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Work after 45?

Proceedings from a scientific conference held in Stockholm 22–25 September 1996 Volume 2

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Preface

These two volumes contain a selection of the contributions presented during the international conference ”Work after 45?” on September 22-25, 1996 in Stockholm, Sweden. The conference was jointly organized by The National Institute for Working Life and the Department of Sociology, University of Göteborg.

The conference dealt with broad issues related to ageing and work, including relationships among ageing, work demands and health. The themes selected and highlighted at the conference concerned issues of ageing at work and, in particular, the impact of social, economic and organizational factors on health and psychological and social functioning. These issues are now more important than ever due to the ongoing changes in labour markets throughout the world, that carry with them implications for the labour market prospects of the ageing work force. An inter-disciplinary scope was sought in composition of programme sessions, workshops and mini-symposia involving participant researchers active in biomedical, behavioural and social sciences.

The selection of presentations for publication was based on a review of all papers, carried out by the international scientific committee commissioned by the organizers.

The conference was organized as a blend of plenary sessions, workshops, mini-symposia and free paper sessions following a pragmatically composed structure of themes and disciplines. At the outset of editing these proceedings we wanted to follow this structure and the course of the conference programme as it actually materialized. This idea was soon abandoned, however, since it was judged not to provide the reader with a satisfactory framework. In many sessions the papers, as they were actually presented, emphasized aspects which were also dealt with in other sessions, emphasizing the multidiciplinary nature of many contributions. We therefore decided on a simple logic of editing the proceedings with contributions ordered alphabetically by name of first author.

We were fortunate to have three key-note lecturers of great distinction participating in the conference, professors Peter F Hjort (Norway), Alan Walker (UK) and Timothy Salthouse (USA). Their three addresses have been included unabridged in the proceedings books, with only a minimum of technical editing.

Our thanks are due to all those who participated in the ”Work after 45?” conference, all who submitted papers to be included in these proceedings, the international scientific committee members reviewing all papers, Gunnar Aronsson (Sweden), Willem J A Goedhard (Netherlands), Juhani Ilmarinen (Finland), Jon Eivind Kolberg (Norway), Jette Nielsen, (Denmark), Clas Håkan Nygård (Finland), Carl Nørregaard (Denmark), Gunnar Olofsson (Sweden), Per Erik Solem (Norway) and Eskil Wadensjö (Sweden).

Our thanks are due to Dan Hultgren for his skilful technical editing of these volumes and for valuable help throughout its preparation. Ann-Britt Mossberg and Eric Elgemyr have also devoted time and effort to this publication. We also wish to thank the Swedish Council for Work Life Research, the Swedish Council for Social Research, and the Nordic Council of Ministers, for their support.

Most important, we thank all those who contributed to the conference for presenting their experiences and views, and subjecting them to scrutiny during exchanges with colleagues. We think that the results of this sharing of knowledge and insights in this research field will be of great practical and political importance and will have direct implications on life at work of the elderly work-force.

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Introduction

According to Industrial Safety and Health Law of Japan, at least one occupational physician should be assigned to a workplace with more than fifty employees, and a workplace with more than thousand employees shall have an occupational physician exclusively assigned to that site. Another unique feature for Japanese occupational health system is that all workers should take a health examination, annually, in rigidly regulated items (3). All of these legal directions put responsibility on employers, and on-site occupational health staffs ardently guide workers to achieve better health status, avoiding various risky behaviors. Although occupational health staffs are usually satisfied to see the workers maintaining health, this solid health care system tends to be disconnected at the retirement and nobody pays enough attention to what will happen during their remaining life span, which is expected to continue 20.2 years more in average, for 60 years old Japanese males (1).

Japanese society traditionally accepts the fixed retirement system, perceiving this system is indispensable to make room for the younger generation in companies, where typical workers stay for years under the life-time contract. The survey data from Japanese Ministry of Labor in 1994 showed 90.5% of Japanese companies with more than 30 employees adopted the fixed retirement system (Table 1), gradually raising the age to 60 years old or even more, especially among larger companies (8). In the meanwhile, decreased birthrate and the pursuit of higher educational career has also accelerated the rapid aging of Japanese work force (7).

These facts put important emphasis on the issue how to maintain health among once retired senior citizens who could also be the possible work force. The mortality of steel workers has extensively studied in US around 1970 (6), and Japan Iron and Steel Federation also reports summarized data of active workers (4),

however, neither of them includes information about the life of retired steel workers. With these background issues, this study was planned to describe how are the lives of once retired steel workers and also to analyze what are the important factors for them to keep activie in our society.

Table 1. Fixed age for retirement among Japanese companies (% of the subjects).

Company	Fixed Age for Retirement (years)					Age is
Size	≤55	56-59	60	61-64	65≥	not Fixed
30-	8.7	8.0	63.5	1.6	5.4	12.9
100-	5.4	5.3	81.6	2.4	2.9	2.4
300-	2.0	4.6	89.4	1.8	1.8	0.3
1 000-	1.3	2.2	92.8	1.9	1.0	0.7
5 000-	-	-	98.0	1.0	0.7	0.3
Total	*7.3*	*7.1*	*69.8*	*1.8*	*4.5*	*9.5*

Source: 1994 National Survey of Employment Administration, Ministry of Labour (modified and translated by the author).

Method

The target population of this study was all of the workers retired at their fixed age from Keihin Steelworks of NKK Corporation since 1975 to 1994. This plant is one of the symbolic factories that promoted growth of manufacturing industry in Japan especially during 1970's, and it is located in waterfront site of Tokyo Metropolitan area. Old workers' records kept at human resource department had a list of 5,054 persons, all male, retired at the fixed age, which had been gradually changed from 55 in 1981 to 60 in 1992. We stratified them by age and randomly chose 2,311 persons as our sample, including all workers who were expected to be 61, 65, 70, 75, and 20% of other ages from 62 to 74. Yet, 310 persons had to be excluded for their address could not be traced.

In October, 1995, a self-reporting questionnaire was mailed to 2,001 persons, asking about their health status, whether they were still at work or not, their satisfaction with daily life at that time, event from the past and future plans of life. In case that the questionnaire was delivered to deceased persons, we put instructions on the front page to ask whoever received it to answer selected items of the questionnaire. We also looked into their old health examination records to compare their life style while at work with their answers.

Data were analyzed with Excel 5.0 (Microsoft) and StatView 4.5 (Abacus Concepts) programs for personal computers.

Results

We received 1,253 answers, the overall response rate of 62.6%, without observing remarkable association between the rate and age categories. The results are summarized in five major parts as follows.

1) Health and working status

Our first question was to choose one out of six choices about their subjective perception of their current health and working status; WH: regularly working healthy, WD: regularly working but suffering from some diseases, AH: usually stays at

home without diseases, AD: usually stays at home and suffering from some diseases, N: stays alive with requiring nursing care, E: already deceased.

The older they got, the higher was the proportion of persons deceased, nursed, and discontinued working (Figure 1). Only exception was those at 61 years of age, who are financially covered by public unemployment insurance, which will partly compensate the former wages for about a year at the longest. Thus the working rate dropped to 27.8% right after the retirement, then jumped up to more than 50% during early 60's, and gradually decreased again until 15.2% at the age of 75. The morbidity increased monotonously from 43.9% at 61 years old to more than 60% at 75 years of age. Reported causes of death among 84 expired persons were 39 cancers, 14 cerebral infarctions, 11 heart attacks, which is at the same order as the general Japanese population of this generation (1).

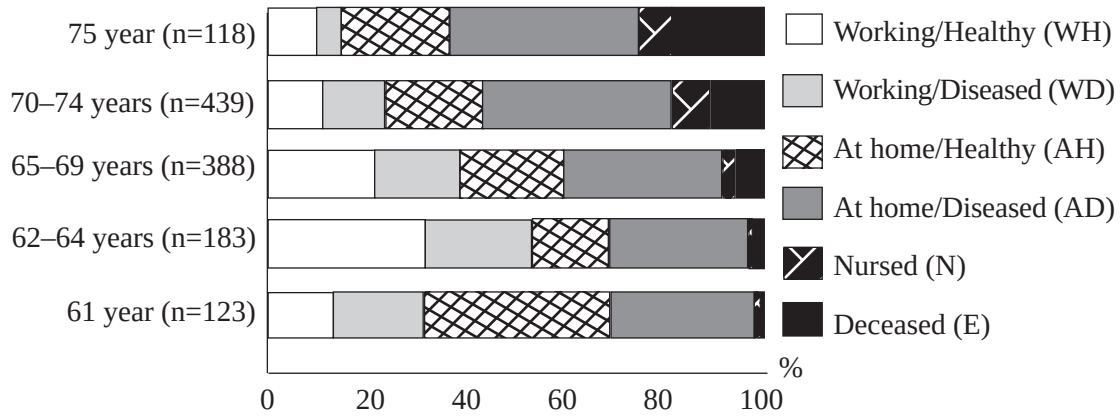

Figure 1. Current health and working status among retired steel workers by age category (n=1251).

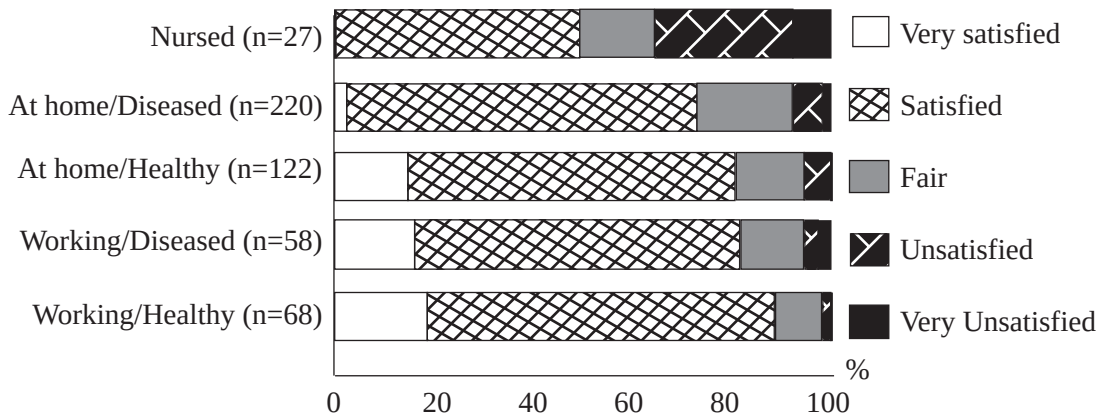

Figure 2. General satisfaction with current life among 70+ year old retired steel workers by current health and working status (n=495).

2) General satisfaction with life

Secondly, we asked them to scale the subjective satisfaction with their daily life at present into five degrees from "very satisfied" to "very unsatisfied". As the age

factor was supposed to play a role as a major confounder, we chose 495 persons over 70 years old for the cross analysis between this and the former question.

Obviously, healthy workers (WH) reported higher satisfaction than those who have a disease or discontinued working. Another interesting finding was that healthy non-workers (AH) reported no better satisfaction than regular diseased workers (WD), which suggested that the attitude towards working itself may sometimes overwhelm the negative feeling of carrying disease (Figure 2).

3) Past time smoking related to current health and working status

Among 495 persons over 70 years old, we could pull out old health examination records for 363 persons. Their smoking status at 50 years of age was extracted from the record to define four different categories; non-smokers, half-pack-a-day smokers, one-pack-a-day smokers, and smokers with more than one pack.

The results showed a dose-response relationship between past time smoking rate and current health and working status (Figure 3). Non-smokers 50 years old had highest probability to become healthy workers (WH) after 20 years, even though this category might include those who had already quit smoking by 50 years for health related reasons. It was also evident that smokers with more than one-pack-a-day at age 50 reported the highest probability of suffering from diseases, which are represented by combining WD, AD and N area of Figure 3.

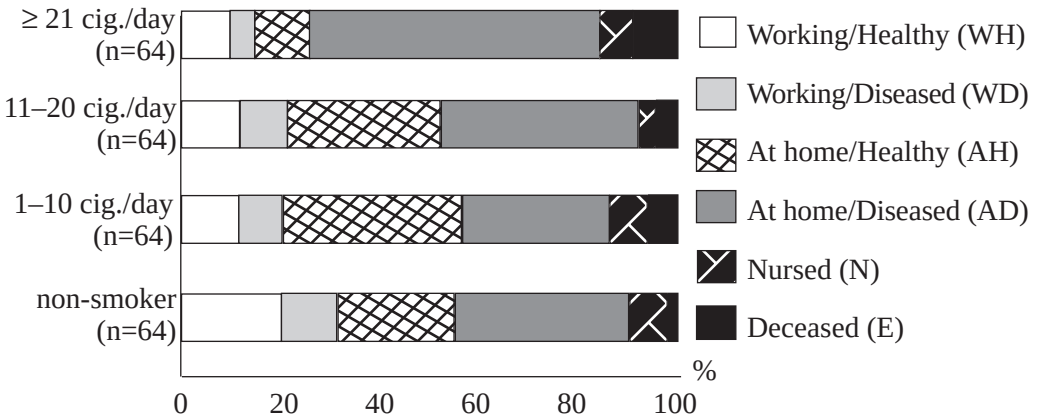

Figure 3. Current health and working status among 70+ year old retired steel workers by smoking status at 50 year old (n=363).

4). Most fruitful times of the past

We also asked all the subjects to freely describe their recollection of the most fruitful times through their life so far.

Only 588 retired workers answered this question. One fourth of them answered “it is right now”, followed by the answers with times when they were in their 50’s and 40’s. The number of persons who cited some events directly related to their former work activities almost tripled the number of those who referred to family matters, such as marriage, purchasing house or bringing up children (Table 2).

Table 2. Most fruitful times recollected by retired steel workers (n=588).

most fruitful time	n	%
at present	148	25.2
in one's 50's	124	21.1
while at work	98	16.7
in one's 40's	98	16.7
in one's 30's	22	3.7
in one's 20's	20	3.4
while bringing up children	20	3.4
when finished projects	14	2.4
when children married	11	1.9
when purchased house	9	1.5
while at military	7	1.2
in one's 60's	6	1.0
while single	4	0.7
before got ill	3	0.5
miscellaneous	8	1.4
not at anytime	8	1.4

5) Future plans of life

The last question was to freely describe any plans which retired workers would like to realize during the next 12 months.

Traveling was the favorite plan. Other kinds of hobbies followed it, and activities related to families, local communities and health maintenance also seemed to be popular. It was also true that more than 50 percent left the answer sheet blank for this question, and moreover about 8 percent of responders intentionally answered they had “no idea” for the future plans (Table 3).

Table 3. Future plans of retired steel workers during next year (n=523, M.A.).

future plan of life	n	%
some hobbies	148	25.2
traveling	*124*	*21.1*
artistic hobbies	*98*	*16.7*
physical hobbies	*98*	*16.7*
unknown hobbies	*22*	*3.7*
just maintaining health	20	3.4
taking care of wives	20	3.4
keep working	14	2.4
local activities	11	1.9
volunteer activities	9	1.5
getting some licenses	7	1.2
treatment of diseases	6	1.0
miscellaneous	8	1.4
no idea	8	1.4

Discussions

According to our result, mortality of 60 year old Japanese male steel workers by the time they reached to age 75 was apparently calculated as 14.4%, which is only half of what is reported in life tables for general Japanese male population in 1995 (1). It is possible that 748 non-responders to our questionnaire might have higher mortality than responders, however, a difference of mortality to this extent could

be explained simply as the healthy workers' effect (2). Another limitation of this study is that most of the results were based on self-reported answers, however, the observed health and working status changes by age seem quite reasonable as the natural course for human life. Moreover, we used the smoking data written in old health records instead of asking about the smoking habit from many years ago to avoid the recall bias. The analysis using smoking status at age 50 suffers from the problem of containing a mixed population such that ex-smokers and temporal non-smokers could be categorized into non-smokers.

However, these possible misclassification may not bring about false associations but rather dilute the associations. Despite this possibility, we did observe a dose-response relationship between smoking habit at 50 years and the health and working status after age 70. In terms of the generalizability of these data, we should admit it was derived from one single factory. However, steel workers are only part of thousands of workers who gathered into Tokyo area from all over Japan to function as strong cogwheels to promote Japanese manufacturing industry since 1950's. It could at least be said that their personality or socioeconomic background are not generally perceived exceptional from average Japanese factory workers.

We observed that more than half of once retired Japanese workers actually returned to some works at 62 years of age. Though it is supposed these works were less rewarding, people who restarted working felt more satisfied with life than people who just stayed at home. Thus the primary finding of this study is that work itself is of essential importance to keep a positive attitude to life even for retired persons. It seems that people do not only work to live but sometimes also live to work. Another important finding from this study is that smoking rate at 50 years of age was associated with a high working rate after 70 years. Though more extensive studies focused on this particular matter are desired, this fact has broadened the merit of on-site smoking cessation program not only to prevent diseases but also to keep capability to work 20 years later. Lastly, even though the Japanese are generally perceived as hard-working people, answers on their future plans showed that they also liked to spend their own leisure time for hobbies, especially for traveling. To sum up these findings, it might be ideal to quit smoking as early as possible, and when once retired, it is better to have easier and less stressful job leaving enough time for hobbies.

As everybody is mortal, people may not simply live along aiming at eternal health. We rather live to accomplish our individual goals of life such as working with pride, helping others or traveling. From this notion, occupational health professionals' role is not only supporting workers' health at work, but also guiding workers for the better accomplishment of their life goals (2). With this attitude, we would like to expect the improvement of their general satisfaction and the quality of working life.

Summary and conclusions

After the fixed age retirement, more than half of the steel workers restarted working. The general satisfaction of life seemed better among those who returned to work than among those who stayed at home without any diseases. Smoking status before retirement was associated with working status of 20 years later. Work itself

seemed to be remembered as the fruitful event of the life in the past, and traveling was selected as the favorite plan for the future. Occupational health specialists should guide the workers to develop and to accomplish their life goals which will be continued after the retirement.

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Who becomes a disability pensioner? The Swedish case 1988 and 1993

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Introduction

In many industrialised countries the labour market participation among elderly people are decreasing. We are facing a rather paradoxical situation. People are healthier and live longer than ever before through improved housing conditions, better nutrition standards, etc. At the same time people are spending shorter and shorter time in paid work. At one end of the life span we study for a longer period which postpones our entrance to the labour market and at the other end different exit possibilities enable (or force) us to quit working prior to the normal old age pension (5, 11, 14, 20).

In Sweden, there are several ways to leave the working life prematurely. One of the most important is through disability pension. When discussing labour market participation and exit the disability pension thus forms an interesting as well as an important case. In this paper we will present and discuss some research results concerning the question *"why do people become disability pensioners?"*.

The disability pension is a publicly financed pension program and it is granted individuals who have limitations in their working capacity due to health problems. Between 1972 and 1990 the benefit could also be granted people above 60 years of age with difficulties getting a job in their home region.

The number of new disability pensions has varied during the past 25 years, from about 42 000 1982 to more than 62 000 in 1993. However, the last two years the number has decreased considerably (17).

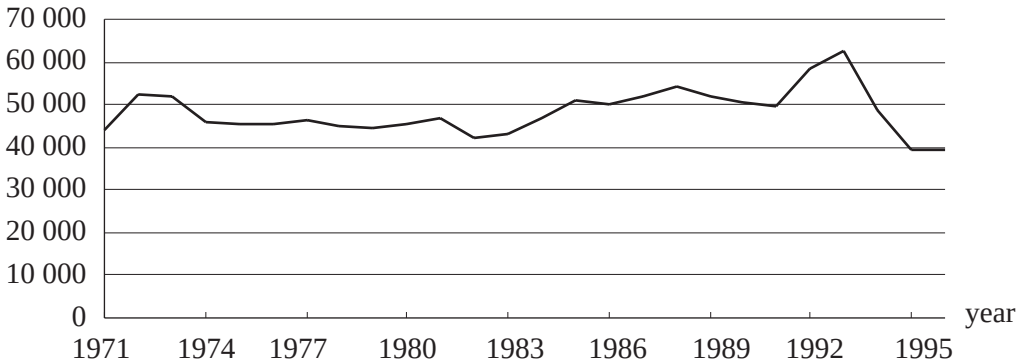

Figure 1. Number of new disability pensions in Sweden from 1971 to 1995.

Since the new entrants outnumber those who leave the disability pension program through rehabilitation, old age pension or death, the total number of disability pensioners in the population increased from 250 000 1977 to about 420 000 1995 (17).

Method

The ”Disability Pension Project” is part of a research program at Umeå University and has been in progress since 1989. It was initially an assignment from the Swedish government who initiated a commission for the work environment ”Arbetsmiljökommissionen”, headed by Anna-Greta Leijon, the former Minister of Labour (1, 8). The mandate of the commission was to gather information about work injuries and propose reforms to reduce them and develop the work environment. Our part in this endeavour was to study the relative risk of becoming a disability pensioner in different occupations**.**

At that time the knowledge about the relationship between occupational background and disability pensioning was very limited. The initial aim to study the occupational background of disability pensioners, has gradually been widened to an analysis including both occupational position, the pensioners' diagnoses, health, education and their general social background. Also the former labour market situation of disability pensioners is a main issue for the project.

Our study has a pseudo case-control-design and we use data from two different sources, the National Social Insurance Board and the Statistics Sweden census 1980, 1985 and 1990. All individuals in Sweden who received a disability pension 1988 (54 000) and 1993 (62 000) have been selected and combined with control groups (50 000 and 75 000 individuals) into two different data-sets.

The data contain variables covering occupation and social background from different years, which gives us an opportunity to study, apart from specific risk factors each year, the importance of occupational and social mobility.

In the research concerning early retirement three perspectives have been dominating. Firstly, structural changes on the labour market and unemployment have been focused. Secondly, occupational and work environment issues have been discussed, and thirdly the social security system has been claimed as an important factor. Added to this, of course, the individual characteristics such as age and sex are of importance (2, 3, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 18). An overwiev of the factors that have been most prominent in the discussion are displayed in figure 2.

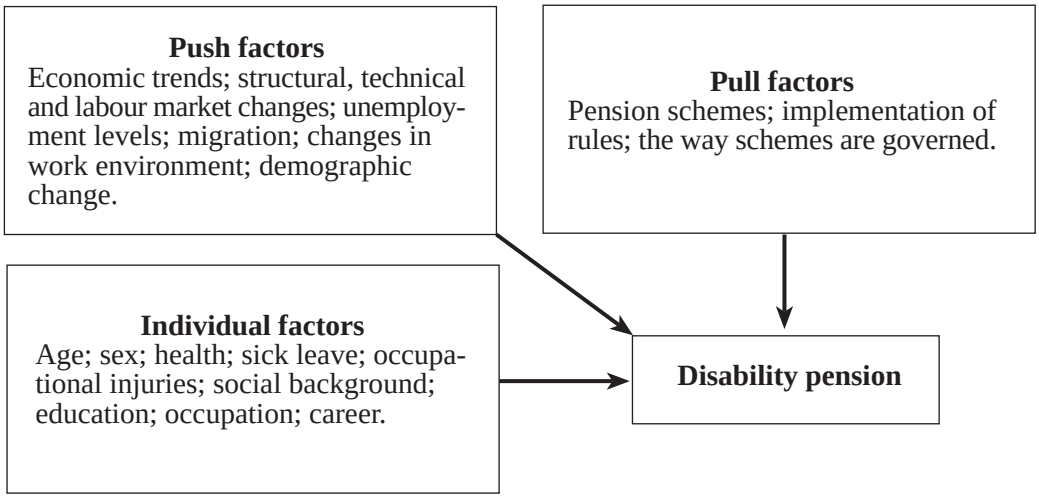

Figure 2. Factors influencing the number of disability pensioners.

The push factors force people out of the labour market through work environment hazards and lack of suitable jobs. The pull factors make a disability pension more attractive and available. The more generous the system is the more likely it is that an average person becomes a disability pensioner.

Below we will first give an overall view of the causes of disability pensioning, secondly discuss differences between age-groups and thirdly penetrate the relation between occupations and disability pensioning. Before we draw our conclusions we will discuss the changes in the disability pensioning pattern between 1988 and 1993.

Results

Guided by the model in figure 2 we specify a logistic regression analysis with factors significant for the individuals position in the labour market: age, sex, country of birth, civil status, occupation, education and average sick-leave 1990 to 1993. The results are manifested in odds ratios shown in table 1. In this and all following tables the significance level .05 is used. Non-significant coefficients are put in brackets.

Table 1. Factors influencing the relative risk (OR) for disability pension 1993.

Factor	Basic model	with education	with sick leave
Age			
16–29	*1.0*	*1.0*	*1.0*
61-year old	67.1	64.4	65.5
Sex			
Male	*1.0*	*1.0*	*1.0*
Female	1.3	1.3	1.0
Country of birth			
Sweden	*1.0*	*1.0*	*1.0*
Eastern Europe	2.4	2.6	1.5
Civil status			
Married with children	*1.0*	*1.0*	*1.0*
Divorsed no children	2.1	2.1	1.3
Unmarried no children	2.0	2.0	1.4
Occupation			
White collar, middle and upper	*1.0*	*1.0*	*1.0*
Unskilled worker in industry	3.1	2.1	1.9
No occupation	3.9	2.9	4.2
Education			
U*niversity*		*1.0*	*1.0*
Compulsary		2.1	2.0
Upper secondary school 2 years		2.2	1.6
Amount of sick leave			
Up to 2 days a year			*1.0*
More than 200 days a year			1011

In the left column we can see the different factors with the reference groups in italics and the most important risk groups in plain letters. In the three following columns the odds ratio for the basic and expanded models are displayed.

