/day: 0.4 (0.04; 3.0) Lifting ≥10 kg 1–10 times/week: 1.9 (0.6; 6.6) Lifting ≥10 kg >10 times/week: 5.3 (1.8; 15.8) Lifting ≥50 kg 1–10 times/week: 8.5 (1.6; 45.3)	Lifting ≥10 kg >10/week: 5.4 (2.4; 12.4) Use of vibration tools: 2.8 (0.8; 10.0) **Osteoarthritis of the hip** ***Women*** Squatting ≥1 hour/day: 1.2 (0.5; 3.0) Stairs ≥15 flights/day: 2.3 (0.6; 8.1) Digging ≥1 hour/day: 2.2 (0.8; 6.5) Lifting ≥10 kg ≤10/week: 0.7 (0.3; 1.7) Lifting ≥10 kg >10/week: 2.4 (1.1; 5.3) Use of vibration tools: 7.9 (0.8; 77.8) ***Men*** Walking ≥2 hours/day: 1.3 (0.3; 6.7) Kneeling ≥1 hour/day: 7.4 (0.7; 76.9) Stairs ≥15 flights/day: 12.5 (1.5; 104.3) Lifting ≥10 kg ≤10/week: 1.8 (0.4; 8.1) Lifting ≥10 kg >10/week: 3.1 (0.7; 14.3)

					Lifting ≥50 kg >10 times/week: 9.6 (2.2; 42.2) Use of vibration tools: 0.7 (0.2; 2.3)	
Lehto et al 1990 [19] Finland	Case-control study Dentists Time when the study was performed not stated	Participants were members of Turku Dental Society who had been practicing dentistry for a minimum of 10 years Age: 33–69 years n=134 91 women and 43 men	**Static work** Data on static work was assessed by comparing the mirror and drill hands of dentists. The work performed by the drill and mirror hands differs in the proportion of static versus dynamic work; the mirror hand is engaged in somewhat more static work than the drill hand	**Arthrosis of the hand** A person was classified as having arthrosis of the hands if any one of the 30 joints classified fell into classes 2–4 of the Kellergren and Lawrence grade The X-ray pictures of the dentists were all evaluated by one roentgenologis, without knowledge of the age and sex of the examinee. The X-ray pictures of the controls had been evaluated by another roentgenologist	**Comparison between drill and mirror hands** There were no statistical differences in the prevalence, extent or distribution of arthrosis observed between the drill and mirror hands (data not shown)	–
Manninen et al 2002 [20] Finland	Case-control study Patients with knee osteoarthritis The study was initiated in 1994	Participants were patients who had undergone their first knee arthroplasty operation for primary knee osteoarthritis in	**Several factors** Information on explanatory variables was obtained by a computer-assisted telephone interview.	**Knee osteoarthritis** The knee osteoarthritis was identified by a physician	Crude association of severe knee osteoarthritis with the level of occupational exposures before the age of 49 years – logistic regression modeling. OR (95% CI) **All** ***Physical workload (low: 1.00)*** Medium: 1.93 (1.18; 3.16) High: 2.19 (1.32; 3.64)	Association of severe knee osteoarthritis with the level of occupational exposure before the age of 49 years – logistic regression modeling. OR (95% CI) adjusted for body mass index, knee injury and physical exercise **All**

		the Kuopio University Hospital in Finland Age: 55–75 years old n=805 281 cases and 524 referents 610 women and 195 men	Exposure was assessed up to 49 years of age Work history was requested retrospectively in detail, and exposure to physical load factors in each job was inquired about separately Questions used to assess the different exposure factors are stated in the article		***Standing (low: 1.00)*** Medium: 0.68 (0.42; 1.09) High: 0.74 (0.50; 1.07) ***Kneeling and squatting (none: 1.00)*** <2 hours/day: 0.95 (0.65; 1.39) ≥2 hours/day: 1.69 (1.17; 2.44) ***Climbing (low: 1.00)*** Medium: 1.36 (0.99; 1.87) High: 1.47 (0.94; 2.32) ***Walking (low: 1.00)*** Medium: 0.89 (0.61; 1.28) High: 1.01 (0.97; 1.43) ***Lifting (low: 1.00)*** Medium: 1.01(0.68; 1.51) High: 1.17 (0.83; 1.64) ***Driving (low: 1.00)*** Medium: 0.73 (0.40; 1.33) High: 1.35 (0.77; 2.37) **Women** ***Physical workload (low: 1.00)*** Medium: 1.64 (0.94; 2.87) High: 2.17 (1.21; 3.88) ***Standing (low: 1.00)*** Medium: 0.78 (0.45; 1.35) High: 0.88 (0.56; 1.37) ***Kneeling and squatting (none: 1.00)*** <2 hours/day: 0.98 (0.64; 1.51) ≥2 hours/day: 1.71 (1.13; 2.60) ***Climbing (low: 1.00)*** Medium: 1.20 (0.84; 1.71) High: 1.36 (0.80; 2.31)	***Physical workload (low: 1.00)*** Medium: 1.74 (0.98; 3.09) High: 2.02 (1.11; 3.65) ***Standing (low: 1.00)*** Low: 1.00 Medium: 0.57 (0.33; 0.99) High: 0.62 (0.40; 0.95) ***Kneeling and squatting (none: 1.00)*** <2 hours/day: 0.85 (0.55; 1.32) ≥2 hours/day: 1.73 (1.13; 2.66) ***Climbing (low: 1.00)*** Medium: 1.31 (0.91; 1.90) High: 1.61 (0.96; 2.71) ***Walking (low: 1.00)*** Medium: 1.00 (0.65; 1.53) High: 1.06 (0.68; 1.64) ***Lifting (low: 1.00)*** Medium: 0.99 (0.63; 1.56) High: 1.04 (0.70; 1.55) ***Driving (low: 1.00)*** Medium: 0.95 (0.49; 1.82) High: 1.23 (0.64; 2.35) **Women** ***Physical workload (low: 1.00)*** Medium: 1.60 (0.83; 3.06) High: 2.03 (1.03; 3.99) ***Standing (low: 1.00)*** Medium: 0.55 (0.29; 1.04) High: 0.70 (0.42; 1.16) ***Kneeling and squatting (none: 1.00)***

