Table 11.1 *Studies of high or moderate quality used for results and conclusions in the present report.*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Amendola et al 2011 [64] USA	Randomised block design where a pre-test measure served as covariate. Blocks included site and time of day of the shifts (8-, 10- and 12-hour shifts) Police departments in two cities 2007–2009	Eligible persons were in patrol operations divisions (assign to respond to calls for officers) and not working on foot patrol or restricted duty The majority of officers were 18–34 years old n=231 (n=69 for 8-hour shifts, n=81 for 10-hour shifts and n=81 for 12-hour shifts). The initial number of subjects was 275 326 volunteers enrolled to the study; 75 women, 251 men	*Shift length* Subjects were randomised to 8-, 10- or 12-hour shifts. Site (Arlington or Detroit) and time of day (day, evening, and midnight) were used for statistical control	*Sleep quality* Sleep quality was assessed using a self-reported instrument developed within the project. Subjects kept a sleep diary rating sleep quality from very poor to very good *Sleep apnea* Sleep apnea was assessed using the Berlin Sleep Apnea Scale	Associated effect sizes measured by block randomised ANCOVA where pre-test served as the covariate (F (df)) Average sleep quality: 0.865 (2, 147), p=0.423 Apnea: 0.208 (2, 224), p=0.812 Effect size was presented as Cohen's *f* to measure the influence of the intervention, ie, length of shift Average sleep quality: 0.09 Apnea: 0.04	–	High

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Burgard et al 2009 [55] USA	Prospective cohort 3 years Working population 1986 and 1989	Participants were working at least 20 hours per week both 1986 and 1989, 25 years and older n=1 101 458 women and 643 men	*Job control* Job control was assessed by interview using three items based on Karasek's measure of decision latitude *Job insecurity* Job insecurity was assessed by interview using two questions; one on being bothered/upset at work	*Sleep quality* Poor sleep quality was assessed by interview using a global item obtained from the Center for Epidemiologic Studies Depression Scale (CES-D)	Poor sleep quality in 1989 in relation to occupational factors. Logistic regression model adjusted for age, gender, race, civil status, children at home, educational level, household income, working hours/week, neuroticism score, self-rated health, obesity and sleep quality at baseline. OR (95% CI) Low control: 1.01 (0.935; 1.094) Low control (change 1986–1989): 1.05 (0.969; 1.133) Job insecurity: 1.11 (0.911; 1.341) Job insecurity (change 1986–1989): 1.04 (0.879; 1.232) Bothered/upset at work: – Bothered/upset at work (change 1986–1989): –	This model also adds measures of feeling bothered/upset at work. OR (95% CI) Low control: 0.99 (0.917; 1.077) Low control (change 1986–1989): 1.03 (0.952; 1.116) Job insecurity: 1.09 (0.895; 1.322) Job insecurity (change 1986–1989): 1.04 (0.873; 1.228) Bothered/upset at work: 1.35 (1.089; 1.676) Bothered/upset at work (change 1986–1989): 1.27 (1.067; 1.502)	Moderate The article also provides data on cross-sectional associations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
de Lange et al 2009 [50] The Netherlands	Prospective cohort 5 years Employees at 34 companies 1994, 1995, 1996, 1997	Companies not involved in major reorganisations. Employees working for at least 1 year, at least 20 hours per week, excluding those on temporary contract and receiving disability benefit Mean age 36 years n=1 136 329 women and 807 men	*Job demands* Job demands were assessed using a 5-item Dutch version of Karasek's Job Content Questionnaire *Job control* Job control was assessed using eight items reflecting skill discretion and decision authority	*Sleep quality* Sleep parameters were assessed using a self-administered questionnaire with a 3-item sleep scale	Correlation between factors and sleep quality at the last measurement (1997). Correlation of 0.06 and higher are significant, $p < 0.05$ *Factors at first measurement (3 years lag)* Job demands: 0.12 Job control: –0.06 *Factors at second measurement (2 years lag)* Job demands: 0.15 Job control: –0.07 *Factors at third measurement (1 year lag)* Job demands: 0.15 Job control: –0.11 Sleep quality at the first measurement (number of subjects). Mean (SE) Stable high strain group (n=61): 0.72 (0.11) Stable low strain group (n=108): 0.25 (0.08) Stable active group (n=97): 0.58 (0.11) Stable passive group (n=93): 0.45 (0.09) Change to high strain (n=84): 0.48 (0.11) Change to no high strain (n=135): 0.65 (0.11) Sleep quality at the last measurement (number of subjects). Mean (SE) Stable high strain group (n=61): 1.13 (0.11) Stable low strain group (n=108): 0.25 (0.09) Stable active group (n=97): 0.79 (0.11) Stable passive group (n=93): 0.54 (0.09) Change to high strain (n=84): 0.73 (0.12) Change to no high strain (n=135): 0.72 (0.12)	Structural equation modelling was used to compare various competing models for the relationships among job demands, job control and sleep quality. MANOVA F-values Sleep quality was significantly affected by job demands and job control across a 1-year time lag when investigating the effect of demand-control history in a four-wave panel study Models include temporal stabilities and effects of variables over time and controls for age, gender, level of education and years of experience Effect of time: $F(1, 458)=1\,855$ (η^2: 0.04) Effect of group: $F(5, 458)=6.72$ (η^2: 0.03) Effect of time x group: $F(5, 458)=2.36$ (η^2: 0.07)	Moderate The article also provides data on cross-sectional correlations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Edmé et al 2011 [51] France	Prospective cohort 4 years Working population in a French region 1999–2000, 2004	Employees with permanent work contract working at the same workplace at the same company at baseline and at follow-up Most of the population between 31–50 years. Men worked frequently in industry and services, women in services n=1 154 357 women and 797 men	*Psychosocial factors* Psychosocial factors were assessed by self-questionnaire using Karasek's and Siegrist's questionnaires translated into French	*Sleep* Sleep parameters were assessed by using sleep disorder scales from Nottingham Health Profile (self-questionnaire)	Relation between psychosocial factors and incidence of sleep problems between 1999 and 2004 adjusted for age, socioprofession and firm size. OR (95% CI) *Women* Decision latitude (low vs high): 0.88 (0.44; 1.75) Demand (high vs low): 1.08 (0.58; 2.04) Social support (low vs high): 0.97 (0.49; 1.94) Job strain: 0.68 (0.32; 1.46) Job iso-strain: 0.30 (0.08; 1.03) Reward (low vs high): 0.65 (0.33; 1.30) Effort-reward imbalance: 0.79 (0.37; 1.69) *Men* Decision latitude (low vs high): 1.18 (0.77; 1.80) Demand (high vs low): 2.20 (1.44; 3.35) Social support (low vs high): 1.13 (0.74; 1.73) Job strain: 1.89 (1.16; 3.06) Job iso-strain: 2.55 (1.41; 4.60) Reward (low vs high): 1.70 (1.12; 2.57) Effort-reward imbalance: 2.20 (1.43; 3.38)	Relation between psychosocial factors and incidence of sleep problems between 1999 and 2004 adjusted for age, socioprofession, firm size and health score at baseline. OR (95% CI) *Women* Decision latitude (low vs high): 0.77 (0.38; 1.55) Demand (high vs low): 1.10 (0.57; 2.14) Social support (low vs high): 0.84 (0.40; 1.75) Job strain: 0.56 (0.25; 1.25) Job iso-strain: 0.26 (0.07; 0.93) Reward (low vs high): 0.54 (0.26; 1.12) Effort-reward imbalance: 0.70 (0.32; 1.53) *Men* Decision latitude (low vs high): 1.21 (0.80; 1.86) Demand (high vs low): 2.05 (1.33; 3.16) Social support (low vs high): 1.12 (0.73; 1.72) Job strain: 1.88 (1.15; 3.07) Job iso-strain: 2.40 (1.31; 4.41) Reward (low vs high): 1.60 (1.05; 2.44) Effort-reward imbalance: 2.02 (1.29; 3.15)	Moderate The article also provides data on cross-sectional relations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Elovainio et al 2009 [57] United Kingdom	Prospective cohort This cohort has been followed for 14 years Civil servants Seven phases (1985–2004)	Office staff, aged 35–55 years n=5 209 1 446 women and 3 763 men	*Organisational justice* A 5-item self-report justice scale which tapped the relational component of organisational justice was used *Job strain* The components of job strain were assessed by using the Job Strain Questionnaire	*Sleeping problems* At Phase 2 sleeping problems in the past fortnight were assessed by two items from a longer symptom checklist At Phase 5 and 7 sleeping problems in the past month were assessed by using the 4-item Jenkins Scale	Association between organisational justice (mean of Phase 1 and 2) and sleeping problems at follow-ups, adjusted for age and baseline sleeping problems. Standardised regression coefficients *beta* *Women* *Overall sleeping problems* beta: –0.10, t: –4.07, p <0.001 *Sleep onset problems* beta: –0.005, t: –1.94, p=0.053 *Sleep maintenance problems* beta: –0.09, t: –3.39, p <0.001 *Non refreshing sleep* beta: –0.12, t: –4.72, p <0.001 *Men* *Overall sleeping problems* beta: –0.11, t: –6.69, p <0.001 *Sleep onset problems* beta: –0.07, t: –4.29, p= –0.08 *Sleep maintenance problems* beta: –0.08, t: –5.26, p <0.001 *Non refreshing sleep* beta: –0.11, t: –6.93, p <0.001 Overall sleeping problems score at follow-up by baseline characteristics. Adjusted mean (95% CI) *Women* Job strain – yes: 11.8 (11.3; 12.3) Job strain – no: 11.3 (10.9; 11.6) p for difference: 0.039 *Men* Job strain – yes: 11.1 (10.8; 11.4) Job strain – no: 10.5 (10.3; 10.7) p for difference: <0.001	Association between organisational justice and sleeping problems, adjusted for age, baseline sleeping problems, employment grade, health behaviours, depressive symptoms and job strain. Standardised regression coefficients *beta* *Women* *Overall sleeping problems* beta: –0.06, t: –2.15, p=0.032 *Sleep onset problems* beta: –0.03, t: –1.21, p=0.227 *Sleep maintenance problems* beta: –0.05, t: –1.87, p=0.061 *Non refreshing sleep* beta: –0.06, t: –2.15, p=0.032 *Men* *Overall sleeping problems* beta: –0.06, t: –3.93, p <0.001 *Sleep onset problems* beta: –0.04, t: –2.66, p=0.008 *Sleep maintenance problems* beta: –0.05, t: –3.01, p=0.003 *Non refreshing sleep* beta: –0.07, t: –4.10, p <0.001	Moderate

