

Aging, work, life-style and work ability among Finnish municipal workers in 1981—1992

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Tuomi K, Ilmarinen J, Martikainen R, Aalto L, Klockars M. Aging, work, life-style and work ability among Finnish municipal workers in 1981—1992. *Scand J Work Environ Health* 1997;23 suppl 1:58—65.

Objectives This study was designed to explain changes in work ability through occupational and life-style factors.

Methods Work ability was measured by an index describing workers' health resources in regard to their work demands. The work factors mainly included physical and mental demands, social organization and the physical work environment. The life-style factors covered smoking, alcohol consumption, and leisure-time physical exercise. The first questionnaire study was done in 1981 and it was repeated in 1992. The subjects (N = 818) were workers in the 44- to 51-year-old age group in the beginning of the study who were active during the entire follow-up. The improvement and, correspondingly, the decline in work ability were analyzed by logistic regression models.

Results Both the improvement and the decline in work ability were associated more strongly with changes in work and life-style during the follow-up than with their initial variation. The model for improved work ability included improvement of the supervisor's attitude, decreased repetitive movements at work, and increased amount of vigorous leisure-time physical exercise. Deterioration in work ability was explained by a model which included a decrease in recognition and esteem at work, decrease in workroom conditions, increase in standing at work, and decrease in vigorous leisure-time physical exercise.

Conclusions Social relations at work can promote or impair the work ability of elderly workers. Although the work ability of elderly workers generally declined with aging, both older and younger workers were also able to improve their work ability.

Key terms life habits, work ability index, work content, work demands.

Introduction

Aging and functional capacity

The maximal functional capacity of people over 45 years of age deteriorates about 1.5% a year (1). The capacity for demanding mental performance, such as selective perception and rapid information processing begins to weaken also. Elderly workers can, however, compensate for their weakening performance with their knowledge and experience (2). In addition, elderly workers are more able than young workers to work independently, and they are loyal to their employer and rarely absent from work (1—3).

Studies on changes associated with aging have revealed difficulties to distinguish between the changes caused by the environment and life-style and those caused by biological aging (1, 2, 4). The simultaneous

presence and interplay of both positive and harmful factors, the diversity and nonspecificity of their effects, and the selection caused by the worker's health have created methodological difficulties for studying aging and work capacity (4, 5). The behavioral changes associated with aging make it more difficult to separate the purely biological effects. The elderly are keener than the young for health promoting activities (6, 7); at the same time they try to adapt and conceal their symptoms and diseases (6, 8). Behavioral changes of this kind may explain the fact that aging decreases the effects of risk factors of a variety of diseases (5).

Assessment of work ability

Even if epidemiologic methods provide explanations for the causes of diseases, the causes of changes in work ability are rarely studied epidemiologically. This situa-

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tion is partly due to the difficulties involved in determining and measuring work ability and partly due to the fact that society does not generally classify and categorize its healthy and capable citizens as it does its sick and disabled ones. The assumption that health is the absence of disease, a typical attitude in medicine, has also affected this view (9). The legislation on disability pensions gives some very general rules for assessing disability to work, but progress in clinical medicine, ideological and political views, and the economic resources of society affect the interpretation of this legislation (10). According to Albrecht & Levy (10) disability means inability to manage expected roles, such as living independently or being employed or being a parent. The disabled, in the same way as the sick (11), are not responsible for their condition, and they strive for health and seek help. Disability to work implies a discrepancy between expected and actual behavior (10) and also a discrepancy between the worker's abilities and job demands (12, 13). Because of the varying capacities of workers and the varying demands of work tasks, the same disease, injury, or limitation in functional capacity can have different effects on work ability. This variation complicates the study of work ability (10, 14).

The increased need to promote the health and work ability of the aged has also created a need for measuring and explaining the positive effects of health (1, 9, 15). Researchers of well-being and gerontologists have adopted a positive attitude towards health. They look at the problem as a question of whether health and illness belong to the same dimension or whether health and well-being should be measured differently than illness and ill-being (9, 16).

In this follow-up study of aging municipal workers, work ability was measured by an index formed of 7 items (17). The work ability index is suitable in many ways for studying health promotion and the maintenance of work ability. The concept of work ability formed by the index regards work ability as a positive resource of health and relates it to the demands of work tasks. The concept includes also the traditional view of disease. The subjective estimates of the previous and future development of work ability included in the concept increase its reliability. The validity to predict work disability by the work ability index suggests that the index measures essential features of the ability to work (18, 19).

