

Changes in the content of Finnish municipal occupations over a four-year period

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HUUHTANEN P, NYGÅRD C-H, TUOMI K, ESKELINEN L, TOIKKANEN J. Changes in the content of municipal occupations over a four-year period. *Scand J Work Environ Health* 1991;17(suppl 1): 48–57. The data of this study are based on questionnaire surveys made in 1981 and 1985. The sample consisted of 1799 men and 2456 women in the age range of 48–62 years. Physical demands were more common in 1985 than in 1981, and more common among the women than among the men. In addition problems with the physical-chemical environment were more common in 1985 and more common among the men. The changes in tasks were evaluated more often as positive than negative. The mental load had increased between 1981 and 1985 due to an increase in the amount of work and the knowledge needed at work. In addition changes in social contacts and client relations increased the mental load.

Key terms: change at work, mental demands, physical demands, physical work environment, social environment, work load.

Economic and technical pressures are changing work-life. During the last few decades structural changes in the labor market have led to an increase in white-collar occupations (1). Organizations are developing new models to increase flexibility, customer orientation, and productivity. The changes involved are multi-dimensional, and organizations have room to select the way new information technology is adopted (2).

Much information has been collected about the work environment, job satisfaction, and stress factors in Finland (3, 4). This article deals with the changes in the job demands, the work environment, and the work load of aging employees in Finnish municipal occupations in 1981–1985. The following two questions were asked: (i) how positive or negative have the overall changes in the tasks, equipment, environment, and work load been and (ii) what kinds of changes have occurred in specific physical and mental demands and stress factors at work?

Subjects and methods

Study sample

The target group of the study comprised employees in municipal occupations between the ages of 45 and 58 years in 1981. The data were based on two questionnaire surveys, one made in 1981 and the other in 1985 (5). The response rate in 1981 was 72 and 79 % for the men and women, respectively. A total of 5556 employees took part in both surveys, 2396 men and 3160 women.

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The respondents were grouped according to job content by the AET (Das Arbeitswissenschaftliche Erhebungsverfahren zur Tätigkeitsanalyse) job analysis method (6). According to the AET method the subjects were divided into 13 profile groups and three general groups (ie, physical, mental, and mixed physical and mental work) according to work content (7). Furthermore the subjects were divided into 40 occupational groups.

After the questionnaire survey in 1985, the respondents to the first questionnaire in 1981 were divided into those who had remained in the same occupation (68 %), those who had changed occupation (5 %), those who had switched to a part-time job (2 %), those who had retired (7 %), those who had been granted a disability pension (9 %), those who had died (1 %), and those who did not respond to the questionnaire in 1985 (8 %) (8).

This article deals with those persons whose job title remained the same during 1981–1985. An additional selection criterion was that the job was full-time. There were 1799 men and 2456 women who fulfilled these criteria.

Methods and scales

Certain questions of the 1981 questionnaire were repeated in 1985 so that job changes could be studied. In addition, questions were asked in 1985 that dealt with changes that occurred during the four-year interval.

Scales of occupational stress factors were constructed by factor analyses (8). First, in sum scales, items whose extreme value was mentioned ("exists much at work") were counted. The scale of three vari-

ables varied between 0 and 3, and that of seven variables ranged from 0 to 7. These combined values were classified further into the following three categories: 0 = no extreme values in the sum scale, 1 = at least one but less than half of the maximum extreme value, 2 = one-half or more of the maximum extreme value. Class 0 did not necessarily mean that the stress factor in question did not exist at all. It indicated only that the respondent did not select any extreme value ("exists much at work") in items of the scale.