The table tells us that people around 60 years, women, migrants from eastern Europe, people who are living alone or are divorced, unskilled workers in industry and people without any registered occupation have a high risk of becoming a disability pensioner compared to the respective reference group.

If we add educational background we notice that people with compulsory or lower secondary school have an increased risk and we can also see that the signifi-

cance of occupation is a bit decreased. This means that part of the risk connected to occupational status has to do with lack of education. It also implies that people in unskilled work with a higher education have a better chance to stay on the labour market than those with a lower education.

In the column to the right we observe that the effect of occupation, sex and country of origin have decreased when we control for sick-leave. Of course it's natural that sick-leave, as an indicator of health, should have the greatest importance. If you have been on sick-leave for at least 200 days a year for four years you could already be considered a disability pensioner. It could even be technically hazardous, due to autocorrelation, to include this factor in the analysis. Still it tells us that some of the power in the basic model depends on health problems among woman, migrants, people with secondary school and unskilled workers.

What is interesting here though is that significant effects of the other factors still remain when we control for health. This means that we can notice a socially constructed exclusion via the disability pension system that forces migrants, divorced, unskilled workers and people with a lower education to leave the labour market before the normal pension age.

Disability pensioning in different cohorts.

Now we will focus on differences between age-groups. As this article is written to a conference devoted to the problem of work after 45, we thought it proper to divide the material in three age-groups, people up to 29, those between 30 and 44 and people who are 45 and older. We use the same analytical model as in table 1, but here we don't take an interest in age as a separate factor (see table 2, notice that we choose to display only the most interesting categories for each factor).

Table 2. Factors influencing the relative risk (OR) for disability pension 1993 in different age groups.

Factor	Total	–29	30–44	45+
Sex				
Male	*1.0*	*1.0*	*1.0*	*1.0*
Female	1.0	0.9	1.3	1.1
Country of birth				
Sweden	*1.0*	*1.0*	*1.0*	*1.0*
Nordic	1.5	(1.1)	1.4	
Eastern Europe	1.6			1.7
Civil status				
Married with children	*1.0*	*1.0*	*1.0*	*1.0*
Single	1.3	2.1	1.8	
Divorsed with children	1.3			1.4
Occupation				
White collar, middle and upper	*1.0*	*1.0*	*1.0*	*1.0*
White collar lowest	1.3	1.7		
Unskilled worker in industry	1.9	1.8		
Skilled worker in industry	1.5			2.3
Education				
University	*1.0*	*1.0*	*1.0*	*1.0*
Compulsary	2.0	6.0	3.3	1.7
Amount of sick leave				
Up to 2 days a year	1.0	1.0	1.0	1.0
More than 200 days a year	1011	3198	1141	625

In the left column the odds ratios for the whole data set are exposed and to the right the results for the different age-groups are shown. Significant for the youngest group is that men, single persons and people with compulsory education experience an increased risk. We have to keep in mind that most people in this group haven't had a chance to complete a higher education because they are too young, which implies that education is a quite spurious factor here. Those with a lower white-collar position also have an increased risk although it is only significant on a 10 percent level. Young people with blue-collar jobs have a lower propensity to be disability pensioners.

In the other two groups, the picture is very different. For those between 30 and 44 female sex is quite important and so is a Nordic or Eastern European ethnic background. The unskilled workers have the highest risk in this group but those in a lower white-collar position also show a high odds ratio. Compared to the youngest group education is a little less though still a very important factor. Among the middle-aged the non-employed group seems to have a specially exposed position.

For those who are 45 or older, we can se a stronger effect of occupation and ethnic background in the model while sex, civil status and education seem to have a more limited importance.

In the middle-aged group it looks as if low qualification among women plays an important role, which means that this is a crucial point in the discussion of work after 45. There seems to be a tendency in the result that the older the pensioner is, the more important are social characteristics like country of birth and occupation, and the younger she is the more important are education and health.

The impression that the older pensioners health problems are work-related to a greater extent is strengthend when we study the distribution of diagnoses (see figure 3). There are three dominating types of diagnoses; psychological, musculoskeletal and cardiovascular (CVD) and that goes for both men and women.

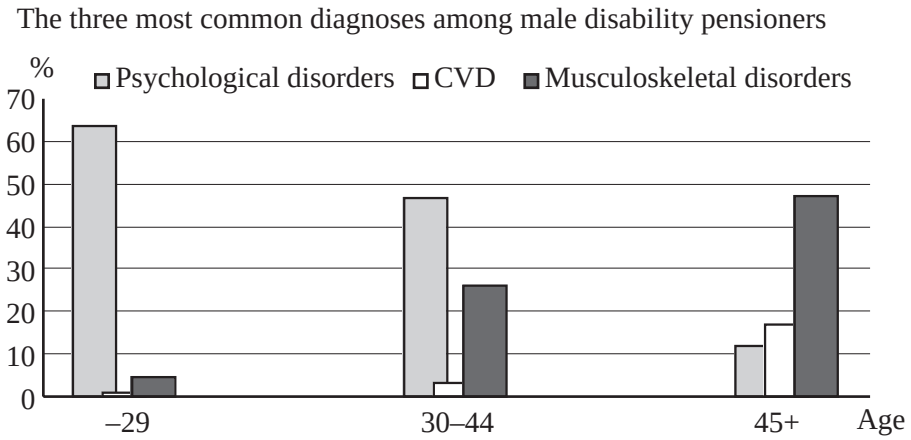

Figure 3a. Diagnoses, sex and age.

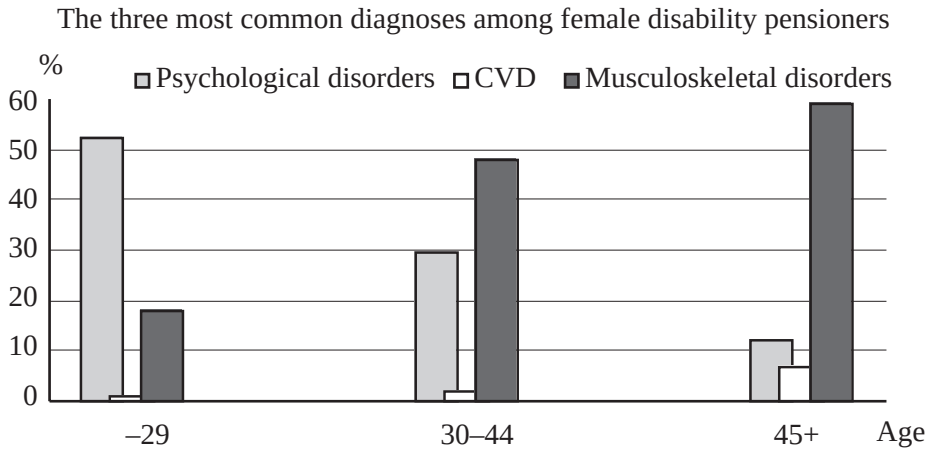

Figure 3b. Diagnoses, sex and age.

Among pensioners below 30 yearsof age the psychiatric diseases are most common. The reason is that this diagnose group includes congenital medical problems which are frequent among the young pensioners. In the oldest cohort, among pensioners above 45 years, the picture is radically different. For this group psychological diseases are rather rare while musculoskeletal diseases are dominating. The older the pensioners are, the more common it is with musculoskeletal and CVD diagnoses, as illustrated in the graph.

To summarise the age-differences we can conclude that among the youngest, health is a dominant factor and their diagnoses are often psychological. Most of them have a weak relation to the labour market, their mental handicap inflicts on their educational status and they get no chance of establishing themselves. This could be labelled the ”*group with problems from the beginning*”.

In the middle-aged group we find that women, people who are single or divorced and have no children, lower white-collar workers and people with low education are among those who are overrepresented. It may not be very obvious but in a sense we find here the ”*female lower middle-class dilemma*”.

Among the oldest the ”*traditional industry worker*” dominates, he is often a man and he is often born outside of Sweden. Education and health status seem to have a lesser importance in this group.

Occupational characteristics, work environment and employment change rates

After having established the fact that occupation is a very important risk factor we must ask ourselves - *What is it in different occupations that creates this pattern of exclusion*? In order to interpret this connection we have tried to isolate different factors associated with occupations. Two such research areas have been studied, work environmental strain and employment change rates in occupations.

To study the influence of the work environment all occupations have been classified into four groups according to different degrees of work environmental strain. The result in table 3 shows that the lowest risk of disability pension is found in occupations with low work environment strain (the reference group) and the highest risk among those having occupations with a bad work environment

(OR=2.7 for men and 3.0 for women). It seems to be a nearly linear relationship. Thus one important factor that explains differences in disability pensioning between occupations is work environment**,** which plays a crucial role for the origin of health problems connected with disability pension.

Table 3. The relative risk (age controlled OR) for disability pension at different levels of work environment strain.

Work environment strain	Relative Risk (OR)	
	Men	Women
Low	*1.0*	*1.0*
Middle Low	1.4	1.5
Middle High	2.2	2.3
High	2.7	3.0

The other indicator of occupational characteristics is employment change rates in occupations. Changes in employment rates can be viewed upon as an indicator of the structural changes in the labour market that create difficulties for certain groups to get or to keep a job. There are three main arguments to support this notion (2, 4, 8, 9, 11, 12, 13, 16).

1) Firstly-When firms are being restructured there is often a group of employees, especially the elderly, who cannot adjust to other jobs. Instead they become unemployed or early retirees.

2) Secondly-It is harder to find a new job in shrinking occupations and branches.

3) Thirdly- Selective drop out is more common in occupations that decreases and branches with economic problems. Individuals who can get other jobs leave voluntarily and the employees who stay are often unskilled or have limitations in their working capacity.

The hypothesis is thus that shrinking occupations generate a higher degree of disability pensioning. In table 4 we can see that such a connection in fact do exist. An occupational background in shrinking occupations increases the relative risk of getting a disability pension. In expanding occupations we found the lowest risk ratios while the highest risk ratios was found in shrinking occupations.

Table 4. The relative risk (age controlled OR) for disability pension at different levels of employment change rates.

Employment change rates	Relative Risk (OR)	
	Men	Women
Expanding occupations	*1.0*	*1.0*
Shrinking occupations	1.5	2.1
Stable occupations	0.9	1.3

Shrinking occupations are often found in the older industry with undeveloped technology and bad work environment. This means that poor work environment coincide with decreasing employment rates which causes an increasing propensity to become a disability pensioner in these occupations. This becomes evident in figure 4.

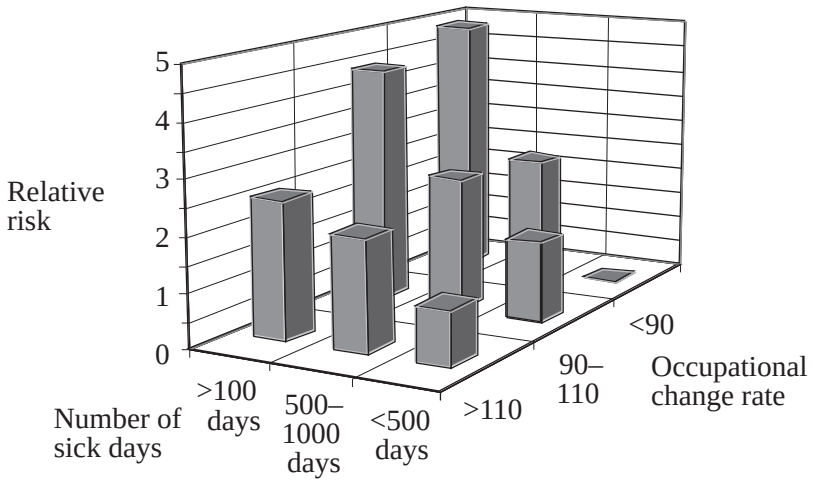

Figure 4. Sick days and occupational change rates in relation to disability pensioning in different occupations. Women.

The relative risk is highest in occupations **with** high work environmental strain **together with** decreasing employment rates. This pattern is similar, with some small differences, for both men and women. There are also very strong connections between work environment, employment change rates and class. It is for the unskilled workers that we find the poorest work environments and a majority of shrinking occupations.

The large differences between occupations and classes concerning risk of becoming a disability pensioner can thus be understood as a result of the specific conditions that go with different positions in the class hierarchy.

Changes between 1988 and 1993

When comparing disability pensioners 1988 and 1993 it is obvious that considerable changes in the composition of the groups have occurred. For 1988 we lack information about the pensioners' education and sick-leave so we are left with the basic model (see table 1) when comparing the two years. We also exclude the labour market rule pensioners from the 1988 pension stock (5408 pensioners) to make the comparison between the years more accurate. In table 4 you are presented the most important differences between the years.

In general high risk ratios of becoming a disability pensioner are more widespread among the population in 1993, and not as clearly tied to specific age groups, occupations or classes. Knowing this there are some interesting trends showing from the late 80s to the early 90s:

A larger number of pensioners are below 60 in 1993 compared to 1988 and this is true also when we eliminate the labour market pensioners who by definition are 60 years of age or more. This means that the probability of becoming a disability pensioner between 45 and 60 has increased in 1993 (21,22).

The proportion of blue-collar workers among disability pensioners have decreased which implies that the white-collar workers have increased. This is particularly true for women. These white-collar women have often had jobs in training, education and health and child care and the pension-diagnosis is *relatively often* related to psychological or psycho-social problems (21,22). The most important diagnose is however also here related to musculoskeletal diseases.

We can notice an increased risk for people outside the labour market or with a weak connection to it. In this group, younger and middle-aged pensioners, immigrants and people with broken marriages are overrepresented.

The odds ratios for people born outside of Sweden have decreased a little, but remains on a high level.

The significance of civil status has increased both for singles and divorced no matter whether they have children or not.

The changes between 1988 and 1993 raise the question if the notion of the traditional disability pensioners as an older man, working in a heavy industry, with a worn-out back - is about to be replaced or at least supplemented by a more modern kind - a younger women from a mixed social and occupational background with more pronounced psycho-social or psychological symptoms.

Table 5. Factors influencing the relative risk (OR) for disability pension 1988 and 1993. Controlled for age.

Factor	1988	1993
Sex		
Male	*1.0*	*1.0*
Female	1.2	1.3
Country of birth		
Sweden	*1.0*	*1.0*
Nordic	1.7	1.7
Eastern Europe	2.7	2.4
Western Europe	1.7	1.7
Rest of the world	1.8	1.5
Civil status		
Married with children	*1.0*	*1.0*
Unmarried no children	1.4	2.0
Unmarried with children	1.1	1.4
Divorsed no children	1.9	2.1
Divorsed with children	1.7	1.8
Occupation		
White collar, middle and upper	*1.0*	*1.0*
White collar lower	2.1	2.0
Unskilled worker in industry	4.0	3.1
Skilled worker in industry	3.0	2.7
No occupation	2.4	3.9

Conclusions

Disability pension is to be granted people with some kind of disablement. Our results show that social position play an important role in exclusion from the labour market via the disability pension system. This is true even when we control for health status and age. The social factors that are most predominant are:

Class and **occupation** - blue-collar workers still have a higher risk to become disability pensioners. When trying to understand the influence of occupation and class on disability pensioning it has become clear that both work environmental strain and structural changes on the labour market are characteristics of significant importance.

Education - there is almost a linear relation between education and risk of disability pensioning.

Origin - migrants from the Nordic countries and specially Eastern Europe are more often pensioners than Swedes.

Civil status - single people, and in particular those with broken marriages are overrepresented among the disability pensioners.

In all - social origin, qualification and social network and support play an import role for the possibility to stay on the labour market and avoid a disability pension.

Summary

The disability pension system in Sweden has been recruiting about fifty thousand new pensioners on an yearly basis between 1975 and 1995 which adds to a stock of about 420 000 1995. Our study focuses on factors important for the probability to become a disability pensioner. The main focus is directed at social factors influencing exclusion from the labour market.

We have studied two specific years, 1988 when 54 000 and 1993 when 62 000 people became disability pensioners. Data have been collected from the National Social Insurance Board and the Statistics Sweden through a combination of public registers concerning the pensioners' age, sex, origin of birth, civil status, education, occupation, sick-leave, pension credits etc. Two control groups (50 000 and 75 000 individuals selected randomly from the censuses) are added to create two different data sets with a pseudo case-referent design.

Our results show that social position plays an important role in the exclusion from the labour market via the disability pension system. Working-class background, occupation in industry, migration especially from eastern Europe, low education and broken families or relations are common features of a disability pensioner both years. This is true also when we control for health status and age.

It is also shown that the effect of occupational background is mediated through work environment hazards and decline in the amount of jobs in working-class positions

When we compare results from 1988 with those from 1993 we see a weak tendency towards a shift from the image of the disability pensioner as an older man, working in a heavy industry and with a worn-out back or a myocardial infarct - to the (perhaps) future model of a disability pensioner - a middle-aged woman from a mixed social and occupational background with more pronounced psycho-social or psychological symptoms.

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Adjustment to early retirement

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Introduction

The transition from work to early retirement is the focus of this longitudinal study, which follows individuals who retired as part of a downsizing program in a Swedish insurance company.

Research on retirement consequences has generally focused on finding critical factors leading to positive or negative outcomes on the individual level. For a majority of retirees previous life-style patterns, as well as previous levels of self-esteem, are maintained during retirement and the transition to retirement appears to be fairly easy and no cause of distress. According to Davies, Matthews and Wong (5), research confirms this expectation: and for most people the transition from work to retirement is unproblematic.

Difficulty in adjusting to retirement has consistently emerged as a problem for approximately one third of retirees (4). Economic conditions and health are among the most common factors associated with retirement satisfaction (15,16). These factors have been reported as critical in studies of both early and old age retirees (12).

Whether the decision to retire is made voluntary or is perceived as compulsory is an example of a factor that appears to be critical and often related to negative reactions. Mc Coldrick (12) concluded that compulsory retirees were significantly less positive in terms of satisfaction and attitudes, more negative about health and had more worries about not working. Similar results were reported by Isaksson and Johansson (unpublished). The persistence of these differences over time however, remains to be closely studied.

Relatively few studies have used a person approach as an alternative to the variable approach in the study of retirement adjustment. The purpose would be to identify groups of individuals with similar patterns of adaptation, using profiles of several variables (2, 11).

The main purpose of this study was to study adjustment in terms of health and well-being during the first post-retirement years.[1] A person approach was used to identify patterns of adaptation among early retirees by means of cluster analysis, combining several of the factors commonly found to be influential. Homogeneity of the patterns was studied, using data from two occasions. The following questions were answered:

1. What are the health effects of early retirement and how is psychological well-being affected?
2. Is it possible to identify homogeneous patterns of adaptation to early retirement?
3. How stable is adjustment during the first 1.5 years?

Method

The study was performed in a Swedish insurance company employing about 4.000 individuals. All employees, 55 years and older, were offered early retirement and were also invited to take part in the study. A total of 357 males and females (55 percent) applied for retirement, were permitted to leave and left the company between April and December in 1992. In the first wave of data collection, a questionnaire survey was performed in December 1992, i e, 0-9 months after retirement (as the retirement date varied). The second questionnaire was answered 1.5 years after the retirement date for each individual. A total of 224 subjects (63 percent) answered both questionnaires. Attrition did not vary significantly between respondents and non-respondents at Time 2, according to age, sex or retirement satisfaction at Time 1.

Measures

The 12-item General Health Questionnaire (GHQ-12) was included in the questionnaire to measure *psychological distress/well-being.* (6,7).

A summary index of health problems was based of seven items on a symptom checklist (such as cardiovascular, muscelo-skeletal and other psychosomatic symptoms). Response alternatives ranged from "never " to "always" (0-4).

Retirement satisfaction: Each participant was asked to indicate his or her satisfaction with the outcome of the retirement scheme on a 1-5 scale.

Voluntary versus forced choice of retirement Participants chose one of the following statements as best describing their situation: "I wanted to retire and I was permitted to leave", "I didn't want to retire but my boss/co-workers urged me to apply". On the basis of response to this item, the retired group could be divided into two sub-groups: those reporting a voluntary choice and those reporting a forced choice of early retirement.

Work centrality was defined as the general belief about the value of work in one's life in relation to other life spheres. It was measured by a single item based on a question from the MOW studies (14) in which a total of 100 points should be distributed between five different life spheres (work, family, leisure, community work and religion). The points each person assigned to "working" were used here.

Perceived social status was one of the five functions of working defined by Jahoda (10). The measure used here was taken from Henwood and Miles (8). For perceived social status the item was "Society in general respects people like me" responses ranging from 1-6.

Statistical analyses

The SLEIPNER statistical package for pattern oriented analyses developed by Bergman and El-Khouri (3) was used for the descriptive pattern analyses[2]. No missing values are allowed in cluster analysis and a method of imputation was used which identifies twin cases with similar values on all other variables involved. Cases for which no twin was identified or with more than one missing values were excluded from further analysis. In an effort to increase homogeneity of patterns, residue cases ("outliers") were identified and excluded from the cluster analysis. The excluded cases consisted of persons with extreme values one one or more variables, who were similar to no other cases. Cluster analyses from Time 1 thus came to involve 178 cases (27 with more than one missing value and 18

residual cases were excluded). From Time 2, 166 cases were retained (35 excluded because of missing values and 23 as residuals).

Ward's method of cluster analysis was used with standardized variables. Finally, a relocation method recommended by Bergman (2) was used to increase cluster homogeneity.

There are no definite rules of thumb for deciding the number of clusters in a data set (1) Several methods or stopping rules were evaluated by Milligan and Cooper (13). Their conclusion was that several procedures performed fairly well but none was superior. The rule applied here was recommended by Bergman (2) and uses a limit of 67% of explained error sum of squares. Bergman also discusses problems with a too strong adherence to this principle in cases with reliability problems or where natural homogeneity should not be expected.

The cluster analysis based on data from Time 1 indicated a large heterogeneity. The recommended limit of 67% explained of the total error sum of squares resulted in a 14-cluster solution. This solution was however abandoned, in favour of a more interpretable six-cluster solution, which after relocation explained 48% of the error sum of squares. To study the change from time 1, the six-cluster solution was chosen again from Time 2 data.

Clusters were compared using one-way analysis of variance and crosstabulated with relevant demograhpic variables to obtain descriptive summaries of each cluster. To evaluate cluster stabilty the EXACON program was used (3) to calculate cellwise analysis of a contingency table based on exact tests of significance (one-tailed hypergeometric probabilities).

Results

Table 1 shows change over time for the variables involved using a traditional variable approach.

Table 1. Change from Time 1 to Time 2, paired t-tests (n= 195).

Variable	Time 1	Time 2	T-value
Well-being	.55(.43)	.54 (54)	n s
Health problems	.97 (1.7)	.62 (.58)	3.2**
Satisfaction w. outcome	4,5 (.87)	4,6 (.77)	1.7, n.s.
Perc. status	3.9(1.5	3.6 (1.5)	2.0*
Work centrality	28.0 (16.9)	19,2(17.1)	5.7***

There was no significant change between Time 1 and Time 2 in psychological distress as measured by the GHQ-12. For reported health problems however, the mean value was significantly lower at Time 2 as compared to Time 1, i.e. the mean number and frequence of reported symptoms was lower, indicating an *improvement* of health among a majority of retirees. Other significant changes were that the value of work as compared to other life areas was significantly lower after 1.5 years of retired life. Perceived status in society was also somewhat lower at Time 2 than before.

Patterns of adjustment at Time 1

The six clusters obtained from cluster analysis of data from Time 1 were compared with each other to achieve accurate descriptions of the uniqenes of each

cluster. Table 2 shows results from one-way analyses of variance and significant differences between the six clusters for the six variables involved.

Table 2. Mean values and standard deviations at Time 1 for six clusters for all variables involved and significant differences between clusters (in footnotes) (Scheffés test) (n=178).

	TOTAL n=178	A n=18	B n= 38	C n=27	D n=39	E n=23	F n=33
Age	60(3)	62(2.4)	62(1.6)	62(1.3)	58 (1.4)	59(2.4)	59(2.0) [3]
Distress	.50(.35)	.73 (.31)	.46(.25)	.35(.23)	.32(.18)	1.1(.35)	.33(.24)[4]
Health probl.	.94(1.8)	1.7(.41)	.28(.20)	1.6(2.4)	1.6(2.9)	.6(.41)	.29(.27)[5]
Work central	27(17)	19(17.4)	20(12.6)	32(10.4)	16(10.5)	30(10.3)	50(10.1)[6]
Percived status	4.0(1.5)	3.3(1.4)	4.6(1.2)	4.3(1.0)	3.9(1.4)	3.4(1.8)	4.0(1.5)[7]
Retirem. satisf.	4.6(.71)	4.7(.5)	4.8(.4)	5.0(0)	4.8(.4)	3.2(.8)	4.9 (.3)[8]

Analyses showed significant differences between at least two groups on all variables except for perceived status. Comparing of cluster via cross-tabulating on demographic characteristics revealed no significant differences between clusters in terms of gender, marital status or living in a city versus a rural area. The distribution of persons reporting a voluntary or a forced choice however, was significantly different between clusters (chi-2 (5, n=178)=19.7, p<.001).