Objectives

Epidemiologic studies on the development of work ability have been almost entirely restricted to this follow-up study of aging municipal employees. In our earlier 4-year follow-up, the maintenance of work ability and retirement on disability pension were explained by almost the same factors as the those applied in the present study (19, 20). Of the features of work, the possibilities

to develop oneself, exert influence, and gain satisfaction at work were associated with good work ability. Difficult work postures, muscular work, poor physical climate, a restless environment, and role ambiguity were associated with poor work ability. Leisure-time activities, such as physical exercise, as well as education and satisfaction with life, were associated with good work ability, whereas age and smoking were related to poor work ability (19, 20). Individual variation in work ability between 1981–1992 was assumed to be associated with the same factors as in the 4-year 1981–1985 follow-up. It was also assumed that the factors which maintain work ability are not necessarily the same as those which weaken it.

The objectives of the present study were to determine the factors and changes in work load and living habits that are associated with improvement in work ability, the factors and changes in work load and living habits that are associated with a deterioration in work ability, and the factors of work load and living habits that predict individual variation in work ability.

Subjects and methods

In this study the subjects were the same as those in the study on aging and the changes in the work ability index (18). The subjects (N=818) had remained active workers during the entire follow-up period, usually in the same occupation, and the index of their work ability was obtained in each cross-sectional study, in the years 1981, 1985 and 1992. At the beginning of the follow-up in 1981, the subjects were 44–51 years of age, and in 1992, at the end of the follow-up, they were in the age range of 55–62 years. The average age of the subjects in the beginning of the study was the same, 47 years, in all the work content groups. The grouping of the subjects according to gender, work content (work with mainly physical, mental and mixed physical and mental demands) and age, and the results of participation have been presented elsewhere (13).

Work ability

The dependent variable of work ability was formed by an index of work ability which covered the following 7 items (17): (i) subjective estimation of present work ability compared with the lifetime best (0–10 points), (ii) subjective work ability in relation to both physical and mental demands of the work (2–10 points), (iii) number of diagnosed diseases (1–7 points), (iv) subjective estimation of work impairment due to disease (1–6 points), (v) sickness absence during past year (1–5 points) (vi) own prognosis of work ability after 2 years (1, 4 or 7 points), and (vii) psychological resources (en-

joyment in daily tasks, activity and life spirit, optimistic attitude about the future) (1—4 points).

The work ability index was calculated by summing the points of each item. The possible range of the index was 7—49 points.

The development of work ability was studied from 3 different points of view. The improvement and decline in work ability was studied by calculating the difference in the index points between 1981 and 1992. Work ability was classified as improved if the index score in 1992 exceeded that in 1981 by at least 3 points. Those whose work ability was excellent in 1981 (ie, the index score was between 44—49 points) were excluded from this examination. According to a dichotomous variable describing improvement in work ability ($N = 555$), the work ability of 51 persons had improved and that of 504 had not. Work ability was classified as having declined if the index score in 1992 was at least 10 points below the score in 1981. Those whose work ability was poor in 1981 (ie, the index score was 7—27 points) were excluded from this examination. Dichotomizing the decline in work ability ($N = 805$) indicated that the work ability of 216 persons had declined and that of 589 had not. These conditions and restrictions in study design were used to facilitate the analysis of the real, rather than chance, changes or subjective estimation errors.

Finally the sum of the work ability scores in 1981 and 1992 was used as a dependent variable to describe the individual differences in work ability (20).

Variables of work and life-style

The variables of work and life-style at the beginning of the study, in 1981, were used as independent variables to explain the improvement and decline in work ability. In addition, the improvement and decline in work ability were explained by changes in work and life-style. The variables of change included either a change from poorer

than average initially to better than average during the follow-up or a change from better than average initially to poorer than average during the follow-up. The sum of the work ability scores also explained the initial work and life-style variables.