Four occupational stress factors were used as sum variables in connection with the physical demands and work environment (8). The first, *physical demands*, included standing; continuous walking; carrying, lifting, holding, and repetitive work movements; and stooped, twisted, or awkward work postures. Of the original variables used in 1981, "sudden strainful effort" and "difficult and uncomfortable work postures" were not in the sum variable in 1985. [In 1981 there were seven items and a reliability coefficient (α) of 0.83, and in 1985 there were five items and an α of 0.79.] The second stress factor, *muscular work and use of force*, included standing, continuous walking, carrying, lifting, and sudden strainful effort (1981: 4 items and $\alpha = 0.76$; 1985: 3 items and $\alpha = 0.72$). The third, *work posture*, included repetitive work movements and stooped, twisted, and awkward postures [1981: 3 items and $\alpha = 0.76$; 1985: 2 items and correlation coefficient (r) = 0.55]. Finally, the fourth, *physical-chemical work environment*, included work hampered by such factors as dirtiness, dust, smoke, steam; risk of accidents; noise; vibration; insufficient lighting or glare; heat, cold, changing temperature; dryness, humidity, wetness; restless work environment; rushed workplace (1985: 9 items and $\alpha = 0.85$; 1985: 9 items and $\alpha = 0.88$). In 1981 the questions were asked in the form of "Does the stress factor hamper?," and in 1985 they were stated as "Does the stress factor exist?"

The mental demands of the work and the social work environment were analyzed with the use of the following scales (8): (i) *use of knowledge*: accuracy in information processing; complex decision making; decision making under time pressure (1981: 3 items and $\alpha = 0.82$; 1985: 3 items and $\alpha = 0.73$); (ii) *responsibility for people*: contacts and communication between people and responsibility for others (1981: 2 items and $r = 0.55$; 1985: 2 items and $r = 0.57$); (iii) *possibilities to develop and influence at work*: possibility to influence the work environment; possibility to help plan the work; possibility to receive training and update skills; possibility to use one's own abilities; possibility to learn new things; possibility to receive recognition and esteem (1988: 6 items and $\alpha = 0.85$; 1985: 6 items and $\alpha = 0.85$); (iv) *lack of freedom*: high workplace and tight time schedule (1981: 2 items and $r = 0.59$; 1985: 2 items and $r = 0.57$). In 1985 the questions were phrased to ask if the factor "causes harm," and in 1985 they asked if the factor "exists at work."

Results

Changes in the physical and mental stress factors

Physical demands. In 1981, 7 % of the men and 20 % of the women reported high physical demands during their work. In 1985 the frequencies had increased to 11 and 27 %, respectively (tables 1 and 2). In both surveys the women in physical work reported higher physical demands than the other women and also higher physical demands than the men in physical work. Auxiliary work was rated as having the highest physical demands in both surveys.

Among the men the highest physical demands in 1981 occurred among the painters, laborers, dump workers, dentists, construction workers and street-sweepers, electricians, car mechanics, and park workers. These occupations also had the highest physical demands in 1985, except that the laborers reported lower physical demands in 1985 than earlier, and the mechanics and pipe fitters had higher physical demands in 1985 than the men in physical work on the average.

For the women the highest physical demands in 1981 were reported by the construction workers and street-sweepers, bathers, park workers, and hospital aides. In 1985 these occupational groups were joined by the cleaners, who also reported a higher than average level of physical demands in the physical work group. In all of these occupations the physical demands had increased during the follow-up period.

Demands for muscular work and the use of force. The women reported higher demands for muscular work and use of force than the men in both 1981 (women 22 % and men 7 %) and 1985 (women 29 % and men 11 %). The women in physical work had the highest demands for muscular work in both years. In the profile groups the highest demands were found among the men in auxiliary work and dump work and the women in auxiliary work.

In 1981 a high amount of muscular work and use of force was found among the men who were laborers, painters, construction workers and streetsweepers, dump workers, electricians, "other" transport workers, or unskilled assistants. The laborers, electricians, and "other" transport workers had fewer demands for muscular work than the other types of workers in the physical work group on the average in 1985, whereas the other types of work had more such demands. Among the women the construction workers and streetsweepers, park workers, and cleaners reported the highest demands for muscular work and the use of force in 1981. In 1985 the female bathers and domestic helpers were added to the aforementioned occupations.

Work postures. Seven percent of the men and 14 % of the women reported using poor work postures much of the time in 1981. The highest demands occurred in

Table 1. Percentage of men with high physical demands, much muscular work, and much use of poor work postures in 1981 and 1985.