Based on these analyses of differences the six clusters from Time 1 were described as follows:

Cluster A (10%) Relatively high mean age, high distress and health problems and low values of work centrality. A relatively high percentage (119%)hetired after a forced choice. *High distress and health problems.*

Cluster B (21%) Relatively high mean age, good health, high values of perceived status and low work centrality scores. *Satisfied with early retirement.*

Cluster C (15%) Relatively high mean age, low distress score, high satisfaction score and high scores on work centrality. *All* subjects in this group retired voluntarily. *Satisfied retirees with high work values.*

Cluster D (22%) Relatively low mean age, low distress but relatively high scores for other health problems, low work centrality. *Satisfied early retirees with some health problems.*

Cluster E (13%) Highest distress scores and lowest satisfaction scores. Highest proportion (38%) with a forced choice of retirement, low perceived status a relatively high proportion of persons working after retirement. *Dissatisfied forced choice and highest distress scores.*

Cluster F (19%) Highest mean work centrality score, low distress, high proportion of persons working after early retirement. *Continued working.*

Patterns of adjustment at Time 2

The same procedure was repeated for the clustering of cases with data from the second questionnaire 1.5 years after retirement. One-way analysis of variance and cross-tabulation with demographic variables were used in a similar way. There were significan differences between clusters on all variables used for analysis. Furthermore, significant differences were found between clusters with a high proportion of persons living in a rural area as compared to a city (chi-2 (5,n=158) =13.7, p<.05). The differences between clusters dominated by persons reporting a free versus a

forced choice of retirement remained significant 1.5 years after retiring (chi-2 (5, n=158) =13.7, p<.05).

The following descriptive summaries of differences between clusters from Time 2 were made:

Cluster A (12%) The lowest mean satisfaction scores and high distress score. 26% did not want retirement and 45% were working. High proportion of males. *High distress and low satisfaction.*

Cluster B(12%) Relatively high mean age, high distress score but low on work centrality and perceived status. 26% did not want retirement at Time 1 but satisfaction now approached the mean. Highest proportion of females. *Adaptation to retirement?*

Cluster C (20%) Relatively high mean age, high on well-being and good health. Low work centrality and high perceived status. High proportion of persons with jobs (34%). *Satisfied early retirees some with at new job.*

Cluster D (13%) Relatively high mean age, high on reported health problems. High work centrality and high status. *Health decline and negative adjustment?*

Cluster E (22%) Relatively young, mean scores on most variables, high in satisfaction, low proportion working and high proportion living in a city. *Positive adjustment, health improvement.*

Cluster F (20%) Mean values on most variables except for work centrality which was higher than all other groups. Relatively young with the highest proportion of persons working (56%) and a high proportion of males. High proportion living in rural area. *Continued working, retirement postponed.*

Stability of adaptation during the first years after retirement

Figure 1 shows change and stability of clusters based on cellwise analysis of a contingency table with clusters from Time 1 and Time 2. The arrows indicate significant overrepresentations of persons from a Time1 cluster grouped together at the same Time 2 cluster. An indication of stability was that four of the six clusters at Time 2 consisted of significant overrepresentations of persons from *one* Time 1 cluster (clusters A, C, E and F). This means that a large proportion of persons who were similar to each other in terms of adaptation remained similar 1.5 years after early retirement and thus grouped together in the same cluster at Time 2 as well.

Plotted profiles were made based on mean values transformed to z-scores in order to show the shape and level of the pattern for each cluster. The shape of the profiles from both occasions were compared to get another indication of stability or change of adaptation patterns over time. Inspection and comparing of profile shape and level for clusters revealed three stable patterns (see figure 2). Besides from similar shape and level of profiles, a pattern considered stable also had a significant over representation of persons belonging to the same cluster on both occasions. The three stable modes of adaptation together represented about 50% of the total group of early retirees.

The first stable adaptation pattern found indicated a general satisfaction with early retirement (clusters B at Time 1 and C at Time 2). Persons in this cluster reported high satisfaction, low values for distress and health problems. Mean age was relatively high, work centrality was low (although 34% were working) and mean value for perceived status was high. This adaptation pattern represented 20% of the total group of early retirees.

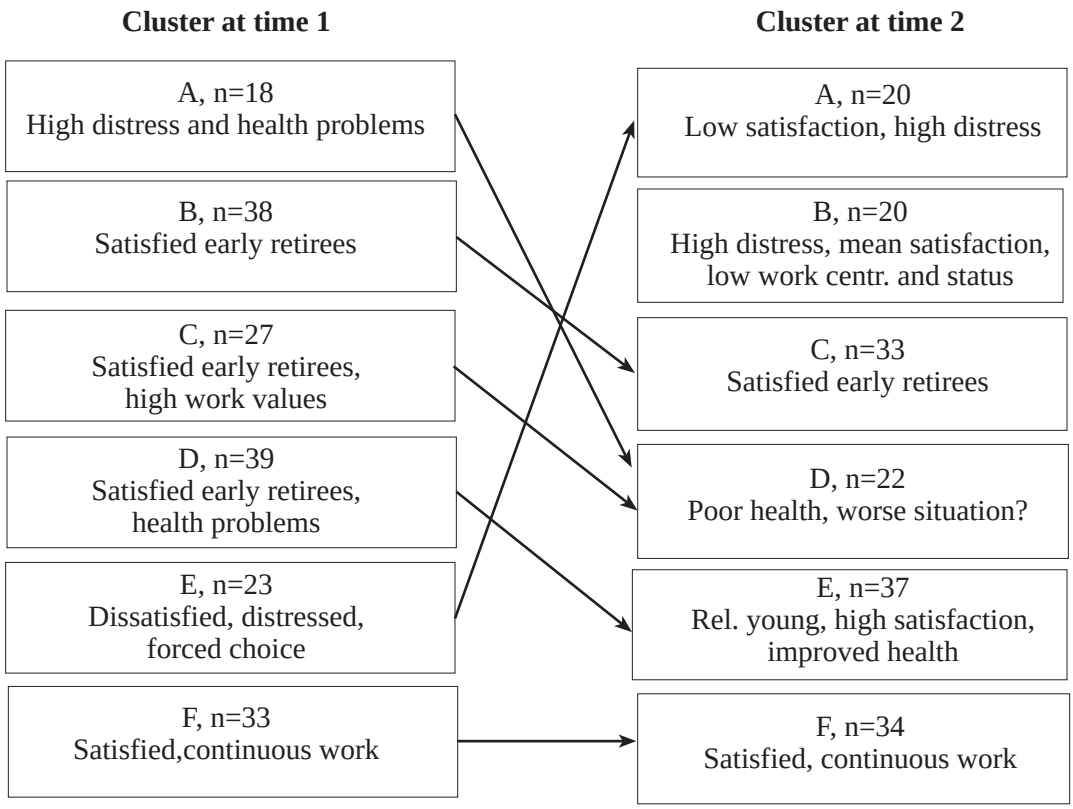
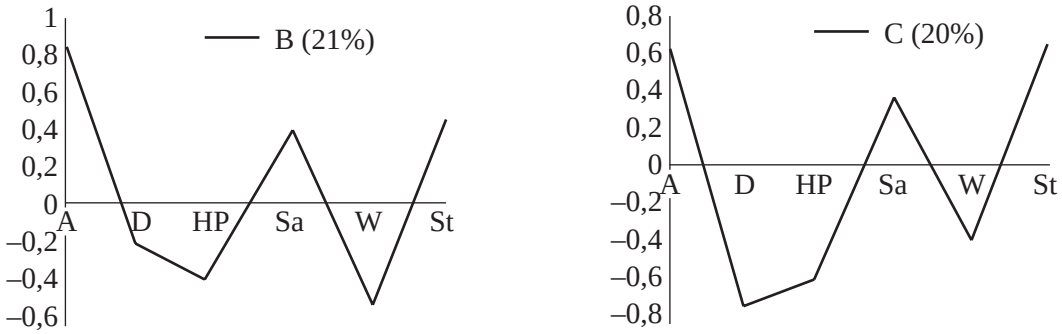


Figure 1. Significant longitudinal streams of cluster membership from Time 1 and Time 2. Arrows indicate significant overrepresentation of persons from a Time 1 cluster moving to the same cluster at Time 2 ($p<.01$).

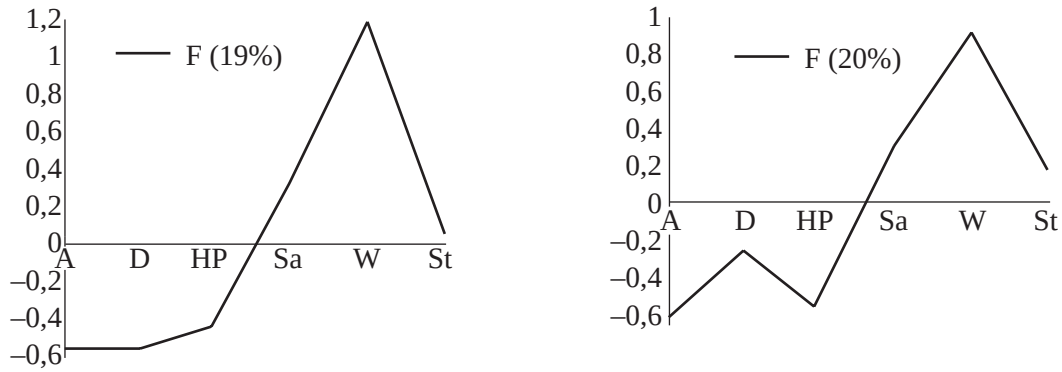
Another stable pattern of adaptation to early retirement was to continue working (cluster F at Time 1 and F at Time 2). The cluster consisted of the highest proportion of persons who had a new job (56%), the highest mean values for work centrality. This mode of adaptation was positive, satisfaction was high and mean values for distress and health problems were low.

A stable but negative adjustment pattern was also observed (clusters E at Time 1 and cluster A at Time 2) and described as *Highest distress and lowest satisfaction* The reluctance to retire appeared as part of the explanation with 26% reporting a forced choice of retirement. A relatively small group (12%) thus continued to show signs of poor adjustment after 1.5 years.

Pattern 1. Satisfied early retirees



Pattern 2. Continued working



Pattern 3. High distress, low satisfaction

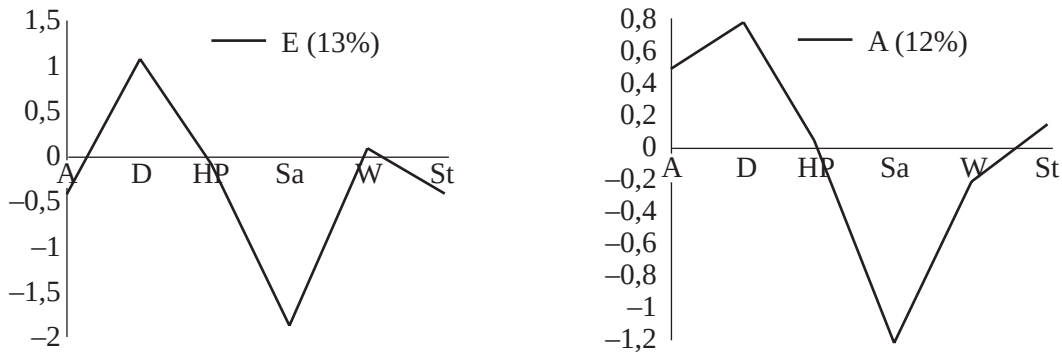


Figure 2. Three stable patterns of adjustment based of cluster profiles of standard scores from Time 1 (left) and Time 2 (right) for age (A), distress (D), health problems (HP), Satisfaction (Sa) work centrality (W), and status (ST).

Conclusions

No signs of a *general* crisis of adjustment in terms of negative effects on psychological well-being were found during the first post-retirement years. The variable approach using traditional paired t-tests revealed a lower mean level of symptoms after 1.5 years, probably the result of a decline in work-related stress. The person approach which showed different patterns of adjustment probably revealed a more accurate picture with a large variation between groups, some reporting relatively unchanged values of health, others showing improvements and one group even reporting a decline in health.

One factor appeared to be very strongly related to poor adjustment among these fairly healthy white-collar employees. A forced choice of early retirement was the most obvious cause of adaptation problems in terms of low satisfaction with retirement and high distress scores. There were some signs of a diminishing effect after 1.5 years but the differences between a voluntary and a forced choice remained significant.

It was also evident that early retirement after downsizing, did not necessarily mean the end of working. The third stable pattern of adjustment was in fact to continue working (cluster F), especially common among males and persons living in small towns and rural areas, who still had a relatively high work centrality score. The more general pattern however showed that the significance of work in relation to other life spheres decreased considerably although working was far from uncommon in the other clusters.

Three patterns of adaptation to early retirement were found which were stable over time. The first one was a generally *positive adaptation to early retirement* in terms of a transition to old age. The second stable pattern was to *continue working* and postpone retirement. The third pattern displayed signs of *poor adjustment*, that appeared to be negatively affected by a forced choice of early retirement with very high levels of distress and low satisfaction at both Time 1 and Time 2. About 50% belonged to these three relatively stable patterns.

There were several indications of heterogeneity in the group, one was the relatively large residual groups consisting of cases which were similar to no other case. One reason for heterogeneity could of course be low reliability of the measures used. This was probably at least part of the problem since three of the measures used were single items. Another and probably more important explanation could be that the degree of homogeneity of adjustment during the first years after early retirement is in fact, relatively low. Data here indicate that work values and health are factors changing during the transition from employment to early retirement. Adaptation could vary in many ways and reactions change considerably during this period. The low stability of clusters and the relative instability of adjustment patterns among 50% of the eary retirees during the first years were clear indication of this.

Summary

Is the transition from work to early retirement generally a cause of distress? This question has been addressed in several research studies over many decades. A recent review by Davies, Matthews and Wong (5) concluded that about one third of the labour force reports some kind of problems with adapting to retirement. This longitudinal study follows individuals who retired early as part of a downsizing program in a Swedish insurance company. The consequences in terms of health and well-being during the first post-retirement years were evaluated and an attempt was made to describe patterns of adjustment by means of cluster analysis. Data were collected through questionnaires on two occasions, the first 0-9 months after retirement and the second wave 1.5 years after retirement. Results revealed that mean values of perceived health problems were significantly lower 1.5 years after retirement. Three stable patterns were described; continuos working, positive adaptation to retirement and finally one small group with signs of high distress.

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Footnotes

1. This study was supported by grants from the Swedish Work Environment Fund and the insurance company. Thanks to professor Gunn Johansson, Department of Psychology, who was my co-worker during this project and to all participants.

2. More methodological details and results can be found in a longer version of this paper (9)
3. F=37.0***, A,B,C>D,E,F
4. F=34.3***, E>A,B,C,D,F, A>B,C,D,E
5. F=4.9,***, D>B, no other sign. difference
6. F=36.0***,F>all other groups,C>A,B,D, E>B,D
7. F=3.3, n.s.
8. F=56.7,***E>all other groups

Adaptation to change in the work environment for senior white collar employees

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Introduction

The white collar labour population is much bigger than that of the blue collar in Japan like in western countries. Up until now, however, the productivity problem of white collar work has been seldom discussed while that of manufacturing sections has improved greatly since after World War II. One of the most crucial problems for management is how to achieve higher productivity in white collar works. White collar work requires various knowledge in performing a job[1, 2] and new knowledge must be continuously acquired because of the rapid speed of technological innovation. Thus, one of the most important points for obtaining high performance in white collar work is to hold rich job-relevant knowledge.

At the same time, Japan experiences a drastic increase of the elder population. It is estimated that a quarter of the population will be composed by over-sixty-five year old people in 2021. Therefore, it is of great importance for management to enable elder employees to actively participate in their working environment. As an *aging* of employees, however, it is found to be more difficult to adapt to technological change due to decreased speed of acquiring knowledge. Thus, it is the most crucial problem to provide an effective training plan so that elder workers can easily adapt to the work environmental change such as technological and occupational changes. For this purpose, the present research proposes *preparatory training* and examines its effectiveness by simulation studies of the knowledge acquisition process.

The idea of the proposed method is to provide an employee with training on future working conditions several years before the actual technological change takes place. According to interviews with managers in various corporate sections, it is found that a rough sketch of the future working environment, e.g. introduction of CAD system without its detailed specification, can be predicted about five years before the actual change. Figure 1 shows the schematic explanation of the knowledge acquisition process by the proposed training. At the starting point of this training, the knowledge acquisition speed is faster than when the actual technological change takes place since an employee is younger. Therefore, this training is expected to enable him or her to obtain more knowledge with the same effort as compared to an ordinary post-change training which starts just after the change. The knowledge acquired by the preparatory training is then maintained by small amount of follow-up training each year.

Method

Effective knowledge level

To obtain data regarding the effectiveness of knowledge that a particular employee has, the following six classes of knowledge are defined:

(1) *Perfect* level (weight of effectiveness: 1.0): holds all the job requirements in satisfactory precision as knowledge.
(2) *Excellent* level (0.9): holds knowledge close to job requirements, but not with enough confidence. Knowledge at this level is sometimes required to be checked.
(3) *Executable* level (0.6): does not hold the job-requirements as knowledge, but store the knowledge for understanding them perfectly and how to acquire them.
(4) *Understandable* level (0.4): holds the knowledge for understanding job requirements, but does not know how to acquire them effectively.
(5) *Assistance-required* level (0.1): needs assistance to understand the job requirements.

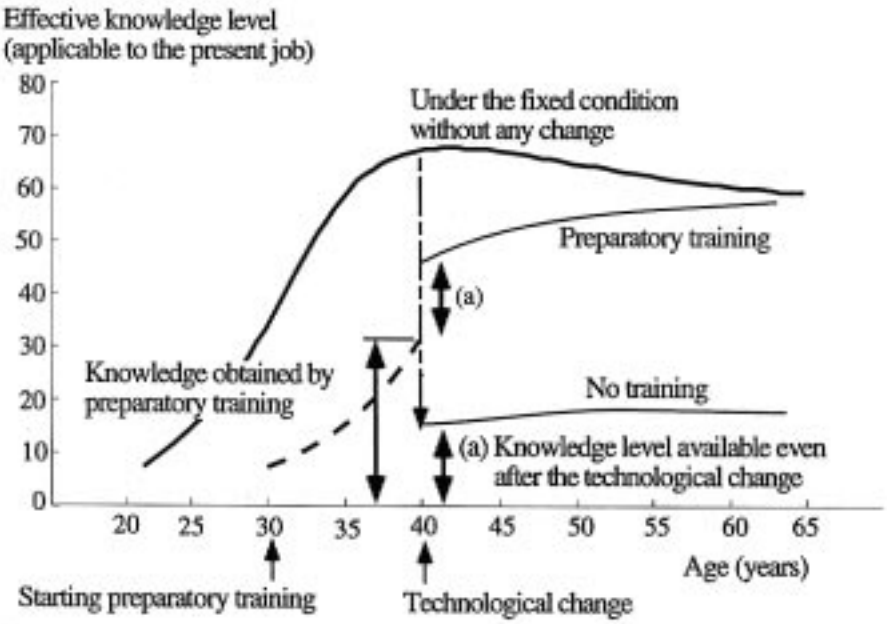


Figure 1. Schematic description of preparatory training's effect.

(6) *Empty* level (0.0): no knowledge.

Herein, the job requirement refers to the complete content required for performing the job. For example, an employee who engages in inventory control requires the stock information, and he/she needs to know the number of stocks to replenish each item appropriately. The number of stock is the job requirement for this information. However, he or she may not remember the numbers of stocks for all the stock keeping units which he/she manages. Instead, a computer database holds such data and he/she can retrieve the required data from the database. The only requisite is to know how to operate the database. In this case, he/she has the knowledge on the stock information at the executable level.

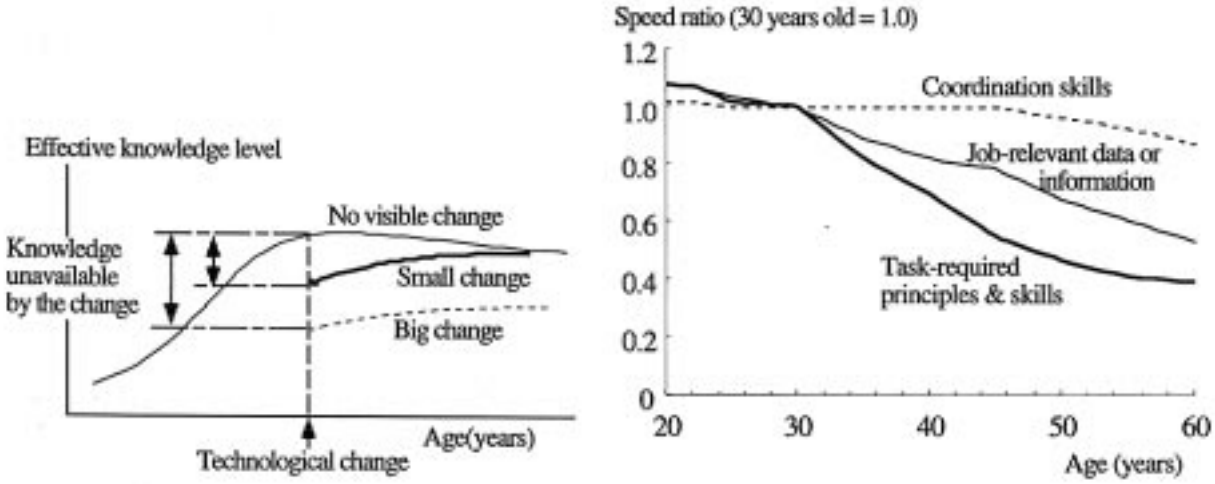
Based on the classification of knowledge effectiveness, the one-dimensional index, *effective knowledge level* is calculated by the weighted summation of holding percentages for all the classes. The effective knowledge level varies between 0% (knowing nothing) and 100% (perfect knowledge) depending on the histories of working condition, training and so forth. For example, when 60% of whole knowledge is at the excellent level and the rest, 40% is at the executable level, the effective knowledge level is calculated $78\%(0.9 \cdot 60 + 0.6 \cdot 40)$.

Knowledge acquisition process

Empirical evaluation of the preparatory training requires many years. Therefore, we examine the effect of the proposed method by simulation of the knowledge acquisition process. The thin, solid line in Figure 2(a) indicates the transition of the effective knowledge level with age under the fixed condition where the same job is being performed in the same workplace with no technological change during the employee's working life. Knowledge relevant to the job is accumulated with his or her working experience in this situation.

Figure 2(b) shows the knowledge acquisition speed with age for three kinds of knowledge which is based on the rating by many managers in industry. The speed for acquiring knowledge is decreasing with an employee's age due to the aging effect. In addition, even if visible technological changes do not take place, a small piece of knowledge becomes unavailable in the next period due to small obsolescence of knowledge on working procedures, their tools, and so forth. Since the reduced speed of knowledge acquisition cannot catch up with such *knowledge obsolescence*, the effective knowledge level is declining at older age.

When a technological change takes place, the effective knowledge level goes down since



(a) Transitions of effective knowledge level with age

(b) Transitions of knowledge acquisition speed for each category

Figure 2. Schematic description of knowledge acquisition.

some amount of knowledge cannot be applied to the new working condition. The thick and the dashed lines in Figure 2(a) indicate this situation. In case a small change is taking place, e.g. the introduction of a PC or an office automation equipment to the office, not much knowledge becomes unavailable by the technological change. A large portion of knowledge is still applicable to the new condition. Then, the employee starts acquiring knowledge for the new technology as shown by the thick line in the figure.

In contrast, a big change, e.g. moving to another occupation or a change in fundamental technology makes a pretty large amount of knowledge unavailable in the post-change working condition. If such changes take place at older age, it is difficult to recover the knowledge level due to the slow speed of knowledge acquisition. The dashed curve in Figure 2(a) indicates that the holding percentage of knowledge relevant to the job is also a factor for the ease of knowledge acquisition. That is, the more knowledge connected with the subject the employ holds, the easier he/she can start learning it.