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Eriksen et al 2008 [52] Norway	Prospective cohort 3 months Health care 1999–2000	Union members nurses aides who were vocationally active and working more than half-time Age described in 5 categories n=4 771 4 585 women and 185 men*	*Working hours per week, night shift work* Recordings were made for number of working hours per week and number of night shifts *Physical work factors* Physical work factors were assessed with a self-questionnaire based on questions by Smedley et al, 1995, and QPS Nordic by Dallner et al, 2000 *Psychosocial work factors* Psychosocial work factors were assessed with a self-questionnaire based on QPS Nordic by Dallner et al, 2000	*Subjective sleep quality* Subjective sleep quality was assessed with a self-questionnaire based on the Basic Nordic Sleep Questionnaire	Relation between occupational factors (described in categories 1–5) at baseline and poor sleep at follow-up. OR (95% CI) *Working hours per week (19–36 hours = 1)* >36 hours: 1.17 (0.90; 1.52) *Frequency of night shifts (Never = 1)* Sometimes: 0.92 (0.75; 1.13) Rather often: 0.74 (0.52; 1.06) Very often: 0.95 (0.72; 1.25) *Handling heavy objects at work (0 per shift = 1)* 1–4 per shift: 1.06 (0.85; 1.32) 5–9 per shift: 1.07 (0.77; 1.49) ≥10 per shift: 1.02 (0.65; 1.61) *Physical endurance required* Never or very seldom: 1 Rather seldom: 0.98 (0.61; 1.57) Sometimes: 0.97 (0.63; 1.48) Rather often: 0.97 (0.62; 1.52) Very often or always: 0.81 (0.51; 1.30) *Quantitative work demands (Level 1 = 1)* 2: 1.40 (1.02; 1.92) 3: 1.40 (1.06; 1.85) 4: 1.35 (1.00; 1.81) 5: 1.54 (1.10; 2.17) *Control of work pace (Level 1 = 1)* 2: 1.00 (0.76; 1.32) 3: 0.92 (0.67; 1.26) 4: 0.84 (0.62; 1.13) 5: 0.81 (0.57; 1.17) *Control of decisions in own work (Level 1 = 1)* 2: 1.11 (0.84; 1.46) 3: 1.20 (0.87; 1.65) 4: 0.95 (0.67; 1.35) 5: 0.95 (0.68; 1.31) Results continues on the next page	Predictors of poor sleep. The results of one logistic regression analysis with a number of factors (specified in a table) entered simultaneously. All covariates dichotomised. OR (95% CI) *Working hours per week* >36 vs 19–36: 1.12 (0.88; 1.41) *Frequency of night shifts* 0.93 (0.79; 1.09) *Handling heavy objects at work* 1.08 (0.86; 1.36) *Work requires physical endurance* 0.97 (0.80; 1.18) *Quantitative work demands* 1.14 (0.95; 1.36) *Control of work pace* 0.88 (0.74; 1.05) *Control of decisions in own work situations* 0.78 (0.66; 0.94) *Fairness of immediate superior* 1.08 (0.89; 1.32) *Support from immediate superior* 0.77 (0.63; 0.94) *Rewards for well-done work* 0.93 (0.77; 1.11) *Exposure to threats and violence at work* 1.19 (1.01; 1.40) *Exposure to bullying at work* 0.75 (0.52; 1.09)	Moderate *nb: the sum of women and men do not add up to the total number of subjects reported in the article