Work content group	Number of workers in 1985	High physical demands		Much muscular work		Much use of poor work postures	
		1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)
Physical	803	13	20	13	18	9	15
Auxiliary work	260	19	31	20	28	13	25
Unskilled assistants	14	7	7	14	21	7	0
Painters	53	28	47	26	30	25	57
Construction workers and streetsweepers	105	16	34	22	33	11	23
Park workers	55	13	27	9	25	11	15
Laborers	33	27	12	27	12	9	12
Installation work	543	10	15	10	13	8	10
Firemen	57	2	9	5	9	2	4
Janitors	117	6	7	6	5	5	7
Mechanics and pipe fitters	102	10	22	9	20	9	11
Car mechanics	63	13	21	10	18	11	10
Carpenters	90	11	17	9	14	10	13
Electricians	114	15	16	17	16	8	12
Mixed physical and mental	432	4	6	3	5	13	21
Transport work	351	2	4	1	3	15	24
Machine operators	243	3	5	2	4	16	25
Bus drivers	101	0	1	0	1	12	23
Other transport workers	7	0	14	14	0	0	14
Dump work							
Dump workers	16	19	19	19	25	6	6
Dental work							
Dentists	11	18	27	9	9	27	36
Nursing work	54	4	11	2	13	2	6
Psychiatric nurses	52	4	10	6	12	2	6
Mental	564	1	1	2	4	1	1
Administrative work	150	0	0	0	0	1	0
Social workers	15	0	0	0	0	7	0
Office supervisors	132	0	0	0	0	0	0
Technical supervision	146	0	0	1	1	1	0
Fire chiefs	6	0	0	0	0	0	0
Supervisors at construction sites	139	0	0	1	1	1	0
Physician's work							
Physicians	52	0	0	0	2	4	0
Teaching work	207	2	2	5	9	1	1
Vocational school teachers	143	2	3	6	11	1	0
Secondary school teachers	63	0	2	3	6	0	2
Total	1799	7	11	7	11	7	12

mixed physical and mental work among the men and in physical work among the women.

Of the profile groups the highest demands for poor work postures occurred in auxiliary, transport, and dental work among the men and in dental and auxiliary work among the women.

Among the men in 1981, the dentists, painters, machine operators, bus drivers, car mechanics, park workers, and construction workers had the highest use of poor work postures. However, in 1985 the male park workers, car mechanics, and carpenters had less use of poor postures than the average of the physical work group in general. Among the women the dentists, bathers, construction workers and streetsweepers, park workers, hospital aides, and cleaners reported the most

use of poor work postures in both surveys. In the year 1985 these workers were joined by the practical nurses.

Physical-chemical work environment. Four percent of the men and 1 % of the women reported that the physical-chemical work environment hampered their work in 1981 (tables 3 and 4). In 1985 the frequencies had increased to 17 % among the men and 4 % among the women. The most hazards or discomforts were reported by the men in physical or mixed physical and mental work and by the women in physical work. Of the profile groups, the auxiliary workers had the most problems with the physical-chemical environment among both the men and the women in 1981. In addition to this group, the transport and dump workers

reported hazards or discomforts in their work environments in 1985.

In 1981 the men working as firemen, mechanics and pipe fitters, dump workers, construction workers and streetsweepers, bus drivers, and laborers reported problems in their physical-chemical work environment. In 1985 the male fire chiefs, park workers, and machine operators were added to these occupations. Female construction workers and streetsweepers often reported problems with their physical-chemical work environment in 1981. In 1985 such problems were found also among the female park workers.

Use of knowledge. The demands for using knowledge and for decision making were highest in the mixed and the mental work groups for both the men and the

women (tables 5 and 6). No changes occurred from 1981 to 1985, except among the men in the mixed work group. (The responses of "much knowledge needed" had risen from 29 to 37 % in this group.)

Accuracy in information processing and complex decision making under time pressure seemed to have increased among the dentists and teachers.

Responsibility for people. Responsibility for people and contacts was a more characteristic feature of the women than the men. The gender difference had increased in 1985 in all the work content groups. Bus drivers, home care personnel, nurses, people in administrative work, doctors, and teachers reported more responsibility than others in both years. Responsibility had clearly increased by 1985 in most of the

Table 2. Percentage of women with high physical demands, much muscular work, and much use of poor work postures in 1981 and 1985.