Formulation of Model

The knowledge acquisition process discussed in Section 2.2 is formulated as the change in the effective knowledge level for each piece of knowledge year by year. The effective knowledge level for (individual) knowledge i at the age t, K_{it}, is formulated by Equations (1) through (4). Here, ΔK_{it} is the increment or decrement of the effective knowledge level for one year from age (t-1) to t.

$$K_{it} = K_{i,t-1} + \Delta K_{it} \tag{1}$$

$$\Delta K_{it} = v_{it} \cdot z\left(K_{i,t-1}, U_i\right) \cdot K_{i,t-1} + D_{it} \cdot h\left(v_{it}\right) - \alpha_i \cdot K_{i,t-1} \tag{2}$$

$$z\left(K_{i,t-1}, U_i\right) = \frac{1+b}{1+b \cdot e^{a\left(\frac{K_{i,t-1}}{U_i}\right)}} \tag{3}$$

$$h\left(v_{it}\right) = \begin{cases} v_{it}/v_0 & \text{if } 0 < v_{it} < v_0 \\ 1.0 & \text{if } v_{it} \geq v_0 \end{cases} \tag{4}$$

a, b: constants determining the shape of the logistic function
(a=10, b=0.001 selected in this study)

v_0: constant determining the training efficiency
(v_0=0.2 selected in this study)

Regarding the change level for one year, the first term of Equation (2) is the part of knowledge acquired by working experience for that year where v_{it} is the present knowledge acquisition speed. $z(K_{i,t-1}, U_i)$ is a logistic function[4] which defines the degree of ease of acquiring further knowledge by Equation (3). This function indicates that, the higher the level of knowledge effectiveness ($K_{i,t-1}$) an employee possesses, the more difficult it is to acquire further knowledge. In this function, U_i is the upper bound of effective knowledge level, and in this study it was set to 100, representing perfect knowledge.

The second term is the knowledge acquired by training which depends on the training level (D_{it}; $D_{it}=0$ if no training) and training efficiency, $h(v_{it})$. The latter factor is defined by Equation (4) as a function of the present knowledge acquisition speed. The reduced level by knowledge obsolescence for a year is calculated by the last term, depending on the present knowledge level ($K_{i,t-1}$) and the obsolescence rate of knowledge (α_i) which defines the degree of usual improvement or minor-change for the job (0.05 for ordinary workplaces in this study).

Knowledge obtained by the preparatory training is stored for a future technological change, but it is not required for the present job condition. This type of knowledge can become applicable to the actual working condition when the technological change takes place. Therefore, the change level for this type of knowledge includes neither an acquired part by working experience nor a reduced part by the knowledge obsolescence unlike in Equation (2). The knowledge level is changed only by the training effect and forgetting due to no use or maintenance of the knowledge, as can be formulated by Equations (5) and (6). Here, β_{it} refers to the forgetting factor at age t. If no training for the knowledge is given ($x_i=1$), then the effective knowledge level is decreased according to β_{it}, else ($x_i=0$) the knowledge level is not reduced.

$$\Delta K_{it} = h(v_{it}) \cdot D_{it} - x_i \cdot \beta_{it} \cdot K_{i,t-1} \tag{5}$$

$$x_i = \begin{cases} 0 & \text{if } D_{it} \neq 0 \\ 1 & \text{if } D_{it} = 0 \end{cases} \tag{6}$$

Results

Estimated knowledge level

The knowledge acquisition process model was applied to actual employees to examine the predictive accuracy of the model. The employee data were obtained by their managers for several types of jobs from a Japanese fishing parts manufacturer. The managers performed the rating of holding percentage of each class of knowledge effectiveness mentioned in Section 2.1. Effective knowledge levels estimated by the model were compared with the actual levels at four time-points: the present time, the point of turnover to the present job, and some years before and after the present time. The individual parameters required in the model, such as the knowledge acquisition speed, were calculated based on the effective knowledge level data of each employee. Figure 3 indicates the estimation of effective knowledge levels for the knowledge concerning task-required principles and skills in relation to the age of employees engaging in *quality control* (a) and *product design* (b). This kind of knowledge is found to be the most important to perform technology-oriented jobs such as product design and quality control[3].

As can be seen in Figure 3, the effective knowledge levels estimated by the model almost fit those obtained by the managers' rating with a few exceptions. The deviation between these two sources is at most 10% for all the job types examined in the present study. In particular, Figure 3(a) indicates the best fit for the oldest employee in the quality control case; Employee 3 moved to the present workplace from another company two years ago. This result shows that

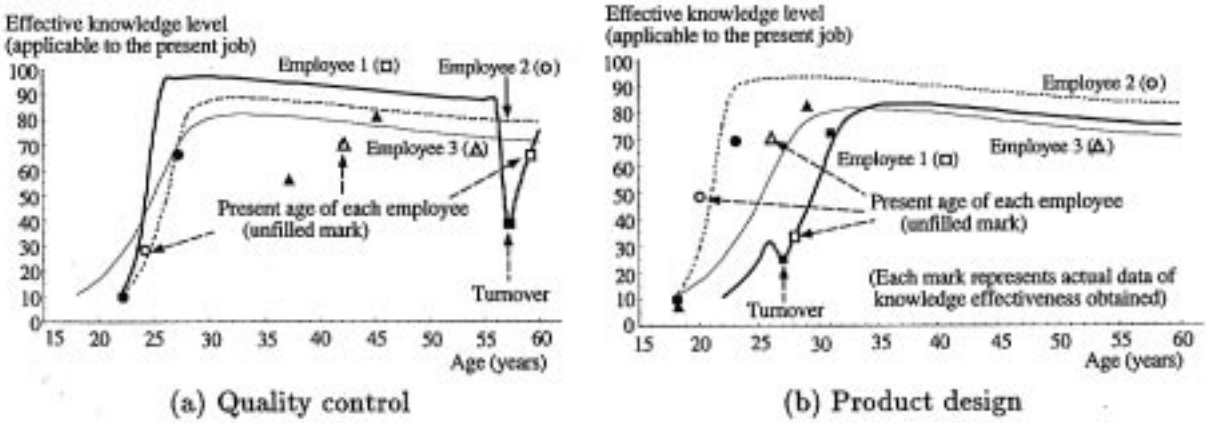


Figure 3. Effective knowledge levels for task-required principles.

he can obtain knowledge required for his new job after the turnover rapidly despite of old age. This case suggests that elder employees could work as effectively as younger employees. For the other two employees, their knowledge are expected to reach the highest levels of effectiveness in their early 30's. Their effective knowledge levels are estimated to go down gradually with their ages.

Regarding the model application to product designers as shown in Figure 3(b), Employee 2 is the most superior of these three in terms of the effective knowledge level at the same ages. Employee 1 has also experienced a turnover and he has good competence for acquiring new knowledge like Employee 2. This may suggest the possibility of effective employment of middle age or senior citizens. In general, the slopes of the knowledge level curves for this job are flatter than those of the quality control employees' curves. This indicates that the product design requires more diversified knowledge than the quality control.

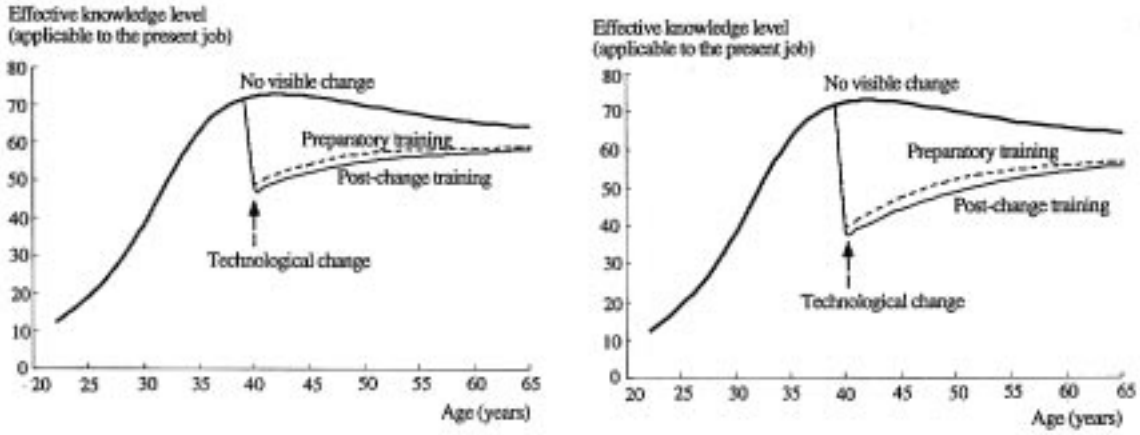
Effects of preparatory training

A series of applications of the knowledge acquisition process model were performed with changing modeling parameters to examine the effects of the preparatory training. The effective knowledge levels after the technological change were compared between the preparatory training and the ordinary post-change training, with identical training quantities given to both methods. Figure 4 depicts the results in case that a technological change takes place at the employee's age of 40 years old. In this case, the preparatory training is given five years before the change, i.e. when he/she is 35 years old.

Figure 4(a) is the case that a medium technological change takes place where 50% of knowledge is still applicable to the new working condition. As seen in this figure, the preparatory training is more effective than the usual post-change training in terms of the effective knowledge level. The relative difference in the effective knowledge level between these two training methods is approximately 15% in average over ten years after the change.

The results applied to a bigger technological change, where 70% of knowledge gets unavailable after the change, are shown in Figure 4(b). The effect of the preparatory training is identical to the case of smaller change but the performance difference between the two methods is bigger.

The effect of preparatory training is derived not only from the knowledge already stored for the technological change but also from facilitation of knowledge acquisition after the change. In addition, this training can be expected to *motivate* elder employees to tackle with new jobs. They do not like to engage in unfamiliar jobs. Instead, they know something about the new working conditions when the technological change takes place.



(a) In case of a medium technological change (b) In case of a big technological change

Figure 4. Effective knowledge levels by preparatory and post-change training.

Conclusion

One of the biggest problems for elder employees in white collar jobs is difficulty to adapt a technological change or new working condition. As a counter-measure for this problem, the present research proposed the *preparatory training*. The fundamental idea of the training is to forecast future movements or changes for the job and to provide an employee with training for his/her future working condition *before* the actual change takes place. This training is expected to overcome the well-known psychological phenomenon that elder people are likely to hesitate starting something unknown or unfamiliar in addition to the effective acquisition of knowledge.

To examine the effects of the proposed training, a knowledge acquisition process model was constructed. This model can estimate the transition of effective knowledge level under various conditions, i.e. employee's individual factors such as knowledge acquisition speed, working environment factors such as the magnitude of technological change and training factors such as training quantity. A number of application results of the model were obtained with various parameter settings in addition to the cases which were mentioned in Section 3.2.

These results indicate that the proposed training is more effective at least by 15% in terms of the effective knowledge level, when the training is given five years before the actual technological change, than the ordinary post-change training. It is found that as higher magnitudes of technological change and as earlier starting ages of the training, the effect by this training is bigger.

Summary

In the present study, one of the key-points for obtaining high performance in white collar jobs is posited to hold rich job-relevant knowledge. For this purpose, we propose a *preparatory training* as a competence development plan especially for efficient adaptation of elder employees to environmental change. The aim of this training is to have elder workers to learn the knowledge required for the future work at their younger ages, in which the speed of acquiring new knowledge is faster than at the age of the actual change.

The effect of the proposed training was examined by a series of simulation studies applying to the field data collected in a Japanese fishing parts manufacturer. A model was developed to represent the *knowledge acquisition process* which can estimate the transition of *effective knowledge level* of the worker with his/her job experience over time. This model was applied to more than fifteen employees who belong to several types of white collar jobs, e.g. product design, production control, quality control, personnel, etc. with and without the proposed

training.

Based on the simulation studies, the following results were identified: The preparatory training, e.g. starting five years before the change at the age of fifty years old, can keep higher knowledge level by approximately 15% in a typical case, compared with the post-change training given the same training level. In particular, the preparatory training allows even a senior employee with low speed of knowledge acquisition to increase the effective knowledge level against the obsolescence of knowledge. The effect of this training is remarkable for the employee who has low speed of knowledge acquisition, and when the technological change is great.

Acknowledgement

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Job advertisements and magic ages

The importance of age in the recruitment of middle aged personnel

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Introduction

Concurrently with the increase in unemployment on the Swedish labour market during the early and mid-1990s - from 1.5 percent openly unemployed citizens in 1989 to 8.0 percent in 1994 (4) - many middle aged and older workers and employees have lost their jobs. The number of persons aged 40-64 registered at the Swedish employment agencies has tripled between 1991 and 1996. The largest increase has been among persons aged 50 to 59 where unemployment has quadrupled. Statistics also show that persons over 40 years stay registered for a longer time than persons under 40. One fifth of these persons had been registered at the employment agencies for more than three years. (1)

One explanation as to why employers prefer younger applicants can be found with the fact that younger persons often have longer and more current education than middle aged and older people and that their education better meets the demands of the labour market. Other examples of reasons that are often referred to are new technology and the rapid changes taking place in modern societies. However, there are other reasons as well. When asking middle aged and older job applicants themselves about possible obstacles they talk about prejudices, ageism and age discrimination. Obstacles of this kind are not mentioned in official reports and labour market statistics. In my opinion, however, there is a need for knowledge about all the kinds of reasons that affect the job situations of the middle aged and older workers and employees.

In 1992 and in 1993 I carried out an interview study with 24 persons, 45-54 years old, inquiring about age and work. I found, among other things, that it was a common conception among the interviewees that most job advertisements called for applicants to be between 25-35 years of age. One of the interviewees expressed this as follows:

> *Look at the job advertisements! There you can see that you have to be between 25 and 35 to get a new job.*

Thus, in the advertisements the interviewees found ”proof” of their assumption that age might be a hindrance for middle aged people when applying for new jobs. I decided to find out whether they were correct in their assumptions that

- there are age demands in most of the job advertisements,
- job advertisements show that employers want young applicants.

The aim of the studies of advertisements, which were carried out in 1992 and in 1995, was to investigate the use of age in job advertisements in a Swedish daily

newspaper. The frequency of age in demand, the most common ages mentioned, and the mode of expressing age, i.e. verbally or by chronological age, were studied. In order to be able to offer a comparison to the frequency of age, the frequencies of demands for experience and for a university degree were studied as well.

The results of the advertisements studies and those parts of the interviews which concern the importance of age in recruiting middle aged personnel are presented in my research report *Platsannonser och magiska åldrar* (Eng: Job Advertisements and Magic Ages) (3). The complete result of the interview study will be presented in my doctor's dissertation.

Methods

In total 6 099 jobs advertised in the Swedish daily newspaper *Dagens Nyheter* were studied: 3 090 of these jobs were studied during the period of July 1 - December 31, 1992 and another 3 009 jobs in the period of March 12 - May 3, 1995. The number of vacant jobs were counted, not the number of advertisements, as a single advertisement sometimes contained several vacant jobs. The frequencies of demands for experience and for a university degree were counted in the same way.

The interview study was carried out with 24 persons, 12 men and 12 women, aged 45-54 years. Half of the interviewees were employed and half unemployed at the time of the interviews. Ten women and seven men had a university degree and all of the men and nine of the women had managerial experience. 15 of the 24 interviewees had experience from private companies and nine from the public sector of the labour market. Both small and big organizations were represented.

Results

The studies of advertisements

As mentioned, 3 090 vacant jobs were studied in 1992 and 3 009 vacant jobs in 1995. As is shown in table 1, 74.5 percent of the vacant jobs in 1992 and still more, or 82.5 percent in 1995, were from the private sector of the labour market.

Table 1. Vacant jobs studied in 1992 and in 1995.

	1992		1995	
	Jobs	%	Jobs	%
All vacant jobs studied	3 090	100.0	3 009	100.0
Public sector	788	25.5	528	17.5
Private sector	2 302	74.5	2 481	82.5

358 (11.6 %) of the jobs listed in 1992 and 399 (13.3 %) of the jobs in 1995 called for applicants to be a certain age. See table 2. The frequency of demands for a university degree was much higher compared to the demands for a specific age, 932 (30.2%) vacant jobs in 1992 and 1,100 (36.6 %) vacant jobs in 1995. The frequency of demands for experience was still higher. In 1992 there was a demand for experience in 2 008 (65 %) vacant jobs and in 1995 demands for experience was found in 2 197 vacant jobs (73 %). It was more common to find a combination of demands for age and experience in the same advertisement than a combination of demands for age and a university degree.

The public sector has official policies that in principle disallow age limits when recruiting. This explains why all of the jobs with an age demand in 1992. i.e. 358

vacant jobs, and 391 out of 399 vacant jobs in 1995 were from the private sector of the labour market. This is shown in table 3.

Over 60 percent of the vacant jobs with an age demand were for salesmen both in 1992 and in 1995. See table 4. There was a slight decrease in 1995 compared to 1992, from 64.8 percent to 61.4 percent. On the other hand, the number of jobs with an age demand in the areas of administration, economy and technology had increased from 1992 to 1995.

In most cases the age demands were expressed by chronological age. This was the case in 328 (91.6 %) out of 358 vacant jobs with an age demand in 1992 and in 346 (86.7 %) out of 399 vacant jobs in 1995.

Age intervals were the most common way of expressing chronological age, and were found 266 times (74.3 %) in 1992 and 271 (67.9 %) times in 1995. See table 5. 25-35 years was the most frequent age interval both in 1992 and in 1995. Other common age intervals were 30-40 years and 25-30 years. Chronological age was also expressed by minimum, maximum and approximate ages, for example, ”you are over 25”, ”you are under 40”, and ”you are about 30 years of age”. The most common approximate age was 30 years.

Table 2. Vacant jobs calling for certain ages, university degrees and experience in 1992 and in 1995.

	1992		1995	
	Jobs	%	Jobs	%
All vacant jobs studied	3 090	100.0	3 009	100.0
Vacant jobs calling for*:*				
Age	358	11.6	399	13.3
University degree	932	30.2	1 100	36.6
Experience	2 008	65.0	2 197	73.0

Table 3. Vacant jobs with an age demand from the private and the public sectors in 1992 and in 1995.

	1992			1995		
	Total	Age	%	Total	Age	%
Jobs in the public sector	788	0	0	245	8	1.5
Jobs in the private sector	2 302	358	15.5	2 481	391	15.8

Table 4. Occupations occuring in job advertisements with age demands.

	1992		1995	
Occupations	Jobs	%	Jobs	%
Sales (i.e. salesmen, sales executives, marketing strategists, shop managers)	232	64.8	245	61.4
Administration and economy (i.e. fdinancial managers, controllers, buyers, secretaries)	67	18.7	80	20.1
Technology (i.e. technicians, engineers, programmers)	41	11.5	60	15.0
Other professions (i.e. instructors, guides)	18	5.0	14	3.5
Total	*358*	*100.0*	*399*	*100.0*

Table 5. Age intervals, minimum-, maximum- and approximate ages in 1992 and 1995.

	1992		1995	
	Jobs	%	Jobs	%
Age intervals	266	74.3	271	67.9
Minimum, maximum and approx. ages	62	17.3	75	18.8
Verbal descriptions	30	8.4	53	13.3
Total	*358*	*100.0*	*399*	*100.0*

When age was expressed by an age interval, the ages asked for were 40 years or younger in 85 percent of the vacant jobs in 1992 and in 84 percent of the vacant jobs in 1995. This is shown in table 6. For 99.6 percent of these jobs, the applicants should be 50 years old or younger both in 1992 and in 1995, i.e. only once in each year was it explicitly written that applicants over 50 years were welcome. The youngest applicants, i.e. those under 25 years of age were not high in demand either. Only 8.6 percent of the vacant jobs in 1992 and 4.8 percent of the jobs in 1995 were for persons 25 years old or younger.

Table 6. Accumulated age intervals in 1992 and 1995.

	1992		1995	
Age limits	Intervals	%	Intervals	%
25 years or younger	23	8.6	13	4.8
30 years or younger	98	36.8	77	28.4
35 years or younger	117	44.0	164	60.5
40years or younger	226	85.0	227	83.8
45years or younger	258	97.0	261	96.3
50years or younger	265	99.6	270	99.6
60years or younger	266	100.0	271	100.0

A few advertisements, nine in 1992 and 14 in 1995, expressed age by verbal descriptions of the company, for example, ”we are a young dynamic company” and ”we are a young team”. In 21 of the cases in 1992 and in 39 cases in 1995, there were verbal descriptions of the applicants, for example, ”we are looking for bright young men and women”. In five advertisements from the private sector, two in 1992 and three in 1995, it was stated that ”age is of no importance”.

Some differences between the two studies were to be found. The number of trainees sought had increased from three in 1992 to 18 in 1995. In 1995, but not in 1992, there were vacant jobs within the European Union administration. In those advertisements the expression ”born later than” was used, for example, applicants ”are to be born later than the 31st of December 1959”.

Another difference between the two years was the increase in the number and size of the advertisements between 1992 and 1995. In 1995 the number of job advertisements per day or week was much higher compared to 1992 and the advertisements were often very big and expensive. Sometimes one single advertisement contained up to 30 jobs. The unemployment rate of the labour market was still high in 1995, so there was no real increase of vacant jobs. The increased number and size of job advertisements might be attributed to an increased mobility in certain areas of the labour market and to a shortage of qualified persons and experts, especially within the information technology area, and thus resulting in a keener competition between companies. The job advertisements of 1995 may also

serve as a reminder of the fact that advertisements can have other functions besides recruitment of personnel, for example to inform the market, to draw attention to the company and to strengthen the company's image.

According to studies carried out by The Swedish Labour Market Board (2) only 7.6 percent of the persons who had got a new job in 1992 and 8.3 percent in 1994 declared that they had got information about the new job from advertisements. Instead, most of them had got information about the new job through direct contacts with the employer or through friends and acquaintances. This further indicates that some job advertisements, especially the big and expensive ones, serve other purposes besides informing job applicants.

The interview study

According to the 45-54 year-old interviewees some ages were considered to be ”magic”. By magic the interviewees seemed almost to mean black magic. By some, 45 and 55 years were called magic ages. From the studies of advertisements we learned that the age interval 25-35 years was very common, almost magic, as it were. But according to the interviewees, 50 years of age was considered to be the most magic age of all. What the interviewees meant was that when applying for a new job, age could be much more of an obstacle for a job applicant aged 50 than for another one aged 49. The age of 55, however, was considered as a magic ”security limit” in a positive sense, both psychologically and economically.

Several of the female interviewees said that for them it was difficult to know whether gender or age had been the most important hindrance to them in their careers. The women felt there was no right age for them on the labour market. When they were young, 25-35 years of age, they had, or were expected to have, small children and when the children had grown up and the women were 10-15 years older, they were considered to be too old.

A couple of the men were of the opinion that their lack of a university degree had been a more important hindrance to their careers than age.

Furthermore, the results of the interview study show that the interviewees themselves when in a recruiting position had never voluntarily or at least rarely employed anyone aged 50 or above. Age was considered to be more important than competence unless the vacant job was at a top management level or an expert position.

None of the interviewees had any experience of their own of getting a new job externally of their own workplace after the age of 45. However, a few persons had been promoted and a couple of persons had set up companies of their own lately.

Most of the unemployed interviewees were convinced that they, in spite of their qualifications, would have difficulties in getting a new job due to their age. A few of the unemployed interviewees revealed strategies which they used when applying for a new job, such as omitting age in the application or lying about their age when making a phonecall to a presumptive employer.

According to the conceptions of the 24 interviewees, the reasons why employers prefer to employ younger applicants to middle aged applicants could be attributed both to the employer and to the employees. Here are some examples of reasons that the interviewees ascribed to the employers:

(a) new technology,
(b) very low or very high average age in the company,

(c) lack of flexibility in the organization,
(d) younger managers fear the competition,
(e) conflicts between generations,
(f) prejudices, ageism, and age discrimination.

Some of the reasons ascribed to the middle aged applicants were:
(a) they are not flexible and mouldable,
(b) they are opposed to changes,
(c) they want to do the jobs their own way,
(d) they have a great need for security,
(e) their commitment is low,
(f) they are negative,
(g) they are tired,
(h) they have an attitude of superiority,
(i) they may become informal leaders,
(j) they cost too much.

Conclusions

The frequency of age demands in job advertisements was as low as a little less than 12 percent in 1992 and about 13 percent in 1995. This means that compared to demands for experience and for a university degree, demands for age were of rare occurrence. In addition, most of the advertisements with an age demand were for salesmen and all of the jobs, except eight, belonged to the private sector. Thus, the conception of the interviewees that most advertisements had an age demand was *wrong*.

The most common way of expressing age was by using age intervals and the most common age interval was 25-35 years. When age was expressed by an age interval, the age in demand was 40 years or younger in about 85 percent of the cases. The most common approximate age was 30 years. Thus, the interviewees were *correct* in maintaining that the advertisements show that employers seek young applicants.

Although age was not common in job advertisements compared to demands for experience and university degrees, the low ages mentioned seemed to have had a strong impact on the interviewees. To some of the interviewees low ages in job advertisements may have served as confirmation of their conception that they were too old for the labour market. It is also possible that some of the unemployed interviewees used low age demands in job advertisements as an excuse when other reasons than age, like obsolete knowledge, might have been the real reason behind their difficulties in getting a new job.

Because of the different functions that job advertisements have, not only to inform job applicants, but also to inform the market and to strengthen the image of the company, job advertisements are read not only by applicants, but also by managers and other people in power. Therefore advertisements may be of great importance when it comes to influencing people's attitudes towards middle aged people and may contribute in a hidden way to the forming of stereotypes.

According to the interviewees the reasons why employers prefer younger applicants could be found with the employers as well as with the applicants. The reasons ascribed to the employers varied from new technology to prejudices, ageism

and age discrimination. Furthermore, the middle aged employee could threaten younger managers and was considered to be more difficult to control and to influence than younger persons, which indicates that a struggle for power and control is at stake and that there is a risk for conflicts between the generations. Stereotypical reasons like low commitment, tiredness and negative or superior attitudes were also ascribed to the middle aged employees.