The variables of work and life-style were the same as in the studies on changes in work (21) and mortality (22). The basic variables of work were grouped by factor and reliability analyses into 4 main and 17 subgroups (21) as follows: (i) physical demands: muscular work (standing in 1 place, frequent walking or moving from 1 place to another, carrying objects by hand), difficult work postures (repetitive movements, bent or twisted postures), sitting in 1 place; (ii) mental demands and possibilities: use of knowledge (accuracy in information processing, complex decision making, decision making under time pressure), responsibility for people (communication with people, responsibility for others), responsibility in work (responsibility in work, fear of failure and mistakes), possibilities for development and influence at work (possibility to influence the work environment, plan own work, take part in training and updating skills, apply own skills, learn new things and study, receive recognition and esteem); (iii) physical-chemical work environment: strain of machine operating (noise, vibration, lighting, glare), dirtiness and risk of accident (dirtiness, dust, smoke, steam, etc, risk of accident), physical climate (heat, cold, changing temperature, dryness, dampness), restless work environment and noisy people; and (iv) organization and social environment: work tools and rooms (personnel facilities, quality and quantity of tools, workrooms), work-time system (rest breaks, workhours), management (cooperation between employer and employees, supervisor's attitude, planning and direction, information), role ambiguity (inconsistent tasks and responsibility), lack of freedom (paced work, tight time schedule), uninspiring work (monotonous and uninteresting work, isolation and loneliness).

The changes in work ability were first explained by the 17 sum variables. The sum variables were treated as continuous variables, and the range of every sum variable was 0—10. In the last phase of the analyses, the sum variables included in the models were scattered again into their basic variables so that the strongest effect of the sum variable could be obtained. The life-style variables were an index for smoking (number of cigarettes per day plus number of years of smoking, range 0—7), alcohol consumption (frequency of getting drunk, range 0—6), and vigorous exercise during leisure time (range 1—5).

Potential confounding factors

The data were grouped according to age in the year 1981, gender, and work content (tables 1 and 2). Since work ability depends strongly on age, the effect of all other

Table 1. Proportion of persons whose work ability improved or declined in the different age groups during the follow-up, 1981—1992.

Work ability	Age in 1981 (years)							
	44—46		47—48		49—51		Total	
	N	%	N	%	N	%	N	%
Improved ^a	284	9.2	155	8.4	116	10.3	555	9.2
Declined ^b	401	26.7	225	30.2	179	31.8	805	28.9

^a The group ($N = 555$) consisted of those whose initial score in the work ability index was 7—43 points. The percentages indicated the proportion of those whose work ability had improved (ie, the score in the work ability index had improved from 1981 to 1992 by at least 3 points). Age was not associated with improved work ability ($P = 0.40$).

^b The group ($N = 805$) consisted of those whose initial score in the work ability index was 28—49 points. The percentages indicated the proportion of those whose work ability had declined (ie, the score in the work ability index had declined from 1981 to 1992 by at least 10 points). Age was not associated with a decline in work ability ($P = 0.64$).

Table 2. Proportion of persons whose work ability improved and proportion of those whose work ability declined among the men and women according to work content during the follow-up, 1981–1992.

Work ability	Men								Women								Total	
	Physical work		Mixed physical and mental work		Mental work		Three groups combined		Physical work		Mixed physical and mental work		Mental work		Three groups combined		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Improved ^a	82	6.1	36	11.1	83	10.8	201	9.0	115	11.3	99	9.1	140	7.9	354	9.3	555	9.2
Declined ^b	100	31.0	48	33.3	152	27.6	300	29.7	127	31.5	140	25.7	238	28.2	505	28.3	805	28.8

^a The group (N = 555) consisted of those whose initial score in the work ability index was 7–43. The percentages indicated the proportion of those whose work ability had improved (ie, the score in the work ability index had improved from 1981 to 1992 by at least three points). Work content was not associated with improved work ability among the men (P = 0.50) or among the women (P = 0.64).

^b The group (N = 805) consisted of those whose initial score in the work ability index was 28–49 points. The percentages indicated the proportion of those whose work ability had decreased (ie, the score in the work ability index had declined from 1981 to 1992 by at least 10 points). Work content was not associated with a decline in work ability among the men (P = 0.71) or among the women (P = 0.58).

risk factors on work ability were adjusted by retaining age in all the models. Occupations were grouped by the AET (Arbeitswissenschaftliche Erhebungsverfahren zur Tätigkeitsanalyse) observation method into three work content groups, namely, work with mainly physical, mental, and mixed (both physical and mental) work demands (13, 23).

Statistical analyses

Interrelated variables of work and life-style were reduced by backward eliminative regression analyses in the examination of individual differences in work ability. The regression coefficients were standardized to facilitate the comparisons.

