

Physiological criteria for retirement age

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The criteria for retirement age have been studied intensively at the Institute of Occupational Health since 1979. The study is based on the different retirement ages in the municipal sector, where, in addition to the normal retirement age of 63 years, altogether eight other so-called lowered retirement ages, between 55 and 62 years, have been used since 1964. The lowered retirement ages have been assessed according to the job title, and about one-third of the 335 000 municipal employees in Finland had the right to early pension in 1980. The questions arose of whether the classification of the jobs into the lowered retirement ages was still appropriate and relevant and of the criteria to be used in cases in which the old classification of job titles would not fit.

Altogether 6 268 employees (mean age 50.5 years) responded to the questionnaire in 1980–1981. A sample of 129 employees participated in a laboratory study which included an assessment of functional capacities. The employees were followed for four years and studied again in 1985 when their mean age was 54.7 years.

Several indices of work content, health, work ability, functional capacity, and symptoms of strain were studied as the criteria for retirement age. This report concentrates on the meaning of functional capacities for the assessment of the appropriate retirement age.

Subjects and methods

Those subjects who had been followed for four years and who had participated in the laboratory studies of cardiorespiratory, musculoskeletal, and psychological capacity were selected for this report. Their characteristics at the onset of the study and the changes after the follow-up are given in table 1.

The submaximal bicycle ergometer test, the 11 test items of musculoskeletal capacity, and the psychological tests have been described in another report (1).

Results and discussion

Cardiorespiratory capacity

The distribution of the maximal oxygen uptake ($\dot{V}O_2$ max) of the older female employees was normal, and that of the older men was somewhat better than expected in the age group above 50 years.

In physically demanding jobs the distribution of $\dot{V}O_2$ max ($l \cdot min^{-1}$) was also normal among both the women and the men. Therefore, depending on the acceptable level of strain during work (from 33 to 50 % of the $\dot{V}O_2$ max), the number of subjects able or unable to carry out typical physical work with an oxygen consumption of $1.0 l \cdot min^{-1}$ varied remarkably. Table 2 illustrates a situation in which the $\dot{V}O_2$ at work corresponded to $1.0 l \cdot min^{-1}$ and the age of the subjects averaged 55 years. The results indicate that, when 50 % of the $\dot{V}O_2$ max is the acceptable level of strain, about one-third of the women and all of the men are able to work at a given level without overstrain in the age group above 50 years. Women are generally not as well prepared as men for physical work, and the critical age for women in prolonged physical work is less than 50 years.

Musculoskeletal capacity

The changes in musculoskeletal capacity after the follow-up were related to work content (table 3). The results indicate that the musculoskeletal capacity decreased systematically for trunk flexion and extension strength, more so among the men than among the women. For hand-grip strength the decrease was found for workers doing physical and mental work but not for those doing mixed work. Mobility of the back increased both among the men and among the women. The most pronounced decrease (over 20 %) was found for the trunk flexion and extension strength of the men (2).

Concluding remarks

In summary, the changes in the cardiorespiratory and musculoskeletal capacity of aging municipal employees indicate that, in spite of the large individual variation, the capacities for physical work are strongly impaired after the age of 50 years. This disability is mainly due to decreased cardiorespiratory capacity among women and to decreased muscular trunk strength among men. If women over 50 years of age are involved in pro-

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Table 1. Characteristics of the subjects at the onset of the study (1982) and the changes after the follow-up period.

	N	Age (years)			Height (cm)			Weight (kg)			Body mass index (kg/m ²)		
		1982		Change	1982		Change	1982		Change	1982		Change
		Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Women	44	51.5	3.8	+3.5**	160.3	5.8	-0.9**	66.2	9.6	+1.2*	25.7	3.5	+0.8**
Men	39	51.3	2.9	+3.6**	175.4	6.7	-0.7**	78.3	10.6	+0.6	25.3	3.0	+0.5**

* P<0.01, ** P<0.001.

Table 2. Percentage of subjects (mean age 55 years) doing physical work whose maximal oxygen uptake ($\dot{V}O_2$ max) is sufficient or not sufficient for work demands ($\dot{V}O_2$) of 1.0 l · min⁻¹ when the acceptable strain ($\dot{V}O_2$ in % $\dot{V}O_2$ max) for prolonged physical work at 33, 40 and 50 % of the $\dot{V}O_2$ max.

$\dot{V}O_2$ max	Acceptable strain (% $\dot{V}O_2$ max)					
	Women (N = 27)			Men (N = 24)		
	33	40	50	33	40	50
Sufficient	0	0	37	25	62	100
Not sufficient	100	100	63	75	38	0

longed physical work, the metabolic demands should be less than an oxygen consumption of 1.0 l · min⁻¹. Alternatively, either an intensive occupational health care system or early retirement should be available.

References

1. Ilmarinen J, Nygård C-H, Suvanto S. Retirement age study: Functional capacity in relation to work content of

Table 3. Changes (%) in musculoskeletal capacity in relation to work content between the age of 51 and 55 years.

Work content	Trunk flexion	Trunk extension	Hand grip		Back mobility
			Right	Left	
Physical work					
Women	-14	-8	-5	-7	+3
Men	-21***	-20***	-9	-13***	+14**
Mixed work					
Women	-12*	-3	+8	+14	+12
Men	-26***	-20**	+2	+10	+10
Mental work					
Women	-6	-13*	-7*	-15***	+11*
Men	-20**	-6	-3	-6	+16*
All					
Women	-9*	-10**	-4	-7	+9*
Men	-22***	-16***	-4	-4	+13***

* P<0.05, ** P<0.01, *** P<0.001.

municipal employees aged 45–58 years: The changing nature of work and workforce. In: Third joint US-Finnish science symposium, October 22–24, 1986, pp 21–26.

2. Nygård C-H, Luopajarvi T, Ilmarinen J. Musculoskeletal capacity of middle aged women and men in physical, mental and mixed occupations: A 3.5-year follow-up. Eur Appl Physiol Occup Physiol (in press).