Work content group	Number of workers in 1985	High physical demands		Much muscular work		Much use of poor work postures	
		1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)
Physical	849	35	44	38	47	20	29
Auxiliary work	504	37	46	39	45	21	33
Cleaners	125	34	50	38	46	21	39
Hospital aides	160	38	39	33	33	24	33
Kitchen helpers	129	27	40	36	46	12	18
Construction workers and streetsweepers	54	59	67	57	69	33	50
Park workers	36	42	53	50	53	25	33
Home care work	343	32	41	36	50	19	24
Bathers	85	47	57	34	52	44	51
Domestic helpers and housekeepers	258	27	36	37	49	11	15
Mixed physical and mental	853	21	31	23	32	16	22
Kitchen supervision							
Cooks	127	10	20	13	28	6	8
Dental work							
Dentists	65	20	19	2	2	51	48
Nursing work	660	24	35	26	35	14	22
Child care workers	184	30	38	30	38	15	27
Practical nurses	194	27	44	34	45	18	30
Psychiatric nurses	58	16	24	22	24	10	19
Specialized nurses	62	18	31	23	36	10	3
Other nurses	162	14	27	17	25	12	17
Mental	754	2	3	3	5	4	4
Office work	269	1	2	1	1	8	9
Draftswomen	48	2	0	0	0	10	15
Typists	48	2	4	0	0	13	13
Clerks	173	1	1	1	2	6	6
Administrative work	293	2	3	2	4	2	1
Social workers	66	2	2	2	2	6	2
Head ward nurses	130	4	5	5	8	2	1
Head nurses	80	0	0	0	0	0	0
Office supervisors	17	0	0	0	0	0	0
Physician's work							
Physicians	22	0	0	0	0	0	0
Teaching work	170	5	7	8	12	1	2
Vocational school teachers	56	2	4	7	13	0	2
Secondary school teachers	16	0	6	6	19	0	0
Day care center teachers	98	7	9	9	11	1	3
Total	2456	20	27	22	29	14	19

Table 3. Percentage of men reporting much hampering by physical-chemical hazards or discomforts in the work environment in 1981 and the existence of such hazards and discomforts in 1985.

Work content group	Number of workers in 1985	Hampered much 1981 (%)	Existed much 1985 (%)
Physical	803	7	22
Auxiliary work	260	8	20
Unskilled assistants	14	0	7
Painters	53	4	9
Construction workers and streetsweepers	105	12	26
Park workers	55	4	22
Laborers	33	9	18
Installation work	543	6	23
Firemen	57	18	61
Janitors	117	1	5
Mechanics and pipe fitters	102	13	40
Car mechanics	63	3	21
Carpenters	90	4	13
Electricians	114	4	15
Mixed physical and mental	432	4	26
Transport work	351	5	30
Machine operators	243	3	27
Bus drivers	101	11	45
Other transport workers	7	0	0
Dump work			
Dump workers	16	13	50
Dental work			
Dentists	11	0	0
Nursing work	54	0	2
Psychiatric nurses	52	0	2
Mental	564	1	4
Administrative work	150	0	0
Social workers	15	0	0
Office supervisors	132	0	1
Technical supervision	146	1	10
Fire chiefs	6	0	50
Supervisors at construction sites	139	1	8
Physician's work			
Physicians	52	2	0
Teaching work	207	0	4
Vocational school teachers	143	1	6
Secondary school teachers	63	0	0
Total	1799	4	17

Table 4. Percentage of women reporting much hampering by physical-chemical hazards or discomforts in the work environment in 1981 and the existence of such hazards and discomforts in 1985.

Work content group	Number of workers in 1985	Hampered much 1981 (%)	Existed much 1985 (%)
Physical	849	2	9
Auxiliary work	504	2	12
Cleaners	125	1	2
Hospital aides	160	0	6
Kitchen helpers	129	2	8
Construction workers and streetsweepers	54	9	56
Park workers	36	0	22
Home care work	343	1	6
Bathers	85	1	6
Domestic helpers and housekeepers	258	1	6
Mixed physical and mental	853	1	2
Kitchen supervision			
Cooks	127	2	9
Dental work			
Dentists	65	0	0
Nursing work	660	1	1
Child care workers	184	1	1
Practical nurses	194	1	1
Psychiatric nurses	58	2	0
Specialized nurses	62	0	2
Other nurses	162	1	2
Mental	754	0	1
Office work	269	0	1
Draftswomen	48	0	0
Typists	48	0	0
Clerks	173	0	1
Administrative work	293	0	0
Social workers	66	0	0
Head ward nurses	130	0	0
Head nurses	80	0	0
Office supervisors	17	0	0
Physician's work			
Physicians	22	0	0
Teaching work	170	0	1
Vocational school teachers	56	0	0
Secondary school teachers	16	0	0
Day care center teachers	98	0	2
Total	2456	1	4

nursing and teaching occupations and in the group of bus drivers.

