QUALITY OF LIFE

A follow-up study of psychosocial factors and musculoskeletal problems among unskilled female workers with monotonous work

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Background: Musculoskeletal problems are among the most prevalent occupational health problems in industrialised countries and seem to be common among unskilled, female industrial workers. However, cross-sectional studies only reflect the current situation with regard to both exposure and effect, and selection bias may mask work-related musculoskeletal problems so the general assumption is that prospective cohort studies are more valid and informative. The aim with the present study was to follow-up a group of unskilled female workers and determine whether the number of musculoskeletal ailments reported had changed after 3 years on a group and/or on an individual level. The women had earlier participated in a cross-sectional study correlating exposure with different physical and psychosocial factors at work, at home and during leisure time with their reports of musculoskeletal ailments in the neck, shoulders and thoracic spine. Methods: One hundred and fifty-three women from the original study group of 173 received a mailed questionnaire, including a visual analogue scale (VAS) and a pain drawing. Results: Ninety-three women were included in the final analyses. Some deterioration in general health and, in particular, in psychological health was observed compared with the earlier study but there was less change in the reporting of musculoskeletal ailments. Conclusion: Economic decline and its consequences may have had both a direct and an indirect impact on the deterioration in general health but not in musculoskeletal problems of the women still employed.

Keywords: follow-up, health, musculoskeletal, psychosocial, work-related

Musculoskeletal problems are among the most prevalent occupational health problems in industrialised countries. During recent years several cross-sectional studies have been performed in order to evaluate the relation between different work- and non-work-related exposure factors and musculoskeletal health problems. However, cross-sectional studies only reflect the current situation with regard to both exposure and effect and selection bias may mask work-related musculoskeletal problems so the general assumption is that prospective cohort studies are more valid and informative. Despite this assumption, relatively few follow-up studies are performed in the investigation of musculoskeletal problems and in occupational epidemiology in general, probably because of a number of methodological difficulties, among them a relatively low response rate and high turnover but also because the difficulties with, over time, controlling all relevant exposure variables.

The present study is a follow-up of a group of unskilled female industrial workers with physically monotonous work tasks. The aim was to evaluate the impact of work-, home- and leisure-related factors on the prevalence and incidence of self-reported musculoskeletal problems with emphasis on neck, thoracic spine and shoulder problems. The initial cross-sectional study, which included a clinical examination, was performed in 1991–1992 and showed that the risk of contracting cervicobrachial problems was not merely work-related but also depended on home and leisure factors. We used the same questionnaires in both studies and a ‘pain assessment instrument’ was used to analyse changes in symptomatology in the women in whom a clinical diagnosis was made in the first study and who also participated in the follow-up study. The study was approved by the Ethics Committee of the Faculty of Medicine, Uppsala University (377/94) and all participants gave their informed consent to participate.

MATERIAL AND METHODS

In the original cross-sectional study, each woman was asked to complete a questionnaire in the presence of a project leader. They were all examined by a registered physiotherapist, following a structured schedule. Due to financial constraints, the follow-up study had to be
Psychosocial factors and musculoskeletal problems

Study 1

Follow up study

Study population and non-participants in 1991-1992 and 1995

undertaken with questionnaires mailed to the women's home address and no clinical examination could be carried out.

Subjects

The selection criteria for inclusion in the cross-sectional study are described elsewhere and only a summary is given here. That study was performed in three counties in mid-Sweden in companies belonging to the metal and food industries. Those companies were listed according to number of employees and grouped into three categories: small (20-99 employees), medium (100-699 employees) and large (5700 employees). A number of companies were proportionally and randomly selected from the three counties. In this way, it was proposed to recruit a quota of 200 women, which was approximately 6% of the total available. Twenty-six companies agreed to allow their employees to participate in the study during working hours and provided lists of all women aged between 20 and 45 years which they employed as unskilled workers. The women were then randomly selected and invited to participate by letters from the project leaders. To be included in the study the women were required to meet the following criteria:

- to be an unskilled worker in a company with more than 20 employees and have a monotonous work task;
- to be aged between 20 and 45 years and have worked in their present job in the previous 6 months and
- to volunteer to participate in the study.

If any woman who was invited to participate failed to meet these criteria, the next woman on the same employer's list in the appropriate age group was invited in her place. One hundred and seventy-three (87%) of the 200 women invited to participate in the study did so. Thirteen percent had agreed to participate but did not come at the appointed time. Of the participating women, 164 (95%) worked in production, eight were cleaners and one worked in a company cafeteria. Twenty of the 173 women in the original group declined to participate further, leaving 153 women available for the follow-up study. All received a questionnaire mailed to their home address and 117 women (76%) replied (figure 1).