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Eriksen et al 2008 [52] Norway					*Fairness of immediate superior (Level 1 = 1)* 2: 1.02 (0.74; 1.41) 3: 1.14 (0.87; 1.48) 4: 1.01 (0.70; 1.44) 5: 1.25 (0.90; 1.73) *Support from immediate superior (Level 1 = 1)* 2: 0.90 (0.68; 1.20) 3: 1.10 (0.77; 1.56) 4: 0.71 (0.50; 1.01) 5: 0.67 (0.46; 1.00) *Rewards for well-done work* Not at all or very little: 1 Rather little: 0.85 (0.67; 1.08) Some: 0.90 (0.72; 1.14) Rather much: 0.74 (0.54; 1.00) Very much: 0.75 (0.41; 1.36) *Exposure to threats and violence at work* Never or very seldom: 1 Rather seldom: 0.87 (0.68; 1.13) Sometimes: 1.08 (0.86; 1.37) Rather often: 1.77 (1.27; 2.46) Very often or always: 1.60 (0.86; 2.98) *Exposure to bullying at work (No = 1)* Yes: 0.65 (0.43; 0.98)		

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Greenberg 2006 [61] USA	Interrupted time series with a nonequivalent no-treatment control group series 6 months Nurses No information on exact years for measurements	Non-unionised nurses who worked on the same shift for at least 49 consecutive weeks at one of four private hospitals n=467 in the final sample (625 at baseline) 412 women and 55 men	*Underpayment inequity (interactional justice)* The pay was reduced for some nurses, while it was unchanged for others Self-questionnaires developed within the projects were used to rate pay fairness For some groups in the experimental design, nursing supervisors received training in promoting interactional justice	*Insomnia* Insomnia was assessed using a variation of the Jenkins Scale (self-questionnaire)	Dependent variables were analysed using 2x2 (between) x4 (within) mixed-design univariate analyses of variance Self-reports of insomnia interacted with training x pay x time interaction: $F(3, 1\ 386)=9.99$, $p<0.01$ Underpaid nurses experienced greater insomnia than those whose pay was unchanged: $F(2, 1\ 398)=1.317$, $p<0.01$ Insomnia among employees with different wages (mean, SD) Underpaid employees: 5.07 (1.34) Unchanged pay: 2.70 (1.10) The degree of insomnia was significantly lower among nurses whose supervisors were trained in interactional justice, both immediately after training and 6 months later	–	Moderate

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Hanson et al 2011 [53] Sweden	Prospective cohort/ two-wave panel 2 years (2 measurements) Working population 2003, 2006, 2008	Gainfully employed members of the working population Mean age 47 years n=3 041 at second measurement 1 599 women and 1 442 men at second measurement	*Psychosocial factors* Demand, control and support were assessed by using the Swedish version of the Demand-Control Questionnaire Work hours were assessed with a modified question from the Swedish Work Environment Survey	*Sleep disturbance, awakening problems* Sleep parameters were assessed by using questions from the Karolinska Sleep Questionnaire	Association between factors and sleep parameters. Standardised regression coefficients adjusted for gender, age, marital status, education, alcohol consumption and job change *Disturbed sleep at second measurement* Demands at first measurement: 0.03 Decision authority at first measurement: –0.01 Support at first measurement: –0.03 *Awakening problems at second measurement* Demands at first measurement: 0.02 Decision authority at first measurement: –0.04, $p < 0.05$ Support at first measurement: –0.04, $p < 0.05$	Association between factors and sleep parameters. Model fit and comparison for structural equation models; analyses controlled for gender, age, marital status, education, alcohol consumption and job change *Disturbed sleep* *Model fit – forward model* Demands: df: 217, χ^2: 1 255.33 Decision authority: df: 103, χ^2: 400.69 Support: df: 263, χ^2: 1 297.11 *Comparison – forward model vs null modell* Demands: df: 217, $\Delta\chi^2$: 4.83, $p < 0.05$ Decision authority: df: 103, $\Delta\chi^2$: 1.08 Support: df: 263, $\Delta\chi^2$: 3.05 *Awakening problems* *Model fit – forward model* Demands: df: 175, χ^2: 1 140.00 Decision authority: df: 73, χ^2: 259.85 Support: df: 217, χ^2: 1 130.69 *Comparison – forward model vs null modell* Demands: df: 175, $\Delta\chi^2$: 2.1 Decision authority: df: 73, $\Delta\chi^2$: 4.78, $p < 0.05$ Support: df: 217, $\Delta\chi^2$: 4.45, $p < 0.05$	Moderate The article also provides data on cross-sectional associations (not included in the present report)