					Walking (low: 1.00) Medium: 0.78 (0.52; 1.17) High: 0.95 (0.60; 1.49) ***Lifting (low: 1.00)*** Medium: 0.95 (0.61; 1.48) High: 1.17 (0.79; 1.72) ***Driving (low: 1.00)*** Medium: 0.93 (0.42; 2.05) High: 1.00 (0.36; 2.81) **Men** ***Physical workload (low: 1.00)*** Medium: 3.00 (1.05; 8.57) High: 2.21 (0.75; 6.47) ***Standing (low: 1.00)*** Medium: 0.52 (0.20; 1.33) High: 0.46 (0.22; 0.95) ***Kneeling and squatting (none: 1.00)*** <2 hours/day: 0.81 (0.34; 1.91) ≥2 hours/day: 1.58 (0.72; 3.46) ***Climbing (low: 1.00)*** Medium: 2.28 (1.12; 4.64) High: 2.02 (0.82; 4.95) ***Walking (low: 1.00)*** Medium: 1.56 (0.67; 3.66) High: 1.20 (0.54; 2.64) ***Lifting (low: 1.00)*** Medium: 1.33 (0.52; 3.41) High: 1.18 (0.57; 2.43) ***Driving (low: 1.00)*** Medium: 0.95 (0.49; 1.82) High: 1.23 (0.64; 2.35)	<2 hours/day: 0.97 (0.59; 1.59) ≥2 hours/day: 1.81 (1.11; 2.95) ***Climbing (low: 1.00)*** Medium: 1.08 (0.71; 1.63) High: 1.50 (0.81; 2.77) ***Walking (low: 1.00)*** Medium: 0.89 (0.56;1.42) High: 1.06 (0.64; 1.76) ***Lifting (low: 1.00)*** Medium: 0.90 (0.55; 1.50) High: 1.11 (0.71; 1.75) ***Driving (low: 1.00)*** Medium: 1.19 (0.49; 2.85) High: 0.98 (0.31; 3.10) **Men** ***Physical workload (low: 1.00)*** Medium: 2.23 (0.64; 7.72) High: 1.53 (0.42; 5.56) ***Standing (low: 1.00)*** Medium: 0.57 (0.18; 1.73) High: 0.36 (0.15; 0.90) ***Kneeling and squatting (none: 1.00)*** <2 hours/day: 0.58 (0.21; 1.64) ≥2 hours/day: 1.68 (0.66; 4.28) ***Climbing (low: 1.00)*** Medium: 3.06 (1.25; 7.46) High: 2.79 (0.96; 8.16) ***Walking (low: 1.00)*** Medium: 2.07 (0.73; 5.89) High: 1.47 (0.55; 3.89)

						Lifting (low: 1.00) Medium: 1.35 (0.57; 4.16) High: 0.92 (0.50; 2.39) ***Driving (low: 1.00)*** Medium: 0.81 (0.28; 2.30) High: 1.35 (0.59; 3.43)
Muraki 2009 [21] Japan	Cohort with exposure data collected retrospectively Description of exposure in the longest held job General population The time when the study was performed is not stated	Participants were 50 years and older (mean age 68 years), recruited from listings of resident registrations in three Japanese communities. Participants were living in mountainous and seacoast areas The most common work was clerical or technical work, followed by agricultural, forestry or fishery and factory or construction work n=1 471	**Several factors** The article does not specify which instrument the authors used to assess data on exposure Information was collected about job title and occupational activity including a lifetime occupational history with details of 7 types of specific work place physical activities Data on lifting weights ≥10 kg at least once a week is listed in the article	**Knee osteoarthritis** Knee pain was assessed by interview Radiographic examination was conducted of both knees Radiographs were read by an orthopedist using the Kellgren/Lawrence radiographic atlas, and the severity was determined by Kellgren/Lawrence grading. Knee osteoarthritis was defined as a grade ≥2 in at least one knee	Association of Kellgren/Lawrence grade >2 knee osteoarthritis with occupational activity. OR (95% CI) adjusted for age, sex, and body mass index in the overall population, and for age and body mass index in both sexes **Occupational activities** ***Women and men*** Sitting on a chair ≥2 h/day: 0.73 (0.57; 0.92) Kneeling ≥1 hour/day: 1.11 (0.83; 1.48) Squatting ≥1 hour/day: 1.23 (0.94; 1.61) Standing ≥2 hours/day: 1.97 (1.43; 2.72) Walking ≥3 km/day: 1.80 (1.42; 2.29) Climbing ≥1 hour/day: 2.24 (1.65; 3.04) Lifting weights: 1.90 (1.50; 2.42) ***Women*** Sitting on a chair ≥2 h/day: 0.80 (0.60; 1.09) Kneeling ≥1 hour/day: 1.36 (0.93; 1.97) Squatting ≥1 hour/day: 1.50 (1.06; 2.13) Standing ≥2 hours/day: 1.78 (1.21; 2.63) Walking ≥3 km/day: 1.59 (1.17; 2.16) Climbing ≥1 hour/day: 1.85 (1.19; 2.96) Lifting weights: 1.68 (1.24; 2.26) ***Men*** Sitting on a chair ≥2 h/day: 0.63 (0.44; 0.92) Kneeling ≥1 hour/day: 0.79 (0.49; 1.26) Squatting ≥1 hour/day: 0.89 (0.58; 1.35) Standing ≥2 hours/day: 2.31 (1.32; 4.17) Walking ≥3 km/day: 2.17 (1.49; 3.16) Climbing ≥1 hour/day: 2.43 (1.64; 3.60)	–

		940 women and 531 men			Lifting weights: 2.26 (1.52; 3.40)	
Olsen et al 1994 [22] Sweden	Case-control study General population The time when the study was performed is not stated	The participants lived in the referral areas of four large hospitals in Stockholm, 1984–1988 The cases were men who received a first-time prosthesis of the hip joint as a result of idiopathic osteoarthrosis The controls were randomly selected participants from the general population The age was 50–70 years n=541 239 cases and 302 controls All participants were men	**Manual handling and static work** Exposure data was obtained by means of an interview and a questionnaire Exposure to physical work load was measured as the cumulative number of hours of exposure up to 49 years of age	**Hip osteoarthrosis** Hip osteoarthrosis was identified in patients who received a first-time prosthesis of the hip joint as a result of idiopathic osteoarthrosis	Association of hip osteoarthritis with physical work loads. RR adjusted for adjusted for age, body mass index, smoking, and sports activities **Static and dynamic work** Low exposure: 1.00 Medium exposure: 1.82 High exposure: 2.42 **Tons lifted** Low exposure: 1.00 Medium exposure: 1.58 High exposure: 1.84 **Number of lifts (>40kg)** Low exposure: 1.00 Medium exposure: 1.38 High exposure: 2.48 **Number of jumps** Low exposure: 1.00 Medium exposure: 1.83 High exposure: 1.52	–
Roach et al 1994 [23] Canada	Case-control study Patients	Participants (both cases and controls) were drawn from the	**Manual handling and work load** Participants	**Hip osteoarthrosis** Data on hip osteoarthrosis	The relationship between work load and osteoarthritis of the hip. OR (95% CI) **Work load**	The relationship between work load and osteoarthritis of the hip. OR (95% CI) adjusted for cancer and obesity at age 40

