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Work-related risk factors for the incidence and recurrence of shoulder and neck complaints among nursing-home and elderly-care workers

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Objectives This study assessed the differences and similarities in the incidence and recurrence of shoulder and neck complaints with respect to work-related physical, psychosocial, and personal risk factors.

Methods A prospective cohort study was carried out among 769 workers of nursing homes and homes for the elderly. At baseline, a questionnaire was used to collect data on personal characteristics, physical workload, psychosocial workload, and the presence of shoulder and neck complaints. After 1 and 2 years, follow-up data were collected on shoulder and neck complaints. Generalized estimation equations were used for analyzing risk factors for the participants with at least one follow-up measurement available (N=556, 72%).

Results In the multivariate model, adjusted for age and gender, obesity [odds ratio (OR) 2.12, 95% confidence interval (95%CI) 1.23–3.65] was related to the incidence of shoulder complaints. The incidence of neck complaints was increased for obesity (OR 1.81, 95% CI 1.07–3.05), work in awkward postures (OR 1.76, 95% CI 1.11–2.78), and poor or fair general health (OR 1.53, 95% CI 1.02–2.31). The recurrence of both shoulder and neck complaints was associated with chronic complaints at baseline (shoulder: OR 1.91, 95% 1.36–2.67; neck: OR 1.71, 95% 1.14–2.55) but not with work-related risk factors.

Conclusions The results suggest that there are differences in risk factors for the incidence and recurrence of shoulder and neck complaints.

Key terms longitudinal study, musculoskeletal complaints, physical load, psychosocial load.

Shoulder and neck disorders are common problems in the general population, the 1-year prevalence rates being 7–47% for shoulder complaints (1, 2) and 16–61% for neck complaints (3). These complaints are characterized by high incidence (18–20%) (4, 5) and recovery (40–59%) (6–8) rates, but also by high rates of recurrence (41–65%) (6–8). They may result in substantial sick leave, loss of productivity, and the inability to carry out household and leisure-time activities (4, 9, 10).

Little is known about the factors that determine the occurrence of neck and shoulder complaints (9–12). A few longitudinal studies have reported gender (women), obesity, work with awkward neck postures, low social support from colleagues, and high work demands as risk

factors for the incidence of neck complaints (13–16). Incident shoulder complaints have been found to be related to obesity, pushing and pulling, and mental distress (17–19). Only two studies (13, 19) have compared the risk factors for incidence and recurrence. Eriksen et al (13) found that high job demands and headache were risk factors for both the incidence and recurrence of neck complaints, while incidence was also associated with emotional well-being and recurrence with gender and shoulder complaints. With respect to shoulder complaints, Miranda et al (19) found that personal characteristics (obesity and mental distress) and work-related physical factors (physical strenuousness of work and work with trunk forward-flexed or hand above shoulder

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level) were risk factors for incidence, but only age over 45 years and overload at work (ie, difficulty and hurry at work) were risk factors for recurrence. Two other studies explored the course of shoulder complaints and found associations between recurrence and the severity of shoulder complaints at baseline (7, 20).

The objective of our study was to assess the differences and similarities in the incidence and recurrence of neck and shoulder complaints with respect to work-related physical, psychosocial, and personal risk factors.

Participants and methods

Participants

Data from a cohort of 769 workers of nursing homes and homes for the elderly in The Netherlands were used. This longitudinal study, with a follow-up of 2 years, was designed to collect information on risk factors for work-related musculoskeletal disorders. The cohort consisted of workers who, at inclusion, had worked over 10 hours a week for at least 12 months in their job. The following professions were represented: nurse (N=129), care giver (N=264), office worker (N=146), kitchen worker (N=58), housekeeper and cleaner (N=49), physiotherapist (N=38), maintenance worker (N=14), and various other jobs (N=62). For the baseline measurements, between March 1998 and March 1999, and the two follow-up measurements a questionnaire was used.

At baseline, 85.1% of the participants were women, 11.2% had a body mass index of >30 kg/m², 23.4% had a lower education status, and 23.2% were single. The mean age of the participants was 40.7 (SD 9.7) years, and they had a mean height of 169.2 (SD 8.9) cm and a mean weight of 71.2 (SD 13.6) kg. They had been employed in their current jobs for a mean of 9.9 (SD 6.7) years.

Questionnaire

The baseline questionnaire on potential risk factors contained questions about (i) personal characteristics, (ii) work-related physical load, (iii) work-related psychosocial load and social support, (iv) sports in leisure time, (v) general health status, and (vi) need for recovery after a workday. A short description of these items is given.

