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Finnish research project on aging workers in 1981—1992

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The objective of this follow-up study of aging workers was to determine changes in the work, life-style, health, functional capacity, and stress symptoms of Finnish municipal employees from 1981 to 1992. In addition, factors that predict improvement or decline in the ability to work were studied. With the use of this information, attempts were made to produce practical measures to decrease the work-related health risks of elderly workers and increase factors promoting work ability. Along with the stress-strain model applied in the study, the reference frame of the World Health Organization (WHO) was used. The WHO model emphasizes the interaction between work, life-style, aging, and health. Work, life-style, health, work ability, and stress symptoms were studied through the use of comprehensive questionnaire surveys in 1981, 1985 and 1992. Initially, all the subjects (N = 6257) were employed in municipal occupations. During the follow-up, the data were supplemented by information on disability to work and mortality. The changes in work, life-style, health, work ability, and stress symptoms were examined among employees who worked in the same job (N = 924) during the entire follow-up period.

Key terms elderly worker, follow-up study, health, life-style, mortality, occupation, symptoms of stress, work, work ability.

Introduction

Research on health and aging

Health promotion is extending its viewpoint from analyzing the causes of diseases to determining the causes of health. The World Health Organization (WHO) included health promotion as a target of its activities in the early 1970s, and this goal has become more important recently in producing a health-maintaining work environment and life-style (1, 2). The purpose of health promotion may change research in this area in many ways. It is no longer feasible to break up health into as many components as it is when diseases are studied. Hence the concept of disease, broken down into numerous diagnoses, can be replaced by a holistic concept of health. Health is also comprehended more easily as a continuum than illness is. Thus the qualitative scale, depicting the presence or incidence of disease, can be replaced by a quantitative scale, depicting the different stages of health. People's own opinions about their health become more important because objective measurements, done in a laboratory, cannot give a sufficiently profound picture of it. This change in the health concept from being dichotomous to being continued is reflected also in many of the theories and reference models that have been proposed recently in health research (3—6). Selye's stress theory is usually the basis of these theories (7), especially the view that stress can cause rather similar physiological reactions in all people. Today, when research often focuses on the concepts of work ability or functional capacity, it is also important to know the harm and restrictions that diseases or poor health can cause (6, 8—10).

Studying the ability to work among aging workers is today of current interest because members of the large groups born after the World War II have already reached middle age. In the year 2000 more than 40% of the Finnish labor force will be at least 45 years of age [ie, elderly workers according to the definition of the International Labour Organisation (ILO)] (11, 12). Most of the Finns approaching retirement age, according to epidemiologic studies (13), suffer from numerous diseases. Aging involves alterations in the organism that may im-

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pair functional capacity already at the age of 30 years. The weakening of functional capacity is connected with a slowing of the organism in its functions and a reduction in flexibility. Delayed reaction speed is a typical feature of weakened mental functional capacity. Genetic factors determine the processes which impair functional capacity, but living conditions may have a strong effect (14—17).

There are at least 3 sources of information in the study of aging: (i) the characteristics of the elderly, (ii) the differences between birth cohorts, and (iii) the alterations associated with the course of time. It is a question of the characteristics of the elderly when the health and functional ability of 45- to 64-year-old persons are examined (eg, in different occupational groups or social classes). The relation between the effect of the differences of birth cohorts and alterations in abilities can be determined when subjects are divided into age groups (for instance, 45- to 54-year-olds and 55- to 64-year-olds) and the characteristics of these age cohorts are compared. Studying the effects of aging, or the passing of time, is possible only if the same people are followed. Aging has an effect on a subject's characteristics if the date of birth or the date of the investigation does not eliminate the effect (15, 18). In other words, an identical result would be obtained if the subjects were born in the 1930s or in the 1950s or if the investigations are done now or 10 years later. In research on aging, it is always difficult to identify normal aging from aging in a specific environment. If the objective is also to promote the health of people other than those whose aging is progressing normally, such identification is unnecessary (5, 18—20).

Table 1. Age distributions of aging municipal employees in the follow-up study. Cross-sectional inquiries in 1981, 1985 and 1992.