	Time when study was performed not stated	population of male patients attending outpatient clinics of a Department of Veterans Affairs Hospital in the metropolitan Chicago area Both cases and controls were excluded if they had a history of a service related injury which would have limited the possibility of exposure to heavy physical labor Cases were identified via the computerized radiology database of all patients who received an outpatient hip radiograph for complaint of hip pain or following a total hip arthroplasty from January 1, 1989 to June 30, 1990	were mailed a questionnaire. They reported the number of years they had worked at jobs in each of 5 occupational categories: (1) light work standing, (2) work sitting, (3) heavy work standing, (4) work kneeling or crouching, or (5) work walking Participants reported the number of years they had performed jobs in these categories only if they spent more than half of their work day performing that physical activity Participants had to report at least 15 years of exposure to any combination of these activities to be classified	was defined by medical records, including postoperative reports. This data was used to determine whether subjects met clinical classification criteria for hip osteoarthritis, which include age greater than 40, complaint of weight bearing hip pain and radiographic evidence of grade 3 or 4 hip osteoarthritis	Light work: 1.00 Intermediate work: 1.9 (1.0; 3.8) Heavy work: 2.4 (1.3; 4.3) **Heavy work** No heavy work, only light work: 1.0 15–24 years: 2.5 25–34 years: 2.8 >34 years: 2.0 Test for trend, p-value: 0.047	**Work load** (also adjusted for running) Heavy work: 2.5 (1.5; 5.0) **Heavy work** (also adjusted for football) No heavy work: 1.0 15–24 years: 2.2 25–34 years: 3.0 >34 years: 2.2 Test for trend, p-value: 0.035

		Possible controls were identified from a radiology database. Controls were excluded if they demonstrated a minimal hip joint space of 1.5 mm or less with minimal joint space defined as the shortest distance from the margin of the femoral head to the acetabulum. Controls who reported hip pain without radiologic findings were not excluded n=332 99 cases and 233 controls All participants were men	as exposed to heavy work			
Rubak et al 2013 [24] Denmark	Register-based cohort study General working population	Participants were born in Denmark between 1925 and 1964	**Physical workload** Cumulative physical was assessed by combining year-	**Total hip replacement due to primary osteoarthritis** Information on type and date	Risk estimate for hip replacement due to primary osteoarthritis. OR (95% CI) adjusted for age **Cumulative physical workload (point-years)***	Risk estimate for hip replacement due to primary osteoarthritis. OR (95% CI) adjusted for age, cumulative physical workload, calendar year, county of residence and socioeconomic status

	Data extracted from registers 2007	Persons were excluded if they had not reached ten years of full-lime employment between 1964 and 2006, if they lived in Greenland, had emigrated or died, and those had a hospital diagnosis of primary hip osteoarthritis between 1977–1995 n=1 910 493 899 549 women and 1 010 944 men	by-year register information on employment with an industry exposure matrix that provided point scores of physical workload. Cumulative physical workload was expressed as point-years Information on industry and degree of employment (part-, full-, or over-time) was retrieved from a national pension register An industry exposure matrix was developed for the purpose of this study. Three of the authors independently rated the overall physical workload to the hip in each industry. Exposures taken into consideration	of surgery was collected from the a national register Until 1994, diagnosis was based on ICD-8 codes (713.00) and thereafter on ICD-10 codes (MI6.0, Ml6.1, Ml6.9). From 1996 and onwards, operations were registered in accordance with the NOMESCO Classification of Surgical Procedures (hip replacement surgery: KNFB20, KNFB30, KNFB40, KNFB99)	***Women*** Never worked in industry with intermediate or high physical workload (reference): 1.0 >0–<5: 0.97 5–<15: 0.97 15–<25: 0.94 25–<35: 0.98 35–86: 1.00 Continuous with 5-point-year increments: 1.0 ***Men*** Never worked In industry with intermediate or high physical workload (reference): 1.0 >0–<5: 1.25 5–<15: 1.33 15–<25: 1.38 25–<35: 1.44 35–86: 1.60 Continuous with 5-point-year increments: 1.03 *)Years of full-time employment weighted by score of physical workload in employment industry	**Cumulative physical workload (point-years)*** ***Women*** Never worked In industry with intermediate or high physical workload (reference): 1.0 >0–<5: 0.96 (0.80; 1.06) 5–<15: 0.96 (0.87; 1.05) 15–<25: 0.94 (0.85; 1.04) 25–<35: 0.99 (0.88; 1.10) 35–86: 1.00 (0.88; 1.16) Continuous with 5-point-year increments: 1.00 (0.99; 1.01) ***Men*** Never worked In industry with intermediate or high physical workload (reference): 1.0 >0–<5: 1.13 (0.98; 1.31) 5–<15: 1.14 (1.00; 1.31) 15–<25: 1.19 (1.04; 1.36) 25–<35: 1.27 (1.11: 1.48) 35–86: 1.33 (1.17; 1.53) Continuous with 5-point-year increments: 1.02 (1.02; 1.03)

			were primarily total load lifted per day, frequency of lifting ≥20 kg, whole body vibration, and standing/walking Point-years was calculated as number of employment years (adjusted to full time employment) in a specific industry x the corresponding score of physical workload from the exposure matrix and summarized across all registered employments			
Rubak et al 2014 [25] Denmark	Nested case–control study General working population 2005−2009	The cohort was identified by linking data from national registers. It included all Danish men and women born between 1935 and 1964 with at least 10 years	**Several factors** Data on exposure was assessed by postal questionnaire on main job titles in specific periods from 2008 going back to 1980	**Total hip replacement due to primary osteoarthritis** Cases of first-time total hip replacement due to primary osteoarthritis were identified by ICD-10 codes M16.0, M16.1,	Conditional logistic regression analyses of total hip replacement due to primary osteoarthritis in relation to cumulative occupational mechanical exposures. OR (95% CI) **Women** ***Lifting (no lifting=reference)*** <10 ton-years: 1.22 (0.96; 1.57) 10–<20 ton-years: 0.96 (0.75; 1.24) 20–86 ton-years: 1.12 (0.83; 1.50) ***Standing (no standing=reference)***	Conditional logistic regression analyses of total hip replacement due to primary osteoarthritis in relation to cumulative occupational mechanical exposures. OR (95% CI). One occupational exposure at a time adjusted for body mass index at age 25 years, change in body mass index, pack-years of smoking, previous fracture of a lower extremity, familial predisposition, endurance and contact sport at age 25 years, and region of residence