Shoulder and neck complaints. The outcomes of this study were the incidence and recurrence of shoulder and neck complaints. An incident case was defined as involving a person who had new episodes of complaints after a year free of complaints. A recurrent case was defined as involving a person who had complaints

subsequent to a previous year of complaints. In addition, the prevalence was assessed by defining the participants who had complaints in a given year. The chronicity of complaints (ie, presence of complaints almost all day for at least 3 months) was only analyzed as a potential risk factor for recurrence.

Data on shoulder and neck complaints were collected by means of the Nordic Questionnaire (21). In this questionnaire a case is defined as involving a person who has had an episode of pain, stiffness, or discomfort at any time during the past 12 months. Data for shoulder and neck complaints were assessed independently of each other with the use of questions specified for either shoulder or neck complaints. A shaded manikin accompanied the questions for both complaints (appendix).

Personal characteristics. In a standardized questionnaire, the participants were asked about their age, gender, height, weight, level of education, family status, and duration of employment (22). Age was divided into the four categories of (i) <30 years, (ii) 30 to 39 years, (iii) 40 to 49 years, and (iv) 50 to 65 years. The body mass index (BMI) was calculated by the standard formula weight/(height²). Obesity was defined as a BMI of >30 kg/m². Low education was defined as ≤ 10 years of school. Family status was dichotomized into singles and people cohabitating or married.

Work-related physical load. The participants were asked to fill out a 19-item questionnaire on physical load, derived from the validated Dutch Musculoskeletal Questionnaire (23). Seven items of this questionnaire were considered to be relevant for this study on shoulder and neck complaints. These items were (i) working with hands above shoulder level, (ii) lifting ≥ 25 kg, (iii) using force with the arms or hands, (iv) bending or turning the torso frequently per hour, (v) working in uncomfortable postures, (vi) prolonged work in the same position of the body, and (vii) repetitive movements with arms or hands frequently per hour. Items 2 and 3 were combined into manual materials handling, and items 4 and 5 were combined into work in awkward postures. A 4-point scale was used with the ratings "seldom or never", "sometimes", "often" and "very often". People were supposed to be at risk if they scored "often" or "very often".

Work-related psychological load and social support. The Job Content Questionnaire (24) was used to obtain information on psychosocial aspects of work according to the demand-control hypothesis of Karasek. In this model workers are supposedly at risk when experiencing high job demands and low job control. Job demands were measured by 11 questions on a 4-point scale ("never", "sometimes", "often", "always"), yielding a sum

score for high work demands. The questions on work demands were related to working fast, working hard, excessive work, insufficient time to complete the work, and conflicting demands. Six questions on skill discretion and eleven questions on decision authority measured low job control. These questions concerned aspects such as required skills, task variety, learning new things, and amount of repetitive work. Workers at risk (ie, high demands and low control) were dichotomized using the median sum scores on the job demands and job control scale. Support of colleagues and supervisors was also measured with the use of the Job Content Questionnaire. Low support was defined as a respondent with a sum score above the median.

Sports in leisure time. Sports in leisure time was measured by the question: "Did you exercise or participate in sport at least once a week in the past 12 months?"

General health. A measure of perceived general health was constructed on the basis of 11 dichotomized questions on general health (25), excluding musculoskeletal symptoms. This Dutch scale has good internal reliability (Cronbach's $\alpha=0.86$) and test-retest reliability (Pearson's $r=0.76$). A sum score was calculated over all 11 items, and a classification of poor-fair general health was assigned to respondents who scored in the highest half of the study population.

Need for recovery. Participants were asked to fill out 11 questions on perceived need for recovery after a workday (26). These questions included items that focus on feelings and emotions after work such as exhaustion, time needed to feel relaxed, energy for leisure-time activities and energy for social contact with others. A sum score was calculated over all 11 items, and a classification of "need for recovery" was assigned to the respondents who scored in the highest half of the study population.

Statistical analysis

To analyze the risk factors for the incidence and recurrence of shoulder and neck complaints, we used generalized estimating equations (GEE) (27, 28). The GEE analysis was performed with all the participants who completed at least one questionnaire during the follow-up period included. In the GEE model all the independent variables were assumed to be time-independent, in other words, only information on risk factors from the baseline measurements was used as in conventional regression analyses. These risk factors at baseline were related to shoulder complaints reported in follow-up 1

or follow-up 2 or both, using the two endpoints of incidence and recurrence. Thus the analysis was stratified for respondents with shoulder complaints (or neck complaints) during the baseline survey (recurrence) and those without complaints (incidence). The odds ratio expresses the association between a risk factor at baseline and the occurrence of shoulder or neck complaints during the follow-up.