Possibilities to develop at work. The workers in the mental work group more often reported that they had possibilities to develop and influence their work and to receive training, recognition, and esteem at work. The responses had become slightly more positive by 1985. Marked positive changes were found in the groups of dentists, workers with nursing tasks, and typists, and also among the male doctors.

Lack of freedom. In general, haste, tight time schedules, and paced work had increased from 1981 to 1985.

Lack of freedom increased the most markedly in the physical occupations held by the women (14 % in 1981 and 28 % in 1985).

Changes in work by work content and gender

Changes in tasks and the work environment. The women stated more often than the men that their work and work tasks had changed during the follow-up period. The change was more often positive than negative (table 7). Among the women, no differences were found between the physical, mixed, or mental work groups. The men in the mental work group were more pessimistic than the men who did physical work.

Changes in the work environment and equipment were evaluated as positive by 30 % of the workers and as negative by only 4 %. Again the men in the mental work group were more critical than the others.

Changes in work load. The majority of the respondents felt that the physical work load had remained unchanged during the follow-up period (table 8). When the physical load had changed, it was more often experienced as decreased among the men but increased among the women. The experienced increase was typical for both the physical and the mixed work groups.

The mental load was evaluated as having increased more often by the women (55 %) than the men (46 %). It had increased especially in the mental work group.

Factors affecting the changes in work load were analyzed for the following four factors among the persons who reported change on the questionnaire: automation and mechanization, amount of work, quality of contacts, and the demand for knowledge at work. The evaluations are presented in table 9 by gender and

work group. The factors that contributed the most to the increase in work load during 1981–1985 were increases in the amount of work, the knowledge needed at work, and the quality of contacts and customer relations. On the contrary, automation and mechanization were estimated to have more often decreased than increased the work load in the physical and mixed work groups. It should be noted that these factors had less an impact on the whole study sample because about half of the respondents did not report any changes in work load.

Changes in work by occupation

Table 10 shows the occupational groups in which an increase in physical load was the most common.

Table 5. Percentage of men reporting use of knowledge, responsibility for people, possibilities to develop at work, and lack of freedom at work in 1981 and 1985.

Work content group	Number of workers in 1985	Use of knowledge		Responsibility for people		Possibilities to develop		Lack of freedom	
		1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)
Physical	803	8	8	4	6	6	7	5	7
Auxiliary work	260	4	4	1	4	3	6	6	7
Unskilled assistants	14	0	7	7	21	0	0	14	21
Painters	53	8	6	0	2	0	2	9	8
Construction workers and streetsweepers	105	2	4	1	3	4	9	7	4
Park workers	55	2	0	0	4	5	7	0	9
Laborers	33	9	6	3	6	3	3	3	3
Installation work	543	10	10	6	7	7	8	5	7
Firemen	57	26	19	12	5	0	7	4	12
Janitors	117	3	2	9	13	11	14	3	3
Mechanics and pipe fitters	102	7	12	5	6	5	6	5	10
Car mechanics	63	13	10	3	3	6	2	14	11
Carpenters	90	11	11	2	6	9	7	1	4
Electricians	114	11	13	4	7	5	10	5	8
Mixed physical and mental	432	29	37	35	42	6	9	16	25
Transport work	351	31	39	30	37	4	7	18	29
Machine operators	243	23	33	13	18	5	7	8	21
Bus drivers	101	53	57	73	83	1	5	43	52
Other transport workers	7	14	0	14	57	0	14	14	0
Dump work									
Dump workers	16	19	6	13	0	0	0	13	13
Dental work									
Dentists	11	27	55	45	91	27	36	9	18
Nursing work	54	22	28	67	74	15	19	4	6
Psychiatric nurses	52	23	29	67	75	15	19	4	4
Mental	564	35	36	45	48	22	27	4	13
Administrative work	150	33	32	41	45	43	48	7	12
Social workers	15	47	60	60	67	7	0	27	60
Office supervisors	132	30	28	37	42	49	54	4	7
Technical supervision	146	34	34	29	32	13	19	3	12
Fire chiefs	6	17	33	0	0	33	0	0	0
Supervisors at construction sites	139	35	35	30	34	12	19	3	13
Physician's work									
Physicians	52	79	67	77	65	23	44	8	27
Teaching work	207	28	32	54	60	11	14	2	10
Vocational school teachers	143	31	35	55	64	11	15	1	7
Secondary school teachers	63	19	27	51	51	11	11	5	17
Total	1799	22	24	24	28	11	14	7	13