		of full-time employment The mean age was 65 years (women) and 64 years (men) A total of 4 410 case–control sets were generated. Among these, 2 500 sets were randomly drawn for the study. For each case, two age- and sex-matched controls were drawn n=5 495 (1 950 cases and 3 545 controls) 861 sets (at least 1 case and 1 control) for women and 915 sets for men	Self-reported job titles were transformed into occupational titles using the International Classification of Occupations (D-ISCO 88). Occupational titles were linked to a newly developed 2-dimensional job exposure matrix Cumulative occupational mechanical exposures were estimated for 20 years up to and including the third year before the index year, disregarding exposure in the index year and the 2 years prior. Recent exposures were disregarded Occupational mechanical exposures were cumulated for 20 consecutive	or M16.9 combined with a surgical procedure code of the Nordic Medico-Statistical Committee Classification of Surgical Procedures codes KNFB20, KNFB30, KNFB40, or KNFB99	<10 years: 0.94 (0.61; 1.43) 10–<20 years: 1.13 (0.90; 1.41) 20–29 years: 1.10 (0.86; 1.40) ***Whole-body vibration*** Vibration: 0.91 (0.56; 1.49) **Men** ***Lifting (no lifting=reference*)** <10 ton-years: 1.01 (0.79; 1.30) 10–<20 ton-years: 0.95 (0.73; 1.23) 20–115 ton-years: 1.50 (1.19; 1.87) ***Standing (no standing=reference)*** <10 years: 1.27 (0.99; 1.63) 10–<20 years: 1.17 (0.93; 1.48) 20–29 years: 1.09 (0.86; 1.38) ***Whole-body vibration*** Vibration: 1.30 (1.03; 1.65)	**Women** ***Lifting (no lifting=reference)*** <10 ton-years: 1.15 (0.87; 1.53) 10–<20 ton-years: 0.81 (0.61; 1.09) 20–86 ton-years: 1.00 (0.72; 1.41) ***Standing (no standing=reference)*** <10 years: 0.91 (0.56; 1.48) 10–<20 years: 0.99 (0.74; 1.25) 20–29 years: 1.03 (0.78; 1.35) ***Whole-body vibration*** Vibration**:** 0.64 (0.35; 1.15) **Men** ***Lifting (no lifting=reference)*** <10 ton-years: 0.99 (0.75; 1.30) 10–<20 ton-years: 0.89 (0.67; 1.17) 20–115 ton-years: 1.35 (1.05; 1.74) ***Standing (no standing=reference)*** <10 years: 1.13 (0.85; 1.50) 10–<20 years: 1.14 (0.87; 1.48) 20–29 years: 0.99 (0.77; 1.28) ***Whole-body vibration*** Vibration**:** 1.26 (0.97; 1.64)

			years up to and including the third year before the index year, being the hip replacement year of the case. Exposure to whole-body vibration was categorized as never/ever. Ton-years were standardized to lifting 1 ton per day for 1 year			
Sandmark et al 2000 [26] Sweden	Population-based case-referent study General population 1991−1995	The study base were men and women born 1921–1938 and living in 14 counties in Sweden The cases had undergone prosthetic knee replacement and were 55–70 years at the time of the surgery. Cases with symptoms of the knee before 50 years of age were excluded Referents were randomly	**Several factors** Exposure data was assessed by professional interviewers by telephone interview and by postal questionnaire. The questions are described in the article All the reported occupational titles were classified according to the Nordic Standard Occupational Classification. Subjects who had worked in occupations	**Knee replacement due to primary osteoarthrosis** Data on prosthetic knee replacement because of clinically significant primary osteoarthrosis were collected through a nationwide knee arthroplasties register	Relationship between knee osteoarthritis and several factors. For heavy jobs, >10 years in the job are compared to subjects who had never had any such jobs. For physical load variables, the multivariate logistic regression analyses included one physical load variable at a time. Comparisons are between the medium or high exposure class and the no or low exposure class. OR (95% CI) controlled for potential confounding from age, body mass index, sports, smoking, and, for the women, hormone substitution **Women** >10 years in physically heavy jobs: 2.5 (1.6; 3.9) ***Standing (hours)*** Medium: 1.2 (0.7; 1.9) High: 1.6 (1.0; 2.8) ***Sitting (hours)*** Medium: 1.1 (0.7; 1.7) High: 0.9 (0.5; 1.5)	Multivariate logistic regression analysis of the relationship between knee osteoarthritis and different variables. Comparisons are between the high and no/low exposure. OR (95% CI) adjusted for age, body mass index, and smoking. There are three different models (here the first one is listed) that demonstrated different ways due to the covariation between the variables kneeling and squatting or knee bending **Women** Standing: 1.2 (0.6; 2.2) Climbing stairs: 1.2 (0.6; 2.2) Lifts at work, model 1: 1.3 (0.7; 2.3) **Men** Standing: 1.3 (0.7; 2.3) Climbing stairs: 1.0 (0.5; 1.6) Lifts at work, model 1: 1.9 (0.9; 3.8) Jumps: 2.0 (1.2; 3.3) Kneeling: 1.6 (1.0; 2.6)

		selected from the study base, through a national population register. Age in 5-year intervals and gender was taken into account. Referents who reported osteo-arthrosis of the knee or who had experienced severe pain or dysfunction of the knee were excluded Subjects were excluded if they reported earlier trauma or surgery to the knee or the surrounding tissues, rheumatoid arthritis, or systemic disease involving the joints or had musculo-skeletal malformation	considered to involve the highest physical load to the knees (according to a score developed by Vingård et al 1992) were identified The criterion for being exposed was ten years of exposure to occupations with high physical load. Subjects who had never had any of these physically demanding jobs were considered unexposed		***Lifts at work (kg)*** Medium: 1.2 (0.7; 1.9) High: 1.7 (1.0; 2.9) ***Squatting or knee bending (number)*** Medium: 1.2 (0.7; 1.9) High: 1.1 (0.6; 1.9) ***Kneeling (min)*** Medium: 1.5 (1.0; 2.3) High: 1.5 (0.9; 2.4) ***Climbing stairs (number of steps)*** Medium: 1.7 (1.1; 2.5) High: 1.4 (0.8; 2.3) **Men** >10 years in physically heavy jobs: 2.5 (1.7; 3.6) ***Standing (hours)*** Medium: 1.5 (0.9; 2.4) High: 1.7 (1.0; 2.9) ***Sitting (hours)*** Medium: 1.0 (0.7; 1.6) High: 0.7 (0.4; 1.2) ***Lifts at work (kg)*** Medium: 2.5 (1.5; 4.4) High: 3.0 (1.6; 5.5) ***Squatting or knee bending (number)*** Medium: 1.3 (0.8; 2.2) High: 2.9 (1.7; 4.9) ***Kneeling (min)*** Medium: 1.4 (0.9; 2.2) High: 2.1 (1.4; 3.3) ***Climbing stairs (number of steps)*** Medium: 1.2 (0.8; 1.9)	