Year of birth	1981		1985		1992	
	N	Age (years)	N[a]	Age (years)	N[a]	Age (years)
1932—1935	2159	44—48[b]	1799	48—52	1497	55—59
1928—1931	2594	49—53	2342	53—57	1929	60—64
1923—1927	1504	54—58	1415	58—62	1108	65—69
1923—1935	6257	44—58	5556	48—62	4534	55—69

[a] Mortality and the number of persons who did not reply to the inquiry decreased the number of subjects in the second and third cross-sectional studies.
[b] The first cross-sectional study was done at the turn of 1980 and 1981, and therefore 5 subjects were only 44 years of age when they replied to the inquiry. The data collection took a few months, and therefore some subjects were shifted to the younger or older age group.

Table 2. Grouping of subjects in 1992 by work withdrawal during the 11-year follow-up.

Grouping	N	%
Same occupation	924	14.8
Changed occupation	130	2.0
Part-time work	47	0.8
Old age pension	2595	41.5
Disability pension	1853	29.6
Non response, not retired	314	5.0
Death	394	6.3
Total	6257	100.0

Interaction between work, life-style, aging and health

A stress-strain model built on the stress theory (7, 21) was used as a reference model in the 2 first cross-sectional studies of this follow-up. According to this model, overstrain results if the ability to work is not sufficient for the performance of the work task. Understrain is obvious if the ability to work considerably exceeds the demands of the work task. Both over- and understrain may be injurious and result in the deterioration of health, work ability, and functional capacity. Proper loading, on the other hand, may promote and maintain health, work ability, and functional capacity (14, 22). The theoretical background of the 3rd cross-sectional study was extended with the WHO reference model, which integrates work, life-style, aging, and health. In it understanding the effects of aging on the ability to work presupposes simultaneous examination of work, life, age, and health (11).

The follow-up study of aging municipal employees took place during the life stage in which extensive changes occur in work and also in other aspects of living. In the first cross-sectional study, in 1981, all the subjects (N = 6257) were still active employees. They were at least 45 years of age (ie, elderly workers by the definition of ILO) (table 1). Four years later, during the 2nd cross-sectional study, in 1985, the subjects were already divided into groups of active workers, retired workers, and deceased persons (23). In the 3rd cross-sectional study, in 1992, when the subjects were 55- to 69-year-olds, most of them were retired or disabled (table 2). Every fifth subject had attained the Finnish general pension age of 65 years, but a rather large number had remained active as a worker during the entire follow-up.

The main objectives of the 11-year follow-up were to determine (i) charges in work, life-style, health, functional capacity, ability to work and stress symptoms among the subjects over 45 years of age during 1981—1992, (ii) which characteristics of work, life-style, aging, and health predict either improvement or deterioration of the ability to work among those who remain active, and (iii) which of the characteristics of work, life-style, aging, and health predict disability and mortality.

The project aimed at producing practical recommendations to help minimize the health risks of elderly employees at work and maximize factors that maintain work ability.

Subjects, progress and parts of the follow-up study in 1981—1992

The subjects of the questionnaire and laboratory studies in 1992 were the same as those of the previous cross-sectional studies in 1981 (and in 1985) (24). The data of

Table 3. Withdrawal from work among the men and women (%) at the end of the follow-up in 1992 by gender, work content, and work profile.

Gender	N	Same occupation	Old age pension	Disability pension	Death	Other[a]
Men	2797	12.5	36.5	32.4	9.8	8.8
Physically demanding work	1361	9.9	30.7	37.8	12.7	8.9
Auxiliary work	503	9.9	23.1	44.1	15.3	7.6
Installation work	858	9.8	35.2	34.0	11.2	9.8
Mixed physically and mentally demanding work	711	7.6	49.0	27.4	8.0	8.0
Transportation	572	7.5	47.9	28.7	7.2	8.7
Dump work	47	6.4	25.5	42.6	19.2	6.3
Dental work	14	21.4	35.7	21.4	14.3	7.2
Nursing work	78	6.4	73.1	10.3	6.4	3.8
Mentally demanding work	725	22.3	35.3	27.2	6.2	8.9
Administrative work	184	22.3	37.5	21.7	5.4	13.1
Technical supervision	203	20.2	40.9	26.1	6.4	6.4
Physician's work	61	50.8	27.9	4.9	—	16.4
Teaching work	263	17.5	31.6	36.1	8.4	6.4
Women	3460	16.6	45.5	27.4	3.4	7.1
Physically demanding work	1288	13.7	37.6	37.4	4.0	7.3
Auxiliary work	785	13.6	34.3	40.1	3.8	8.2
Home care work	500	14.0	43.0	33.2	4.4	5.4
Mixed physically and mentally demanding work	1196	12.9	58.2	19.7	2.8	6.4
Kitchen supervision	146	17.8	33.6	28.8	5.5	14.3
Dental work	81	30.9	34.6	19.8	—	14.7
Nursing work	968	10.6	64.0	18.2	2.7	4.5
Mentally demanding work	976	24.9	40.3	23.6	3.4	7.8
Office work	328	25.0	30.8	27.4	4.0	12.8
Administrative work	396	25.0	46.5	18.4	3.3	6.8
Physician's work	25	48.0	28.0	24.0	—	—
Teaching work	227	22.0	44.5	26.9	3.1	3.5
Total	6257	14.8	41.5	29.6	6.3	7.8