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Heiskel et al 2002 [70] Germany	Case-referent 1997–1998	Cases with apnea were compared to reference groups, n=946 (443 cases and 503 controls) *Cases* All male patients referred to selected sleep laboratories during a 1-year recruitment period who were diagnosed with obstructive sleep apnea. Mean age 54.8 years n=443 *Population based reference group* Random sample of the population in the geographical area of the sleep laboratories. Mean age 54.2 years n=397 *Sleep laboratory reference group* All male patients referred to selected sleep laboratories during a 1-year recruitment period with no pathological findings. Mean age 49.8 years n=106	*Chemical substances* Exposure to gasoline, diesel fuel, paints and solvents were assessed by questionnaires	*Obstructive sleep apnea* Obstructive sleep apnea was diagnosed by polysomnography	Exposure of reference groups vs cases. Adjusted for age, BMI, smoking, alcohol intake and region. OR (95% CI) *Gasoline (none in reference group = 1)* *Population based reference group vs cases* Low: 1.1 (0.6; 1.8) Medium: 0.9 (0.6; 1.6) High: 0.6 (0.3; 1.2) *Laboratory reference group vs cases* Low: 0.7 (0.4; 1.4) Medium: 0.9 (0.4; 1.9) High: 0.2 (0.1; 0.5) *Diesel fuel (none in reference group = 1)* *Population based reference group vs cases* Low: 0.8 (0.4; 1.5) Medium: 1.2 (0.7; 2.2) High: 1.0 (0.5; 2.2) *Laboratory reference group vs cases* Low: 1.0 (0.4; 2.5) Medium: 1.4 (0.6; 3.3) High: 0.5 (0.2; 1.0) *Paints (none in reference group = 1)* *Population based reference group vs cases* Low: 0.8 (0.5; 1.2) Medium: 1.0 (0.5; 1.7) High: 1.0 (0.4; 2.2) *Laboratory reference group vs cases* Low: 0.6 (0.3; 1.1) Medium: 0.9 (0.4; 2.0) High: 0.5 (0.2; 1.5) *Solvents (none in reference group = 1)* *Population based reference group vs cases* Low: 1.2 (0.8; 1.9) Medium: 1.1 (0.6; 1.9) High: 0.8 (0.4; 1.6) *Laboratory reference group vs cases* Low: 1.0 (0.5; 1.9) Medium: 0.8 (0.4; 1.6) High: 0.8 (0.3; 1.8)	Obstructive sleep apnea by cumulative exposure to solvents as assessed with a job exposure matrix. Adjusted for age, BMI, smoking, alcohol intake and region. OR (95% CI) *Population based reference group vs cases* None: 1 ≤197 ppm-years: 0.9 (0.3; 2.9) >197 ppm-years: 0.5 (0.2; 1.5) *Laboratory reference group vs cases* None: 1 ≤197 ppm-years: 3.1 (0.4; 27.4) >197 ppm-years: –	Moderate

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Jansson et al 2006 [54] Sweden	Prospective cohort 1 year General population No information on exact years for measurements	Participants were employed at baseline Age 20–60 years (mean 43 years) n=1 530 765 women and 765 men at baseline	*Psychosocial factors* Psychosocial work stressors were assessed using a 43-item self-questionnaire based on an instrument developed by Haynes et al	*Insomnia* Insomnia was assessed using a self-questionnaire. Items concerning sleep were taken from the Nordic Sleep Question-naire	Correlation between factors and insomnia. Stepwise logistic regression with the following predictor variables: age, gender, civil status, educational status, irregular work hours and work characteristics. OR (95% CI) *No insomnia at baseline to future insomnia* Irregular work hours: ns Autonomy and control: ns Influence over decisions: ns Professional compromise: ns Role conflict: ns Work demands: 1.38 (1.11; 1.71) Peer support: ns Leader support: ns Role clarity: ns Feedback: ns *Insomnia at baseline to future insomnia* Irregular work hours: ns Autonomy and control: ns Influence over decisions: ns Professional compromise: ns Role conflict: ns Work demands: ns Peer support: ns Leader support: 0.69 (0.51; 0.94) Role clarity: ns Feedback: ns *Maintained insomnia* Irregular work hours: ns Autonomy and control: ns Influence over decisions: 1.30 (1.05; 1.62) Professional compromise: ns Role conflict: ns Work demands: 1.27 (1.02; 1.58) Peer support: ns Leader support: ns Role clarity: ns Feedback: ns	–	Moderate

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Karlson et al 2009 [65] Sweden	Prospective study of change of shift schedule 1 year and 3 months Employees at manufacturing plant No information on exact years for measurements	Day-time and shift workers Mean age 46 years n=283 at baseline and 185 at follow-up (118 shift workers and 67 day-time workers at follow-up) 31 women and 154 men at follow-up	*Psychosocial factors* Psychosocial workload was assessed using a self-questionnaire based on Karasek's Job Content Questionnaire	*Awakening problems, sleep disturbance* Sleep parameters were assessed using a self-questionnaire based on the Karolinska Sleep Questionnaire (KSQ)	Sleep disturbance measured before (T1) and after (T2) a change of shift. Mean difference, 95% CI [a]: Age included as covariate [b]: Gender included as covariate *Shift workers* KSQ awakening problems[ab]: −0.30 (−0.43; −0.17) KSQ sleep disturbance[b]: −0.21 (−0.33; −0.10) *Day-time workers* KSQ awakening problems[ab]: 0.01 (−0.17; 0.18) KSQ sleep disturbance[b]: 0.02 (−0.13; 0.18) The magnitude of change from T1 to T2, computed as the mean difference between groups from T1 to T2, divided by the average standard deviation of the two points within each group (reported as Cohen's *d*). For awakening problems age and gender were included as covariates, and for sleep disturbance gender was included as a covariate *Shift workers (before/after shift change)* Awakening problems: 0.33, p <0.001 Sleep disturbance: 0.36, p <0.001 *Day-time workers* Awakening problems: 0.01, p=0.942 Sleep disturbance: 0.06, p=0.583 *Interaction time x group* Awakening problems: p=0.006 Sleep disturbance: 0.06, p=0.001	–	High The article also provides data on cross-sectional correlations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Lallukka et al 2011 [62] Finland	Prospective cohort 5–7 years Civil servants 2000–2002, 2007	Employees of the City of Helsinki Age described in a separate publication n=6 646 (sum of reported women and men) 5 399 women and 1 247 men The author reports 8 960 subjects at baseline and 7 332 at follow-up	*Work place bullying* Bullying was assessed by two questions in a mailed survey	*Sleep problems* Sleep problems were assessed using the Jenkins Sleep Questionnaire, which was mailed to the participants	Bullying at baseline and subsequent sleep problems. OR (95% CI) adjusted for age *Women (no bullying = 1)* Reported earlier bullying: 1.47 (1.26; 1.72) Reported current bullying: 1.69 (1.30; 2.20) Observed bullying – sometimes: 1.13 (0.99; 1.30) Observed bullying – frequent: 2.00 (1.61; 2.48) *Men (no bullying = 1)* Reported earlier bullying: 1.58 (1.06; 2.36) Reported current bullying: 3.17 (1.85; 5.43) Observed bullying – sometimes: 1.15 (0.85; 1.56) Observed bullying – frequent: 2.04 (1.23; 3.39) Bullying at baseline and subsequent sleep problems. OR (95% CI) adjusted for age and baseline sleep problems *Women (no bullying = 1)* Reported earlier bullying: 1.30 (1.10; 1.53) Reported current bullying: 1.25 (0.94; 1.66) Observed bullying – sometimes: 1.04 (0.90; 1.21) Observed bullying – frequent: 1.55 (1.23; 1.96) *Men (no bullying = 1)* Reported earlier bullying: 1.40 (0.91; 2.18) Reported current bullying: 2.60 (1.43; 4.72) Observed bullying – sometimes: 1.04 (0.75; 1.44) Observed bullying – frequent: 1.51 (0.87; 2.65)	Bullying at baseline and subsequent sleep problems. OR (95% CI) also adjusted for childhood bullying, education, working conditions, obesity, illness, baseline sleep problems *Women (no bullying = 1)* Reported earlier bullying: 1.14 (0.96; 1.36) Reported current bullying: 0.99 (0.74; 1.33) Observed bullying – sometimes: 0.94 (0.81; 1.10) Observed bullying – frequent: 1.23 (0.96; 1.56) *Men (no bullying = 1)* Reported earlier bullying: 1.20 (0.76; 1.91) Reported current bullying: 1.81 (0.94; 3.48) Observed bullying – sometimes: 0.94 (0.66; 1.32) Observed bullying – frequent: 1.05 (0.57; 1.94)	Moderate

