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## Summary of the Finnish research project (1981—1992) to promote the health and work ability of aging workers

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**Key terms** diseases, life-style, mortality, stress symptoms, work, work ability index.

The objective of the follow-up study on aging workers in municipal occupations in 1981—1992 was to seek means to prevent diseases and disability among workers approaching pension age and also means to maintain their health and work ability. The inquiry was based on the stress-strain model derived from stress theory and on work (1), life-style, health and aging from the point of view of the World Health Organization (2). Attention was focused on changes in work, life-style, health, stress symptoms and work ability and on the causes of such changes. The changes were examined with respect to age, gender, work content, and work profile. The promotion of health, and work ability was studied by examining factors associated with good and improved health and work ability. Means for prevention were sought by studying factors associated with poor and deteriorated health and work ability (3).

Although, during the follow-up, cross-sectional studies were done in 1981, 1985 and 1992, the actual object of interest was changes occurring over the 11-year period between 1981 and 1992. The subjects (N = 6259) were born in 1923—1935. Their ages were 44—58 years at the beginning of the study, when they were active workers employed in over 40 different occupations. The occupations were grouped according to job analyses (4) into three work content groups (table 1) representing physically, mentally, and mixed physically and mentally demanding work. The occupations were further grouped into 13 work profile categories (4). During the follow-up, 6.3% of the subjects died, 29.6% retired on disability

pensions, and 41.5% retired on old age pensions. Only 924 (14.8%) were employed in the same occupation during the entire follow-up.

### **Changes in work, life-style, health and stress symptoms**

After 11 years of aging the workers felt that their work had become heavier both mentally and physically (5). The increased mean values of the demands of physical work (muscular work, difficult work postures) and mental work (use of knowledge, possibilities for development and influence) expressed this trend. The subjects also reported that the physical and mental strain of their work had increased more often than it had decreased. The differences found between the work content groups in the earlier cross-sectional studies had remained constant. In the physical occupations the work demands were physically the most exacting and the physical work environment was the poorest. In the mental occupations the work demands were physically the least exacting and the physical work environment was the best. A slight deviation from this trend was noted for the mixed physically and mentally demanding work, for which the men (transportation, nursing and dump work) experienced an increase in the possibilities to develop and influence more often than the men in mental work did and for which the women (nursing, kitchen supervision and dental work)

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experienced an increase in the use of knowledge more often than the women in mental work did. Age was not greatly associated with the perception of work and its changes. (The age range of the active workers was only 44–51 years at the beginning of the study. The subjects whose age was higher than 51 years at the baseline had retired on an old-age pension during the follow-up.) The older workers experienced an increase in muscular work demands more often than the younger ones, however.

An increased interest in sports and physical activity, especially among the subjects doing mental work, was the greatest change in life-style. Already at the beginning of the follow-up, the workers in mentally demanding occupations were more interested in leisure-time physical activities than were the workers in physically demanding jobs (6). Interest in studying, social activity, literature, and handicrafts had decreased, in spite of the fact that the differences between the work content groups had remained the same. The subjects doing mental work were the most active in studying and social activities, whereas those doing physical work turned to handicrafts the most often. Smoking and alcohol consumption had remained about the same. More workers in mental than in physical or mixed physical and mental work con-

sumed alcohol weekly, and workers in physical and mixed work smoked more than workers with primarily mental tasks. The workers in mental work were the most satisfied with their life situation. The satisfaction of the older subjects ( $\geq 49$  years in 1981) had increased more often than that of the younger subjects ( $< 49$  years). Especially the older men had increased their leisure-time physical activities. The trend in life-style was similar among the subjects still working, as well as among those retired on disability or old age pension. Life satisfaction and active hobbies were associated with good health and work ability.

Aging was accompanied by the appearance of various diseases; especially the number of subjects suffering from diagnosed musculoskeletal and cardiovascular diseases increased (7). In spite of the increased number of diseases, the subjects perceived their health as improved. In 1992, 42% of those who suffered from diagnosed diseases perceived their health as good, but only 11% had the same opinion in 1981. The changes tended to be the same in all the work content groups. The subjects doing physical work had developed some form of disease the most often, and they were the ones who most often perceived their health as poor. Those under 49 years

**Table 1.** Proportion category of the men and women with a decreased work ability in the different work profile groups according to their mean ages in 1981 (51 years), 1985 (55 years) and 1992 (59 years) and also the proportion categories of the men and women who retired on a disability pension or died. (\*\*\*) = highest proportion, \*\* = second highest proportion, \* = third highest proportion, \$\$\$ = smallest proportion, \$\$ = second smallest proportion, \$ = third smallest proportion, .. = too small a number)