Table 6. Percentage of women reporting use of knowledge, responsibility for people, possibilities to develop at work, and lack of freedom at work in 1981 and 1985.

Work content group	Number of workers in 1985	Use of knowledge		Responsibility for people		Possibilities to develop		Lack of freedom	
		1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)	1981 (%)	1985 (%)
Physical	849	4	6	25	33	3	6	14	28
Auxiliary work	504	2	2	9	13	4	6	13	26
Cleaners	125	1	2	0	2	5	5	9	17
Hospital aides	160	3	3	19	28	6	11	16	33
Kitchen helpers	129	3	4	9	12	0	4	19	38
Construction workers and streetsweepers	54	0	0	0	0	0	4	3	9
Park workers	36	0	0	6	3	11	3	3	8
Home care work	343	6	11	49	63	3	6	16	32
Bathers	85	2	4	52	60	0	4	15	37
Domestic helpers and housekeepers	258	7	13	48	64	4	7	16	30
Mixed physical and mental	853	21	24	53	67	12	20	8	20
Kitchen supervision									
Cooks	127	16	21	32	41	16	23	11	26
Dental work									
Dentists	65	29	48	69	85	17	26	5	8
Nursing work	660	22	23	55	70	11	19	8	20
Child care workers	184	18	21	45	65	16	22	5	11
Practical nurses	194	11	14	56	71	7	13	10	30
Psychiatric nurses	58	26	24	64	72	10	19	7	7
Specialized nurses	62	42	42	53	63	13	16	18	32
Other nurses	162	29	27	64	75	11	23	5	17
Mental	754	25	28	43	51	22	29	7	17
Office work	269	5	5	4	7	7	13	8	20
Draftswomen	48	4	2	0	0	15	19	4	13
Typists	48	6	6	2	0	6	17	17	38
Clerks	173	5	5	5	11	6	11	7	17
Administrative work	293	38	41	62	75	28	38	6	16
Social workers	66	50	50	61	68	14	21	9	30
Head ward nurses	130	37	39	69	86	26	38	7	17
Head nurses	80	31	34	53	68	39	50	1	6
Office supervisors	17	35	47	53	53	47	41	6	6
Physician's work									
Physicians	22	64	59	64	64	32	27	5	14
Teaching work	170	29	39	69	77	32	41	8	14
Vocational school teachers	56	38	50	61	73	27	32	16	36
Secondary school teachers	16	38	38	50	81	25	50	0	0
Day care center teachers	98	22	34	77	78	37	44	4	3
Total	2456	16	19	40	50	12	18	10	22

Table 7. Percentage of the men and women who experienced changes in their tasks and work environment between 1981 and 1985.

Evaluation	Men (N = 1757) (%)	Women (N = 2407) (%)
Remained the same	60	45
Positive change	16	19
Negative change	8	9
Both positive and negative changes	16	27

Table 8. Percentage of the men and women who experienced changes in their work load.

Change	Physical load		Mental load	
	Men (%)	Women (%)	Men (%)	Women (%)
Decreased very much	4	4	2	2
Decreased somewhat	16	15	7	8
Remained the same	65	51	46	35
Increased somewhat	11	18	32	35
Increased very much	4	11	14	20

In each occupational group, an increase in mental load was estimated more often than a decrease. Such an increase was the most common in those occupa-

tional groups in which employees had contacts with customers, clients, or pupils. Especially teachers and social workers felt that the mental load of their work

Table 9. Percentage of change in the work load of the men and women by cause of change and work group.