Summary

The aim of the two studies of advertisements in 1992 and in 1995 was to investigate the frequencies of age demands, the most common ages mentioned and the modes of expressing age. The results show that age demands in job advertisements were much less frequent than demands for experience and for a university degree and less frequent than the middle aged employees interviewed in 1992 and 1993 believed. However, when there was an age demand in a job advertisement the age in demand was generally low, which also met the expectations of the interviewees. The results of the studies of advertisements and of the interview study show that there are both conceptions and experiences of age barriers that middle aged employees need to take into account when applying for a new job.

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A practical ergonomic approach to developing supporting equipment for older workers

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Introduction

Japan is rushing headlong into becoming an aged society, at a rapid pace that is clearly unlike the experience in other countries with advanced aged populations such as Sweden and France.

According to indicators of the population age structure in Japan, the productive age population (15 to 64 years) presently accounts for 69.45% of the total, the proportion of those aged 65 and above stands at 14.53%, and the median age is 39.6 years. Estimates for the year 2025 indicate a decline in the productive age population to 59.71%, a rise in the proportion of aged people to 25.79%, and an increase in the median age to 45.6 years (1).

The actual numbers for this phenomenon illustrate that the productive age population is predicted to decline by around 12 million between 1995 (87,130,000 people) and 2025 (forecast to be 75,118,000).

In more detail, forecasts of Japanese population trends indicate that the percentage of aged people in the population will exceed that of youth in 1998, and at the beginning of the 21st century, one in five members of the population will be aged 65 and above, and one in four members of the labor force will be aged workers aged 55 and above. As a result, it is predicted that the balance between demand and supply for labor will be upset from about the year 2010 due to the decline in the population that is able to work, impacting heavily on Japan's economic activity. For that very reason, strategies to deal with Japan's aging population are critical management issues that should be accorded the highest priority.

Faced with such an outlook, Japan's Ministry of Labor is using administrative guidance to recommend that companies abandon the current mandatory retirement age of 60 and enable their employees to continue working to the age of 65.

The forecast advent of this aged society is prompting companies to continue to adopt measures of various types based on Ministry of Labor guidance. One of these measures is making headway at companies everywhere. It is based on the idea of redesigning work duties and implementing the resulting changes.

More than 16 years have passed since The Association of Employment for Senior Citizens in Japan in 1979 initiated as one of its activities surveying and researching examples of redesigning work duties at the request of the Ministry of Labor.

Now that we have moved from the phase of awareness of these concepts to the phase of their diffusion we should reexamine the positioning and role of redesigning work duties as one of the policies for aged labor, as well the effectiveness and limits of this redesign.

The Association of Employment for Senior Citizens in Japan observed the results of the consigned and joint research conducted from 1986-1995. They studied the actual redesign of work duties in 66 of the 99 researched cases, or 66.7% (2).

An examination of the research content in the joint projects during this 10-year period shows that it was limited in many cases to the narrow sense of ”work improvement”. As the starting point for this work improvement, attention was focused on introducing the use of supportive equipment, including tools, to lessen the workloads for the aged workers.

The supportive equipment resulting from this joint research involved improvements of existing equipment generally available on the market. Little if any new equipment was developed to correspond to the characteristic changes that occur with aging.

At today’s industrial labor sites, there has been a marked transfer of advanced technology to the workplace. In Japan, this is commonly called office automation or factory automation. The result has been an increase in work involving human sensory information input capabilities and processing that requires human recognition, judgment, and control. This is causing significant changes in the approach to conventional work safety and hygiene activities.

Working conditions for production systems at manufacturing sites combine both the use of advanced technology such as the numerical controlled machines by using human-computer system and the use of classical type of the human-machine /tool system. Many jobs remain that impose excessive physical workloads.

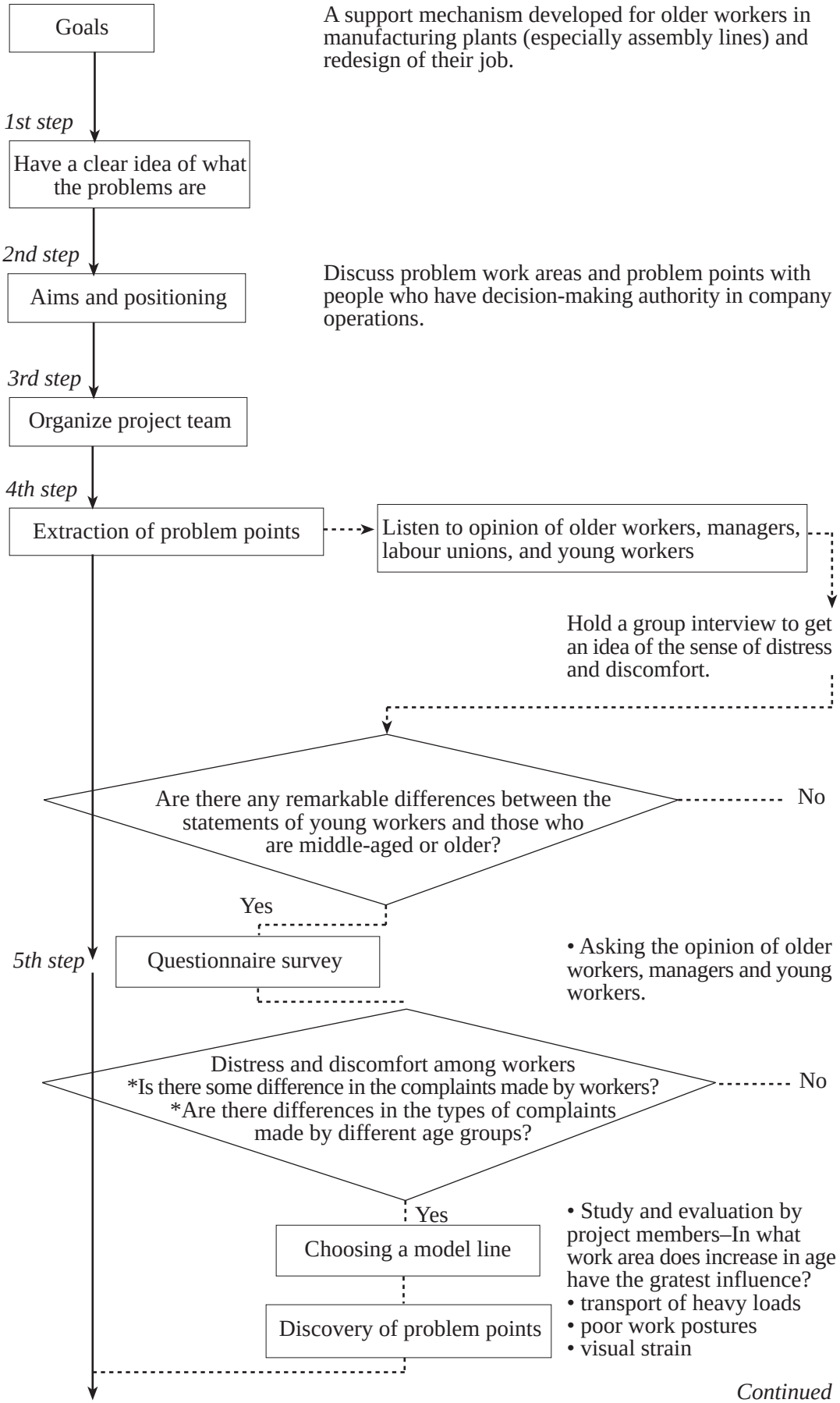
In particular, the partial use of automation and robots in the flexible manufacturing process is expanding in large divisions for machinery production.

Despite this, however, the use of integrated automated systems by the people working at these sites is increasing. As the work force continues to age, urgent tasks will include redesigning work duties and developing workplace and supporting equipment. The objective is to lessen the physical workloads on older workers and eliminate poor conditions in these situations.

The ultimate goal of this research is to create a pleasant working domain for the development and integration of supporting equipment for older workers on flexible manufacturing and assembly lines in machinery-manufacturing divisions that will combine sensory information input and processing work with the former type of the human-machine / tool system.

Methods: Outline of an ergonomic approach to developing supporting system for the older worker

A project which is reviewed in this paper was performed in the order of the flow chart shown in Figure 1.


Goals
A support mechanism developed for older workers in manufacturing plants (especially assembly lines) and redesign of their job.
1st step
Have a clear idea of what the problems are
2nd step
Aims and positioning
Discuss problem work areas and problem points with people who have decision-making authority in company operations.
3rd step
Organize project team
4th step
Extraction of problem points
Listen to opinion of older workers, managers, labour unions, and young workers
Hold a group interview to get an idea of the sense of distress and discomfort.
Are there any remarkable differences between the statements of young workers and those who are middle-aged or older?
No
Yes
5th step
Questionnaire survey
• Asking the opinion of older workers, managers and young workers.
Distress and discomfort among workers
*Is there some difference in the complaints made by workers?
*Are there differences in the types of complaints made by different age groups?
No
Yes
Choosing a model line
Discovery of problem points
• Study and evaluation by project members–In what work area does increase in age have the gratest influence?
• transport of heavy loads
• poor work postures
• visual strain

Continued

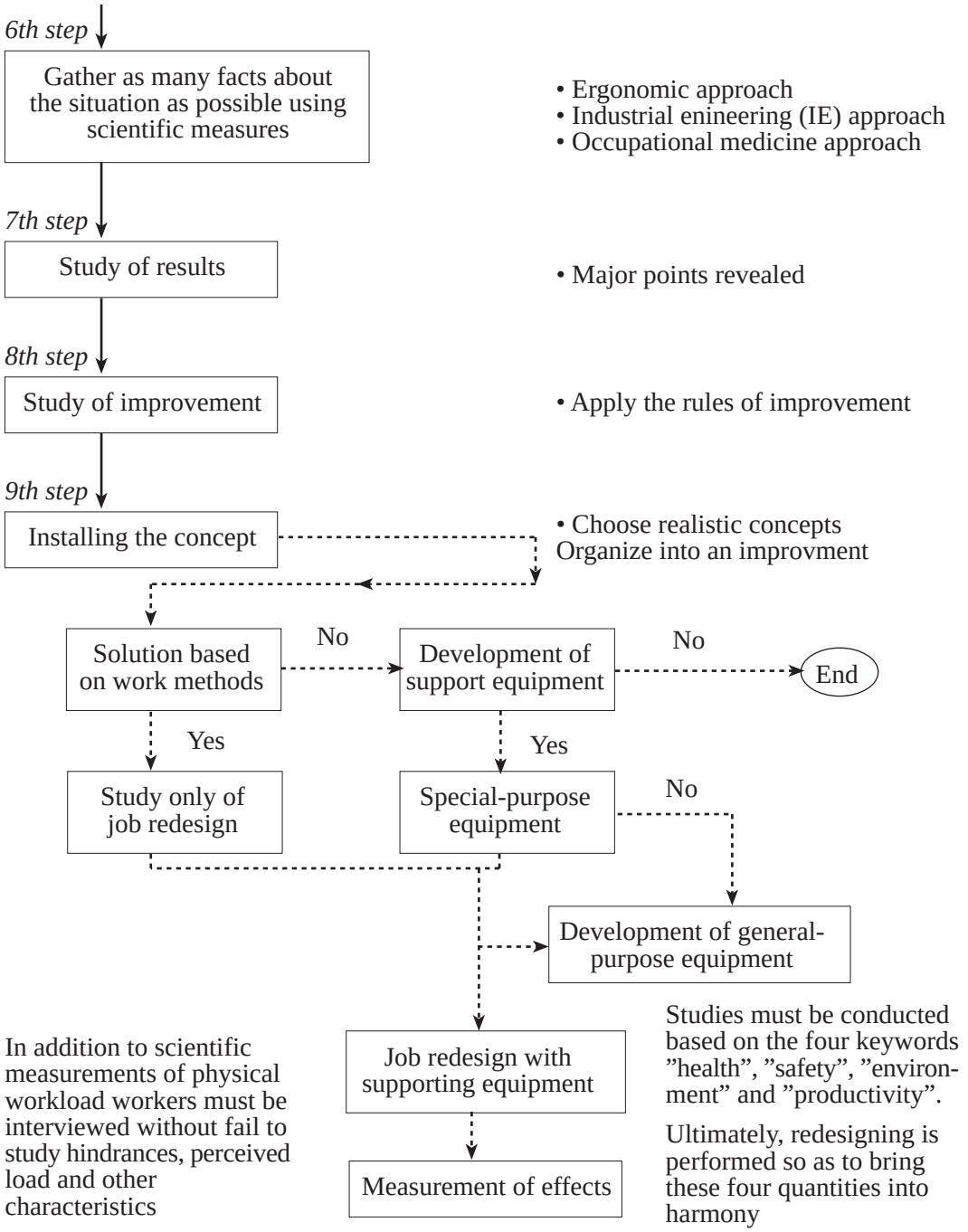


Figure 1. An ergonomic approach to support older workers in assembly line through the development and introduction of support equipment to reduce workloads and enhance productivity.

Case study: Support system to reduce physical work loads and enhance productivity

A multifunctional workstation, based on an ergonomic approach, to reduce the physical workload of assembly line workers has been developed to satisfy work conditions and the work environment. Figure 2 shows the design of such a multifunctional workstation for an assembly line of large air-conditioners for industrial use by a composite-production system.

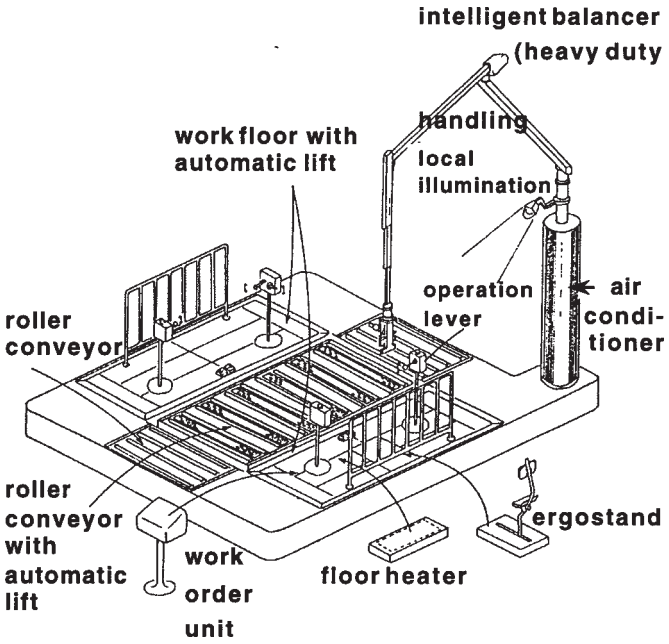


Figure 2. Design of multifunctional workstation for an assembly line in a flexible manufacturing system.

The support system was designed for small-lot, variable product assembly lines. This system includes the following functions (Table 1).

Table 1. The five primary problems and the countermeasures to these problems.

	Problem Point	Function for Countermeasures
1.	Improving facilities, equipment and methods to eliminate unnatural posture that constantly impose a heavy load on the waist, neck or other parts of the body.	Both of the work floor and the roller conveyor with automatic lifts minimize undesirable work posture and enables individual workers to determine their right work posture.
2.	Introducing support devices or altering work methods for work such as carrying baggage that requires strong muscles.	An intelligent balancer reduces the load during lifting. This balancer contains a motor that can follow the movements of workers.
3.	Installing heat proof and soundproof walls in places with high temperature, high humidity or loud noises.	An air conditioner and a floor heater built into the work station allow workers to work at a comfortable temperature. The illumination system allows partial or full illumination to eliminate a visual strain.
4.	Introducing devices that help workers with jobs that involve high tension or a fixed posture over long periods to relax.	A new chair, called the ”Ergostand”, supports workers who must crouch or stand. It can be used both in the standing and sitting positions.
5.	Equipment, facilities and work supplies used daily should be labeled using letters that make identification easy. They should be arranged so that workers can work comfortably with them.	A work instruction unit facilitates visual recognition and operation. Simple instructions, using the bar-code system, are shown on a computer screen.

Two examples of major effects are:

1) The use of multifunctional workstations developed for this project reduced the appearance of bad work postures. For example, a comparison of the rate of appearance of the two primary bad working postures before and after the use of multifunctional workstations is (Table 2).

Table 2. Postural effects of workstation redesign.

posture	before improvement	after introduction
bent over more than 60 degrees	28.9%	13.1%
twisting at waist	19.7%	0.5%

2) A comparison of the results of time study methods before and after the use of multifunctional workstations shows that productivity rose 15.7%.

Therefore, we believe the development and use of a multifunctional workstation was a success in terms of both the physical workloads and the productivity of older workers.

A follow-up survey was conducted by questionnaire of the effectiveness of multifunctional workstations for those workers who used these workstations for one month immediately after they were introduced into the workplace. The survey included those workers who used the workstations only occasionally.

The survey questions covered safety, productivity, work loads, and the workstation environment. The result showed that most respondents found these multifunctional workstations easy to use three weeks after their introduction.

The response was extremely good for the amelioration of the work burden, safety, and productivity from the stage of mastery of the equipment.

The multifunctional workstations were developed here as a result of surveys for how much support to provide for the fluid capabilities that decline with aging – specificaly the muscle strength, visual functions, and short-term memory capacity closely related to the subject work. As can be understood from the approach in this paper, the question of how much support to provide for fluid capabilities in conjunction with aging means that first, a study must be made of the improvement of work methods. If no conclusion can be drawn from the improved methods, studies must be made to determine what sort of support equipment must be developed.

Is is believed that the satisfactory results for the user and management are due to studies from the perspective of both methodological research and equipment development.

Workers also submitted their ideas, and the key to success was the full incorporation of these ideas. This support equipment was built through a process of this type. The workloads and lack of convenience were eliminated as much as possible for the elderly workers who will use the equipment.

Concluding remarks

This research was planned to develop supportive equipment to reduce the physical workloads for older workers based on an ergonomic approach. The final output of ergonomics involves both design and production for content and equipment. The

basic concept for this design incorporates human characteristics. Specifically, conditions are designed to minimize the burden and poor conditions externally imposed on people and maximize the use of their human characteristics. At the same time, efficiency is sought in all matters involving people.

An interdisciplinary approach is required when promoting ergonomics to achieve these goals. Specialists from a wide range of fields joined this research and were involved in this development. These fields included ergonomics, occupational health, robotics, mechanical engineering, industrial engineering, and systems engineering. Participants included technicians and people involved with labor management.

The final result of this research is design and manufacture.

Therefore, this paper took that approach to explain the circumstances and functions of developing the supportive equipment developed and produced: multifunctional workstations.

Summary

In planning an ergonomic design supporting the aged worker at the workplace, a practical approach based on three key methods - listening / asking, direct observation and scientific measurement - is necessary. In this project, a practical ergonomic approach based on these three key methods was drawn up for an assembly line in a flexible manufacturing system. The focus of this project was to implement an ergonomic approach to support the older workers on the assembly line through the development and introduction of supporting equipment to reduce the physical workloads while enhancing productivity.

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* This research was one part of the research commissioned by the Ministry of Labor to study and develop equipment for supporting aged workers.

Age and occupational accidents among Swedish nurses

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Introduction

The decremental theory of aging posits that, as a person advances in age, some work capacities, both physical and mental weaken progressively. This, in turn, lessens the person's aptitude to cope with his/her job demands. Further, as body resilience diminishes with age, the probability that bodily trauma may be severe, or recovery slow, tends to increase.

By way of compensation, older workers have the capacity to reduce difficulties in meeting job demands through acquired experience and the more efficient utilization of personal resources (3,4,13,18,23,24,21,25,26). But it is only under particular conditions that they can rely on their compensatory skills for this purpose. First, such compensation is only feasible for so long as job demands remain lower than overall work capacity. Second, flexibility is essential, compensation not being feasible where work organization and working methods are rigid. In more general terms, to paraphrase Warr (25,26), the occupational activities which may be defined as "age-impaired" are limited in range. They must have the twin characteristics that "basic capacities" are liable to be exceeded by job demands and that experience is of no benefit to performance (i.e. it does not compensate for age-related shortcomings). But, though less common than expected at first sight, age-impaired activities, in the long run, have the potential either to force older workers to leave their jobs or to cause them considerable difficulties.

Among possible negative outcomes of age impairment are occupational accidents (11), and the current study focuses on these. It investigates whether or not there is evidence of age-related accident risks among Swedish nurses, an occupation in which age-impairment conditions, such as strenuous work tasks, awkward (and repeated) postures, and time pressure clearly apply.

The occupation's membership has been both increasing and aging during the 80s. As shown in Table 1, membership increased by 21.7 percent (from 49,104 in 1980 to 66,857 in 1990). It also tended to age, nurses steadily becoming more concentrated in the age categories 35–44 and 45–54. It is worth noting that an increase in the accident rate was observed over the same period (from 10 accidents per 1,000 workers for 1980–81 to 15 for 1990–91).

A review of the scientific literature reveals that earlier studies of the accident and injury risks faced by health-care workers have dealt mainly with nursing auxiliaries, and concentrated on overexertions. The bulk of injuries to direct providers of hospital care are sustained by nursing auxiliaries, and some studies suggest that the risk of auxiliaries sustaining such injuries increased during the 80s (6,17). In the case of nurses, the literature indicates that young nurses are at greater risk of sustaining overexertion injuries during the lifting of patients, and that female workers are especially vulnerable (19). These age and gender related phenomena have also been observed among nursing auxiliaries (2,6,12,17).

Table 1. Age distribution (%) of Swedish nurses in three time periods.

Age	Period 1980–81	Period 1985–86	Period 1990–91
16–24	8.3	4.6	4.5
25–34	38.6	33.7	26.8
35–44	28.0	34.3	34.8
45–54	16.2	19.4	23.3
55–65	8.9	8.0	10.5
Total	*100.0*	*100.0*	*100.0*
N	*49,104*	*54,944*	*66,857*

In this study, the questions of age-related occupational-injury frequency among nurses, and some of the mechanisms involved, are investigated in a longitudinal manner (to avoid possible generation bias), and attention is paid to accident ratios by age category, all accidents aggregated (non-specific risk) and by accident pattern (specific risks). Age-related injury severity is also considered.

Materials and methods

A retrospective longitudinal analysis of occupational injuries sustained by Swedish nurses was conducted over a 10-year period. Five age categories (16–24, 25–34, 35–44, 45–54, 55–65) and three two-year periods (1980/81, 1985/86, 1990/91) were considered. Accident frequency and accident severity by age category and time period were calculated using data from official Swedish national sources: from the ISA (the work-injury information system maintained by Sweden's National Board of Occupational Safety and Health) for numerators, and from census data gathered by Statistics Sweden for denominators.

Accident data were taken from all the 2,311 injury-declaration forms referring to male (n= 165) and female (n= 2,146) nurses that had reached the ISA during three selected time periods (excluding accidents traveling to and from work). The accidents were then broken down by main event (mechanism), time period and age category. "Main event" is an ISA variable divided into ten main categories, and refers primarily to the force/energy that causes an accident. Classification within the variable is based on ILO recommendations for the structuring of accident-data sets (5). In the current study, there was a focus on three events (or groups of events): overexertions; falls and missteps; and all possible injury-inducing contacts with objects, e.g. fixed, falling, or in motion). Other main events were allocated to the category "Other", which encompasses burns and poisoning among other types of cases.

The data were first examined to check whether there was a significant relationship between category of main event and time (reference) period. Thereafter, non-specific (aggregated) and specific (by type) accident risks were compared using a

single indicator of accident frequency: the accident ratio (AR). The AR for a given age group during a given period is the ratio of two percentages: accidents in that age group as a percentage of accidents in all age groups (numerator); workers in that age group as a percentage of workers in all age groups (denominator). A ratio greater than 1.0 indicates that the percentage for accidents is greater than the percentage for employment.

With regard to accident severity, the indicator employed was the median number of days lost through injury. In the Swedish Work Injury Information System (ISA, as referred to above), the number of days lost through injury by accident is treated as equivalent to the number of (working) days for which Sweden's national social-insurance system has provided wage compensation. As is the case for accident-frequency risks, severity risks have been calculated by time period and age, all injuries aggregated and by main event.

Results

Table 2 shows that there is a strong and significant relationship between main event leading to injury and time period of occurrence ($Chi^2=34.92$; $p < 10^{-5}$). This relationship is most strikingly apparent when looking at the observed numbers of injuries due to overexertions. Such injuries were incurred much more frequently than expected in 1985–86, and even more so in 1990–91. From being slightly less frequent than injuries due to falls and missteps in 1980–81, injuries due to overexertions were nearly twice as frequent at the end of the 80s. Injuries due to falls and missteps were less frequent than expected in 1985–86 and 1990–91, while injuries related to various kinds of contacts with objects became less frequent than expected in 1990–91.

Table 2. Relationship between main event and period of occurrence of accident.*

Main event	1980–81		1985–86		1990–91		Total
Overexertions	167	(213.7)	382	(371.2)	482	(446.1)	1,031
Falls, missteps	170	(134.7)	221	(234.0)	259	(281.3)	650
Contacts	126	(116.3)	214	(202.0)	221	(242.8)	561
Others	16	(14.3)	15	(24.8)	38	(29.9)	69
Total	*479*		*832*		*1,000*		*2,311*

*Observed value (expected value); $Chi^2 = 34.92$; d.f. = 6; $p < 10^{-5}$

Table 3 shows that, among the five age categories, all accidents aggregated, ARs greater than 1.0 were observed for both the youngest and two older groups of workers in all three time periods. ARs were systematically high among workers aged 55 and over.