		n=1 173 (625 cases and 548 controls) 584 (300/284) women and 589 (325/264) men			High: 1.2 (0.7; 2.1) ***Vibration (hours)*** Medium: 1.0 (0.6; 1.7) High: 1.3 (0.9; 2.1) ***Jumps (number)*** Medium: 1.4 (0.9; 2.4) High: 2.7 (1.7; 4.1)	
Seidler et al 2008 [27] Germany	Case-control General population The time when the study was performed is not stated	Participants were aged 25–70 years Cases were patients at orthopedic clinics and practices with radiographically confirmed knee osteoarthritis associated with chronic complaints. Practices from which cases were drawn were not specialized in workers' compensation cases or certain industries Control subjects were randomly selected from a one percent random sample of male residents aged	**Manual handling and posture** Data were gathered in a structured personal interview using a questionnaire developed by the authors To calculate cumulative exposure, the self-reported duration of kneeling and squatting as well as the duration of lifting and carrying of loads were summed up over the entire working life Cumulative exposure was calculated up to the year of	**Symptomatic knee osteo-arthritis** Participating physicians identified patients with knee osteo-arthritis associated with chronic complaints Patients were not eligible for the study if the initial diagnosis of knee osteoarthritis had been made more than five years earlier Knee X-rays were re-assessed by a reference radiologist according to the criteria defined by Kellgren	Occupational exposure and symptomatic knee osteoarthritis. OR (95% CI) adjusted for age and region **Kneeling and squatting combined** No kneeling/squatting: 1.0 <870 h: 0.7 (0.3; 1.5) 870–4 757 h: 1.4 (0.8; 2.5) 4 757–10 800 h: 2.8 (1.5; 5.4) ≥10 800 h: 4.0 (2.1; 7.6) **Cumulated lifting and carrying combined** No lifting/carrying: 1.0 <630 kg*hrs: 1.3 (0.7; 2.4) 630–5 120 kg*hrs: 2.0 (1.2; 3.4) 5 120–37 000 kg*hrs: 3.6 (2.1; 6.0) ≥37 000 kg*hrs: 3.5 (1.7; 7.2) **Kneeling/squatting and lifting/carrying** No kneeling/squatting or lifting/carrying: 1.0 Kneeling/squatting <870 hrs. or lifting/carrying <630 kg*hrs: 1.2 (0.7; 2.3) Kneeling/squatting 870–4 757 hrs. or lifting/carrying <5 120 kg*hrs: 1.3 (0.8; 2.4) Kneeling/squatting 4 757–10 800 hrs. or lifting/carrying 5 120–37 000 kg*hrs: 3.5 (2.0; 6.0) Either kneeling/squatting >10 800 hrs. or lifting/carrying >37 000 kg*hrs: 3.8 (2.1; 6.8)	Occupational exposure and symptomatic knee osteoarthritis. OR (95% CI) adjusted for age, region, body mass index, jogging/athletics, kneeling/squatting, and lifting/carrying (without considered variable) **Kneeling and squatting combined** No kneeling/squatting: 1.0 <870 h: 0.5 (0.2; 1.2) 870–4 757 h: 0.8 (0.4; 1.5) 4 757–10 800 h: 1.6 (0.8; 3.4) ≥10 800 h: 2.4 (1.1; 5.0) **Cumulated lifting and carrying combined** No lifting/carrying: 1.0 <630 kg*hrs: 1.2 (0.6; 2.3) 630–5 120 kg*hrs: 2.0 (1.1; 3.6) 5 120–37 000 kg*hrs: 2.0 (1.1; 3.9) ≥37 000 kg*hrs: 2.6 (1.1; 6.1) **Kneeling/squatting and lifting/carrying** No kneeling/squatting or lifting/carrying: 1.0 Kneeling/squatting <870 hrs. or lifting/carrying <630 kg*hrs: 1.1 (0.5; 2.1) Kneeling/squatting 870–4 757 hrs. or lifting/carrying <5,120 kg*hrs:

		25–70 years in the same region as the patients n=622 (295 cases and 327 controls) All participants were men	diagnosis (in cases) or to the year of interview (in control subjects) To calculate cumulative exposure to lifting/carrying, all weights >5 kg lifted or carried at work were multiplied by the corresponding durations (assuming 2.5 seconds duration per single lifting act) and summed	To finally qualify as cases, patients had to have at least grade 2 osteoarthritis according to the reference radiologist's assessment	Both kneeling/squatting >10 800 hrs. and lifting/carrying >37 000 kg*hrs: 7.8 (2.1; 28.3)	1.2 (0.7; 2.2) Kneeling/squatting 4 757–10 800 hrs. or lifting/carrying 5 120–37 000 kg*hrs: 2.7 (1.5; 4.8) Either kneeling/squatting >10 800 hrs. or lifting/carrying >37 000 kg*hrs: 3.4 (1.8; 6.3) Both kneeling/squatting >10 800 hrs. and lifting/carrying >37 000 kg*hrs: 7.9 (2.0; 31.5)
Stenlund et al 1992 [28] Sweden	Cohort with exposure data collected retrospectively Construction industry The time when the study was performed is not stated	Participants were construction industry representatives, randomly selected from the local union files to make up 54 bricklayers (mean age 50 years), 55 rock blasters (mean age 52 years), and 98 foremen (mean age 46 years)	**Manual handling and vibration** Exposure was assessed by interview by a trained nurse using a protocol developed by the authors. The items are stated in the article Load lifted was categorized in three classes. The value of	**Osteoarthrosis in the acromio-clavicular joint** Radiographic anteroposterior views of the right and left acromio-clavicular joints were obtained. The films were viewed and approved by a radiologist. The radiographs were then categorized by the radiologist	Risk factor analysis for osteoarthrosis of the acromioclavicular joint in relation to exposure variables. OR (95% CI) standardized for age **Right hand** ***Years of manual work*** >28 years vs <10 years: 2.91 (1.15; 7.35) 10–28 years vs <10 years: 2.23 (1.06; 4.69) ***Load lifted (tonnes)*** 710–25 999 vs <710: 2.28 (0.97; 5.39) >25 000 vs <710: 3.18 (1.09; 9.24) ***Vibration (hours)*** 9001–255 200 vs <9001: 1.13 (0.53; 2.40) >255 200 vs <9001: 2.18 (1.04; 4.56) **Left hand**	Unconditional multiple logistic regression of osteoarthrosis of the left and right acromioclavicular joint. OR (95% CI) adjusted for age, smoking habits and dexterity. There are five different models presented in study. The lowest number to the greatest number are listed **Right hand** Vibration: 1.27 (0.90: 1.79) (also adjusted for lifted load): 1.05 (0.69; 1.59) Lifted load: 1.55 (1.03; 2.34) (also adjusted for vibration): 1.51 (0.92; 2.47)