[a] Changed occupation, part-time work, no response but not retired.

the inquiry were completed with information from disability and mortality registers. Those who participated in the functional capacity studies done in the laboratory also filled out the questionnaire. The work profile studies were carried out at the same workplaces as 10 years earlier. The subjects were compared in the same groups as earlier, classified by whether or not they had left active work, by their work content, and by their work profile (table 3). The questionnaires were mailed in the spring of 1992 to all the living subjects examined in the first cross-sectional study. During the follow-up period (1981—1992) altogether 394 of the 6257 subjects died. The response rate, calculated from the living subjects, was 77.3%. The women (79.5%) answered more often than the men (74.4%). The subjects employed in physically demanding work, especially in auxiliary work, and work with mixed demands (both mental and physical), especially dump work and dental work, had a lower than average response rate. It was possible to classify almost all the subjects who did not respond into groups of active, retired, and deceased persons according to information from the registers (table 2).

Because the mean age of the subjects at the end of the follow-up was 61.6 years, the oldest age group to leave active work comprised those retired on an old age pension (41.5%). The next oldest group was that of the disabled (29.6%), while only 14.8% of the subjects had continued to work actively (table 2). More women than men had continued in the same work or had retired. More men than women were disabled or deceased. The mortality of the men was almost 3 times higher than that of the women. Mortality and disability were generally higher in the physically and mixed physically and mentally demanding work categories than in mentally demanding work. Because of the reduced pension ages, 55—60 years in mixed work, the nurses and bus drivers had retired more often than the other workers. Every second physician worked in the same occupation. Those who worked in the same occupation were about 5 years younger than those who had retired (table 4). There were some age differences between the retirees' groups also in that those who had retired due to disability were about 2 years younger than the other retirees. The men began to retire slightly earlier than the women because of lower pension ages in some occupations (fire fighters, bus drivers).

The study methods and the themes of the 11-year follow-up were mainly the same as earlier. The questionnaire study also enabled us to determine changes in lifestyle (figure 1).

Table 4. Mean age (mean value and standard deviation) of the men and women in 1981 by gender and withdrawal from work in 1981—1992.

	Men			Women		
	N	Mean age (years)	SD	N	Mean age (years)	SD
Same occupation	350	47.3	1.8	574	46.9	1.8
Old-age pension	1022	52.4	3.2	1573	52.4	3.0
Disability pension	906	50.1	3.3	947	49.8	3.3
Death	275	51.8	3.7	119	51.7	3.7
Other[a]	244	47.5	2.5	247	47.6	2.7

[a] Changed occupation, part-time work, no response but not retired.