The analysis was carried out with Proc Genmod in the statistical package of SAS (version 8.2) (SAS Institute, Gary, NY, USA). The protocol for the analysis consisted of four steps. First, all the independent variables were analyzed in a univariate model. Second, the variables with a P-value of ≥ 0.10 were included in a multivariate model by a step forward procedure. The variable with the lowest P-value was put in the model first, followed by the next lowest, and so on. Variables with a P-value of < 0.05 remained in the model, and the other variables were excluded. Age and gender were both included in the multivariate models independently of their P-value. Third, we determined whether all nonsignificant variables were excluded correctly by including them in the multivariate model of step 2. When the model changed more than 10%, the variable was included in the multivariate model of step 2. And fourth, the risk factors that were significant in the multivariate model for incidence were added to the multivariate model for recurrence, and vice versa, in order to retain comparable multivariate models for incidence and recurrence.

Results

At baseline 769 workers agreed to participate in the study and completed the baseline questionnaire. At the time of the 1-year follow-up, 529 (68%) of the participants filled out the questionnaire again, of whom 346 (65%) responded also at the 2-year follow-up. The respondents and nonrespondents did not differ according to the prevalence of shoulder and neck complaints in the year before dropout. The respondents to the first follow-up questionnaire had had a baseline prevalence of 38% for shoulder complaints, and for the nonrespondents this prevalence was 34%. For the prevalence of neck complaints the corresponding figures were 36% and 40%.

At the time of each follow-up measurement, approximately 18% of the workers reported incident episodes of shoulder and neck complaints, as is shown in table 1. The annual recurrence was approximately 64% for both shoulder and neck complaints. Data on the occurrence of shoulder and neck complaints for at least one of the two follow-up measurements was available for 556 workers (71.4%). These data were used in the analysis with the GEE method.

Table 1. Twelve-month incidence and recurrence of both shoulder and neck complaints at follow-up 1 and 2.

Measurement	Shoulder complaints				Neck complaints			
	Incidence		Recurrence		Incidence		Recurrence	
	N	%	N	%	N	%	N	%
Follow-up 1 (N=529)	49	14.8	126	63.3	64	19.0	113	59.0
Follow-up 2 (N=346)	42	17.9	76	69.4	40	17.4	75	64.7

Table 2. Personal and work-related physical and psychosocial risk factors for the 12-month incidence and the 12-month recurrence of shoulder complaints—results of the analyses with univariate generalized estimating equations (GEE). (OR = odds ratio, 95% CI = 95% confidence interval)

Variable	Incidence (N=357)			Recurrence (N=199)		
	N	OR	95% CI	N	OR	95% CI
Personal characteristics						
Gender (women)	286	1.62	0.84–3.10	187	1.29	0.74–2.27
Age						
<30 years	60	1.00	.	34	1.00	.
30–40 years	100	0.95	0.47–1.93	54	0.74	0.45–1.22
40–50 years	122	1.72 ^a	0.89–3.29	70	0.76	0.48–1.21
50–65 years	65	1.14	0.51–2.52	51	0.77	0.48–1.26
Body mass index >30 kg/m ²	37	2.23 ^b	1.29–3.87	25	0.95	0.57–1.57
Family status (single)	81	1.12	0.69–1.85	48	0.99	0.68–1.46
Work-related physical factors						
Manual materials handling	96	1.39	0.88–2.19	67	1.38 ^b	1.00–1.92
Repetitive movement with arms or hands frequently per hour	123	1.59 ^b	1.03–2.46	97	0.99	0.72–1.37
Work in awkward postures	79	1.44	0.89–2.31	60	1.29	0.91–1.84
Prolonged work in the same position	109	1.41	0.89–2.22	70	0.92	0.65–1.30
Work with hands above shoulder level	32	1.22	0.60–2.49	34	1.13	0.75–1.71
Work-related psychosocial factors						
Low job control–high work demands	77	1.49 ^a	0.92–2.39	66	1.21	0.86–1.69
Low job control	141	1.14	0.73–1.76	108	0.87	0.63–1.21
High work demands	171	1.11	0.72–1.72	120	1.12	0.81–1.55
Low supervisory support	153	1.27	0.82–1.96	97	0.99	0.71–1.37
Low support from colleagues	159	0.76	0.49–1.18	119	0.92	0.66–1.27
Health						
Poor–fair general health	136	1.35	0.87–2.09	124	1.24	0.88–1.74
Need for recovery	152	1.21	0.78–1.87	139	0.97	0.69–1.38
Duration of complaints >3 months	–	.	.	52	1.72 ^b	1.22–2.42
Sport						
Exercise for at least once a week	157	0.87	0.55–1.36	83	0.99	0.71–1.39

^a P-value >0.05–<0.10.^b P-value ≤0.05.