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Linton 2004 [60] Sweden	Prospective cohort 1 year Residents from three counties in middle Sweden No information on exact years for measure-ments	Participants were gainfully employed and had no self-reported sleeping problems at the initial assess-ment Age 20–60 years n=816 384 women and 432 men	*Psychosocial factors* Work factors were assessed with a questionnaire Stress at work was assessed with a 10-item standardised form based on assessment of psycho-social work environment (Hane et al, 1984, Linton et al, 1989) and the demand-control-support model by Karasek et al	*Sleep problems* Sleep problems were assessed with a question-naire Items concerning sleep were taken from the Basic Nordic Sleep Questionnaire and the Uppsala Sleep Inventory (Broman et al, 1996, Liljenberg et al, 1988)	Logistic regression analyses (OR, 95% CI) for developing a new episode of sleeping problems. Adjusted for age and gender *Work hours* Irregular work hours: 1.02 (0.60; 1.72) Night work: 1.34 (0.55; 3.29) Shift work: 1.21 (0.53; 2.72) *Psychosocial work environment* Psychosocial work index: 2.15 (1.40; 3.29) Work content: 1.49 (0.96; 2.33) Work load: 1.42 (0.93; 2.17) Social support at work: 1.64 (1.06; 2.54)	–	Moderate

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Niedhammer et al 1994 [68] France	Prospective cohort 10 years (2 follow-ups) Nurses 1980, 1985 and 1990	Nurses randomly selected from staff records (50 on day schedule and 50 on night schedule from 10 hospitals) at baseline Mean age at baseline 30 years n=440 year 1980 n=361 year 1985 n=303 year 1990 n=279 both 1980 and 1985 n=203 both 1985 and 1990 Gender not listed	*Time schedule* Self-administered questionnaire Working schedule was classified as permanent night, alternating with nights, alternating day or permanent day. All, except the last, were considered as shift work	*Sleep quality* Self-administered questionnaire Sleep disorders were defined as "premature awakening" or "difficulties in getting to sleep"	Percent of sleep disorders reported in 1980 and 1985 by the same nurses Permanent day 1980: 22.22% Permanent day 1985: 15.87% n=63, difference: ns Permanent day 1980: 21.43% Shift work 1985: 14.29% n=14, difference: ns Shift work 1980: 31.58% Shift work 1985: 23.36% n=244, difference: p <0.05 Shift work 1980: 52.38% Permanent day 1985: 19.05% n=42, difference: p <0.001	Sleep disorders. Factors associated with transfer from shift work to standard day-time schedule. Logistic regression. OR (95% CI) *1980/1985* No: 1 Yes: 3.01 (1.43; 6.34) *1985/1990* No: 1 Yes: 0.49 (0.17; 1.44)	Moderate The article also provides data on cross-sectional associations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Ota et al 2009 [58] Japan	Prospective cohort 2 years Electrical products companies 2003 and 2005	Participants were 39 years or older and had no work limitations due to health conditions at baseline n=1 022 151 women and 871 men	*Psychosocial factors* Assessed by means of a self-reported Japanese version of the Job Content Questionnaire	*Insomnia* Insomnia was assessed by means of a self-reported questionnaire based on non-organic definitions of insomnia in ICD-10 and DSM-IV	Risk with regard to insomnia at the follow-up. OR (95% CI) adjusted for gender and age *Insomniacs at baseline (n=292)* Not high strain: 1 High strain: 1.27 (0.75; 2.16) High social support: 1 Low social support: 1.70 (1.04; 2.72) Effort-reward imbalance – absent: 1 Effort-reward imbalance – present: 2.18 (1.08; 4.40) *Not insomniacs at baseline (n=730)* Not high strain: 1 High strain: 1.53 (0.97; 2.43) High social support: 1 Low social support: 0.92 (0.61; 1.37) Effort-reward imbalance – absent: 1 Effort-reward imbalance – present: 1.28 (0.61; 2.67)	Risk with regard to insomnia at the follow-up. OR (95% CI) also adjusted for illness being treated, occupational conditions (managing position, shift-working, overtime work), frequent drinking and smoking *Insomniacs at baseline (n=292)* Not high strain: 1 High strain: 1.32 (0.75; 2.34) High social support: 1 Low social support: 2.00 (1.18; 3.40) Effort-reward imbalance – absent: 1 Effort-reward imbalance – present: 1.39 (0.83; 2.34) *Not insomniacs at baseline (n=730)* Not high strain: 1 High strain: 1.72 (1.06; 2.79) High social support: 1 Low social support: 0.95 (0.63; 1.45) Effort-reward imbalance – absent: 1 Effort-reward imbalance – present: 1.38 (0.65; 2.94)	Moderate