Questionnaires

The same questionnaire was used as in the cross-sectional study. The form of the questionnaire has been given elsewhere and only a brief account is given here. The questionnaire comprised the following:

- Demographic questions about age, weight, stature, civil status, family, work, home and leisure activities.
- Home duties and children's activities considered the extent to which the woman herself undertook cleaning, shopping, cooking, gardening, house bookkeeping, planning of vacations, contacts with relatives, childminding duties, reading stories, supervising homework, attending parents' meeting and being at home with sick children. The answers were transformed into two indices: taking care of children aged less than 13 years at home and home duties. These two indices were then summarised into a further index.
- Questions about health status and about musculoskeletal problems, for which the modified Standardised Nordic Questionnaire was used.
- The modifications were a change in the prevalence period from 12 months to 3 months and no body map was included. These answers were analysed by factor analysis.
- Questions regarding work-related physical and psychosocial factors. These answers were analysed by factor analysis and the psychosocial factors transformed into a 'demand-control index' and two indices regarding the degree of positive or negative perception of support at work.

Pain assessment

The participants were asked to mark perception of current pain in the neck and shoulders on a visual analogue scale (VAS) and a pain drawing.

i) In the cross-sectional study, the intensity of current pain was indicated by means of a hand-held scale (VAS) with a moveable hand designed by Arner, Sweden, graded from 0-100 mm (no pain to worst imaginable pain). In the follow-up study, a 100 mm long horizontal line, drawn on paper was used instead.

ii) Symbols for different qualities of pain (aching, burning, numbing, stabbing/cutting, stinging/prickling and muscle cramps) were used on the pain drawing. The quality of the pain was interpreted according to Rydén et al. These authors classified the drawings according to the symbols used and their distribution as 'adequate', which corresponded to an orthopaedic diagnosis, 'possibly psychogenic', where the distribution and qualities of pain did not seem to match the diagnosis and 'psychogenic', where pain was spread to various parts of the body and where an inordinate number of pain qualities were indicated. Localisation of pain in the body was determined by using a transparency of the body map from the
Analyses
All statistic analyses were performed using SPSS/PC+®. Frequencies, mean values, standard deviations and ranges, were calculated and sign and t-tests were used. A p-value of 0.05 was regarded as significant.

RESULTS
Non-responders
Significantly more of the 36 non-responders compared to the responders belonged to the case group in the first study (p=0.03). More were single and more had reported bad health than the responders (table 1).

Responders
One hundred and seventeen women from all but one of the original 26 companies responded in the follow-up study but only 93 women were included in the final analyses (figure 1), 88 (95%) of whom were working in production. The criterion for inclusion in the final analyses was that the women should have been occupationally active during the preceding 3 months. This was considered to be time enough to become used to the work tasks, old or new. Six of the women had changed their place of work during the 3 years and in the follow-up study they worked in five new places. Four of these were industrial companies, one an information centre with a cafeteria and one a nursing home. Three of the women were working as cleaners and one had become a union representative in a company. Two had left industrial work, one to work in the information centre and one in the nursing home.

Twenty-four of the 117 responders were excluded (figure 1); nine were on sick leave, three were on maternity leave, six were unemployed and two were studying. A further three women had been occupationally active for less than 5 months after an absence from work and one woman did not answer the questions relating to her work. Comparisons of demographic and health-related data were carried out in order to look for differences between the 93 women finally included and the 24 not included but no significant differences were found, although the 93 participants had more musculoskeletal problems in the lumbar spine, which were close to significant (tables 2 and 3).

Comparative analyses of the participants in both studies
Work-related demographic data from the two studies of those 93 women who were included in both studies showed a strong similarity in all variables (table 4).

Good to very good health was reported by 68% of subjects in the first study and by 58% in the follow-up study, a non-significant decrease. On an individual level there were changes within the group with respect to both deterioration and improvement of musculoskeletal ailments and the percentage of women reporting changes was different for different body parts; however, the majority reported no change (table 5). No significant difference was found on a group level for reported musculoskeletal ailments.