		Around 80% of the participants were right handed, depending on sub-group n=207 The gender of the participants is not stated	710 tonnes corresponds to about 19.7 kg per working day for a person who has worked 225 days a year for 20 years at eight hours a day	and an orthopedic surgeon into one of five grades of osteoarthrosis according to Collins (1950)	***Years of manual work*** >28 years vs <10 years: 2.46 (1.01; 5.97) 10–28 years vs <10 years: 2.32 (1.02; 5.25) ***Load lifted (tonnes)*** 710–25 999 vs <710: 7.29 (2.49; 21.34) >25 000 vs <710: 10.34 (3.10; 34.46) ***Vibration (hours)*** 9001–255 200 vs <9001: 2.16 (1.00; 4.68) >255 200 vs <9001: 3.13 (1.40; 6.99)	Manual work adjusted for vibration and lifted load: 1.58 (1.09; 2.30) **Left hand** Vibration: 1.79 (1.24; 2.59) (also adjusted for lifted load): 1.36 (0.90; 2.09) Lifted load: 2.55 (1.50; 4.35) (also adjusted for vibration): 2.08 (1.14; 3.78) Manual work adjusted for vibration and lifted load: 1.93 (1.28; 2.90)
Toivanen et al 2010 [29] Finland	Prospective cohort General population Follow-up 22 years, ie 1978–1980 to 2000–2001	Participants were representative of the Finnish population aged 30 years or over at baseline. Participants were drawn from a national population register and invited to participate in a health survey The mean age was 42 years Persons with osteoarthritis at baseline were excluded from the analysis in the follow-up study	**Manual handling** Exposure data was collected with questionnaires and interviews conducted by trained nurses Physical workload was classified into six categories: Group 1: light sedentary work Group 2: mainly sedentary, but involves handling fairly heavy objects Group 3: physically light standing work or light work	**Knee osteoarthritis** Specially trained physicians carried out clinical examinations and diagnosed osteoarthritis according to a standardized written protocol This standardized clinical examination included estimations of limitations in the range of motion, tenderness, deformations, joint effusion and stability of	Association of physical work load and knee osteoarthritis. OR (95% CI) adjusted for gender and age 1 (mildest): 1.0 2: 1.6 (0.6; 4.8) 3: 1.1 (0.6; 2.1) 4: 1.4 (0.8; 2.7) 5: 1.8 (0.8; 3.8) 6 (heaviest): 11.5 (2.9; 45.8)	Association of physical work load and knee osteoarthritis. OR (95% CI) adjusted for gender and age, tobacco smoking and regular physical activity during leisure time 1 (mildest): 1.0 2: 1.6 (0.5; 4.9) 3: 1.1 (0.6; 2.1) 4: 1.3 (0.7; 2.6) 0.02 5: 1.7 (0.8; 3.9) 6 (heaviest): 18.3 (4.2; 79.4)

		n=823 369 women and 454 men Of which 94 cases occurred during the follow-up	involving movement Group 4: fairly light or medium heavy work involving movement Group 5: heavy manual work Group 6: very heavy manual work	the knee joint. The physicians made their final diagnoses on the basis of clinical findings, knee symptoms (pain and stiffness), disease histories and related documentation applying uniform diagnostic criteria		
Vingard et al 1997 [30] Sweden	Case referent study General population 1991–1994	The study base comprised all women of ages 50–70 years, living in five counties and four towns in Sweden Cases had under-gone total hip replacement Referents were women without hip problems randomly selected from the study base the mean age at interview was	**Several factors** Exposure data was assessed by professional interviewers by telephone interview and by postal questionnaire. The questions are described in the article Exposure information was collected from the age of 16 to the age of 50. Each exposure was aggregated throughout life	**Hip replacement due to primary osteoarthrosis** Cases who had under-gone total hip replacement for primary osteoarthrosis of the hip were identified by means of the Swedish National Register of Total Hip Replacements	Developing osteoarthrosis's in women exposed to high to medium physical loads of various kinds, compared with those with low exposure. RR (95% CI) adjusted for age, body mass index, smoking, sports activities, number of children, and hormone therapy **Sitting (h)** Medium exposure: 0.8 (0.5; 1.2) High exposure: 0.8 (0.4; 1.3) **Standing (h)** Medium exposure: 1.4 (0.8; 2.2) High exposure: 1.6 (0.9; 2.8) **Heavy lifting (n)** Medium exposure: 1.1 (0.7; 1.7) High exposure: 1.5 (0.9; 2.5) **Twisted position (h)** Medium exposure: 1.1 (0.7; 1.8) High exposure: 1.6 (0.9; 2.6) **Jump (n)**	–

		63 years (range 50–75) n=503 (230 cases and 273 referents) All participants were women			Medium exposure: 1.0 (0.5; 2.0) High exposure: 2.1 (1.1; 4.2) **Stairs climbed (n)** Medium exposure: 1.3 (0.8; 2.0) High exposure: 2.1 (1.2; 3.6)	
Vingard et al 1993 [31] Sweden	Case-control Individuals with severe idiopathic osteoarthrosis and general population 1984–1988	The study population comprised all Swedish men between the ages of 50 and 70 years who lived in the referral areas of four large hospitals in Stockholm The cases were recipients of a hip prosthesis as a result of severe idiopathlc coxarthrosis Referents were randomly selected from the study population Men in both groups with malformations, sequelae after poliomyelitis,	**Physical work load** The work load was assessed through an interview and a self-administered questionnaire on the men's specific work periods The questionnaire items are described in the article Information regarding exposure was collected from the start of the occupational career to the year of the diagnosis for the cases and to the year of the interview for the referents.	**Prosthesis of the hip joint as a result of idiopathic osteoarthrosis** Cases were those men in the study population who received a first-time prosthesis of the hip joint as a result of idiopathic osteoarthrosis. The orthopaedic clinics involved were contacted each week; they delivered the names and addresses of new patients Information regarding the occurrence of disorders was obtained from the files of the hospital or through	Relative risks (CI) for developing osteoarthrosis of the hip with different combinations of high and low exposure to physical load from occupation and sport adjusted for age and body mass index, for men **Physical load from work- Low** ***Exposure to sports*** Low: 1.0 Medium: 1.6 (0.6; 3.7) High: 2.1 (0.9; 4.9) **Physical load from work- Medium** ***Exposure to sports*** Low: 2.1 (0.9; 4.8) Medium: 3.9 (1.6; 10.1) High: 6.0 (2.7; 13.0) **Physical load from work- High** ***Exposure to sports*** Low: 3.3 (1.4; 7.7) Medium: 4.0 (1.7; 9.6) High: 8.5 (4.0; 17.9)	–