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Pereira et al 2012 [63] Switzerland	Observation study 2 weeks Swiss organisations No information on exact years for measurements	Subjects employed in organisations constructed of teams of supervisors and colleagues. None had night shifts during the study period Mean age 34 years n=90 57 women and 33 men	*Social exclusion* Social exclusion was assessed with a self-questionnaire based on a 7-item scale by Leary et al, 1995	*Several sleep outcomes* Subjective sleep quality was assessed with a self-questionnaire (single item) based on Buysse, 1988 Sleep actigraphy was assessed by Body Media´s Sensewear Armband	Estimates for predicting sleep parameters. The model was group-mean centred, ie, within-persons relationships between social exclusion and sleep parameters. Correlation coefficient (SE) Sleep fragmentation: 0.23 (0.12), p <0.05 Sleep onset latency: 0.30 (2.41) Sleep efficiency: –0.31 (1.52) Self-reported sleep quality: 0.04 (0.15)	–	Moderate

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Postuma et al 2012 [71] Several countries	Case-control General population Time for measurements not specified	Cases were patients with idopatic REM sleep behaviour disorder. Controls were matched 1:1 on age and gender. The controls were patients referred to sleep centres for other sleep problems and normal volunteers. Recruitment procedures ensured that no more than 35% of controls could have any single sleep disorder Mean age was 67.7 years (cases) and 66.0 years (controls) n=694 (347 patients and 347 controls) 148 women (66 cases, 82 controls) and 546 men (281 cases, 265 controls)	*Occupational pesticide use* Pesticide exposure was assessed by self-questionnaire developed by the authors	*Idopatic REM sleep behaviour disorder* Disease was confirmed with polysomnography	REM sleep behaviour disorder among pesticide users compared to non-users. OR (95% CI) adjusted for age, gender and centre Pesticide, regular occupational use: 2.23 (1.24; 4.01) Herbicide, occupational use: 2.54 (1.05; 6.16) Insecticide, occupational use: 3.67 (1.42; 9.30)	–	Moderate Included countries: Canada, Spain, Italy, France, Japan, Germany, USA, Denmark and Czech Republic

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Rosa et al 1996 [69] Finland	Prospective cohort, including an intervention. Shift schedule was changed at one of two factory sites Baseline testing 4–6 months before change in shift schedule. Follow-up testing occurred after a 4-month trial period Steel rolling mill Time for measurements not specified	Participants were workers at one of two factory sites The site where the shift was changed (S1) had 36 younger (<40 years) and 32 older (>40 years) workers. The control site (S2) had 47 younger and 93 older workers n=208 (68 at site where the shift was changed and 140 at control site) 18 women and 190 men	*Work schedule change* At both sites a rotating three shift was used. During the new schedule, all start and end times at S1 were delayed by one hour	*Two sleep outcomes* Sleep parameters were assessed by self-administered questionnaires based on the standard shift-work index by Folkard et al	Ratings of sleep quality before and after change. Mean (SD). Significances in change calculated by Newman-Keuls test *Quality of sleep* *Morning* S1 – before/after: 2.98 (0.92)/3.09 (0.74) S2 – initial/final: 3.12 (1.07)/3.07 (1.01) *Evening* S1 – before/after: 3.68 (0.71)/3.39 (0.88), p <0.05 S2 – initial/final: 3.62 (0.78)/3.54 (0.79) *Night* S1 – before/after: 2.89 (0.98)/2.63 (1.01), p <0.05 S2 – initial/final: 2.85 (1.09)/2.80 (0.98) *Free day* S1 – before/after: 3.86 (0.67)/3.84 (0.73) S2 – initial/final: 3.85 (0.80)/3.81 (0.74) *Awaken refreshed from sleep* *Morning* S1 – before/after: 2.65 (1.06)/3.15 (0.78), p <0.05 S2 – initial/final: 3.00 (0.97)/2.95 (0.96) *Evening* S1 – before/after: 3.89 (0.69)/3.60 (0.78), p <0.05 S2 – initial/final: 3.66 (0.73)/3.61 (0.81) *Night* S1 – before/after: 2.80 (0.99)/2.51 (0.96), p <0.05 S2 – initial/final: 2.79 (1.06)/2.70 (1.00) *Free day* S1 – before/after: 4.16 (0.71)/4.07 (0.60) S2 – initial/final: 3.93 (0.79)/3.93 (0.76)	Interaction of test phase with shift. ANOVA F-values *Quality of sleep* S1: 3.42, p=0.02 S2: <1, ns *Awaken refreshed from sleep* S1: 10.92, p=0.001 S2: 1.05, ns	Moderate The article also provides data on sleep quantity (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Rugulies et al 2009 [59] Denmark	Prospective cohort 5 years Working general population 2000 and 2005	Employed, working >20 hours per week, younger than 60 years, free of sleep disturbance at baseline n=2 351 free of sleep disturbance at baseline 1 154 women and 1 197 men (total: 2 614 at baseline; 1 318 women, 1 296 men)	*Effort-reward imbalance* Effort-reward imbalance (ERI) was assessed with questions developed by the research team Data at baseline were collected by telephone interview. Data at follow-up were collected by telephone interview and self-administered questionnaires	*Sleep disturbance* Sleep disturbance was assessed with two questions developed by the research team Data at baseline were collected by telephone interview. Data at follow-up were collected by telephone interview and self-administered questionnaires	Prospective associations: ERI at baseline and incident sleep disturbance at follow-up. Reference: low ERI. OR (95% CI) adjusted for survey method, age, occupational grade, married/ cohabitating, age of youngest child *Women* Medium–low ERI: 1.31 (0.86; 1.99) Medium–high ERI: 0.81 (0.50; 1.31) High ERI: 1.07 (0.66; 1.73) ERI ratio continuous: 1.00 (0.79; 1.28) *Men* Medium–low ERI: 1.43 (0.80; 2.55) Medium–high ERI: 1.23 (0.68; 2.22) High ERI: 2.02 (1.15; 3.55) ERI ratio continuous: 1.36 (1.03; 1.81) Prospective associations: continuous ERI at baseline – continuous sleep disturbance at follow-up. Linear regression (same adjustment) *Women* 0.59 (SE 0.30), p=0.05 *Men* 0.10 (SE 0.29), p=0.73	Prospective associations between ERI at baseline and incident sleep disturbance at follow-up. Reference: low ERI. OR (95% CI) also adjusted for smoking, alcohol consumption, physical activity, BMI, self-rated health, sickness absence days, weekly working hours, work time arrangement *Women* Medium–low ERI: 1.33 (0.86; 2.06) Medium–high ERI: 0.87 (0.53; 1.43) High ERI: 0.98 (0.59; 1.63) ERI ratio continuous: 0.97 (0.76; 1.24) *Men* Medium–low ERI: 1.44 (0.80; 2.61) Medium–high ERI: 1.34 (0.73; 2.47) High ERI: 2.06 (1.14; 3.74) ERI ratio continuous: 1.39 (1.03; 1.87) Prospective associations between continuous ERI at baseline and continuous sleep disturbance at follow-up. Linear regression analysis also adjusted for smoking, alcohol consumption, physical activity, BMI, self-rated health, sickness absence days, weekly working hours, work time arrangement *Women* 0.59 (SE 0.30), p=0.05 *Men* –0.07 (SE 0.29), p=0.80	Moderate The article also provides data on cross-sectional associations (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Takahashi et al 2012 [56] Japan	Prospective cohort 1 year Workers 2007–2009	Subjects were randomly selected from a market research panel according to gender, age and industry. Age 20–59 years (mean 40.6 at baseline). They were managers, professionals, clerical-, sales- or transportation workers n=2 382 829 women and 1 553 men	*Psychosocial factors* Occupational factors were assessed by using a self-questionnaire developed within the project	*Insomnia, incomplete recovery* Sleep parameters were assessed by using a self-questionnaire developed within the project	Correlation between occupational factor at baseline and sleep parameter at follow-up *Insomnia* Work time control: –0.10 Quantitative job overload: 0.12 Job control: –0.09 Social support at work: –0.11 *Incomplete recovery* Work time control: –0.15 Quantitative job overload: 0.24 Job control: –0.15 Social support at work: –0.10	Changes in work time control to predict outcome variables were assessed by a repeated-measures analysis of covariance to test the main effects of group and measurement time. Covariates included gender, age, occupation, weekly work hours and psycho-social work characteristics at baseline Insomnia symptoms: F(3, 2 261)=4.81, p=0.002	Moderate