The improvement and deterioration in work ability were analyzed by cross-classifications and chi-square tests of the variables of change. Statistically significant but interrelated variables were removed by stepwise logistic regression analyses, and their effect in the groups (gender, age and work content) were analyzed by odds ratios (OR) and confidence limits. The strongest explanatory variables and the final models were chosen from the sum variables by cross-classifications and logistic regression analyses. A 5% significance level was aimed at as a criterion according to which to select a variable into the final multivariate models. The final models were fitted by EGRET software (24); otherwise SAS software was used in the analyses.

Results

Aging, age and work content

Between 1981 and 1992 the work ability of the majority of the subjects (82.3%) had declined. The work ability of only every tenth (13.6%) subject had improved. Age, gender, and work content did not explain the improvement or decline in work ability (tables 1 and 2).

Work and life-style variables associated with improved work ability

Changes in work and life-style during the follow-up were associated more strongly with improvement in work ability than these variables were initially (table 3). Work ability had improved more often among those who experienced a lack of freedom as harmful than among those who had not experienced it as harmful, even though the association was slightly curvilinear. Improved work postures and decreased restlessness and management strain during work explained improvement in work ability in the final multivariate model. The greatest improvement in work ability was seen when difficult postures, restlessness, and management strain had diminished. Increased vigorous exercise during leisure time, but not age, was statistically significantly associated with improvement in work ability.

Less restlessness and fewer noisy people in the work environment were associated with an improvement in work ability mainly among the men aged 47–51 years and employed in mental work (table 4). Improved work postures were associated with an improvement in work ability mainly in the age group of 44–46 years and in

Table 3. Work and life-style variables associated with an improvement in work ability. Single effects of variables and their multivariate model — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression models (N = 555).

Variable	Univariate model		Multivariate model	
	OR	95% CI	OR	95% CI
Lack of freedom	1.1	1.0–1.2		
Decreased muscular work	2.8	1.2–6.6		
Improved work postures	3.7	1.7–8.1	2.9	1.3–6.5
Decreased restlessness	3.6	1.7–7.4	3.4	1.6–7.2
Decreased management strain	1.9	1.0–3.6	2.0	1.0–3.7
Decreased role ambiguity	2.1	0.9–5.1		
Increased freedom	2.8	1.0–7.8		
Increased vigorous physical exercise	2.0	1.1–3.7		
Age	1.0	0.9–1.2	1.0	0.9–1.2

Table 4. Work and life-style variables associated with an improvement in work ability according to gender, age and work content — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression models.

Variable	Men (N = 18)		Women (N = 33)		44—46 years of age (N = 26)		47—51 years of age (N = 25)		Physical work (N = 18)		Mixed work (N = 13)		Mental work (N = 20)	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Decreased muscular work														
Improved work postures					6.8	2.4—19.1			5.2	1.5—18.3				
Decreased restlessness	8.6	2.9—25.4	6				6.3	2.4—16.7					5.5	1.9—15.6
Decreased management strain									4.1	1.5—11.6				
Increased vigorous physical exercise														
Age	0.9	0.7—1.3	1.1	0.9—1.4	1.4	0.6—3.2	1.1	0.8—1.6	0.7	0.5—1.0	1.5	1.1—2.0	1.1	0.9—1.5
Number of cases	18		33		26		25		18		18		20	
Number of persons	201		351		284		271		108		135		220	

Table 5. Model of work and life-style factors associated with an improvement in work ability^a (N = 555) — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression model.

Variable	OR	95% CI
Repetitive movements ^b		
Not decreased	1.0	
Decreased	2.1	1.0—3.4
Satisfaction with supervisor's attitude ^b		
Not increased	1.0	
Increased	3.6	1.8—7.2
Vigorous physical exercise in leisure time ^b		
Not increased	1.0	
Increased	1.8	1.0—3.5

^a The score in the work ability index had improved at least three points from 1981 to 1992.

^b Change from 1981 to 1992.

Table 6. Work and life-style variables associated with a decline in work ability. Single effects of the variables and their multivariate model — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression models (N = 805).