A few variables showed significant differences. The number of hours per day sitting with a twisted back (mean 0.7 and 1.3 h respectively) (p=0.01) and standing with the back bent forward (mean 1.3 and 2.0 h respectively) (p=0.002) were significantly less in the follow-up than in the first study. No other physical work-related exposure factors had changed significantly between the two studies. Significantly more women felt anxious and worried more often (p=0.04) in the follow-up than in the cross-sectional study. Some of the psychosocial work-related...
Psychosocial factors and musculoskeletal problems

Factors had changed significantly during the follow-up period. Decision latitude was reported to be higher (p<0.001) and social support at work was reported to be lower (p<0.001) in the follow-up study. The atmosphere and togetherness in the workplace had deteriorated from the first study, with more frequent conflicts with both supervisors and workmates and fewer women considered their boss to be a good supervisor.

The data for home and leisure activities showed some changes between the two studies. The workload index at home had increased significantly (p=0.03) in the follow-up study and women attended courses to a significantly higher degree (p=0.04), but were knitting or sewing to a significantly lower degree (p=0.01). More were solely responsible for contact with their relatives (p=0.02) in the follow-up study.

Development of ailments
Sixteen of the women with diagnoses in the first study reported perceptions of pain in both studies. Their VAS data from the two studies demonstrated a significant worsening in the intensity of pain (p=0.03); the mean VAS value in the first study was 31.6 mm and in the follow-up study 52.8 mm. The distribution and quality of pain differed between the two studies, but pointed towards an organic origin, when interpreted according to the criteria of Ryden et al.20

DISCUSSION
Although the study group was small and most findings were statistically non-significant, the results might have important implications. The main findings were that health had deteriorated slightly and that there was a higher perception of pain, more anxiety and worry than before and a significantly higher workload at home in 1995 than compared to 1991–1992. Some significant improvements in work postures were found but, conversely, some factors in the psychosocial work environment had deteriorated significantly. On a group level, slightly fewer musculoskeletal problems were reported, but at the individual level there were changes for both better and worse in the neck, shoulders and thoracic spine.

In the cross-sectional study, we had a representative sample of the women working in the metal and food industries in the region. The original study group included women working during the previous 6 months in companies of different sizes in both urban and rural neighbourhoods. In the follow-up study, one of the criteria for inclusion was to have been occupationally active during the previous 5 months so that we would have a sample of women whose work situation on both occasions would be comparable. The consequences of the strict criteria for participation were that the number of women available for the follow-up study was relatively small.

In the follow-up study, the response rate of the 153 subjects approached after 3 years was 76%, which is comparable to other studies.21 However, there are difficulties in connection with the rate of participation in follow-up studies. In the few follow-up studies which have been published in this area, response rates between 63% and 88% have been reported.7–9

Ideally, in a follow-up study aimed at evaluating the health effects of workplace exposure, the participating subjects will be employed by the same company and the work tasks can be controlled over time. However, work tasks in the industry have been changing quickly as

| Table 4 Demographic work-related data (total months at present work and present work tasks, weekly time at work and commuting) reported in 1991–1992 and in 1995 among the group included in both studies (n=93) |
| Variables | Mean | SD | Range | n |
| Total months at present work | 1991–1992 | 83 | 6.26 | 68–91 | 93 |
| 1995 | 84 | 6.81 | 69–94 | 92 |
| Total months with present work tasks | 1991–1992 | 87 | 4.39 | 72–92 | 93 |
| 1995 | 88 | 5.16 | 72–95 | 75 |
| Work time/week (h) | 1991–1992 | 37 | 5.53 | 20–41 | 88 |
| 1995 | 37 | 5.60 | 18–42 | 93 |
| Commuting time to work (min) | 1991–1992 | 18 | 15.39 | 2–120 | 93 |
| 1995 | 18 | 10.13 | 3–60 | 93 |

| Table 5 Musculoskeletal problems: 3 month prevalences in 1991–1992 and 1995 and direction of changes from 1991–1992 to 1995 within the group expressed in percentages of the occupationally active (n=93) |
| Neck | 68 | 59 | 18 | 9 | 73 | 0.15 | 91 |
| Shoulders | 75 | 65 | 19 | 9 | 73 | 0.11 | 91 |
| Elbows | 16 | 24 | 9 | 16 | 75 | 0.29 | 89 |
| Hands/wrists | 34 | 42 | 11 | 19 | 70 | 0.25 | 91 |
| Thoracic spine | 43 | 43 | 15 | 15 | 69 | 1.00 | 91 |
| Lumbar spine | 56 | 61 | 19 | 24 | 57 | 0.52 | 91 |
| Hips | 17 | 23 | 9 | 15 | 76 | 0.38 | 89 |
| Knees | 33 | 26 | 20 | 13 | 67 | 0.34 | 86 |
| Feet/ankles | 12 | 16 | 10 | 14 | 76 | 0.52 | 90 |
production methods alter and women change their places of work, as has been shown in two studies. In a follow-up study, Ohlsson\textsuperscript{5} reported an initial response rate of 98% and found that only 54% of the cases and 77% of a reference group were still in the same workplace after 3 years. Jonsson et al.\textsuperscript{9} followed up a population of female workers in order to study the impact of repetitive work on cervicobrachial problems. Seventy-two percent of the original population participated in both the 1 and 2 year follow-up studies, but some subjects only participated in the first or in the second year follow-up. At the beginning of the investigation all the subjects were engaged in repetitive tasks in the same factory. After the first year, one group had been reallocated to more varied tasks and one continued with the repetitive tasks. The experience from our cross-sectional study, in which the women reported all the places in which they had worked since leaving school, was that they showed great occupational mobility. We therefore included those who had changed work within the same company or who had changed to another workplace but were still engaged in unskilled work.\textsuperscript{5}