Gender	Decreased work ability			During follow-up	
	51 years	55 years	59 years	Disability pension	Death
<b>Men</b>					
Physically demanding work					
Auxiliary work	**	***	***	***	**
Installation work		*	**		*
Mixed physically and mentally demanding work					
Transportation work		**	*		
Dump work	***		..	**	***
Dental work	*	..	..	\$	
Nursing work			..	\$\$	\$
Mentally demanding work					
Administrative work	\$\$	\$\$	\$\$		\$\$
Technical supervision	\$		\$		\$
Physician's work	\$\$\$	\$\$\$	\$\$\$	\$\$\$	\$\$\$
Teaching work				*	
<b>Women</b>					
Physically demanding work					
Auxiliary work	***	**	**	***	
Home care work	**	***	***	**	**
Mixed physically and mentally demanding work					
Kitchen supervision	*	*	*	*	***
Dental work	\$\$\$		\$\$\$	\$\$\$	\$\$
Nursing work				\$\$\$	\$
Mentally demanding work					
Office work	\$	\$			*
Administrative work	\$\$	\$\$\$	\$	\$\$	
Physician's work		\$\$\$	\$\$		\$\$
Teaching work					

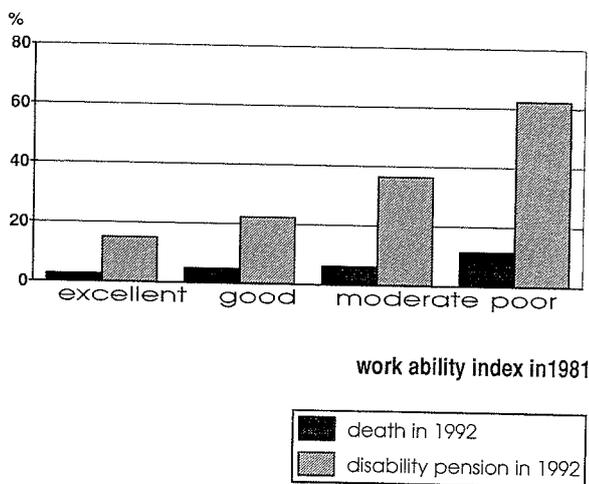
of age in 1981 had the highest rate of musculoskeletal diseases. The men had cardiovascular diseases more often than the women. An improvement in perceived health was associated with physical exercise and other active hobbies during leisure time.

Symptoms of stress had increased during the 11 years of follow-up (8). Symptoms in the lower and upper limbs and cardiorespiratory symptoms had increased the most. As regards mental symptoms, avoidance reactions, such as the desire to stay at home and stay away from work, had clearly increased. The women had symptoms more often than the men and, as in 1981, the subjects doing physical work had the most symptoms in 1992. If the occupational work load had decreased, the symptoms of stress had, as a rule, also decreased, and, if the work load had increased, the symptoms of stress had correspondingly increased.

### Work ability, disability and mortality

#### Changes in the work ability index

Changes in the work ability of the active workers were examined with the work ability index (9). The work ability index depicts the ability to work from a positive point of view of health and mental resources, and it also, at the same time, relates the ability to work to the demands of work and to disease (10, 11). With the aid of the work ability index it was not only possible, in both the 4-year and the 11-year follow-up studies (figure 1), to predict retirement on disability pension, but also mortality. Of those whose work ability in 1981 was poor, according to the work ability index (7—27 points), 62.2%



**Figure 1.** Work ability index predicting death and work disability pensioning of municipal workers in 1981—1992. Classification: poor = 7—27, moderate = 28—36, good = 37—43, and excellent = 44—49 points.

had retired on disability pension, 11.6% had died, and only 2.4% continued to work full-time in 1992.

The ability to work, measured by the work ability index, had declined significantly among those who were active workers during the entire follow-up, and in all of the work content groups too (10). The differences in work ability, age, and work content had remained fairly the same as before for those of the same gender. Work ability was the poorest among the subjects whose jobs were physical and best among those whose jobs were mental. Although work ability had generally decreased in all the work content groups, there were also those whose work ability had improved in spite of aging. Figure 2 shows how the work ability of the installation workers changed throughout the 3 follow-up periods.