Table 3. ARs among Swedish nurses for each time period and age category, all accidents aggregated.

	Period 1980–81			Period 1985–86			Period 1990–91		
Age	% A	% W	AR	% A	% W	AR	% A	% W	AR
16–24	9.39	8.32	1.13	1.09	4.65	1.52	5.70	4.55	1.25
25–34	28.18	38.59	0.73	25.60	33.70	0.76	19.90	26.81	0.74
35–44	24.42	27.98	0.87	32.93	34.31	0.96	32.00	34.83	0.92
45–54	21.09	16.20	1.30	21.39	19.38	1.10	27.20	23.30	1.17
55–65	16.91	8.90	1.90	12.98	7.96	1.63	15.20	10.51	1.45
N	*479*	*49,104*		*832*	*54,994*		*1,000*	*66,857*	

% A: % accidents; % W: % workers; AR: % accidents/% workers

A closer look at age-related ARs by accident type (Table 4) suggests that there was some degree of type-specificity to the risks encountered by certain age groups. For instance, for injuries due to overexertion, the only age group to register ARs systematically (and considerably) higher than 1.0 was that comprising young nurses (16–24). By contrast, injuries due to falls and missteps were systematically higher among older nurses, i.e. those aged 45 to 54 and, more particularly, those aged 55 and over. Injuries due to various contacts with objects tended to be over-represented among both the youngest (16–24) and oldest nurses (55–66); and, by the mid-80s and onwards, also among nurses in the age range 45–54.

Table 4. ARs among Swedish nurses for each time period and age category by accident type.

	Overexertions			Falls and missteps			Various contacts		
Year	80/81	85/86	90/91	80/81	85/86	90/91	80/81	85/86	90/91
Age									
16–24	1.65	2.08	1.73	0.64	0.78	0.42	1.05	1.31	1.29
25–34	0.85	0.79	0.87	0.47	0.51	0.42	0.88	0.92	0.88
35–44	0.98	1.08	0.97	0.74	0.83	0.75	0.94	0.87	0.96
45–54	1.11	1.01	1.01	1.71	1.28	1.47	0.98	1.13	1.11
55–65	0.87	0.85	1.07	3.17	3.24	2.50	1.69	1.41	1.08

Table 5 reveals that accident severity, measured as the median number of working days lost, tended to decrease over the decade. All age groups aggregated, injuries due to falls and missteps tended to be more severe than those due to overexertions or various contacts with objects. And the former kind of injuries systematically gave rise to a (considerably) longer median number of working days lost among workers aged 55–65.

Table 5. Median number of working days lost among Swedish nurses for each time period and age category by accident type.

	All accidents			Overexertions			Falls/missteps			Various contacts		
Year	80/81	85/86	90/91	80/81	85/86	90/91	80/81	85/86	90/91	80/81	85/86	90/91
Age												
16–24	4.0	8.0	6.0	6.0	10.0	8.0	5.0	4.0	2.0	4.0	4.0	3.0
25–34	5.0	7.0	5.0	10.0	10.0	5.0	11.0	8.0	7.0	3.0	3.0	3.5
35–44	12.0	10.0	5.0	14.0	13.0	5.0	17.0	8.0	6.0	4.0	6.5	3.0
45–54	12.0	22.0	6.5	13.0	14.0	8.0	14.0	10.0	6.0	5.0	4.0	5.0
55–65	19.0	23.5	9.0	9.0	28.5	6.5	30.5	20.0	17.5	18.0	35.0	4.0
Total	*11.0*	*11.0*	*5.0*	*8.0*	*12.5*	*6.0*	*15.0*	*12.0*	*7.0*	*4.0*	*4.0*	*3.0*

Discussion and conclusions

The results of the current study reveal, in the first instance, that the increase in occupational injuries reported by Swedish nurses during the 80s is a reflection of an increase in the occupation's membership and of the substantial increase in injuries of one particular type, namely those due to overexertion. Overexertion injuries, from representing 34.9 percent of the injuries sustained by nurses in 1980–81, constituted a proportion of 48.2 percent in 1990–91. Accordingly, the picture for nurses is in line with that found in several earlier studies for nursing auxiliaries (6,17,12).

Also in accordance with earlier studies of health-care workers is the finding that injuries due to overexertion are over-represented among young members of the

occupation (2,6,12,17,19). It is doubtful, however, that age is a factor that intrinsically accounts for this result. An alternative possible explanation for the phenomenon lies in inequality of risk exposure between age categories, which tends to act to the detriment of young workers. More specifically, there is evidence that the inter-age difference may be the result of three not mutually exclusive factors: job assignments (work tasks) that are genuinely more strenuous for younger workers, a lack of "relevant experience" on their part (25,26), and discrepancies in working methods (1).

From a different perspective, the current study highlights the fact that older nurses also show an excess risk of a particular kind of injury, namely that associated with falls and missteps. Though it is doubful that age alone accounts for this phenomenon, it can be pointed out that it has been observed in other groups of workers in earlier studies (1,16,20). In addition, our results also reveal that as the number of older workers (and the proportion they constitute of all workers) in the occupation increased during the 80s, so did the number of injuries due to falls and missteps. However, despite a numerical increase of nearly 50 percent, such injuries became less frequent than expected as the period progressed (see Table 2).

Further, the study suggests that the relation between accident severity and age does not show a consistent pattern, and is only partly influenced by accident type. Despite this, in the particular case of overexertion injuries, according to some researchers, rehabilitation and rapid job re-insertion may well act as a support to recovery (7).

Before concluding, it should be emphasized that the study sheds no light on the work loads and demands associated with the tasks during which each kind of injury is incurred. It lacks precision in this respect because there is an absence of information in the data set employed on the tasks performed by workers of different ages and on the circumstances of occurrence of the injuries. Nor are possible gender differences considered despite the ambiguity currently prevailing concerning the relationship between age, gender and performance (10).

Among nurses – as among other health-care workers – accident-prevention strategies should place greater emphasis on the likelihood of unequal exposure to risks across age strata. Differences in experience, in work capacity and in personal risk management should also be considered more closely (19). In particular, work-related factors, such as forceful exertions and awkward postures (8), ought to be looked at seriously; and there is considerable evidence that the lifting of patients should receive high priority with regard to the prevention of overexertion injuries (2,6,12,17,19).

Following suggestions already made in the literature, the prevention of injuries among nurses could be achieved by new forms of work organization, by ergonomic job design or re-design (10), by the re-design of facilities, equipment, tools and work methods (8), and by avoiding risk factors such as lack of freedom of movement and short staffing levels (19). Training and re-training might also be necessary, taking into account the context of the area of health-care specialty (review by McAbee, 19). It should be added that the literature also offers ideas for strategies concerning manners in which preventive measures can be conceived and prioritized (8,14).

Summary

The study examines age-related injuries among Swedish male and female nurses. Age-related accident ratios (ARs) and injury severity were measured over a ten-year period, all accidents aggregated and by main injury event (overexertions, falls and missteps, and various contacts with objects), employing five age categories and three time periods. All accidents aggregated, ARs greater than 1.0 were registered by nurses aged 16–24, 45–54 and 55–65 in all time periods. Young workers showed an excess risk of injuries due to overexertions, and older ones of injuries due to falls and missteps. The findings suggest that there is some specificity to the types of accidents sustained by various age categories of workers, though the factors contributing to this may be both individual and work-related. There are, for example, age differences in job assignments, experiences and individual capacities. Possible preventive strategies are outlined.

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Australian managers' attitudes towards older workers

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Introduction

The study of mature and older workers, reported in this paper, was conducted in 1995 and funded by the New South Wales government's Consultative Committee on Ageing. The purpose of the study was to investigate managers' attitudes towards employing, and retaining in employment, mature and older workers. The study was designed to examine the stereotypes held by managers of their older workers and their related employment policies, experiences and workplace practices.

Australia, in common with all other advanced industrialized countries, is experiencing a rapid ageing of the population. Together with this demographic fact there is an increasing decline in older workers' retention in the workforce. Much retirement from work is involuntary and has resulted from the structural changes which are the result of the transition from a predominantly secondary industrial base to one in which tertiary positions predominate. Social attitudes are also instrumental. Older workers are expecting to retire to a life of active leisure and frequently accept early retirement packages. In addition it is generally assumed that many employers are actively attempting to shed older workers in favour of a younger and more adaptable work force and, when vacancies occur, prefer to employ younger people. Premature retirement places a considerable burden upon income support programmes and retirement income schemes (superannuation and pensions). It also negatively affects the dependency ratio. Concern about these trends has resulted in Australian governments incorporating age as a factor in anti-discrimination legislation, the abolition of compulsory retirement and the gradual raising of the age at which women are eligible for state pensions to that of men (65 years). It has also resulted in the encouragement of research into employer and employee attitudes and into the post retirement experience. Stereotypes of older people as inflexible, disinclined to adapt to modern industrial procedures and as inclined to take more sick leave are thought to contribute to managers' reluctance to employ older workers. The research sought to examine these stereotypes.

Stereotypes

Stereotypes are simplified and undifferentiated impressions about the characteristics of a particular group. They can be dangerous as they obscure the view of an individual and can be resistant to contrary evidence and because they influence the behaviour of, and towards, individuals in that category. For example, many people approaching the age of sixty years begin to think they should "slow down" or

"retire" because that is the popularly held opinion of the society in which they live and because they have accepted the stereotype. Frequently, stereotypes do have a grain of reality, however they are slow to change with changing circumstances and they limit the opportunities of individuals in that category who do not conform to the stereotypical prejudice.

Collins (4) documented the extent to which stereotypes of different *ethnic groups* have affected their experience of migration. The introduction of the Restrictive Immigration Act 1901 was a direct response to the negative stereotypes held by many Australian workers of migrants from a non-English background. Although prejudices continued (8,26) and prejudices were also present within the various ethnic communities (12,13) it was the stereotypes held by health and legal authorities about "Mediterranean back" and "compensation neurosis" which affected the social and working lives of many ethnic groups in a negative manner (2,23).

Stereotypes also affected *older workers*. With the advent of the industrial revolution and the consequent widespread use of technology rendering the work of a large labour force in many industries unnecessary, it was generally argued that, by the age of sixty individual abilities declined too much to fit the fast moving world (17). In the United Kingdom the Carnegie Enquiry into the Third Age (3) opined that perhaps the greatest barriers to an active and independent life are not a person's abilities but negative stereotypes and sweeping generalizations (p.23). In Australia, the House of Representatives Standing Committee for Long Term Strategies (11) considered that older employees have limited prospects of gaining full-time employment. Negative attitudes among employers include general doubts about the capabilities of older workers, assumptions about their high level of injury and the concomitant high levels of workers' compensation and sick pay. The report comments that employers' experience with older workers in many of these firms largely contradict these prejudices (p.35). That is, despite the actual experiences of employers, the stereotype is maintained.

In an overview of the literature on ageing, Friedan (9, p.171) demonstrates that the continued stereotype of age as a devalued status is a major factor in the retrenchment of workers and an impediment to adequate in-service training opportunities. Thence a vicious cycle is established: stereotypes regarding older employees' lower abilities, motivation and learning capacity lead to restricted opportunities for training and development; incapacity then confirms the stereotype. An extensive overview of British research (18) demonstrated a widely held perception of older workers as superior in terms of attitude, personality and general behaviour. Adjectives such as responsible, reliable, conscientious, tolerant, reasonable and loyal were frequently used, but the overview demonstrated that there was still a retention of the negative stereotype.

In Australia, research by Falconer and Rothman (8,p.2) showed that employers had reservations about employing older workers because of their perceived lack of enthusiasm and drive. Falconer and Rothman conclude there is an area of cognitive dissonance, with employers recognising positive attributes such as loyalty, commitment, reliability, strong work ethic and maturity of individual older workers yet still maintaining a negative stereotype. They found that, overall, older workers were perceived by the employer to be slower intellectually and less creative than younger workers, less skilled and fearful of using new technology as well as resistant to being trained (p.29).

Between 1993 and 2041 the overall working age population is expected to increase by 28.1%, with an expected increase of 20.2% in the Australian State of New South Wales. The fastest growing sectors are in the older age groups (1). It is important therefore that the consequences of these workforce ageing trends be considered. The difficulties of older Australians in maintaining their employment, or seeking alternative employment when they lose their jobs, should be addressed.

Edgar (6) illustrated the difficulty of trying to implement social policies that adequately provide for the health and welfare of an ageing Australian population. Research into social networks, life changes and the needs of older people confirms that marginalisation of older people in a work oriented society results in the formation of dependency perceptions and creates social isolation for many older people (5).

The workplace has been identified as a convenient site for preventive and therapeutic interventions to meet the social problems associated with longevity (24). The ageing population can alternately be seen as a promising pool of competence and human help to be drawn upon with enthusiasm or as a drain upon resources (6). The challenge, articulated by the House of Representatives Standing Committee for Long Term Strategies (11), was to create effective social strategies, to recognise the opportunities offered by the developing social structure and to develop policies that tap into the vast resources of energy, knowledge, experience, competence, skill and wisdom of older workers. The experiences of the United Kingdom firm of Tesco are relevant (19): research into their experience of mandating 10% employment of older workers (defined as 60+) demonstrated that older people were more reliable, efficient, loyal and better with customers. The older workers were willing to work unpopular hours and had a stabilising effect on the younger workers. The older workers also reported that their health improved on joining Tesco. Phillipson (19) however, argued that detailed analyses of the organizational and economic pressures faced by older workers are needed.

Fears of dismissal were examined by McFee (15) who discussed the opportunities to experiment with innovative approaches to the employment and training of mature workers as well as addressing the attitudes held about older workers. McFee particularly focused upon the effects of industry restructuring and age discrimination on an ageing workforce, and the lack of opportunities for employment for older workers. McCallum (14) argued no one necessarily has the right to a job, rather they have the right to seek work without fearing prejudice on the basis of age or gender. The literature shows that many older workers experience discrimination on the grounds of age (7,16,21,22). Schrank and Waring (25) call for age neutrality in the workplace. They suggest that interventions such as performance appraisals and post-retirement employment opportunities, as well as general positive attitudes towards older employees, would result in improvements in the quality of ageing as well as in the lives of workers of all ages.

Method

A combination of research methods was used, these included secondary data analysis, unstructured interviews, mailed questionnaires and focus groups. Analysis of workplace absenteeism records by age of worker was undertaken in three selected sites. These sites were a local council area, a pharmaceutical manufacturing plant and a group of hospitals. Interviews with the human resources managers (HRMs)

and the health and safety officers (HSOs) were conducted and discussion with 12 focus groups of blue collar workers undertaken. Questionnaires (N=95) were received from HRMs working in these three areas of industry. The mailed questionnaire consisted of twenty questions, all of which used likert scales, except the final one, where a forced choice was utilized. The final question presented the HRMs with a list of 10 characteristics and asked whether in the *experience* of the managers (respondents) these were more likely to be found in workers over 55 years of age or in workers under 30 years of age.

Results

The final question in the mailed out survey forced respondents to polarize workers on a series of ten attributes which the literature on stereotypes indicates are important in comparing older and younger workers (Table 1). This question was placed last as it directly forces respondents to endorse, or reject, a stereotype. As shown by the percentage of respondents answering the question, about 20% refused to endorse any stereotype. For those who did complete the question, younger workers received high positive scores for their ability to learn new skills (95%) and willingness to learn new skills (87.4%). They were clearly identified as the group more likely to take “sickies” (91.1%).

The highest positive scores for older workers were received for their strong work ethic (94.7%), attention to detail (90.9%), promptness (88.6%) and accuracy (79.2%). Older workers were also seen as more likely to provide excellent customer service (64.5%); however, younger workers were seen as more likely to be motivated (60.2%). In Table 1 the responses are divided into two categories. Those which had a positive response for older workers and those which defined younger workers positively.

Table 1. Characteristics of older workers (55+) and younger workers (<30).

	More likely to be found in workers older than 55 years (%)	More likely to be found in workers under 30 years (%)	Total %
Older workers +ive			
Strong work ethic	72 (94.7)	4 (5.2)	80.0
Reliability	73 (92.4)	6 (7.6)	83.1
Attention to detail	70 (90.9)	7 (9.1)	81.0
Promptness	70 (88.6)	9 (11.4)	83.1
Accuracy	61 (79.2)	16 (20.8)	81.0
Excellent customer service	49 (64.5)	27 (35.5)	80.0
Younger workers +ive			
Ability to learn new skills	4 (4.9)	77 (95.0)	85.3
Willingness to learn new skills	10 (12.6)	69 (87.4)	83.1
Motivation	31 (39.7)	47 (60.2)	82.1
Younger workers -ive			
Absenteeism (eg., taking a“sickie”)	7 (8.9)	72 (91.1)	83.1

Thus the results appear to endorse the stereotypes, however these results need to be read with caution. In all the individual interviews conducted with both HRMs and HSOs, there was a refusal to categorize people. Comments consisted of phras-

es such as: *I don't see people that way, - they are individuals, we don't collect statistics by category. I have no feeling for the direction they would go.*

These comments, whilst "politically correct", also appeared to be the genuine position of the interviewees. The interviews were only conducted in large scale employment situations and it could be argued that the organizations were too large for the officers to know their workers as individuals and that, because of their knowledge of Equal Employment Opportunity legislation and principles, they had filtered out stereotypical observations. However, the respondents to the mailed questionnaire came from organizations with a wide spread of workforce size. In smaller organizations, the HRM is unlikely to be a specialist position. They are unlikely therefore to be as fully conversant with EEO legislation and may be less inclined to screen out stereotyping. On the other hand, their greater contact with their workforce promotes the perception of people as individuals rather than categories. As can be seen in the questionnaire comments reported below many of these respondents reflected the interview comments.

After this question, respondents to the questionnaire were asked if they had any other comments they wished to make. Many respondents who had not completed the forced choice table wrote comments which specifically rejected age as an issue. The final comments reflect the general tenor.

I do not believe you can divide people into brackets by age - each person's reactions to whatever are constant throughout their lives, be it attention to detail or sickness leave.

Majority of staff have good attention to detail and customer service.

While accuracy is important, quality must be maintained. Younger workers may produce more, sacrificing quality.

Many decisions were borderline. Many attributes not related to age at all, but matters such as cultural upbringing, education level, professionalism etc.

None of these are age related and we find no difference due to age with our people. In our organization we have not found age to be a factor regarding any performance or learning issue.

Some young people have an excellent work ethic and some older people have a lousy work ethic. The balance is probably equal. A great deal depends on the challenge offered and the recognition given when the challenge is met.

It is difficult to make too many clean cut distinctions between younger and older workers.

Age is not a large factor in employment - our factory staff, the majority are in the 40-60 age group. Sales - 20-40 age group.

The above question has not been answered as I don't believe that the differentiation can be made in such a general manner. There will be individuals in both groups who display these characteristics, but I believe that you cannot differentiate between which group is more likely to reveal them.

Their responses showed a general adherence to the principles underlying the Equal Employment Opportunity and anti-discrimination legislation. Questioned on the procedures in place when downsizing became necessary, the majority indicated that the position, not the person, was the target, and that, where work appraisal was used, all employees were assessed, and voluntary redundancy was usually offered. A significant number of private industry respondents adhered to the principle of "last-on, first-off".

Discussion

In the interviews all HRMs and in the questionnaire the majority of HRMs reported that they had not experienced older workers, women and NESB workers as more likely than other groups to have health problems, injury patterns or absenteeism. However, they did report that factors affecting workplace attachment were affected by both age and gender.

The responses of the HRMs indicate that while older workers possess the qualities of promptness, reliability and a strong work ethic they are generally perceived to be less willing and less able to learn new skills. In workplaces with new, often changing and increasing technologies, this perception, whether borne out in reality or not, could be a liability for older workers. These attitudes offer support to the stereotypes often associated with older workers and which are evident in the literature (9) and in a recent study examining employers' attitudes to older workers (8). These attitudes apply to both men and women. The stereotype was not endorsed by the findings of Pickersgill et al (20). Their research indicated that inappropriate or restricted in-service training rather than worker characteristics should be investigated. In this project's interview sites HRMs reported a conscious effort to include all workers in in-service training. The HRMs in these workplaces rejected the idea of incapacity to learn but offered moderate endorsement for reluctance to undertake training when approaching retirement. However, the older blue collar tradesmen at one acute care hospital expressed extreme resentment at the hospital's refusal to pay for work related courses at a nearby technical college.

When asked about their experience of workers' attitudes, some of the HRMs' questionnaire responses endorsed existing stereotypes. For example, older workers were perceived as being resistant to the introduction of new technologies, however, the HRMs rejected ill health of older workers as a problem. The negative stereotypes of younger workers, as more likely to be distracted and to take "sickies" than older workers, were also endorsed. Workplace employment records, which were obtained for the three case study sites, demonstrated that younger workers took more frequent leave but that when older workers took leave it was of longer duration. Stereotypes were also endorsed when questioned about factors affecting workers' decisions to leave their current workplace, with younger workers more interested in better pay and career prospects and older workers in superannuation and health status. There was strong endorsement of older workers for their promptness, reliability, work ethic, attention to detail and as providing excellent customer service.

Overall, the responses to the survey offered considerable reassurance that the recent legislative changes have resulted in improvements in the attitudes and behaviours of HRMs. Amongst our respondents there was a high level of knowledge of the legislation and a considerable degree of conscious conformity with the provisions of the Act. However, as questionnaires were returned anonymously and there was only a 42.6% response rate to the mailed questionnaire we cannot assert with any degree of confidence that this conformity is widespread. It may be that preparedness to complete the questionnaire was an indicator of 'best practice' managers.

Conclusion

The negative stereotypes described in the literature received some endorsement, they were however were rejected by the majority of the respondents in both the survey and in the interviews with individual managers. The effect of these attitudes is possibly dependent upon the type of workplace. Newly emergent, technologically advanced, industries are likely to value younger workers, whereas those industries where the foci are customer service, dependability and promptness are more likely to value older workers. For those older workers who have lost their positions through retrenchment, the stereotypes of older workers may effectively preclude many from re-entering the workforce.

Summary

This paper reports research conducted at three large workplaces and a mailed questionnaire to managers in similar enterprises throughout the State of New South Wales, Australia in 1995/6. The responses of the managers indicated that while older workers possessed the qualities of promptness, reliability and strong work ethic they were generally percived to be less willing, less motivated and less able to learn new skills. In workplaces with new, often changing and increasing technologies, this perception. whether borne out in reality or not, could be a liability for older workers. These attitudes offer support to the stereotypes often associated with older workers and which are evident in the literature. More positively managers had not experienced older workers as more likely than other groups to have high levels of health problems or injury patterns. Unnecessary sick leave, or absenteeism, was not attributed to older workers. However, managers did report that factors influencing workplace attachment were affected by both age and gender.

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Work career and health in aged urban population

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Introduction

A lifelong work career has an influence on a worker‘s health and ability to work. Most chronic diseases arise gradually in the course of time as a result of interaction between an individual and the environment (4). Many indicators describing work career, like duration of work career, job mobility and progress of work career, have at least an indirect influence on the state of health. Pavalko et al. (6), for example, have reported, that men experiencing a period during which they moved through a series of unrelated jobs had a higher risk of mortality, and that men who progressed early in their careers but then remained stable during later periods tended to be at a greater risk of mortality than those who progressed in both time periods. In addition, a career with high job mobility and multiple transitions of the work place has been reported to correlate with a high number of health impairments after retirement (3). Most work career studies have been made in sociology and behavioural sciences and information concerning the relationship between health and work career are available only in limited amount.

The aim of this study was to describe associations between work career and health. Job mobility, progress of work career, self-estimated state of health, ability to work and retirement were used as the main indicators. Sociodemographic and background factors of work career were also taken into account.

Material and methods

The entire study population consisted of all subjects (n=1012) who were born in 1935 and who lived in northern Finland, in the city of Oulu on the first of October in 1990. From that population, 778 workers (77 percent) answered a postal questionnaire and attended clinical examinations during the years 1990 and 1991. Twenty people had been retired longer than they had actively worked during their work career and 30 of the subjects had worked mainly at home. They were not included in the final study group of 728 workers (397 women and 331 men), in which the associations between work career and health were analyzed.

In the questionnaire, people were asked to give their sociodemographic data, the basic facts of all occupations and work tasks which they had had during their working life and the basic data of health status. Job mobility of the participants was defined as the number of different occupational branches in which they had worked. As regards the indicator describing progress of work career the categories used were: poor progress of the career, no changes in work-status (worked in different professions during work career), no changes in work-status (worked in the same profession during whole work career) and advancing during the work

career. The progress of work career was defined to be poor, if the work-status had lowered during the work career or if the worker was forced to retire because of long-term disease or decrease of the ability to work. Work career was advanced, if the work-status had increased or if the responsibility of the work tasks had increased during the work career.