Risk factors for the incidence and recurrence of shoulder complaints

The work-related physical and psychosocial factors and personal characteristics were analyzed for their associations with the incidence and recurrence of shoulder complaints (table 2). The incidence of shoulder complaints was increased for obesity [odds ratio (OR) 2.23, 95% confidence interval (95% CI) 1.29–3.87] and repetitive movement of the hands or arms (OR 1.59, 95% CI 1.03–2.46). Neither health-related factors nor sports

activities were significantly associated with incidence. Recurrence was associated with manual materials handling (OR 1.38, 95% CI 1.00–1.92) and chronic complaints in the year before the baseline measurements (OR 1.72, 95% CI 1.22–2.42).

In the multivariate analyses (table 3) only obese people had a higher risk of incident shoulder complaints (OR 2.12, 95% CI 1.23–3.65), and people with chronic complaints at baseline (OR 1.91; 95% CI 1.36–2.67) had a higher risk of recurrence of these complaints.

Risk factors for incidence and recurrence of neck complaints

The relationship between work-related physical, psychosocial, and personal factors and neck complaints are listed in table 4. The incidence of neck complaints was increased for obese people (OR 2.21, 95% CI 1.32–3.70), work in awkward postures (OR 1.65, 95% CI 1.04–2.60), prolonged work in the same position (OR 1.61, 95% CI 1.05–2.46), manual materials handling (OR 1.57, 95% CI 1.03–2.37), high job demands–low job control (OR 1.55, 95% CI 1.00–2.40), and a poor–fair general health (OR 1.62, 95% CI 1.07–2.44). The recurrence of neck complaints was related to chronic complaints at baseline (OR 1.71, 95% CI 1.17–2.47). In the multivariate analyses (table 5), obesity (OR 1.84, 95% CI 1.09–3.10), work in awkward postures (OR 1.76, 95% CI 1.11–2.78), and poor–fair general health (OR 1.57, 95% CI 1.04–2.36) remained significantly associated with the incidence of neck complaints. Chronic complaints at baseline (OR 1.71, 95% CI 1.14–2.55) remained associated with the recurrence of neck complaints.

Discussion

The results of our longitudinal study suggest that risk factors for incidence differ from those for the recurrence shoulder and neck complaints. When adjusted for age

Table 3. Results of the analyses of risk factors with multivariate generalized estimating equations (GEE) for the 12-month incidence and recurrence of shoulder complaints. (OR = odds ratio, 95% CI = 95% confidence interval)

Variable	Incidence (N=357)		Recurrence (N=199)	
	OR	95% CI	OR	95% CI
Body mass index >30 kg/m ²	2.12 ^a	1.23–3.65	0.92	0.57–1.51
Gender (women)	1.59	0.81–3.11	1.44	0.83–2.49
Age				
<30 years	1.00	.	1.00	.
30–39 years	1.04	0.51–2.10	0.78	0.36–1.45
40–49 years	1.73	0.90–3.32	0.74	0.34–1.30
50–65 years	1.21	0.54–2.68	0.69	0.43–1.12
Duration of complaints >3 months	.	.	1.91 ^a	1.36–2.67

^a P-value ≤0.05.

Table 4. Personal and work-related physical and psychosocial risk factors for the 12-month incidence and recurrence of neck complaints—results of the analyses with univariate generalized estimating equations (GEE). (OR = odds ratio, 95% CI = 95% confidence interval)