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Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Virtanen et al 2009 [32] United Kingdom	Prospective cohort 5 years Civil servants 1991–1994, 1997–1999, 2002–2004	Full time office staff, 35–55 years, free of sleep disturbance at baseline n=886–1 510 depending on time of measurement and outcome. The total number of subjects was 2 470 at baseline 598 women and 1 872 men at baseline	*Weekly working hours* Working hours were assessed by using a self-questionnaire with items developed within the project	*Several sleep outcomes* Sleep parameters were assessed by using the Jenkins Scale	Incidence of sleep problems. OR (95% CI) adjusted for age, gender, marital status, occupation grade and education *Difficulty in falling asleep* *1st follow-up* 41–55 hours/week: 1.58 (0.88; 2.82) >55 hours/week: 3.68 (1.58; 8.58) *2nd follow-up* 41–55 hours/week: 1.63 (0.88; 3.00) >55 hours/week: 6.66 (2.64; 16.83) *Frequent waking* *1st follow-up* 41–55 hours/week: 0.94 (0.69; 1.27) >55 hours/week: 0.86 (0.50; 1.56) *2nd follow-up* 41–55 hours/week: 1.08 (0.78; 1.49) >55 hours/week: 1.17 (0.60; 2.25) *Early waking* *1st follow-up* 41–55 hours/week: 1.04 (0.73; 1.46) >55 hours/week: 1.58 (0.91; 2.73) *2nd follow-up* 41–55 hours/week: 1.26 (0.87; 1.82) >55 hours/week: 2.23 (1.16; 4.31) *Waking without feeling refreshed* *1st follow-up* 41–55 hours/week: 1.14 (0.76; 1.72) >55 hours/week: 1.98 (1.04; 3.77) *2nd follow-up* 41–55 hours/week: 1.48 (0.96; 2.28) >55 hours/week: 1.85 (0.79; 4.39)	Incidence of sleep problems. OR (95% CI) also adjusted for illness, exercise, BMI, smoking, alcohol and job demands *Difficulty in falling asleep* *1st follow-up* 41–55 hours/week: 1.69 (0.92; 3.08) >55 hours/week: 4.12 (1.71; 9.94) *2nd follow-up* 41–55 hours/week: 1.72 (0.91; 3.25) >55 hours/week: 7.94 (2.97; 21.25) *Frequent waking* *1st follow-up* 41–55 hours/week: 0.87 (0.63; 1.20) >55 hours/week: 0.77 (0.45; 1.33) *2nd follow-up* 41–55 hours/week: 0.99 (0.71; 1.39) >55 hours/week: 1.04 (0.53; 2.03) *Early waking* *1st follow-up* 41–55 hours/week: 1.01 (0.70; 1.45) >55 hours/week: 1.44 (0.81; 2.54) *2nd follow-up* 41–55 hours/week: 1.22 (0.83; 1.89) >55 hours/week: 2.03 (1.03; 4.02) *Waking without feeling refreshed* *1st follow-up* 41–55 hours/week: 1.09 (0.72; 1.67) >55 hours/week: 1.82 (0.93; 3.54) *2nd follow-up* 41–55 hours/week: 1.41 (0.90; 2.21) >55 hours/week: 1.71 (0.71; 4.09)	High The article also provides data on short sleep and cross-sectional odds ratios (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Åkerstedt et al 2001 [67] Sweden	Prospective cohort, including an intervention (reduced weekly work time) 2 years Health and day care personnel Time for measurements not specified	Mean age 39 years n=63 (41 in experimental group and 22 in control group) 53 women and 10 men at follow-up	*Reduced working time* Reduced working time from 39 to 30 hours per week	*Several sleep outcomes* Sleep parameters were assessed by using a self-administered questionnaire with a 5-item scale (1–5 p) developed by the authors	Sleep disturbance before and after reduced working time. Mean (SEM)* *Experimental group* *Before reduction* Insomnia complaints: 3.81 (0.13) Sleep quality: 3.85 (0.15) Difficulty awakening: 3.80 (0.16) Refreshed at awakening: 3.23 (0.17) *After reduction* Insomnia complaints: 4.19 (0.11) Sleep quality: 4.22 (0.14) Difficulty awakening: 4.08 (0.15) Refreshed at awakening: 3.74 (0.16) *Control group* *Before reduction* Insomnia complaints: 3.71 (0.18) Sleep quality: 3.82 (0.23) Difficulty awakening: 3.82 (0.27) Refreshed at awakening: 2.91 (0.26) *After reduction* Insomnia complaints: 3.90 (0.16) Sleep quality: 3.64 (0.20) Difficulty awakening: 3.86 (0.22) Refreshed at awakening: 3.52 (0.21)	Interaction between experimental and control groups over time. Two-way repeated measured ANOVA F-values *Insomnia complaints* Between groups: 1.1 Over time: 15.4 (0.1% significance) Interaction: 1.7 *Sleep quality* Between groups: 1.8 Over time: 0.7 Interaction: 6.1 (5% significance) *Difficulty awakening* Between groups: 0.2 Over time: 1.7 Interaction: 0.9 *Refreshed at awakening* Between groups: 1.1 Over time: 18.5 (0.1% significance) Interaction: 0.2	Moderate The article also provides data on sufficient sleep and sleep need (not included in the present report) * The author has not explicitely specified that the measurements are given as mean (SEM). This was assumed at tabulating data