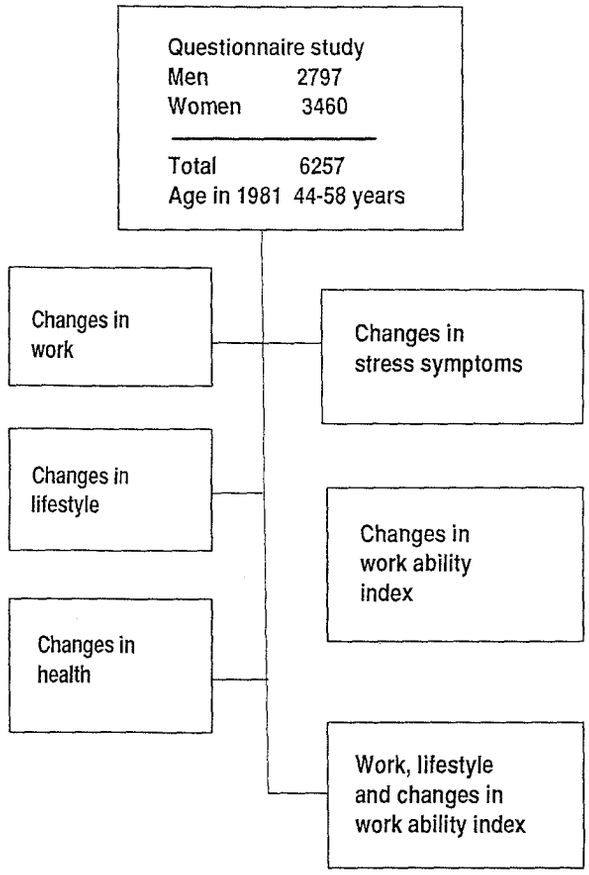

Figure 1. Content of the cross-sectional study in 1992. A follow-up of aging municipal employees in Finland, 1981—1992.

Themes of the study

One of the main targets in the first theme of the study, the *perceived changes in work characteristics* (25), was to determine how the subjects employed in the same occupation during the entire follow-up period experienced changes in their work. The variables of interest covered the physical and mental demands of the work and the physical and social work environment. Whether the work load had remained equal, decreased or increased was the key question. This was examined both at the general level and by gender and occupation. During the 11 years, the technical development and advances in municipal labor protection may have decreased the work load. On the other hand, the aging of the subjects and the tightened economic situation may have made the work, and how it was experienced, more loading. According to the 4-year follow-up (26), the work seemed to have become physically lighter but mentally more demanding.

The second study, on life-style, aging and work ability (27), examined life-style as a whole and included a person's activities (hobbies, living habits) on the 1 hand, and the subjective dimension satisfaction with life on the other. The associations and changes in these factors were compared among active workers, old-age pensioners, and disability pensioners. Special attention was paid to connections between life-style and changes in work ability.

In the next study, on changes in health (28), changes in subjective health experiences and changes in the occurrence of diagnosed diseases were primarily of interest. The comparison of the occupational and retirement groups was of importance. The results of the 4-year follow-up study (13) suggested that health was impaired with aging.

Changes in stress symptoms (29) were studied only among those who had worked in the same occupation during the follow-up period. From the stress symptoms, the immediate physical symptoms at work, mental reactions, and musculoskeletal and cardiovascular symptoms were described. The direction of change (more, fewer, or an equal number of symptoms than at the beginning of the study) was the important factor, and it was determined both for the study population in general and for the gender and work content groups. Through extrapolation of the results of the 4-year follow-up (30), the subjects were assumed to have more symptoms than earlier.

Changes in work ability (31) were studied also among those who had worked throughout the entire follow-up period. The ability to work was assessed according to the work ability index both from the physical and mental demands of the work and from the subjects' own health and resources. The work ability index has been constructed from the following 7 items: current work ability compared with the lifetime best, work ability in relation to demands of the job, number of current diseases diagnosed by a physician, estimated work impairment due to disease, sick leave during the past year, own prognosis of work ability 2 year's later, and mental resources (32). In the 4-year follow-up (23) the work ability index proved to be a good predictor of disability to work. The index measures the needs of activity for maintaining ability to work well because it reflects a harmful environment, it is all-inclusive and continuous, and it takes the subject's

own experiences into consideration. This study concentrated on depicting changes in work ability by age group, gender, work content and work profile, as well as the work ability of the individual workers. It was assumed that the ability to work decreases with age.

The study on aging, work, life-style, and work ability (33) focused on the causes of improved or deteriorated work ability among the subjects who remained active during the follow-up. The changes in work ability were determined from the work ability indices of 1981 and 1992. Both work and life-style factors in 1981 and the changes in these factors during the 11-year follow-up were used as predictors of the work ability index. In this respect we tried to identify factors which maintain or detrimentally affect work ability.

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