The background of work career was described with three main items: 1) shifting age(the age at time of moving for the first time into working life), 2) the nature of the work, which was classified using the scale made by Ilmarinen et al. (2) (physical, mixed and mental work) and 3) work status used describing the position of the respondent in the work hierarchy in the main occupation (an occupation which a worker has had for the longest time): employee, specialist, manager or foreman and entrepreneur.

Health and ability to work were described by four indicators: 1) the self-estimation of health, 2) a physician's conclusion on clinical examination about the participant's ability to work, 3) the retirement and 4) long-term diseases. The prevalence of the long-term diseases was obtained by the questionnaire, and a physician confirmed them in the clinical examination. Ability to work was assessed only among those subjects who were still working.

A short inquiry was returned by 53 percent of the 234 missing cases, of which 69 percent were still actively working. The proportion of the retired was fairly similar among the cases and the missing cases. There were slight dissimilarities in the distribution of the professions between the participants and the missing cases. Among the missing cases 17 percent worked in industrial occupations and 18 percent in service occupations. Corresponding proportions among the participants were 23 percent and 20 percent.

The results were presented as frequencies, means and standard deviations. The groups were compared using cross-tabulation. The results were analysed by the X^2 -test to evaluate the significance of the difference in the results. P-value < 0.05 was used as significant.

Results

The largest main professions (according to the main occupation) were metal- and construction industry (23 percent), transportation- and traffic trade (15 percent) and technical planning profession (10 percent) among the men. Correspondingly, among the women the largest main professions were home and large-scale domestic trade (20 percent), administrative and office-technical profession (17 percent) and commercial trade (16 percent).

The duration of work career among the men was 37 years (SD 5) and among the women 33 years (SD 6). Of the women 50 percent had been absent from the paid work at least once for over a year and the mean of the cumulative length of these periods was 7.5 years. The level of occupational education was low (not at all or short courses) among 70 percent of the women and among 59 percent of the men, moderate (school certificate) among 14 percent of the women and among 21 percent of the men and high (college diploma or university) among 16 percent of the women and among 20 percent of the men.

The majority of participants (70 percent) were employees, 15 percent were specialists and 8 percent of them belonged to the group of foremen or managers based on the main occupation. The rest (7 percent) of the participants were entrepre-

neurs. Most (79 percent) of the participants had started to work under the age of 20 and 21 percent of the subjects had got their first job at the age of 20 or more. Of the women 42 percent had worked mainly in physical work tasks, 28 percent in mixed work tasks and 30 percent in mental work tasks. Corresponding figures were 40 percent, 30 percent and 30 percent among the men.

During the work career, 37 percent of the women and 28 percent of the men had stayed in the same occupational branch and 8 percent of the women and 12 percent of the men had worked at least in four branches. Job mobility had a statistically significant association with the shifting age (P=0.000) and with the nature of work (P=0.003) in the main occupation (Table 1). In addition, job mobility had an association with the level of the education of the subjects (P=0.000). Half (51 percent) of those, who had worked in one occupational branch, had at least moderate occupational education.

Table 1. Work status, shifting-age and nature of work according to job mobility, rowpercent.

		Job mobility (the number of occupational branches)			
	N	One	Two	Three	Four or more
Work status					
Employee	511	28	39	23	10
Specialist	106	53	30	11	6
Manager, foreman	62	39	38	20	3
Entrepreneur	50	36	38	12	14
Shifting-age					
under 20 years	572	24	41	24	11
20 years or older	156	63	26	8	3
Nature of work					
Physical work	298	22	40	24	14
Mixed work	212	32	37	25	6
Mental work	218	49	34	11	6

The progress of work career had been advantageous among 13 percent of the women and 33 percent of the men. No changes in work status or in the responsibility of the work tasks had been experienced by 77 percent of the women and 57 percent of the men and the progress of work career had been poor among 10 percent of the women and the men. The career development had statistically significant (P=0.000) association with nature of work in the main occupation (Table 2). In addition, the progress of work career had significant (P=0.000) association with the level of education. Most (62 percent) of the workers, who had advanced during their work career, had at least moderate occupational education. Progress of work career had a significant association with job mobility both among the men (P=0.000) and among the women (P=0.000). Job mobility was low in 90 percent of the women who had advanced during their work career and in 63 percent of the women who had poor progress of work career. The correspondent proportions were 69 percent and 46 percent among the men.

Table 2. Work status and nature of work according to progress of work career, rowpercent.

	N	Progress of work career			
		Poor progress	No changes in work-status (different professions)	No changes in work-status (the same profession)	Advance-ment during work career
Work status					
Employee	511	11	52	29	8
Specialist	106	1	7	46	46
Manager, foreman	61	13	6	2	79
Entrepreneur	50	18	20	20	42
Nature of work					
Physical work	298	11	56	25	8
Mixed work	212	14	38	31	17
Mental work	218	5	17	33	45

Health was estimated good by 28 percent of the participants, moderate by 54 percent and poor by 18 percent of the subjects. A physician concluded that half of the participants were still able to manage all their work tasks. Managing was estimated to be uncertain with 41 percent, and 9 percent were thought to be incapable of managing their work tasks. There were no differences between the genders in the management of their work tasks.

The proportion of the retired was 22 percent among the women and 35 percent among the men. Retirement was most common among the subjects who had worked either in transportation and traffic occupation (53 percent had retired) or in the metal and construction trades (38 percent had retired) or in home and large-scale domestic trades (34 percent had retired).

Musculosceletal diseases were the most common diseases (62 percent) among the participants and other fairly common diseases were diseases of the circulation, pulmonary system and nervous system (Table 3). Only 102 persons (51 women and 51 men) or 14 percent did not have any diagnosis.

Table 3. The prevalences of long-term diseases, percent.

Long-term disease	Women n=397	Men n=331	All n=728
Pulmonary diseases	21	14	18
Diseases of nervous system	14	15	14
Skin diseases	4	5	4
Tumours	10	2	7
Disorders of mental health	7	5	6
Diseases of digestive organs	11	10	10
Musculosceletal diseases	65	59	62
Diseases of endocrinological system	13	12	13
Circulatory diseases	37	39	38
Blood diseases	0.8	0.6	0.7

The state of estimated health and ability to work were better and proportion of the retired was smaller among those women and men who had worked only in one occupational branch during their work career, compared with the participants who had worked at least in four branches (Table 4). The differences were statistically insignificant. In addition, the prevalence of musculosceletal diseases and that of mental health disorders increased slightly as the number of the branches increased. The participants who had advanced during their work career, estimated their state of health (P=0.013 among the women and P=0.000 among the men) and their work ability (P=0.305 among the women and P=0.018 among the men) to be better than the other participants (Table 5). The proportion of the retired was also larger (P=0.001 among the women and P=0.187 among the men) among the participants having poor progress of work career compared with the others. In addition, there were statistically significant associations between the prevalence of musculosceletal diseases (P=0.000), that of mental health disorders (P=0.029) and the progress of work career.

Table 4. Health, work ability, retirement and the prevalences of long-term diseases according to job mobility, percent.

	The number of occupational branches			
	One	Two	Three	Four or more
Health-estimation	*(n=237)*	*(n=269)*	*(n=147)*	*(n=68)*
Good	30	28	27	21
Moderate	54	53	56	60
Poor	16	19	17	19
Work ability	*(n=169)*	*(n=185)*	*(n=94)*	*(n=39)*
Good	56	48	46	41
Moderate	34	43	47	46
Poor	10	9	7	13
Retirement	*(n=239)*	*(n=273)*	*(n=148)*	*(n=68)*
Proportion of retired	23	28	31	35
Prevalences of long-term diseases	*(n=239)*	*(n=273)*	*(n=148)*	*(n=68)*
Musculosceletal diseases	58	61	68	69
Circulatory diseases	36	43	31	40
Pulmonary diseases	17	21	14	21
Mental health disorders	4	6	7	10

Table 5 Health, work ability, retirement and long-term diseases according to progress of work career, percent.

	Progress of work career			
	Poor progress	No changes in work-status (different professions)	No changes in work-status (the same profession)	Advance-ment during work career
Health-estimation	*(n=72)*	*(n=285)*	*(n=207)*	*(n=157)*
Good	13	24	29	41
Moderate	65	56	56	44
Poor	22	20	15	15
Work ability	*(n=23)*	*(n=189)*	*(n=146)*	*(n=129)*
Good	26	43	52	61
Moderate	61	45	38	34
Poor	13	12	10	5
Retirement	*(n=73)*	*(n=287)*	*(n=210)*	*(n=158)*
Proportion of retired	44	32	26	15
Prevalences of long-term diseases	*(n=73)*	*(n=287)*	*(n=210)*	*(n=158)*
Musculosceletal diseases	67	72	55	53
Circulatory diseases	45	38	38	35
Pulmonary diseases	11	22	15	18
Mental health disorders	14	5	5	4

Discussion

A lifelong work career seems to have an influence on a worker's health, but only a few studies have been published where the relationship between the characteristics of the work career and health has been analysed. In the present study, both an intact work career and a favourable career development were associated with a good state of health and a high job mobility seemed to be associated with a poor state of health.

More than a fourth of the subjects had estimated their health to be good and a physician concluded that half of the participants still working were able to manage all their work tasks. Musculosceletal diseases were the most common long-term diseases. The prevalence of them (65 percent among the women and 59 percent among the men) were higher than, for example, in the Finnish aging municipal workers of which every second man and woman reported the presence of a diagnosed musculosceletal disease (7). In this study men's work tasks were usually more physically loading than women's work tasks. The physical loading of work tasks has been noticed to correlate with the risk of disability for work and premature retirement (5). Matching this, the proportion of the retired was larger among the males (35 percent) than among the females (22 percent).

Job mobility seemed to increase the risk of losing both health and the ability to work. The results corresponded with those found by Pavalko et al. (6). In their study the men who experienced a period during which they moved through a series of unrelated jobs had a higher risk of mortality. Here, job mobility was more common among the males than among the females. That difference might partly

be caused by the variation in the length of the work career. Also, the proportion of the retired increased as the number of the occupational branches increased.

The intact work careers were associated with good self-estimated health and good ability to work. This association was stronger among the females than among the males. A positive work career may also have other favourable effects. For example, Wilensky (8) has demonstrated, that men who spent at least a fifth of their working life in functionally-related, hierarchically-ordered jobs had stronger attachments to formal associations and the community compared with men, who had chaotic work histories. In the present study, job mobility was most uncommon among those who had advanced during their work career. It can be assumed that working in the same branch creates possibilities to advance in one's career. The positive or negative health effects associated with job mobility and progress of work career seemed to cumulate in the same subjects. The advancement of work career was more common among the males than among the females. It may be caused by the higher level of occupational education among the men and numerous absences from paid work among the women.

In the present study the results were based on a retrospective questionnaire and clinical examinations. The replies to the questionnaire seemed to be quite reliable in a general way. For example, the added length of the informed periods of work tasks corresponded to the length of work career calculated from the shifting-age into the working life and the age of a participant with an accuracy of 1-2 years. Bourbonnais et al. (1) also concluded in their study that the workers themselves can provide valid information and no difference was observed in the validity of information of recent and remote events. The missing cases (23 percent) may increase the selectivity slightly among the original study group, but they do not interfere seriously with the interpretation of the main findings. The replies of 728 people can be believed to give a sufficiently representative cross-section of experienced health and work careers among the aged urban population living in northern Finland.

In the present study, the study group, 55 years old people (n=728) living in the city of Oulu in northern Finland, represent the generation of the post-war reconstruction era. During the time after the war the quality of paid work has changed mainly from agricultural into industrial and further into service occupations and during recent years more and more into teleinformatics. The decrease in the physical loading of the work tasks and the improvement of the occupational education has probably influenced the work careers of the younger generations and the generalizations of these results to cover younger generations must be made with great caution.

There is evidence that work career and state of health have associations and in the future they should be studied in more detail. In this study, both an intact work career and advancement during the work career were associated with good health and good work ability. According to these results, regular positions and working on a permanent basis seem to be advantageous for health and the current trend to change regular positions into short-term work tasks should be discussed critically.

Summary

A lifelong work career has an influence on a worker's health, but only a few studies have been published about the relationship between the characteristics of the

work career and health. In the present study, associations between job mobility and progress of work career and health were studied. The data was obtained by a postal questionnaire and clinical examinations. The study group consisted of 728 (72 percent) aged urban persons (397 women and 331 men), who were born in 1935 and who lived in northern Finland. The majority of participants (70 percent) were employees. Of the participants 41 percent had worked mainly in physical work tasks, 29 percent in mixed work tasks and 30 percent in mental work tasks.

The duration of work career was on average 35 years. During their work career 37 percent of the women and 28 percent of the men had stayed in the same occupational branch and 8 percent of the women and 12 percent of the men had worked in at least four branches. Progress of work career had been favourable among 13 percent of the women and among 33 percent of the men. An intact work career including only few changes of occupational branches and advancement during work career were associated with good health and good work ability. Correspondingly, a work career including numerous changes of branches was associated with poor health and poor ability to work. The health effects of both indicators (job mobility and progress of work career), positive as well as negative, seemed to cumulate in the same subjects.

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Evaluation of policies and measures for older workers from the viewpoint of occupational health

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Introduction

The average life span for Japanese males and females was 68 and 73 years, respectively, in 1965, but by 1994, it was 77 and 83 (8). The birth rate has declined significantly over the last 30 years, and the total fertility rate (the aggregate total birth rate of women by age in a given year) has been on the decline. It has continued to record the lowest numbers, falling from 2.14 in 1973 to 1.50 in 1992 (9). The population aged 65 or over in Japan was 18 million in 1995, accounting for 15% of the total population. It is estimated to surpass 30 million by 2014, accounting for 24% of the total population. The rate of workers aged 60 or over was 13% of the total workers in 1995, and it is estimated to be 20% in 2010 (17).

Ninety-three percent of white-collar workers claim to be willing to continue to work past the age of 65 (14). Seventy-eight percent of those aged 60 or over believe that the retirement age should be 65 or over. Currently, 86% of all companies set their retirement age at 60 or over, but only 19% of companies have a retirement age of 65 or over (17). The assurance of jobs for older workers is an extremely important issue in satisfying the needs of workers and maintaining vitality in Japanese society in the face of the aging of the population.

A variety of measures to deal with this issue have been established in various sectors of society (17), but little research seems to have been conducted from the viewpoint of occupational health of workers with the objective of protecting and improving their physical, mental and social well-being. This study was carried out to evaluate current measures for older workers, and identify problems, and based on the findings, to propose measures to improve the health of the Japanese workforce.

Methods

The current measures for older workers in Japan were evaluated using the WHO recommendations to Member States regarding older workers as the criteria (22). Papers and research reports on the aging of the working population were collected through the use of a computer literature search. Four areas were examined: laws and legislation, activities of governmental organizations, activities of nongovernment organizations (NGOs), and activities of companies. Because the WHO recommendations are qualitative in nature, the evaluation conducted was also primarily qualitative.

Results

Recommendation 1: *National policies aimed at maintaining older workers in a socially and economically meaningful role should be adopted by governments and supported by appropriate legislation."*

The Law Concerning the Stabilization of Employment of Older Persons was enacted in 1971 (21). The purposes of this law were to promote the employment stability and welfare of older persons, and to contribute to the development of the economy and society in general. Comprehensive measures were designed to increase employment security for older persons by raising the retirement age, to promote the employment of older persons, and to secure work opportunities for those who retired upon reaching the retirement age. The law stipulated that, in cases in which the employer set the retirement age of workers, the employer should endeavor to ensure that the retirement age was not below 60. By1998, according to this law, employers must set retirement age at 60 or over. The Ministry of Labor decided to subsidize companies that employed a certain number of employees of at least 65 years of age.

Recommendation 2: *"Public policy should support social partners in the establishment of working conditions and occupational health services that will enable workers to realize a full and productive working life into their old age."*

The Ministry of Labor promoted older-worker employment measures through the promotion of continued employment and re-employment, and by offering supplementary or short-term jobs to those who were forced to leave their jobs upon reaching the retirement age (20).

The Association of Employment Development for Senior Citizens was a non-governmental organization established in 1978. It was affiliated with the Ministry of Labor, and supported financially by the Ministry. It was designated as an employment security center for senior citizens in 1986. The objectives of the association were to contribute to solving problems related to the employment of older persons, thereby enabling a smooth transition in the workplace for a society composed of an increasing proportion of older citizens (18). The activities of the Association included consultation and assistance in enterprises, education and training for employers and for those in charge of the promotion of senior-citizen employment, and for those working beyond retirement age. The Association has its headquarters in Tokyo and 47 prefectural centers throughout the country.

The Silver Human Resources Center was established in 1980. The objectives of the Center were to provide short-term jobs for retirees, and to help find new jobs for older workers (16). As of 1995, the numbers of centers and their members were 680 and 334,346, respectively, throughout the country.

Recommendation 3: *"In view of the increase in the ratio of retired people to those of working age, governments should consider incentives to encourage older workers to continue to work as long as their health permits."*

The pensionable age for Employees Pension Insurance is currently 60, but it will be 65 in 2,013 (15). This change in the pensionable age will encourage employees to continue to work until the age of 65.

Recommendation 4: *"Employers should be provided with specific and detailed guidelines so that they can adapt the work environment to suit the needs of older workers."*

The Association of Employment Development for Senior Citizens provided consultation and offered advice to employers concerning the continued employment of older workers (18). Lectures and training programs were provided to enable company executives to develop a greater understanding of the importance of employing older workers. The aim of these programs was to encourage employers to act independently and positively to overcome the problems that may arise in employing the elderly.

Recommendation 5: *"Employers, managers, supervisors, planners, and designers who make decisions regarding the work environment, work organization, and job design should be provided with training, education, and information concerning the need to adapt work and the work environment to the worker, and should be instructed on methods of putting these principles into practice."*

The Association of Employment Development for Senior Citizens provided training courses for those in charge of promoting the employment of older workers on how to achieve the best possible employment conditions for such a task (18).

Comfortable workplaces were defined, by the Ministry of Laborís guidelines, as those in which workers could engage in their work with the least possible physical and mental stress. The creation of comfortable workplaces was necessary for workers, as such workplaces would upgrade the quality of working life. The JISHA made efforts to disseminate these guidelines and established the Center for Promoting Comfortable Workplaces within JISHA in 1992 (1).

Recommendation 6: *"Experts in occupational health and safety, such as occupational physicians and nurses, industrial hygienists, ergonomists, psychologists, psychotherapists, and safety engineers, should be taught about aging and the workforce as part of their professional training at both the basic education, postgraduate, and continuing education levels."*

The Japan Society for Occupational Health furnished a syllabus for the systematic and basic training course for applicants to become certified occupational physicians (4). Middle-aged workers and labor, and age and physical strength were specified as topics in the syllabus.

The Japan Medical Association provided training courses for those who wanted to become occupational physicians or wanted to update their qualifications (13). Health care for aging workers was included in the basic and applied curriculum.

The Japan Industrial Safety and Health Association (JISHA) introduced the Total Health Promotion Plan (THP) in 1988, under the guidance of the Ministry of Labor (2). Occupational health personnel involved in THP included occupational physicians, health educators, dietitians, mental health advisors, and health care leaders or trainers. JISHA developed and provided training programs for those health professionals.

The occupational health training center, affiliated with the University of Occupational and Environmental Health (UOEH), was established in 1991. It included four departments: the department of general management, the department of

health management, the department of work management, and the department of working environments. Its main objective was to provide education and training for occupational physicians (5). The Institute of Industrial Ecological Sciences, affiliated with UOEH, provided a 3-months course in fundamental occupational health, continuing education in occupational health and an advanced course for specialists (6).

Recommendation 7: *"More research is necessary to determine both the strengths and needs of older workers."*

The Association of Employment Development for Senior Citizens conducted commissioned or joint research related to employment security, the assurance of appropriate working conditions, and the promotion of welfare for older persons (17). Topics of research included the improvement of personnel management to assure a more lively workplace, career development for middle-aged and older workers, and the creation of an appropriate working environment, and health maintenance measures for older workers.

The National Institute of Industrial Health (NIH) was established in 1976 to promote interdisciplinary research into the improvement of workers' health and the prevention of occupational disease (12). Older workers were one of the main research topics in the NIH. Physiological studies on the mental and physical characteristics of older workers were performed, and the improved adaptation of the workplaces to older workers with the aid of microelectronics in modern industrial society were the goals of the studies.

The UOEH was established by the Ministry of Labor in 1978 for the purpose of promoting occupational health and educating physicians and other occupational health personnel, as well as researchers who were to work in the area of occupational health. In 1986, the Institute of Industrial Ecological Sciences was established to conduct specialized researches in the field of occupational health. Research on older workers and their health were primarily conducted at the departments of ergonomics and health development (6).

The Japan Institute of Labor (JIL) was established in 1958. Japan was being dramatically transformed by many factors, such as changes in the international economic system, technological innovations, vocational structure, maturing labor-management relations, the aging population, and the advances of women in society. Under these circumstances, the JIL was forging ahead with comprehensive research and studies in an effort to solve a wide range of labor problems. Aging and work was one of the fields of research of the JIL (19).

Recommendation 8: *"In order to develop better tools for the study of age-specific health and employment issues, information should regularly be gathered on such occurrences as occupational injuries, sick leave and retirement due to disability."*

The Ministry of Labor mainly conducted various statistical surveys regarding aging and work, and the above information was gathered extensively (20). The Ministry of Health and Welfare was also in charge of statistical surveys (8,9).

The Association of Employment Development for Senior Citizens gathered a wide range of information and reference material concerning older workers with emphasis on the problems involved in employing older workers (17). Such information was readily available for those interested at the labor information center.

The JIL was working with the Ministry of Labor to establish the Labor Information Network Center (LINC) (19). The center would collect and catalog information on labor issues for easy access by anyone concerned. As a general network center of labor information, the LINC would establish database and personal computer communication networks, send labor information overseas via the Internet, build an integrated library of books, magazines, videodisks and other media, collect, process and provide statistical data, promote overall labor information and reference services, and provide lectures, symposia and other forms of interaction.

Recommendation 9: *"Periodic health examinations should be carried out for all workers aged 45 or older."*

The Industrial Safety and Health Law mandated that all employers provide annual health examinations for their workers (21). Items in the health examinations included height, weight , eyesight and hearing, chest X-ray examination, blood pressure, red blood cell counts, hemoglobin levels, liver function, total cholesterol, triglyceride levels, urinalysis, and electrocardiogram. Periodic health examinations were conducted at 86% of all the companies, but the percentages were 61% and 44% among companies with 30-49 employees and 10-29 employees, respectively (10) .

Health Insurance Societies provided comprehensive periodic health examinations for older workers as one of their preventive health programs (11). Examination items in the comprehensive health examinations included upper G-I series and abdominal ultrasonography, in addition to the examination items of the annual health examinations.

The Ministry of Health and Welfare introduced a health service system for the elderly in the community in 1983 (9). Health examinations, including cancer screening (stomach, uterus, lung, breast, and colon), were provided to people aged 40 or over in the community in addition to the basic health examination.

Recommendation 10: *"Employers and workers should be encouraged to support long-term workplace health promotion programs concerned with lifestyle, which are known to encourage the maintenance of health and vigor with increasing age."*

In 1988, the Ministry of Labor instituted a health promotion campaign called Total Health Promotion Plan (THP) to promote the physical and mental health of all workers (2). The THP program started with health checkups that included cardiopulmonary function tests such as vital capacity, electrocardiogram, and exercise function tests. Based on this fitness assessment, plans for exercise, diet, and daily activities were prescribed by occupational physicians. Guidance in exercise, diet, daily activities and stress management were provided by the previously mentioned health personnel. Subsidies were provided by the government for a workplace-implemented THP (2), but only 6% of companies implemented the THP by 1992 (10). Regarding health promotion programs conducted other than the THP, 44% of all workplaces implemented health promotion programs, but the percentage was 6% and 5% among companies with 30-49 employees and 10-29 employees, respectively.

Tablel 1. Activities of organizations whose main responsibilities are issues related to aging and work.

Name	Affiliated with	Established Year	Main Activities: Employ-ment	Volun-teer	Health	Seminar	Social Activities	Coun-seling
A	Labor	1973	o			o	o	o
B	Labor	1978	o				o	o
C	Labor	1982	o				o	o
D	Labor	1984		o		o	o	o
E	Health	1973			o			o
F	Health	1974		o	o	o		
G	Health	1987				o	o	
H	Health	1990		o			o	o
I	Health	1991			o	o		
J	Trade	1990				o		
K	Trade	1992				o		
L	Trade	1992				o		o
M	Economic	1988		o			o	
N	Economic	1992				o		o
O	Education	1983		o			o	
P	Foreign	1979		o				
Q	-	1983				o		

Labor: Ministry of Labor; Health: Ministry of Health & Welfare;
Trade: Ministry of International Trade and Industry; Economic: Economic Planning Agency;
Education: Ministry of Education; Foreign: Ministry of Foreign Affairs

Measures other than WHO recommendations

The Association of Employment Development for Senior Citizens provided seminars for those planning to leave their jobs after having reached the mandatory retirement age (17). The aim of these seminars was to provide the necessary information for older workers to adapt smoothly to the huge changes in life that inevitably accompanied retirement. A textbook developed by the Association was prepared for the seminars. It dealt with a wide range of topics, including post-retirement life, physical and mental health, health insurance policies, pension schemes, taxes, re-employment, and community life.