Variable	Incidence (N=352)			Recurrence (N=204)		
	N	OR	95% CI	N	OR	95% CI
Personal characteristics						
Gender (women)	289	1.30	0.74–2.30	184	1.36	0.70–2.63
Age						
<30 years	59	1.00	.	35	1.00	.
30–39 years	100	1.90 ^a	0.96–3.73	54	0.85	0.50–1.47
40–49 years	123	1.54	0.80–2.45	69	1.11	0.68–1.83
50–65 years	70	1.66	0.81–3.41	46	1.16	0.69–1.95
Body mass index >30 kg/m ²	38	2.21 ^b	1.32–3.70	24	0.82	0.47–1.42
Family status (single)	77	1.20	0.74–1.95	52	0.81	0.53–1.24
Work-related physical factors						
Manual materials handling	98	1.57 ^b	1.03–2.37	65	1.11	0.77–1.61
Repetitive movement with arms or hands frequently per hour	125	1.45 ^a	0.96–2.19	102	1.22	0.86–1.71
Work in awkward postures	75	1.65 ^b	1.04–2.60	64	1.28	0.90–1.83
Prolonged work in the same position	107	1.61 ^b	1.05–2.46	72	1.00	0.70–1.43
Work with hands above shoulder level	35	1.32	0.71–2.45	31	0.93	0.60–1.46
Work-related psychosocial factors						
Low job control–high work demands	87	1.55 ^b	1.00–2.40	56	1.25	0.87–1.79
Low job control	151	1.37	0.91–2.06	98	0.90	0.63–1.27
High work demands	178	1.22	0.81–1.83	113	0.90	0.63–1.27
Low supervisory support	167	0.91	0.60–1.37	83	1.00	0.70–1.42
Low support from colleagues	163	1.05	0.70–1.58	115	1.16	0.81–1.66
Health						
Poor–fair general health	131	1.62 ^b	1.07–2.44	129	1.18	0.82–1.71
Need for recovery	162	1.16	0.77–1.74	129	1.17	0.81–1.68
Duration of complaints >3 months	–	.	.	45	1.71 ^b	1.17–2.47
Sports						
Exercise for at least once a week	153	0.85	0.56–1.29	87	0.91	0.64–1.29

Table 5. Results of the analyses of risk factors with multivariate generalized estimating equations (GEE) for the 12-month incidence and recurrence of neck complaints. (OR = odds ratio, 95% CI = 95% confidence interval)

Variable	Incidence (N=352)		Recurrence (N=204)	
	OR	95% CI	OR	95% CI
Gender (women)	1.20	0.67–2.13	1.28	0.65–2.54
Age				
<30 years	1.00	.	1.00	.
30–39 years	1.94	0.95–3.94	0.99	0.58–1.70
40–49 years	1.67	0.83–3.37	1.28	0.76–2.15
50–65 years	2.08	0.98–4.44	1.19	0.67–2.10
Body mass index >30 kg/m ²	1.84 ^a	1.09–3.10	0.75	0.44–1.28
Work in awkward postures	1.76 ^a	1.11–2.78	1.31	0.90–1.89
Poor–fair general health	1.57 ^a	1.04–2.36	1.11	0.75–1.61
Duration of complaint >3 months	.	.	1.71 ^a	1.14–2.55

^a P-value ≤0.05.

and gender, obesity was related to the incidence of shoulder complaints. The incidence of neck complaints was also associated with obesity, and, in addition, with work in awkward postures and poor–fair general health. The recurrence of both shoulder and neck complaints, however, was only associated with chronic complaints at baseline.

The indication that risk factors may differ with respect to incidence and recurrence has also been found in other studies (13, 19). Eriksen et al (13) found that, for neck complaints, emotional well-being was associated with incidence, while gender and shoulder complaints were associated with recurrence. They also found that high job demands and headache were associated with the 4-year incidence and recurrence of neck complaints. Miranda et al (19) found associations with age and overload at work for the 1-year recurrence of shoulder complaints, while the 1-year incidence was associated with age, obesity, mental stress, and physical strenuousness of work. In our opinion, it seems reasonable to expect that specific risk factors causing the onset of shoulder and neck complaints would also play a role in initiating a recurrent episode. One possibility for gathering data to help explain the differences might be the use of self-administered questionnaires for physical load. Viikari-Juntura et al (29) compared self-administered questionnaires to task analysis and the observation of physical workload. They found that subjects with complaints tended to overestimate their exposure to physical loads at work. To assess whether this finding could explain the differences found by us, we compared the baseline data of our cases and symptom-free persons with respect to physical workload stratified for the three largest occupational groups (nurses, care givers, and office workers). Within these groups, the differences in self-reported physical load were reflected in the differences

in the observation of back position (30). The results of this analysis suggest that the persons with complaints did not report significantly higher exposures for different aspects of physical workload than their healthy colleagues.