		rickets, or trauma to the trunk or lower extremities were excluded n=541 (239 cases and 302 referents) All participants were men	Exposure was then aggregated for the men's work life up to 49 years of age	personal interviews		
Vingard et al 1998 [32] Sweden	Case-control General population 1991–1994	The study population comprised all Swedish women between the ages of 50 and 70 years who lived in five counties in west Sweden (Halland, Göteborg- and Bohus, Älvsborg, Skaraborg and Värmland) and referral areas of five hospitals (Gävle, Linköping, Norrköping, Malmö, and Huddinge) during the the period 1991–1994 Cases were women with	**Physical work load** The work load was assessed through an interview and a self-administered questionnaire on the women's specific work periods The questionnaire items are described in the article Information regarding exposure was collected from the start of the occupational career to the year of the diagnosis for the cases and to	**Prosthesis of the hip joint as a result of idiopathic osteoarthrosis** Cases were those women in the study population who have had clinical and radiographic preoperative examinations according to a well-defined protocol, and only the patients with primary osteoarthrosis of the hip were included Information regarding the occurrence of disorders was obtained from	Relative risk for developing osteoarthrosis of the hip for women with different degrees of exposure to physical load from work and sports activities aggregated to the age of 50. RR (95% CI) adjusted for age and body mass index **Physical load from work- Low** ***Exposure to sports*** Low: 1.0 Medium: 1.1 (0.3; 3.4) High: 2.0 (0.7; 5.2) **Physical load from work- Medium** ***Exposure to sports*** Low: 1.1 (0.5; 2.0) Medium: 1.8 (0.8; 4.1) High: 2.7 (1.2; 5.9) **Physical load from work- High** ***Exposure to sports*** Low: 1.7 (0.8; 3.5) Medium: 2.7 (1.1; 7.0) High: 4.3 (1. 7; 11.0)	–

		primary osteoarthrosis of the hip. All patients had clinical and radiographic preoperative examinations according to a well-defined protocol, and only patients with primary osteoarthrosis of the hip were included The control subjects were randomly selected from the study base by means of local population registers. The control subjects were matched for age (1-year interval) and county or hospital referral area Women from the study base with known hip disorders were excluded	the year of the interview for the referents. Exposure was then aggregated for the women's work life up to 50 years of age	the Swedish National Registry of total hip replacements		

		n=503 (230 cases and 273 referents) All participants were women				
Vingard et al 1991 [33] Sweden	Case-control General population 1984–1988	The study population comprised all Swedish men between the ages of 50 and 70 years who lived in the referral areas of four large hospitals in Stockholm The cases were recipients of a hip prosthesis as a result of severe idiopathic coxarthrosis Referents were randomly selected from the study population Men in both groups with malformations, sequelae after poliomyelitis, rickets, or trauma to the trunk or lower	**Manual handling and static work** The work load was assessed through an interview and a self-administered questionnaire on the men's specific work periods The questionnaire items are described in the article Information regarding exposure was collected from the start of the occupational career to the year of the diagnosis for the cases and to the year of the interview for the referents. Exposure was then	**Prosthesis of the hip joint as a result of idiopathic osteoarthrosis** Cases were those men in the study population who received a first-time prosthesis of the hip joint as a result of idiopathic osteoarthrosis. The orthopaedic clinics involved were contacted each week; they delivered the names and addresses of new patients Information regarding the occurrence of disorders was obtained from the files of the hospital or through personal interviews	Risk for developing coxarthrosis from medium or high exposure before the age of 49 years as compared with low exposure of different types. RR (95% CI) adjusted for age, body mass Index, smoking, and sports activities up to the age of 29 years **Static+dynamic exposure** ***Medium exposure*** Total: 1.82 (1.02; 3.24) ≤29 years exposure: 1.74 (1.06; 2.87) >30 years exposure: 2.25 (1.35; 3.76) ***High exposure*** Total: 2.42 (1.45;4.04) ≤29 years exposure: 1.97 (1.22; 3.18) >30 years exposure: 2.87 (1.79; 4.62) **Only static** ***Medium exposure*** Total: 1.21 (0.64; 2.31) ≤29 years exposure: 1.91 (1.06; 3.44) >30 years exposure: 1.13 (0.68; 1.86) ***High exposure*** Total: 2.92 (1.69;5.05) ≤29 years exposure: 2.29 (1.36; 3.81) >30 years exposure: 2.12 (1.32; 3.41) **Only dynamic** ***Medium exposure*** Total: 1.92 (1.11; 3.32) ≤29 years exposure: 2.09 (1.27; 3.48) >30 years exposure: 1.50 (0.90; 2.49)	–

		extremities were excluded n=541 (239 cases and 302 referents) All participants were men	aggregated for the men's work life up to 49 years of age		***High exposure*** Total: 2.17 (1.27; 3.73) ≤29 years exposure: 1.83 (1.09; 3.06) >30 years exposure: 2.36 (1.46; 3.82) **Lifted tons** ***Medium exposure*** Total: 1.58 (0.93; 2.66) ≤29 years exposure: 1.73 (1.06; 2.63) >30 years exposure: 1.63 (0.98; 2.73) ***High exposure*** Total: 1.84 (1.12; 3.03) ≤29 years exposure: 1.95 (1.23; 3.09) >30 years exposure: 2.74 (1.70; 4.43) **Number of lifts (>40 kg)** ***Medium exposure*** Total: 1.38 (0.81; 2.36) ≤29 years exposure: 1.73 (1.06; 2.82) >30 years exposure: 1.60 (0.81; 3.15) ***High exposure*** Total: 2.40 (1.50; 3.83) ≤29 years exposure: 2.35 (1.47; 3.74) >30 years exposure: 3.31 (1.97; 5.57) **Number of jumps** ***Medium exposure*** Total: 1.82 (1.06; 3.14) ≤29 years exposure: 1.80 (1.09; 3.04) >30 years exposure: 1.92 (1.07; 3.46) ***High exposure*** Total: 1.52 (0.91; 2.53) ≤29 years exposure: 1.39 (0.85; 2.26) >30 years exposure: 1.38 (0.77; 2.46)	
Vrezas et al 2010 [34] Germany	Case-control General population	Participants were aged 25–70 years	**Manual handling and posture**	**Symptomatic knee osteo-arthritis**	Interaction of body mass index and_ physical workload (kneeling/squatting; lifting or carrying of loads) and the risk of knee	Interaction of body mass index and_ physical workload (kneeling/squatting; lifting or carrying of loads) and the risk of knee osteoarthritis. OR (95% CI)