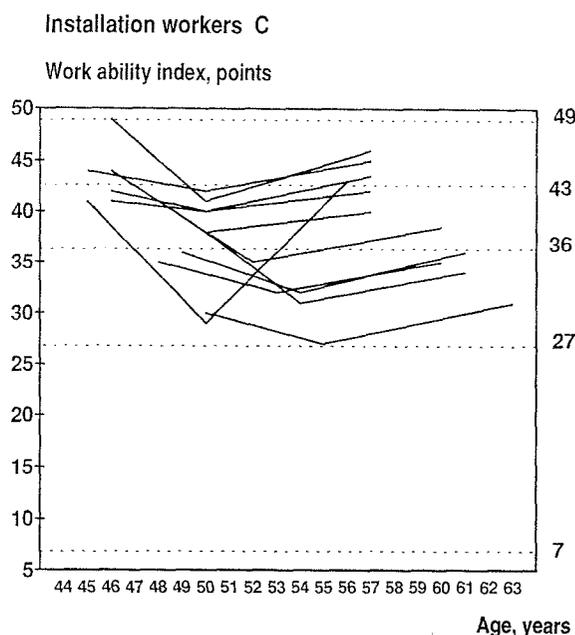
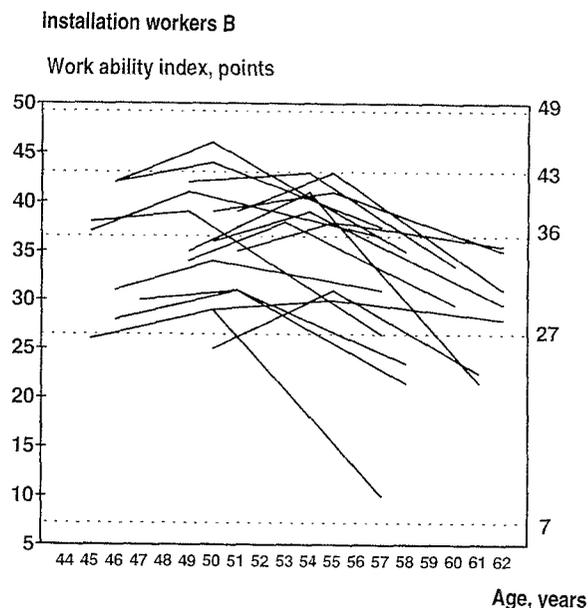
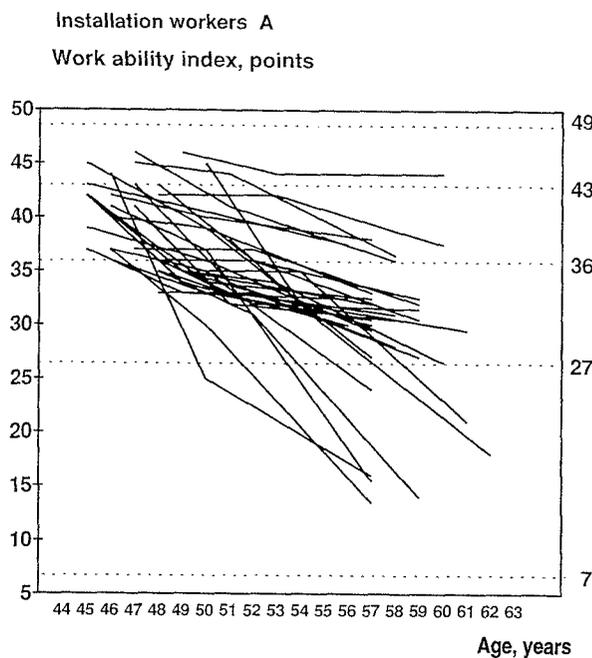
Improvement in work ability was associated with a decrease in poor work postures, restlessness, and management strain, and also with an increased interest in physical exercise (11). Of the basic variables on the questionnaire, improved work ability was best explained by a model which included improvement in the supervisor's attitude, decreased repetitive work movements, and increased vigorous physical exercise during leisure time. Decline in work ability, as measured by the work ability index, was explained in a logistic regression analysis by a model which included lowered recognition and esteem, increased standing at work, poorer workrooms, and decreased vigorous exercise during leisure time.

#### Risk occupations, gender and age

The proportions of workers with decreased work ability among the active workers, as well as the proportions of retired persons on disability pension and the proportions of those who had died during the follow-up, revealed a similar picture of the risk occupations in all three cross-sectional studies (table 1). The subjects engaged in physical work had the poorest means of coping.

Among the women, the workers in physical (auxiliary and home care) and mixed physical and mental (kitchen supervision) work had the poorest means of coping. Of those engaged in mental work, physicians and administrative workers and, of those in mixed physical and mental work, dentists coped the best. Among the men, the risk occupations were found in the physical (auxiliary and installation) and mixed physical and mental (dump and transportation) work content groups. The female office workers had a slightly higher mortality rate than that of the other women in mental work, and male teachers were retired on disability pension slightly more often than the other men in mental work.

Age, in addition to gender, was associated statistically significantly with mortality and with retirement on both old age and disability pension (table 2). (The positive correlation between disability pension and age was revealed when the deceased and those on old age pension



**Figure 2.** Individual changes in the work ability index according to age and the trend of change among male installation workers: a) the installation workers whose work ability index declined continuously through the three follow-up points, b) the installation workers whose work ability index first increased and then declined, c) the installation workers whose work ability index first declined and then increased. The individual changes have been calculated on the basis of the three study points (in 1981, 1985 and 1992).

were eliminated from the subjects.) More women than men had retired on old age pension.