The rate of non-responders may have different explanations. Comparatively more of the 36 non-responders in the cross-sectional study were single than the 117 responders. Single women, particularly those with children, are at higher risk of unemployment compared with others according to Åberg et al.,\textsuperscript{22} so it is possible that such a selection effect affected the response rate. The non-responders appeared less healthy in the cross-sectional study and significantly more of them also reported persistent pain in the neck and shoulder region. They might have been on sick leave or in receipt of a disability pension, as were 28% of the workforce in the study by Ohlsson,\textsuperscript{5} most as a consequence of musculoskeletal problems. Finally, de Zwart et al.\textsuperscript{23} followed a group of 45,000 employees over a period of 11 years and concluded that musculoskeletal problems led to selection out of work and that this affects the validity of both cross-sectional and longitudinal studies.

The manner in which the questionnaires were distributed differed between the two studies because of economical constraints, but the questionnaires were the same and, in the first study, the subjects were all personally instructed in how to complete the forms. The instrument for measuring the intensity of reported pain was VAS and the VAS data indicated a significantly higher perception of pain on the second occasion. Several studies have shown that VASs and pain drawings truly reflect perceptions of pain in a population.\textsuperscript{18–20} Sandmark and Nisell\textsuperscript{17} combined a questionnaire, a VAS and a pain drawing into a ‘pain assessment instrument’ and tested it in relation to verbal reporting and found it to be useful in epidemiological studies of subjects with pain related to work posture. In both our studies, the pain drawings were similar in design to those of Sandmark and Nisell\textsuperscript{17} and the quality of pain was interpreted according to the recommendations of Rydéén et al.\textsuperscript{20} The methodological difference between the two designs of VAS – plastic ruler with a moveable hand\textsuperscript{15} in the first study and a line drawn on paper\textsuperscript{16,17} in the follow-up study – could possibly have affected the reporting of pain. However, the plastic ruler has been used in pain clinics and is considered to be a good instrument\textsuperscript{13} and the paper VAS is well tried and tested.\textsuperscript{16,17} However we have not been able to find a validated comparison of the two designs. Since the difference in the mean VAS values was so great we believe that it reflects a real increase in the degree of pain.

Our results concerning the incidence of neck and shoulder problems are not in agreement with those of Jonsson et al.\textsuperscript{9} They found that the percentage of female workers with severe problems in the neck, shoulders and arms increased from 11 to 24% after 1 year. After 2 years, 26% of those with unchanged repetitive working tasks and 16% of those with more varied tasks had severe problems although the authors did not explain what they meant by ‘severe problems’. Their study had some contradictory results, as during the first year, the number of musculoskeletal problems increased in parallel with increased production, but, during the second year, increased productivity had the opposite effect.

In the cross-sectional study, the women who reported higher control over their work tasks had a greater risk of contracting neck and shoulder problems.\textsuperscript{24} Those findings in our study were contradictory to Karasek\textsuperscript{13} but in accordance with Barnekow-Bergkvist et al.\textsuperscript{25} In the latter study, high decision latitude (control) was also associated with an increased risk of having neck-shoulder symptoms among women. They pointed out that Karasek’s model was initially constructed for men and assumed that women react differently to responsibility associated with high decision latitude at work. The reported increase in control in the follow-up study should consequently have resulted in a higher incidence of neck and shoulder problems in the group particularly as they also experienced less social support at work. However, the results could be due to the ‘healthy worker’ effect, e.g. the less healthy workers might already have left the work places. We found that more of the non-responders than the responders in the follow-up study had belonged to the case group in the cross-sectional study, which probably obscured the true incidence of musculoskeletal problems. The slight improvement in physical strain at work may have been solely due to chance but it could also be due to an attempt to avoid poor work postures after participating in the cross-sectional study.