	Time when the study was performed not stated	Cases were patients at orthopedic clinics and practices with radiographically confirmed knee osteoarthritis associated with chronic complaints. Practices from which cases were drawn were not specialized in workers' compensation cases or certain industries Control subjects were randomly selected from a one percent random sample of male residents aged 25–70 years in the same region as the patients n=622 (295 cases and 327 controls) All participants were men	Data were gathered in a structured personal interview using a questionnaire developed by the authors To calculate cumulative exposure, the self-reported duration of kneeling and squatting as well as the duration of lifting and carrying of loads were summed up over the entire working life Cumulative exposure was calculated up to the year of diagnosis (in cases) or to the year of interview (in control subjects) To calculate cumulative exposure to lifting/carrying, all weights >5	Participating physicians identified patients with knee osteoarthritis associated with chronic complaints Patients were not eligible for the study if the initial diagnosis of knee osteoarthritis had been made more than five years earlier Knee X-rays were re-assessed by a reference radiologist according to the criteria defined by Kellgren To finally qualify as cases, patients had to have at least grade 2 osteoarthritis according to the reference radiologist's assessment	osteoarthritis. OR (95% CI) adjusted for age and region **Kneeling/squatting** ***BMI not stated*** Kneeling/squatting <4 757 h: 1.7 (1.0; 2.9) ***BMI<24.92 kg/m²*** No kneeling/squatting: 1.0 Kneeling/squatting ≥4 757 h: 3.0 (1.5; 6.0) ***BMI≥24.92 kg/m²*** No kneeling/squatting: 2.7 (1.6; 4.6)* Kneeling/squatting ≥4 757 h: 8.9 (4.4; 17.9)* *vs BMI <24.92 and no kneeling/squatting **Lifting/carrying** ***BMI not stated*** Lifting/carrying <5 120h: 2.6 (1.5; 4.6) ***BMI<24.92 kg/m²*** No lifting/carrying: 1.0 Lifting/carrying ≥5 120h: 3.9 (1.9; 7.9) ***BMI≥24.92 kg/m²*** No lifting/carrying: 2.7 (1.4; 5.1) Lifting/carrying ≥5 120h: 6.8 (3.6; 12.9)	adjusted for age, region, body mass index, jogging/athletics, kneeling/squatting, and lifting/carrying (without considered variable) **Kneeling/squatting** ***BMI not stated*** Knee-/squatting <4 757 h: 1.2 (0.7; 2.2) ***BMI<24.92 kg/m²*** No kneeling/squatting: 1.0 Knee-/squatting ≥4 757 h: 1.8 (0.8; 3.9) ***BMI≥24.92 kg/m²*** No kneeling/squatting: 2.5 (1.5; 4.3) Knee-/squatting ≥4757 h: 5.3 (2.4; 11.5) **Lifting/carrying** ***BMI not stated*** Lifting/carrying <5 120h: 2.4 (1.3; 4.3) ***BMI<24.92 kg/m²*** No lifting/carrying: 1.0 Lifting/carrying ≥5 120h: 2.4 (1.2; 4.7) ***BMI≥24.92 kg/m²*** No lifting/carrying: 2.4 (1.2; 4.7) Lifting/carrying ≥5 120h: 5.0 (2.4; 10.5)

			kg lifted or carried at work were multiplied by the corresponding durations (assuming 2.5 seconds duration per single lifting act) and summed			
Yoshimura et al 2000 [35] Japan	Case-control study Patients and general population The time when the study was performed is not stated	The participants were from two health districts in Wakayama Prefecture, Japan Cases were women and men aged ≥45 years listed for total hip arthroplasty due to osteoarthritis over one year who did not have an established cause of secondary osteoarthritis For each case, a control was selected randomly from the general population. Each control	**Several factors** Physical factors were assessed by a structured questionnaire	**Hip arthroplasty due to osteoarthritis** Hip osteoarthrosis was identified in patients who were listed for total hip arthroplasty The radiographs of all cases were assessed by a single trained observer using the Kellgren Lawrence grading system for osteoarthritis in each hip	Association between hip osteoarthritis and occupational lifting of the first and main job. Unadjusted OR (95% CI) **First job** Lifting +10 kg: 1.4 (0.8; 2.7) Lifting +25 kg: 3.6 (1.3; 9.7) Lifting +50 kg: 5.4 (1.2; 25.4) Sitting ≥2h: 0.5 (0.3; 0.9 Standing ≥2 h: 1.4 (0.7; 2.6) Kneeling ≥1 h: 0.8 (0.1; 1.6) Squatting ≥1 h: 1.2 (0.5; 2.4) Driving ≥4h: 1.0 (0.1; 7.1) Walking ≥3 km: 1.1 (0.5; 2.4) Climbing ≥30 flights of stairs: 0.8 (0.4; 1.6) **Main job** Lifting +10 kg: 1.4 (0.8; 2.4) Lifting +25 kg: 1.6 (0.8; 3.2) Lifting +50 kg: 4.0 (1.1; 14.2) Sitting ≥2h: 0.8 (0.5; 1.4) Standing ≥2 h: 1.1 (0.6; 2.1) Kneeling ≥1 h: 1.1 (0.6; 2.2) Squatting ≥1 h: 1.5 (0.7; 3.1) Driving ≥4h: 1.5 (0.4; 5.3) Walking ≥3 km: 1.2. (0.6; 2.3) Climbing ≥30 flights of stairs: 1.0 (0.5; 1.9)	Association between hip osteoarthritis and occupational lifting and activities of the first and main job. OR (95% CI) adjusted for history of knee pain and age left school **First job** Lifting +10 kg: 1.2 (0.6; 2.4) Lifting +25 kg: 3.5 (1.3; 9.7) Lifting +50 kg: – Sitting ≥2h: 0.6 (0.3; 1.0) Standing ≥2 h:1.4 (0.7; 2.8) Kneeling ≥1 h: 0.7 (0.4; 1.4) Squatting ≥1 h: 1.0 (0.5; 2.2) Driving ≥4h: 1.1 (0.1; 7.6) Walking ≥3 km: 1.0 (0.4; 2.2) Climbing ≥30 flights of stairs: 0.9 (0.4; 2.0) **Main job** Lifting +10 kg: 1.2 (0.6; 2.1) Lifting +25 kg: 1.5 (0.7; 3.0) Lifting +50 kg: 4.1 (1.1; 15.2) Sitting ≥2h: 0.8 (0.4; 1.4) Standing ≥2 h: 1.1 (0.6; 2.3) Kneeling ≥1 h: 1.0 (0.5; 2.1) Squatting ≥1 h: 1.3 (0.6; 2.8) Driving ≥4h: 1.4 (0.4; 5.4) Walking ≥3 km: 1.2 (0.6; 2.4) Climbing ≥30 flights of stairs:

		was individually matched to a case according to age, sex and district of residence The mean age was 64 years n=103 92 women and 11 men				1.1 (0.5; 2.1)

CI=Confidence interval; ICD=The International Classification of Diseases; KNFB20=operational procedure codes, total hip arthroplasty –cemented prostheses; KNFB30=operational procedure codes, total hip arthroplasty –cemented prostheses; KNFB40=operational procedure codes, total hip arthroplasty; KNFB99=operational procedure codes, total hip arthroplasty; MI6.0=ICD-10 codes; Ml6.1=ICD-10 codes; Ml6.9=ICD-10 codes; MRI=Magnetic resonance imaging; NOMESCO=The Nordic Medico-Statistical Committee; OR=Odds kvot; RR=Relative risk

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