Cause of change	Increased (%)	Remained the same (%)	Decreased (%)
Automation and mechanization			
Men (N = 1206)			
Physical work	5	70	25
Mixed physical and mental work	9	73	18
Mental work	6	90	4
Total	6	77	17
Women (N = 1495)			
Physical work	5	71	25
Mixed physical and mental work	9	74	17
Mental work	11	80	9
Total	8	75	17
Number of tasks			
Men (N = 1283)			
Physical work	23	68	9
Mixed physical and mental work	30	63	7
Mental work	49	44	7
Total	33	59	8
Women (N = 1724)			
Physical work	46	46	8
Mixed physical and mental work	49	41	10
Mental work	53	37	10
Total	50	41	9
Contacts with co-workers and clients			
Men (N = 1208)			
Physical work	10	85	5
Mixed physical and mental work	14	78	7
Mental work	33	61	6
Total	19	75	6
Women (N = 1640)			
Physical work	24	71	5
Mixed physical and mental work	36	55	9
Mental work	36	55	10
Total	32	60	8
Increase in demand for knowledge			
Men (N = 1235)			
Physical work	22	73	6
Mixed physical and mental work	20	76	4
Mental work	56	41	3
Total	33	62	4
Women (N = 1599)			
Physical work	20	74	6
Mixed physical and mental work	48	48	4
Mental work	56	41	4
Total	42	53	4

Table 10. Percentage of increase in the physical load of the men and women in occupational groups in which such an increase was the most common.^a

	Increase (%)
Men^a	
Unskilled assistants	43
Dentists	36
Firemen	28
Psychiatric nurses	26
Park workers	22
Janitors	21
Car mechanics	20
Women^{b, c}	
Specialized nurses	46
Bathers	44
Practical nurses	44
Hospital aides	39
Domestic helpers	36
Vocational school teachers	35

^a Groups with an increase of at least 20 %.

^b Groups with an increase of at least 34 %.

^c Only those occupational groups are listed whose evaluation of change was higher than the highest evaluation of the physical, mixed, or mental work groups.

Table 11. Percentage of increase in the mental load of the men and women in the occupational groups in which such an increase was the most common.

	Increase (%)
Men^a	
Fire chiefs	83
Vocational school teachers	81
Secondary school teachers	81
Social workers	80
Women^b	
Vocational school teachers	93
Secondary school teachers	81
Head nurses	71
Specialized nurses	68
Domestic helpers	65
Social workers	65
Head ward nurses	65

^a Groups with an increase of at least 65 %.

^b Groups with an increase of at least 63 %.

had increased between 1981 and 1985 (table 11). Table 12 summarizes the causes of increased mental load in the various occupations.

In general the workers felt that automation and mechanization had had rather little impact on their work load between 1981 and 1985. Automation and mechanization had increased the work load more often than it had decreased the load only in the occupational group of draftswomen (table 13). Table 14 shows the occupational groups in which the positive effects of automation were the most common. As noted earlier, these occupations belong to the physical and mixed work groups.

Discussion

The data of this study are based on the results of two questionnaire surveys, one made in 1981 and the other in 1985. The sample consisted of 2456 female and 1799 male employees who had remained in the same municipal occupation during the study period. The data have been presented by the content of the work and by occupational group. The physical demands had increased during the follow-up period, more among the women than among the men. The highest physical demands were found in physical work among both the men and the women. In addition hazards increased in

Table 12. Causes of increased mental load among the men and women by occupational group.

	Number of workers in 1985	Automation/ mechaniza- tion (%)	Amount of work (%)	Social contacts (%)	Knowl- edge needed (%)
Men					
Social workers	11	9	82	75	85
Fire chiefs	6	0	25	75	40
Vocational school teachers	100	8	58	40	73
Secondary school teachers	43	5	42	47	63
Women					
Domestic helpers	160	1	52	45	32
Specialized nurses	45	18	62	35	63
Social workers	40	3	55	45	68
Head ward nurses	85	2	53	49	60
Head nurses	53	2	67	50	67
Vocational school teachers	38	3	63	60	74
Secondary school teachers	12	0	54	31	64

Table 13. Percentage of increase in work load due to automation and mechanization among the men and women in the occupational groups in which such a change was the most common.