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Åkerstedt et al 2010 [66] Sweden	Prospective cohort 5 years Working population 1996–1998, 2000–2003	Participants from a Swedish database (WOLF) n=3 637 Study included both women and men, but explicit total numbers are not listed. Approximately 20% women	*Shift work* The work was classified in the following categories: remained working day, entering shift work, exiting shift work, entering night work, exiting night work and remained working night Shift work was assessed with one question developed by the authors	*Several sleep outcomes* Sleep parameters were assessed by using the Karolinska Sleep Questionnaire	Prediction of new cases and loss of cases with sleep/wake problems. Logistic regression analysis. OR (95% CI). Adjusted for gender, age, demands, control, socio-economic group, education, heavy/light work and marital status *Difficulties falling asleep* *New cases (day = 1)* Entry night: 0.82 (0.33; 2.00) Night: 1.08 (0.72; 1.62) Entry shift: 1.73 (1.14; 2.63) Shift: 1.08 (0.88; 1.32) *Loss of cases (shift = 1)* Exit shift: 2.82 (1.78; 4.48) *Loss of cases (night = 1)* Exit night: 1.91 (0.97; 3.74) *Difficulties awakening* *New cases (day = 1)* Entry night: 2.30 (1.00; 5.28) Night: 1.14 (0.72; 1.81) Entry shift: 0.92 (0.56; 1.51) Shift: 1.12 (0.89; 1.42) *Loss of cases (shift = 1)* Exit shift: 1.40 (0.88; 2.23) *Loss of cases (night = 1)* Exit night: 1.21 (0.65; 2.22) The results continues on the next page	–	Moderate The article also provides data on falling asleep at work (not included in the present report)

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Åkerstedt et al continued 2010 [66] Sweden					<u>*Repetitive awakenings*</u> *New cases (day = 1)* Entry night: 0.38 (0.13; 1.11) Night: 1.30 (0.87; 1.94) Entry shift: 0.89 (0.59; 1.34) Shift: 0.98 (0.80; 1.20) *Loss of cases (shift = 1)* Exit shift: 1.77 (1.13; 2.78) *Loss of cases (night = 1)* Exit night: 1.44 (0.75; 2.76) <u>*Not rested*</u> *New cases (day = 1)* Entry night: 0.95 (0.41; 2.21) Night: 1.04 (0.70; 1.56) Entry shift: 1.28 (0.85; 1.94) Shift: 1.14 (0.93; 1.39) *Loss of cases (shift = 1)* Exit shift: 0.67 (0.37; 1.21) *Loss of cases (night = 1)* Exit night: 0.80 (0.41; 1.59)		

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Table 11.1 *continued*

Author Year Reference Country	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor(-s)	Outcome	Association between occupational factor and sleep; least adjusted model	Association between occupational factor and sleep; most adjusted model	Study quality Comments
Åkerstedt et al 2012 [49] Sweden	Prospective cohort 5 years Working population 1996–1998, 2000–2003	Participants were working and without any disabling disease. Participants were part of the WOLF cohort which is further described in other articles n=3 077 515 women and 2 562 men	*Psychosocial factors* Demands were assessed by the demand-control model postulated by Karasek Control was assessed by a Swedish version of the Job Strain Questionnarie Work preoccupation (WP) was assessed by three questions from the work commitment scale of Siegrist et al	*Disturbed sleep* Sleep parameters were assessed by using the Karolinska Sleep Questionnaire	Multivariate logistic regression predicting new cases of disturbed sleep – unadjusted model. Baseline disturbed sleep excluded. OR (95% CI) *Predicting new cases from situation at baseline* Low work demands: 1 High work demands: 1.48 (1.19; 1.83) Low WP: 1 High WP: 1.54 (1.27; 1.88) High control: 1 Low control: 1.10 (0.89; 1.35) *Predicting new cases from development I parameters* Consistent low demands: 1 Increased demands: 1.56 (1.17; 2.07) Consistent high demands: 1.87 (1.43; 2.44) Decreased demands: 1.36 (0.99; 1.87) Consistent low WP: 1 Increased WP: 1.89 (1.58; 2.26) Consistent high WP: 3.40 (2.33; 4.95) Decreased WP: 0.71 (0.51; 1.00) Consistent high control: 1 Increased control: 1.03 (0.73; 1.44) Consistent low control: 1.12 (0.87; 1.44) Decreased control: 1.29 (0.92; 1.81)	Multivariate logistic regression predicting new cases of disturbed sleep – model adjusted for covariates at first and second measurement and two other predictors. OR (95% CI) Covariates: gender, age, demands, work preoccupation, control, shift work, socioeconomic group, education, heavy work, marital status, childbearing, physical activity *Predicting new cases from situation at baseline* Low work demands: 1 High work demands: 1.47 (1.15; 1.89) Low WP: 1 High WP: 1.55 (1.23; 1.96) High control: 1 Low control: 0.98 (0.77; 1.25) *Predicting new cases from development I parameters* Consistent low demands: 1 Increased demands: 1.39 (1.00; 1.95) Consistent high demands: 1.49 (1.06; 2.11) Decreased demands: 1.24 (0.85; 1.80) Consistent low WP: 1 Increased WP: 2.47 (1.78; 3.43) Consistent high WP: 3.79 (2.70; 5.31) Decreased WP: 0.65 (0.45; 0.95) Consistent high control: 1 Increased control: 1.22 (0.82; 1.82) Consistent low control: 1.09 (0.79; 1.51) Decreased control: 0.98 (0.68; 1.41)	Moderate

BMI = Body mass index; CI = Confidence interval; OR = Odds ratio; SD = Standard deviation; SE = Standard error; SEM = Standard error of the mean