Variable	Univariate model		Multivariate model	
	OR	95% CI	OR	95% CI
Poor physical climate	1.1	1.0—1.1	1.1	1.0—1.1
Increased muscular work	1.9	1.2—2.8	1.8	1.2—2.8
Increased difficult work postures	1.5	1.0—2.2		
Decreased possibilities for development and influence at work	2.4	1.3—4.1	2.4	1.4—4.3
Decreased satisfaction with worktools and workrooms	2.0	1.3—3.1	1.8	1.1—2.8
Increased role ambiguity	1.9	1.4—2.7	1.9	1.4—2.7
Decreased freedom	1.4	1.0—2.0		
Decreased vigorous physical exercise	1.9	1.2—2.9	1.8	1.1—2.8
Age	1.1	1.0—1.2	1.1	1.0—1.2

the group of men doing physically demanding work. Decreased management strain improved work ability, especially among the men and women doing physically demanding work.

In the multivariate model of the basic variables, the independent variables explaining work ability were a decrease in repetitive movements, an increase in satisfaction with supervisor's attitude, and an increase in vigorous exercise during leisure time (table 5). An increase in satisfaction with the supervisor's attitude was the most strongly associated with improved work ability.

Work and life-style variables associated with a decline in work ability

Changes in work and life-style were more strongly associated with a decline in work ability than the variables were initially (table 6). Work ability had declined the most frequently among those who experienced an increase in role ambiguity and a decrease in possibilities to develop, among those whose work environment contained problems with the physical climate, and among those who exercised less during their leisure time. A decrease in satisfaction with worktools and workrooms and an increase in muscular work seemed to be related to a decline in work ability.

An increase in role ambiguity was associated with a decline in work ability, especially among the 44- to 46-year-olds, women, and workers doing physical work (table 7). Problems with unpleasant temperatures in the work environment predicted a decline in work ability among the men and among the workers doing mainly mentally demanding work. Decreased possibilities to develop oneself and exert influence was associated with a decline in work ability among persons doing mixed physical and mental work, among those 47 to 51 years of age, and among the women. A decrease in satisfaction with worktools and workrooms was related to a decline

Table 7. Work and life-style variables associated with a decline in work ability according to gender, age and work content — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression models.

Variable	Men		Women		44—46 years of age		47—51 years of age		Physical work		Mixed physical and mental work		Mental work	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Poor physical climate	1.1	1.0—1.2			1.1	1.0—1.2	1.1	1.0—1.2					1.2	1.0—1.3
Increased muscular work			2.5	1.4—4.3			2.4	1.3—4.3					2.0	1.0—3.7
Decreased possibilities for development and influence at work			2.9	1.3—6.6			3.8	1.6—9.0			4.1	1.2—13.7		
Decreased satisfaction with worktools and workrooms	4.4	1.9—10.5					2.3	1.2—4.5					3.0	1.5—5.8
Increased role ambiguity			2.1	1.4—3.2	2.2	1.4—3.6	1.7	1.1—2.8	2.1	1.1—3.7			1.8	1.1—2.9
Decreased freedom														
Decreased vigorous physical exercise	2.7	1.3—5.5												
Age	1.1	0.9—1.2	1.1	1.0—1.2	1.2	0.7—1.8	1.0	0.9—1.2	1.0	0.8—1.2	1.2	1.0—1.4	1.1	1.0—1.3
Number of cases	80		143		107		125		71		52		109	
Number of persons	300		505		401		404		227		188		390	

in the work ability of the men especially, whereas an increase in muscular work was associated with a decline in the women's work ability.

In the multivariate model of the basic variables, the independent variables explaining a deterioration in work ability were increased standing at work, decreased satisfaction with workrooms, decreased recognition and esteem at work, and decreased physical exercise habits during leisure time (table 8). Decreased recognition and esteem at work had the strongest association with a decline in work ability.

Features of work and life-style predicting individual differences in work ability

In the estimation of the reliability of the results of the 4-year follow-up, the sum of the work ability index measured in 1981 and 1992 was applied as a dependent variable. According to the regression model, muscular work, poor work postures, unpleasant temperature in the work environment, uninspiring work, and role ambiguity predicted poor work ability (table 9). Possibilities for development and influence at work, as well as physical exercise activity in leisure time, predicted good work ability.

Discussion

In this follow-up study, the 11 years of aging, between 1981 and 1992, were generally associated with a decline in the work ability of our subjects. However the initial age differences did not explain the changes in work ability either for better or worse. Some of the older (49—51

Table 8. Model of work and life-style factors associated with a decline in work ability^a (N = 805) — odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression model.