In the present study, the reported increase in worry and anxiety may be an early sign of a change in the perceived quality of work, what has been called ‘work role quality’. In a longitudinal study, Bergman et al.\textsuperscript{18} demonstrated a relationship between the rate of change in work role quality over time and the rate of change in self-reported health over time. In that study, work role quality was determined by the prevalence of work obstacles, incompatible demands, work regulated by others and workload. Forty-seven women answered a questionnaire on two different occasions several years apart (mean = 6.8 years and SD=2.7 years). The major findings of the study were...
that the changes in work life quality covaried with the changes in somatic problems and in psychological distress. The combination that had the worst impact on health was an old-fashioned patriarchal organisation and incompetent leadership and, in the present study, relationships with managers and their ability to take the lead at work showed more negative values in the follow-up study. Workload at home was also reported to have increased in the follow-up study and this may have added to the reported increase in worry and anxiety, as Roman found that women in lowly positions in particular experience conflicts between the demands of work and the needs of their family.

From the results of our study, it seems that the women as a whole were less healthy than at the time of the cross-sectional study. The first study was performed during a period when the economy was booming, but the follow-up study took place during a slump and this may have reflected in the results. We did not study this possibility directly, but the suggestion is supported by the findings of another Swedish study. At the time of our follow-up study, Elofsson et al. compared the health of a population in 1993 and 1995 in nearby Stockholm County. They did not follow-up individuals, but studied two different samples chosen at random from the Stockholm area, with a 70% participation rate in both studies. They found that women but not men reported less good health in the follow-up study in all social groups and in all age groups. There were no differences in social status, but the authors discussed the impact of the economic decline and reduction in public services such as child care and health care.

Between 1993 and 1995 there were many news reports of companies who had dismissed a substantial proportion of their workforce and those who were still employed were required to work harder and longer. In a workforce survey (AKU 1999), Statistics Sweden reported a diminishing number of work hours per week between 1990 and 1995 and a lower employment rate compared to the increasing of economic decline. Deteriorating health among the still gainfully employed is harmful for both the individual worker and for the company and the society as a whole. Figure 2 Employed men and women in Sweden during the years 1976-1998 Source: Statistics Sweden http://www.scb.se/arbetsmarknad/aku/AKU

40% of those companies diminished their workforce by 10%, 30% of the companies by 10–20% and 30% of the companies by more than 20%. The total number of work hours per week was lower in 1995 than in 1990 for both men and women (table 6).

In the present study, the less supportive atmosphere at work may have been the result of fear of being made redundant at that time. This assumption is supported by some of the studies in a comprehensive report from Statistics Sweden (The Living Conditions from 1975 to 1995), which was based on yearly performed surveys of individual and household living conditions (ULF). In that report, Åberg et al. found that the tendency for the unemployed to report worry and anxiety decreased during the period 1992–1995 as compared to earlier periods. They assumed that the reason for this was that worries and anxiety for the future were also higher in groups of the gainfully employed at the time compared to the increasing group of unemployed. In the same report, Diderichsen discussed the health effects of the economic crisis and suggested that both unemployment and the increased demands on the workforce were to blame. He found that the proportion of those reporting deteriorating health and psychological symptoms increased among those aged 45 years or less during the 1990s. As the mean age of our population was 38 years this might have played a role in less good psychological health.

In conclusion, the results from the present study among a group of female industrial workers are supported by the results of other longitudinal studies. The study seems to reflect the changes in the living conditions in Sweden during a time of economic slump and unemployment. With respect to that, both the management and departments of occupational health in the companies should take preventive measures into consideration during times of economic decline. Deteriorating health among the still gainfully employed is harmful for both the individual worker and for the company and the society as a whole.

Table 6 Labour market: labour force study (AKU) showing the total numbers of work hours per week (millions of hours) 1990-1995

<table>
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<th>Year</th>
<th>Both genders</th>
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<th>Women</th>
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<td>134.8</td>
<td>80.2</td>
<td>54.6</td>
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<tr>
<td>1991</td>
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<td>77.9</td>
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<tr>
<td>1992</td>
<td>127.3</td>
<td>74.8</td>
<td>52.6</td>
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<tr>
<td>1993</td>
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<td>1995</td>
<td>125.0</td>
<td>73.2</td>
<td>51.8</td>
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Figure 2 Employed men and women in Sweden during the years 1976-1998 Source: Statistics Sweden http://www.scb.se/arbetsmarknad/aku/AKU

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