### Concluding remarks

The study showed that the work ability of most Finnish workers deteriorates before retirement age. The decrease in work ability is reflected as disease and symptoms, as decline in work ability, as retirement on disability pension, and even as mortality before the age of retirement. In spite of the fairly low pension ages in force for some

municipal occupations, the common pension age being 63 years but the lowest being 55 years, only a little more than one-third of the workers, according to this study, will continue working until old age retirement. This result is poorer than could be expected on the basis of the theoretical knowledge of the effects of aging. Aging may cause difficulties to cope with tasks that demand quick responses, for example, such as rapid reactions and perception, speedy information processing and selection, or tasks which involve heavy physical work (13).

The impairment associated with physical work was reflected as general poor health. An increase in muscular

**Table 2.** Proportions (%) of the subjects who died or retired on an old age or disability pension in 1981–1992 by gender and age. [.. = too small a number (already retired on old age pension)]

Gender <sup>a</sup>	N	Death	Old age pension <sup>b</sup>	Disability pension <sup>c</sup>
Men	2797	9.8	40.5	60.4
44–48 years	938	7.1	16.9	42.1
49–53 years	1168	8.5	42.3	73.1
54–58 years	691	15.8	72.7	..
Women	3460	3.4	47.1	53.6
44–48 years	1221	2.3	15.0	38.2
49–53 years	1426	3.2	56.8	69.5
54–58 years	813	5.7	79.5	..
Total	6257	6.3	44.3	56.7

<sup>a</sup> The subgroups of the men and women are the age groups in 1981.

<sup>b</sup> The proportions were calculated after the deceased were eliminated.

<sup>c</sup> The proportions were calculated after those who had died or retired on an old age pension were eliminated. The number of disability pensions also includes the subjects with predisability and partial and distinctive pension.

work, especially increased standing at work, was associated with a decline in work ability, whereas a decrease in difficult work postures and, especially, decreased repetitive movements was associated with improvement in work ability. The increased hazards of muscular work may be due to a decline in muscular strength in association with aging. Even in the first 4-year follow-up the physical capacity of many of the women was poorer than expected on the basis of the demands of the work (14). The increase in adverse effects may also be partly due to the rationalization of jobs and to the increase in the total amount of work, required by individual workers, that prevailed generally in the 1990s (15). Physical work tasks have nevertheless become easier because difficult work postures are less prevalent. The muscular demands of work must not exceed the physical capacity of the workers, especially of aging women. Because this capacity was often exceeded, pain in the lower limbs was the symptom that increased the most and standing impaired work ability the most. Especially the older workers experienced more muscular work than before. Thus it is important to decrease static work and standing among aging workers, and to decrease muscular work in general.

Thus factors associated with physical occupations decreased work ability the most and caused some workers to leave worklife. Those who continued working during the entire follow-up were few. The occupational structure in this group had changed, and it included more mental occupations than earlier. At the beginning of the follow-up in 1981, when all the subjects were employed, only 27% was employed in mental occupations. However, at the end of the follow-up in 1992, as many as 44% of the still employed subjects were in mental occupations. The relatively high number of workers in mental jobs may explain why the factors of organization and social environment stood out so strongly when the

changes in work ability were explained. However, the fact that the improvement in work ability was strongly associated with better relations to the supervisor, especially in physical work, and that the decline in work ability was associated with recognition and esteem, especially in mixed (mental-physical) work, indicates that these factors have an effect on work ability in all occupations. When death or disability is concerned, the effect of social organization may be eliminated by more concrete factors such as those associated with physical jobs. Since most of the variables that explained both improvement and decline in work ability also measured change, the results have to be confirmed by other studies. The application of these results, however, is not contradictory to the promotion of work ability or the prevention of disability. The importance of recognition and esteem and the positive attitude of supervisors, demonstrated by the results of this study, are key issues in human relations, as stressed in many organization theories, but very little confirming research has been done on this topic thus far (17). The results also support the theories suggesting that, in middle age, one's work career can either progress or decrease drastically (2).

Positive changes related to aging, mainly improved perceived health and an increased interest in physical exercise, correlated with each other. Other active hobbies were also associated with good health and work ability. Other studies have also found that perceived health may improve with aging (17) and that satisfaction with life predicts longevity (18). Physical exercise also has a positive effect on mental health (19). A positive change in the attitude of the subjects regarding physical exercise and the efforts of occupational health care personnel to promote work ability during the follow-up period may have influenced the increase in physical exercise during leisure time. People should be continuously encouraged to participate in physical activities since the positive effects of these activities have been confirmed. In the future, studies should be carried out to examine more closely the interaction and effects of physical efforts during work and leisure time on health and work ability so that also work tasks could be designed to be healthier and to promote work ability. In the assessment of health, more attention should be paid to the perceived health of elderly people, rather than to their diseases only.

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