Variable	OR	95% CI
Standing in one place ^b		
Not increased	1.0	
Increased	1.7	1.0—2.9
Satisfaction with workrooms ^b		
Not decreased	1.0	
Decreased	1.6	1.0—2.6
Possibility for recognition and esteem at work ^b		
Not decreased	1.0	
Decreased	2.4	1.4—4.3
Vigorous physical exercise in leisure time ^b		
Not decreased	1.0	
Decreased	1.8	1.2—2.8

^a The score in the work ability index had fallen by at least 10 points from 1981 to 1992.

^b Change from 1981 to 1992.

Table 9. Work and life-style factors predicting work ability during the follow-up — standardized regression coefficients and their significance.^a

Variable	Standardized regression coefficient
Muscular work	-0.15***
Difficult work postures	-0.13**
Physical climate	-0.14***
Possibilities for development and influence at work	0.14***
Role ambiguity	-0.07*
Uninspiring work	-0.10**
Vigorous physical exercise in leisure time	0.10**
r ²	0.2***
Number of subjects	805

*P ≤ 0.05, **P ≤ 0.01, ***P ≤ 0.001.

years in 1981) and younger (44–46 years in 1981) subjects had been able to improve their work ability; similarly the work ability of many of the older and the younger workers declined.

The results of the present follow-up corresponded well with the results of the 4-year follow-up (19, 20, 25). With the exception of uninspiring work, restless work environment, age and smoking, the same features of work (ie, poor work postures, muscular work, temperature problems at work, and role ambiguity) were associated with poor work ability. Correspondingly, the same features of work and life-style (ie, possibilities for development in work and physical exercise during leisure time) were associated with a maintained status of good work ability. Although smoking was not associated with changes in the work ability of these active workers, it strongly predicted mortality and disability.

The changes in work and life-style that explained improvement in work ability were not in contrast with the factors explaining the individual differences in work ability. Our results showed, as did our previous reports, that especially high physical demands at work impair the work ability of aging workers (19, 20). Changes in the organization of work and in the social work environment also had a strong effect. In order to promote the work ability of aging workers, it is of practical interest that satisfaction with the supervisor's attitude best explained the improvement in work ability and that decreased recognition and esteem at work best explained the decline in work ability. Although explaining 1 change by the occurrence of others, namely, the change in work ability through changes in work and life-style, does not reliably reveal which is the cause and which is the effect, knowledge of the factors influencing these variations suggests ways to improve the work of elderly workers and its organization. The importance of the supervisor's attitude and an appreciation of the changes in work ability can be illustrated by the fact that an elderly worker whose productivity and performance begin to decline will probably be removed to other tasks or rejected. An aging but productive worker will be rewarded by a better work status or leadership position (1). The decreased satisfaction with workrooms, which helped explain the decline in work ability, may also be associated with decreased status.

The results agree with earlier views about the problems connected with the work ability of aging workers. Repetitive movements may often result in musculoskeletal symptoms. Because of poorer muscular strength and endurance, elderly workers cannot work in a standing work posture as well as younger people. Restlessness in the work environment and noisy people may disturb elderly workers more than young workers. Because of hearing problems, aging workers are more distressed by a noisy work environment. Lack of freedom and role am-

biguity may weaken the performance and self-confidence of older persons (1). The observed benefit of physical exercise during leisure time on work ability is in agreement with the results of the 4-year follow-up, according to which the physical performance of workers over 45 years of age decreases in the absence of regular physical exercise (14). Physical activities maintain mental health and well-being as well (1, 7, 26, 27). The beneficial effect of physical exercise on mental health and mental performance may be due to improved blood circulation and oxygen intake, increased hormone secretion (27, 28), and the fact that physical exercise decreases emotional stress reactions (29) and improves self-esteem (30).

The physical demands of work (ie, muscular work and difficult work postures) and also physical exercise during leisure time consistently explained both the variation and change in work ability. However, the associations with the mental demands of work, a physical-chemical work environment, and work organization and the social environment were not so consistent. This finding may suggest that the work ability index measures more physical than mental health and capacity. On the other hand, the physical items of the work ability index better predicted both mortality and disability than did the psychological items of the index. One explanation may be that it is harder to improve physical work ability than mental and social work ability. However, the small changes may weaken the explanation strength of the variables constructed for the physical work environment (21).

It is furthermore worth noting that the variables of work and life-style that varied during the follow-up explained the changes in work ability more strongly than did the basic variables. This result shows the need for parallel analyses of both positive and negative changes in work ability, and also the need for variables of change to be included as independent variables.

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