	N	Increase (%)
Men		
Machine operators	163	12
Women		
Draftswomen	40	25
Typists	34	21
Clerks	129	24

Table 14. Percentage of decrease in work load due to automation and mechanization among the men and women in the occupational groups in which such a decrease was the most common.

	Decrease (%)
Men^a	
Park workers	41
Unskilled assistants	40
Streetsweepers	29
Janitors	29
Electricians	28
Carpenters	27
Bus drivers	26
Women^a	
Construction workers	42
Kitchen supervisors	36
Typists	32
Kitchen helpers	31
Domestic helpers	27

^a Groups with a decrease of at least 25 %.

the physical-chemical work environment during the follow-up period, and more men than women reported such an increase. Only the women in physical work reported the existence of many hazards, whereas the men in both physical and mixed physical and mental work did so.

The high physical demands experienced by the women is in agreement with the objective estimation made of the work load, in which the musculoskeletal work load was found to be the same for both the men and the women in auxiliary work (9). This is an important finding because the maximal muscular strength among elderly women is only about 60 % of the strength of elderly men (10). Because of the lower physical capacity but the same levels of work load, the women reported higher physical work demands than the men. The increase in the use of poor work postures can also be explained by an accelerated decrease in muscular strength among workers older than 50 years of age (10). Elderly workers with low muscular strength and a high physical work load also have higher cardiorespiratory and perceived strain during their work than elderly workers with high muscular strength and a high work load (11). The increase in perceived physical demands can also be explained by the increase in the prevalences of diseases and a decrease in work ability during the follow-up period (12).

The marked changes in the perceived physical-chemical work environment could partly be explained by the differences in the questions. The question used in 1981, "Does the work environment factor hamper . . .," was more demanding than the question "Does the factor exist . . ." used in 1985 because, although a stress factor exists, it does not necessarily have to hamper the work. On the other hand, an increase in stress factors may also reflect a real increase in the amount of the stress factor.

The majority of the respondents reported no marked changes in their work content and tasks during the previous four years. However, if changes had occurred, they were evaluated more often as positive than negative. Especially the work environment and equipment had developed favorably.

The women had experienced more changes than the men. Even though the overall evaluation of changes was positive, the trend was not as coherent concerning the changes in work load. The employees reported

that especially the mental load had increased between 1981 and 1985. This change was connected primarily with the increase in the amount of work and the knowledge needed at work. In addition, changes in the quality of social contacts and client relations increased the mental load of the work. In contrast, automation had less of an impact on work load, and it was more often positive than negative. The same trend has been found also in other studies (2).

This study was based on two surveys and the responses of those employees whose occupations had remained the same between 1981 and 1985. This selection of the sample means that the evaluations of the changes give a more positive picture than would have been the case if all the employees had been included. Those who had changed their jobs or had been pensioned during the study period might have experienced an increased work load and negative changes at work.

When evaluating the results, one should keep in mind some general problems in describing change. In cross-sectional studies, the reliability of the results is dependent on study design, on the representativeness of the sample, and on the reliability and validity of the measurements (13).

Problems of reliability are greater in studies of change than in cross-sectional studies (14). In studies of change one must evaluate whether or not the scores are the result of an actual change in the measured phenomenon or are caused by measurement error. Someone may have recalibrated the scale or have given another meaning to the concept evaluated. In addition technical dependencies between the questions can be created in questionnaire studies. This response set might exacerbate the differences between the measurements even though no real change has occurred.

An evaluation of psychological stress factors and work load can also be affected by a decreased work capacity due to aging or illness (as for the aforementioned physical stress factors).

One typical problem is limitation of the extremes when standardized questionnaire scales are used. There is no room for changes in scales if extreme values have been given in the first measurement.

It should also be noted that the results were based on subjective evaluations of changes by elderly employees in 1985. Continuous changes, especially in the use of information technology, are reshaping job demands, and the situation in municipal occupations has probably changed during the last five years. If one is interested in the perceived changes of municipal occupations in general, these changes should be studied in all age groups. Finally, before generalizations can

be made and firm conclusions drawn about changes at work, the questionnaire data must be supplemented by other job analysis methods.

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