Factors related to the incidence of shoulder complaints have been studied in a few longitudinal studies (17–19, 31). Contradictory results were reported. Obesity was found to be relevant in our study and that of Miranda et al (19), but not in the study of Leclerc et al (31). Low job control–high job demands was a risk factor in our study and that of Leclerc et al (31), but not in the study of Miranda et al (19). Dissimilarities in exposure definition and in the frequency of exposure may have caused these differences. Frequent repetitive movements of the hands and arms have not been evaluated in other longitudinal studies, although several cross-sectional studies have found associations with repetitive work (10, 32). Working with the hands above the shoulder was not found to be significantly related to incidence in this study, although it was in others (19, 31), presumably because this exposure occurred relatively infrequently in our study. The incidence of neck complaints was associated with several physical factors (work in awkward postures, prolonged work in the same position, and manual materials handling). This finding is consistent with the results of other studies (5, 11, 14, 33). The influence of high job demands–low job control has also been corroborated in other studies (13, 15).

Some methodological aspects possibly influenced our results. Unfortunately, we had to deal with a substantial loss to follow-up. However, it is unlikely that this loss strongly influenced the outcome since we found no significant difference between the respondents and the nonrespondents with respect to personal characteristics and the prevalence of complaints. Moreover, a recent study (34) indicated that differences in occupational conditions and health among participants and dropouts did not markedly influence the risk ratios.

Three other methodological aspects are related to the case definition used by us. First, we used the original case definition from the standardized Nordic Questionnaire: “having any complaints in past year”. One might argue whether this undefined duration of complaints is relevant. Therefore, we also analyzed our data with a more strict case definition, which included complaints existing for at least 7 days in the past year, as has been suggested by some authors (16, 19). The outcome of this analysis did not differ much from our original findings; the lack of difference can be explained by the fact that 80% of our original cases reported complaints for at least 7 days.

Second, the cutoff point between the incident and recurrent complaints was prompted by the study design with its annual measurements of the occurrence of shoulder and neck complaints. In this relatively long

recall period, a subject may have experienced a first spell of complaints followed by a recurrent spell in the same year. Thus an incident case may also be a recurrent case in terms of the number of episodes in one single year. However, we separated the recurrent cases from the incident cases by requiring the latter to be free of complaints for at least 1 year. This issue of separating incident from recurrent episodes with musculoskeletal complaints has previously been noted for low-back pain (35, 36). The authors proposed specific definitions for the duration of an episode, although there is still no consensus on this topic (35, 36).

Third, although we measured and analyzed shoulder and neck complaints separately, we found an overlap of 50–60% between these complaints during the three measurements. Given this overlap, it is interesting to see whether an analysis of the combination of these complaints would produce other results. Therefore, we analyzed the relationship between the personal, work-related physical and psychosocial factors, and the simultaneous presence of shoulder and neck complaints. We found some differences for the recurrence of neck-shoulder complaints. Low job control–high job demands and poor–fair general health were both associated with these complaints, whereas these factors were not associated with the separate complaints. However, the observed differences may also be due to changes in the occurrence of complaints and associated sample sizes, since the number of participants with both complaints (who are at risk of recurrence) increased and the number of healthy persons (who are at risk of incident complaints) decreased.

In summary, we observed differences in factors related to the incidence and recurrence of shoulder and neck complaints. When adjusted for age and gender, obesity was related to the incidence of shoulder complaints. The incidence of neck complaints was increased for obesity, work in awkward postures, and poor–fair general health. The recurrence of both shoulder and neck complaints was, however, only associated with chronic complaints at baseline.

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Appendix

Preshaded manikins used in the Nordic Questionnaire, with accompanying text as used in the questionnaire

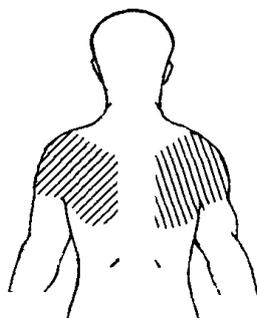


Figure 1. Shoulder: in this picture you can see the part of the body referred to in this questionnaire as shoulder. By shoulder problems are meant: pain, discomfort, stiffness or numbness in the shaded area. There are separate questions on neck complaints.

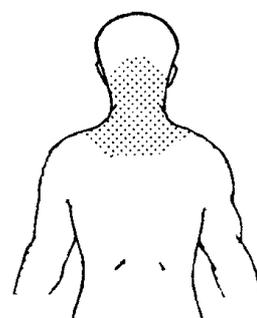


Figure 2. Neck: in this picture you can see the part of the body referred to in this questionnaire as neck. By neck problems are meant: pain, discomfort, stiffness or numbness in the shaded area, independent of adjacent areas. There are separate questions on shoulder complaints.