A public opinion poll conducted in 1991 showed that Japanese people placed greater value on mental enrichment than material possessions (14). Japanese people were said to have been uninterested in voluntary activities in the community, but research showed that the number of aged employees who wanted to participate in volunteer activities increased in recent years. Hundreds of NGOs throughout the country provided technical assistance including education and training for older workers who wanted to volunteer in community activities (3).

The Ministry of International Trade and Industry, the Ministry of Education, the Ministry of Foreign Affairs, and the Economic Planning Agency also showed an interest in our aging society, and established affiliated organizations to deal with this issue. (Table 1). Some municipalities provided financial and technical support for post-retirement farming by retirees who had worked in urban setting (7).

Discussion

National policies aimed at maintaining socially and economically meaningful roles for older workers have been suggested for adoption with support by legisla-

tion in Japan. Based on these policies, various sectors of society have provided various services for older workers and retired citizens. WHO recommendations for older workers seem to have been implemented to a fairly high degree in Japan.

Considering that 30% of companies had no intention to implement a retirement age of 61 or over (17), however, further effort is required. In particular, education and training for experts in the field of occupational health and safety regarding aging and health seems insufficient, and a great deal more of such education and training should be provided. Compared with the volume of research in the field of economics, law, psychology, and sociology, there has been little research in the field of occupational health and safety concerning aging and health. Considering that 25% of older workers feel that their health is not very good (10), more research should be conducted to promote their health.

WHO recommendations do not have concrete figures as a criteria (22), but the objective of their policies should be given quantitatively in a national level. A great deal of effort is required to set concrete standards for the promotion of the health of older workers.

Summary

WHO recommendations concerning policies and measures for older workers seem to have been implemented to a fairly high degree in Japan. Education and training for experts in the field of occupational health and safety, as well as research on the strengths and the needs of older workers, need to be conducted to a much greater extent. All possible efforts should be made to set concrete standards for the promotion of the health of older workers.

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Workers in the Nordic countries – working conditions in relation to age

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Introduction

The Nordic countries share several cultural, historical, political and organizational conditions. However, in 1990 substantial differences existed among the countries - such as the general level of unemployment. For many years the unemployment rate has been high in Denmark and low in Norway, Finland and Sweden. Unemployment rates for age groups younger than 25 have consistently been higher than for the other age groups. The unemployment rate for the elderly above 55 did not differ systematically from that for the middle aged people from 25-54 years (2).

Fear of unemployment is one of the indicators of uncertainty in the job situation. Further you can expect a negative correlation between uncertainty in job situation and health. Therefore it is obvious to focus on fear of unemployment.

These considerations give rise to the question if we can demonstrate similarities or differences within working conditions between the Nordic countries in 1990, especially if we focus on differences on fear of unemployment. Moreover, do the working conditions differ for elderly employees compared to other age groups?

Table 1. Workers (age: 19-59 years) in the Nordic countries. Mean of hours per week (cont.)

	Educational, male				Educational, female			
	Finland	Sweden	Norway	Denmark	Fin	Sw	Nor	Den
Working conditions N=		111	125	166		311	166	281
Hours per week*	•	39	41	39	•	34	35	33
Regular working hours	•	94	84	89	•	91	82	83
Fixed salary	•	97	98	98	•	97	100	95
Seniority in current occup.**	•	5	15	7	•	15	6	8
Fear of unemployment	•	11	15	27	•	5	23	30
Fear of transference	•	15	•	16	•	17	•	19

* The mean of hours per week for the occupational group. ** Proportion of employees at age from

Population and method

This study is based on four surveys conducted in the Nordic countries, Finland, Norway, Sweden and Denmark from 1989 to 1990. They included approximately 25,000 persons who participated in an interview concerning occupational health. All four surveys had a cross-sectional design and included employees from 19 to 59 years of age. The surveys had a core of similar questionnaires and homogeneous random sampling strategy in common (3). Four occupations were selected for further analyses. The criteria for selection were size (more than 100 participants in each group compounded according to country, occupation and gender), homogeneous jobs and occupations of relevance for the future. The selected occupations were 'educational work'(female: 758, male: 402), 'health and nursing work'(f: 1145), 'clerical and related work'(f: 1107) and 'metal machine work and building metal work'(m: 1164).

The working conditions were described by working hours (regular, irregular), working hours per week, payment (fixed or payment for results), fear of unemployment, fear of transference and seniority in current occupation. For each country and occupation the occurrence of working conditions was calculated for three age groups (19 - 34 years, 35 - 44 years, 45-59 years). Comparison between age groups within the occupation was performed by the Mantel-Haenzsel test for linear trend (a non parametric test (chi^2)).

Results

'Educational work' was characterized by normal day work, and the mean working hours was 35 - 36 hours per week. Reporting fear of unemployment was more frequent among Danish employees than among Swedish employees, Table 1.

'Health and nursing work' was characterized by many female workers, irregular hours and part-time jobs. However, Finns worked full-time. When ranking the reporting on fear of unemployment Finns and Swedes were low and Norwegians and Danes were high. The proportion of employees who reported fear of transference was high in the Danish group. Further, fear of transference occurred more often than fear of unemployment in The Swedish group and the Finnish group, Table 1.

'Clerical and related work' was characterized by many female workers, part-time jobs and low seniority in current job. The fear of unemployment was much higher in Denmark than in Finland and Sweden, Table 1.

and proportion of employees with working conditions in occupational groups (percent).

Health				Clerical				Metal			
Fin	Sw	Nor	Den	Fin	Sw	Nor	Den	Fin	Sw	Nor	Den
200	449	289	209	224	396		487	200	442	227	295
37	31	29	32	36	35	•	33	39	39	39	38
35	37	22	45	96	97	•	99	80	84	82	85
97	100	98	98	97	99	•	98	59	74	84	79
•	10	19	3	•	15	•	27	•	10	11	28
9	4	19	34	13	4	•	33	25	4	27	36
23	19	•	33	23	10	•	17	25	10	•	14

45 to 59 years with 0-4 years of seniority. • No data available.

'Metal machine work and building metal work' was characterized by male workers, and payment for results and full-time jobs was frequent. Within the Danish group low seniority in current job was frequent. Reporting on fear of unemployment was frequent in the Danish group, the Norwegian group and the Finnish group. However, it occurred seldom in the Swedish group. Reporting fear of transference was on the same level in the Swedish and the Danish groups and more frequent in the Norwegian group, Table 1.

As can be expected the different types of occupation had their own characteristic job profiles. For example, 'Health and nursing' differs from clerical work in many ways. On the other hand the job profile 'Health and nursing' was very similar for the different countries. This went for all occupations.

As expected a very strong correlation between the seniority in current occupation and age was observed for all 4 occupational groups, Table 2. However, the proportion among elderly employees (age 45-59 years) with low seniority (0-4 years) differed in the occupational groups and the countries, Table 1. Beyond this only few correlations between working conditions and age were found, Table 2. No association between age and the work conditions could be observed for the Finns in this study. For the other countries the youngest group in 'health and nursing work' reported working irregularly hours more often than the older groups. The youngest group in 'educational work' occupation more often complained about fear of unemployment or fear of transference than the older groups. In Sweden the youngest group within 'health and nursing work' and the youngest group within 'clerical and related work' reported fear of transference more often than in the older groups.

Discussion and conclusions

It is very striking that we have found more Nordic similarities than differences for the four occupations we have studied. However, fear of unemployment was more related to the general unemployment rate in the countries than to the occupations.

During the eighties the general attitude within the public debate was that the elderly employees had a higher risk of becoming unemployed than middle aged employees. However, the results concerning fear of unemployment presented in this study did not support this attitude. The figures presented on fear of unemploy-

Table 2. Workers (age: 19–59 years) in the Nordic countries. Correlation between age* (cont.)

	Educational, male				Educational, female			
Working conditions	Finland	Sweden	Norway	Denmark	Fin	Sw	Nor	Den
Hours per week	•	0	+	+	•	0	0	0
Regular working hours	•	0	0	0	•	0	0	0
Fixed salary	•	0	0	0	•	0	0	0
Seniority in current occupation	•	+++	+++	+++	•	+++	+++	+++
Fear of unemployment	•	0	—	—	•	0	0	0
Fear of transference	•	0	•	(—)	•	0	•	0

* Age is grouped into 19–34 years; 35–44 years; 45–59 years. • No data available.
The signs are summed up from the test performed for linear trend: 0 no correlation, — negative inage and the parameter observed. +/— p value =< 0.05; ++/—— p value =< 0.01;

ment in the different countries seemed to reflect the national levels of actual unemployment rates in 1990 (2). For the four selected occupations the fear of unemployment among the elderly employees was lower or equal to the fear of unemployment among the younger employees. This reflected that the risk of dismissal was lower among older employees than among the younger employees. A possible explanation was that low seniority was associated with a higher risk of dismissal (1).

However, drop out from the labour market might consist of several processes where one was to become unemployed and another was not to be able to return to the labour market. If the first process was rare, but the last process was frequent then it would still result in a selection out of the labour market for elderly workers. All Nordic countries had unemployment benefits which under certain minimum conditions were paid for a period. If an unemployment period lasted more than acceptable time for an elderly person, they were usually transferred to early retirement. Further, none of the Nordic countries had much to offer in terms of job assignments for the elderly above 55 years of age. Special labour market offers, like training and job creation, were almost entirely limited to persons below the age of 55 or even lower (2). This meant that if a person became unemployed at the age of 55 the probability of returning to the labour market was low. Instead the person might be transferred to an early retirement scheme.

The generally higher fear of transference observed in younger groups might reflect that the younger employees had a higher in-firm mobility (voluntary or forced) than the elderly employees. Higher seniority in the firm or the institution could imply that more employees had obtained better attachment to the work place. This association seemed to be strongest within ’educational work’. The differences in regularity of working hours between younger and elderly groups in ’health and nursing work’ also reflect an age-related mobility to jobs with better conditions (i.e. working regularly).

The tendency to few associations between working conditions and age can have many explanations. One reason might be that increased age led to job mobility, which generally placed the elderly employees in jobs with better conditions, e.g. normal day work or that the possibilities of planning the work themselves were sufficient to avoid or reduce unwanted working conditions. Methodologically it

and working conditions in occupational groups.

Health				Clerical				Metal			
Fin	Sw	Nor	Den	Fin	Sw	Nor	Den	Fin	Sw	Nor	Den
0	0	0	0	0	(—)	•	———	0	(+)	0	0
+	+++	(+)	++	0	0	•	0	0	+++	0	0
0	0	0	0	0	0	•	0	0	+	0	0
•	+++	+++	+++	•	+++	•	+++	•	+++	+++	+++
(—)	0	0	0	—	0	•	0	0	0	0	0
0	—	•	0	0	0	•	0	0	0	•	0

correlation between increase in age and parameter observed. + positive correlation between increase +++/——— p value =< 0.001.

could be a selection effect which led to elderly wage earners leaving the labour market. This effect would not be seen in a cross-sectional study which did not include those who had left the labour market. Further, the most homogeneous occupations were selected for the study of the Nordic similarities or differences of work conditions within occupations. Still the classification of occupations was rather crude, e.g. 'health and nursing' included all employees from nurse aids to doctors. 'Metal work' and 'clerical work' were fairly homogeneous, but 'educational work' ranges from work in kindergartens to teaching at university. Within the occupations certain groups might have a high probability of dropping out of labour market due to e.g. working irregular hours. These specific groups could be hidden in the mean for the occupation as a whole. These (and other possible) explanations did not exclude one another, and they probably appeared in various combinations. However, the analyses gave rise to the assumption that one needs to be careful not to exaggerate the importance of age in relation to work, but when it comes to special risk groups further follow-up studies need to be carried out.

Finally, during the nineties the unemployment rates have increased dramatically, except in Denmark. This makes it interesting to conduct a follow-up study.

Summary

The analyses were based on four coordinated cross-sectional studies conducted in Finland, Norway, Sweden and Denmark around 1990. Four occupational groups were selected for further study, educational work, health care work, clerical work and metal work. Within these groups working conditions were described by regularity of working hours, weekly working hours, mode of payment, fear of unemployment, fear of transference and seniority in current occupation. The aim was to detect similarities and differences between nations, occupational groups and age groups.

The occupational groups had their own characteristic job profiles (based on working conditions). Only seniority in current occupation and age correlated for all occupational groups and all countries. The fear of unemployment and the fear of transference were higher or at equal levels among the young ones compared to the elderly employees. Concerning the other indicators the correlation with age was weak.

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Firms and the older workforce: The case of Sweden in the 1990's

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Introduction

Until the early 1990's, when Sweden went into a deep economic crisis, the country had experienced a long period of full employment, with high employment rates for both men and women and a low level of unemployment. Until the early 1990's Sweden had expe-rienced little of the general trend towards early retirement among older workers. (1)

During the full employment period few specific measures were enacted to solve the dilemmas of the older workers, except a law that protected older workers from dismissal. The older workers were de facto protected by the generally positive employment situation.

Sweden developed policies to further the role of firms and employers in counteracting early exit from the labour market, e.g. by enforcing legal responsibility for firms to plan rehabilitation for workers with health problems. In the early 1990's the emphasis was to enforce (by legal rules) and to induce (by economic incentives) firms to keep their older workers, e.g. by reforming the work environment. (2)

An economic crisis hit Sweden in 1991 and was quite severe in 1992 and 1993. Quite a few firms went bankrupt and closed. Many firms reduced their personnel. Many firms reorganized their production. The rate of unemployment rose rapidly, esp. for the younger age groups. The unemployment rate for the 55-64 age groups also increased but more slowly from 1991 (cf. table 1).

Table 1. Unemployment among men aged 55-64. 1990-1995.

	Age						
	55-59	60	61	62	63	64	(16-64)
Year							
1990	1.1	1.3	2.2	1.1	0.7	1.4	1.5
1991	1.8	1.9	2.1	2.3	2.7	1.9	3.0
1992	3.1	5.6	2.5	3.5	4.4	3.3	5.7
1993	6.1	7.9	7.3	7.4	6.8	8.4	9.7
1994	7.0	7.9	8.7	9.4	9.0	12.4	9.1
1995	7.4	9.3	9.0	10.1	12.7	10.9	8.5

Source: Statistics Sweden: The Swedish Labour Force Surveys (AKU) 1990-1995.

Changes in the employment ratios of the older work force

During the first half of the 1990's a relatively large proportion of the older age-groups over 55 years lost their work, become unemployed or left the labour mar-

ket. The employment ratios for men and women in 1995, as well as the changes in the employment ratio 1991-1995 are shown in table 2. “Relative exit rate” is defined as the change in the employment ratio between 1991-95 as a percentage of the 1991 ratio.

Table 2. Employment ratios for men and women aged 50-65, 1991-1995.

	Men			Women		
	1995	**Change 1991-95**		**1995**	**Change 1991-95**	
		absolute change	*relative exit rate*		*absolute change*	*relativ exit rate*
Age-group						
50-54	85,5%	-6.4%	- 7,0	84.6%	-4.1%	- 4,6
55-59	76.2%	-9.8%	-10.4	73.0%	-5.4%	- 6,9
60-64	50,9%	-12.0%	-19.1	44.8%	-8,5%	- 15.9
60	65.0%	-9.2%	-12,4	61.6%	-5.3%	- 7,9
61	59.4%	-10.1%	-14,5	54.6%	-7.6%	-12,3
62	49.9%	-14.2%	-22,2	47.4%	-9.3%	-16.4
63	43.8%	-14.4%	-24,7	34.2%	-7.9%	-18.7
64	36.6%	-11.6%	-24,1	27.1%	-12.0%	-30,7

Source: Calculations based on the Swedish Labour Force Surveys (AKU) 1991-1995.

The relative exit rates in table 2 show that between 1991-1995 a fifth of all males in the age-group 60-64, and a fourth of all males in the agegroup 63-64 lost their job or left the labour market. Today less than 40% of all males work the last year before they reach the retirement age. However, in a comaparative perspective, the employment rates for older workers are still high in Sweden

How can the decreasing employment ratios among the older workers be explained?

(a) One possible explanation is that existing early exit options had become more available or more generous, attracting more older workers to leave the labour market.

The Swedish *part-time pension scheme* and the *disability pension scheme* had by the late 1980’s become rather well developed and generous. Many older workers used the part-time pension scheme and thereby created a path of gradual retirement. (3) Many older workers in economically weak regions left the labour market by getting a disability pension for lack of appropriate jobs in the region.

However, access to these exit routes progressively narrowed during the 1990’s. The part-time pension became less generous, and the possibility to get a disability pension through the labour market clause, i.e. if it was impossible to find a new job for older workers that were longterm unemployed, was closed in 1992. (2) Today only health reasons are accepted. Furthermore, no new exit route was created in the first half of the 1990’s.

We can add that there are still strong incentives in the public super-annuation ATP scheme, as well as in the occupational pension systems, for older workers to stay in employment as long as possible and even to increase their working weekly hours when they approach the retirement age. (1,2).

(b) The employment and dismissal policies of firms can be modified by public policies. The intention behind the legislation on work environment reform and on rehabilitation policies that were enacted in the early 1990’s was to get firms to

take a larger responsibility for employees that were in the risk zone of becoming marginalised or dismissed. In this vein a large and ambitious programme was built up. In the early 1990's large "Working Life Funds" were established. The aim of the Working Life Funds was to create a better work environment by extensively subsidizing investment, training and organisational changes in firms.

The effects of high unemployment rates on the Swedish public and the political system have been deep-going. The discussion as well as the policies are primarily directed towards groups or sections of society whose social integration are seen as crucial such as the younger age-groups and the immigrants and refugees.

At the same time the problems of the older workforce have become less important on the political agenda. There is a silence in major policy documents of the Swedish government with regard to older workforce and a corresponding lack of new policy initiatives that could enable this age-group to stay in their jobs, or to be re-employed, once they become unemployed.

Furthermore, some conservative and liberal forces came to regard policies that were enacted to protect the position of the older work-force as examples of rules and regulations that made it more difficult for young persons to enter the labour market.

The decisions taken in firms with regard to employment and dismissals would therefore seem to be less modified by public policy today than in the full employment period. Thus, decisions taken in firms came to have a larger direct impact on the situation of the older workforce.

(c) Another explanation for the rising early exit trends would be increasing exit pressures in firms. The rest of this paper will argue that the exit patterns for the older workforce in the 1990's can be linked to the organizational practices as well as the attitudes towards the older workforce within Swedish firms.

Strategies and attitudes towards the older work-force in 380 Swedish firms

A survey on the employment patterns and policies towards the older workforce between 1991 and 1993 in 380 Swedish Firms was carried out in 1994. (4) The survey was carried out through a stratified sample of firms where large firms are overrepresented. The survey was answered by the management of the firms, primarily the personnel manager. In the survey we got detailed information about the employment of different age-groups and categories of workers between 1991 and 1993,

About half of the firms had reduced the number of the lower grades of white collar employees as well as the manual workers, esp. the unskilled. (cf. table 3).

Table 3. Changes in the size of different categories of employees in 380 Swedish firms between 1991 and 1993.

Categories of employees	Increase (%)	No change (%)	Decrease (%)
Higher grades of white collars	17	59	25
Lower grades of white collars	11	41	49
Skilled workers	15	40	44
Unskilled/semiskilled	13	33	54

Source: FOP-Survey 1996.

We also asked the firms about how they perceived their age balance. (table 4).

Table 4. Views of Swedish firms on the age balance for different personnel categories and age-groups in 1994 in their own firm.

Age balance for personnel categories	Too few (%)	About right (%)	Too many (%)
Younger white collar employees	52	46	2
Younger manual workers	35	59	6
Middle-aged white Collar	9	59	16
Middle-aged workers	13	79	9
Older white collar	4	56	40
Older manual workers	6	64	29

Source: FOP-Survey 1996.

Most firms judged that they had a proper balance. However, many firms perceived that they had too few young white collar employees while having too many in the older category. The survey data also show that those firms that decreased their number of employees more often held the view that they had too many older workers/employees. This indicates an increasing exit pressure on the older workforce in firms that decrease their personnel.

The firms in the survey perceived that the older workforce had great problems to adapt to changes in the work organisation, as well as to the demands of new technology. Between a half and two thirds of the firms judged that their older workers had problems with regard to their level of training and their capacity to master new technology. Two thirds of firms thought that the older white collar groups had problems with the work tempo, while they thought this applied to three fourths of the older workers. A majority of firms also reported that their demands on the workforce in these matters had increased in the 1990's. (4)

There is thus a congruence between the pattern of change in the firms, the attitudes in firms towards the older workforce and the exit patterns among different categories of employees.

Employment effects of policies intended to reform work environment

The aim of the large Working Life funds, that started to operate in 1990, was to promote changes in the work organisation and to make the work environment better. The idea was that firms thereby could make room for employees in different ages and health status.

Evaluations of the programmes subsidized by these funds indicate that some firms developed new forms of organising their work processes. Some firms developed a flatter and more horizontal organisation of their work and some firms became more proactive in handling their work environment.

During the years 1991-93, 65% of the firms included in our survey had been supported by the Swedish Working Life Funds. In the survey we asked the firms (through their personnel manager) how the different aims of the Working Life funds had been met (table 5).

Table 5. The views of Swedish firms on the effects of Working Life Funds in their own firm.

Views of effects	Yes (%)	No (%)
(a) The Funds had contributed to a change in working conditions (work environment)	81	19
(b) The contribution from the Funds had made it possible to retain employees	28	72

Source: FOP-Survey 1996.

Most firms reported that the work environment goal had been reached while in a majority of the firms it had not been possible to retain those employees that they had intended to keep by changing the work conditions in the firm.

Exit pressures in firms and the perception of pension systems

In Sweden there has been a recurrent debate in the political arena about raising the retirement age from 65 to 67 years, i.e. a reversal of the decision taken in 1976. Firms were asked how they judged the possibility for different categories of their workforce to continue working in their job, if the retirement age was raised. (table 6).

Table 6. Will raising the pension age cause problems for the employees in your firm?

Personnel categories	No problems (%)	Some problems (%)	Large problems (%)
Higher grades of white collars	42	42	16
Lower grades of white collars	36	46	18
Skilled workers	14	41	44
Unskilled/semiskilled	12	41	47

Source: FOP-Survey 1996.

Raising the pension age, esp. for their blue collar workers, is seen as problematic by most firms. Seeing a raise in the retirement age as a problem, and even as a major problem, can be interpreted as an indicator of an exit pressure for the older age-groups.

The level of exit pressure in firms is further demonstrated by the frequent use firms have made of the occupational pension schemes in order to reduce their staff, in targeting the older workers for retirement. (4,5) 33% of the firms in the survey had used this technique, although they have had to pay substantial sums to the persons taking early retirement, by topping up the benefits paid from the occupational pensions schemes. (5)

Concluding Remarks

The combination of full employment and protection of the older workforce up till the early 1990's led to a rather high proportion of older workers in Swedish firms compared with the situation in many other European countries. High unemployment rates increased the exit pressure on the remaining older workforce.

This paper detailed the exit process of the older workforce between 1991-1995. Data from a survey on 380 Swedish firms were used to interpret the decrease in the employment rates of the older workforce as an effect of actions taken in Swedish firms and work places, in response to economic, organizational and technical dilemmas within these firms.

The pace of change and the momentum of rationalization in the Swedish economy since the late 1980's has been accompanied by a managerial ideology of concentrating on core operations and shedding of peripheral operations, comparable to the strategy of "lean and mean". (6) This is combined with the manpower-reducing effects of information technology, eradicating many routine jobs among the lower white collar grades as well as among blue collar workers. These are also the groups which within the firms in the survey are most exposed to exit pressure.

When firms have to decrease their staff, the older workforce will be targeted for several reasons.

(a) Many Swedish firms perceive that they have a problematic age balance in their staff.

(b) This is further underlined by the increased importance personnel managers in firms give to the qualifications and competence of the workforce, which are being seen as negatively associated with age.

(c) In firms there exist widely shared perceptions of older workers as being tired, worn-out and having a questionable competence.

The evaluations of the age balance dilemmas made by firms are filtered through the perceptions that firms and their managers have of the older workforce. (7) Thereby the managerial perceptions of age-related dilemmas channel the economic pressures and organizational changes in firms into age-specific employment and dismissal strategies. increasing the exit pressure on the older workforce.

Summary

Based on data from the Swedish labour force surveys and a survey of 380 Swedish firms made in 1994-95, this paper sets out to explain the rapidly declining employment rates among the 55-64 age group. It is shown that firms increased their demands on their labour force. Firms also saw their older workforce as increasingly having competence problems. Thus strong exit pressures within firms, in a bleak labour market situation, combined with less proactive social and labour market policies, led to a marked decline in the employment rates among the older workforce.

Notes

1. Wadensjö 1991.
2. Olofsson & Petersson 1994.
3. Olofsson 1993.
4. FOP-Survey 1996.
5. Petersson 1996, Olofsson 1996a.
6. Harrison 1994.
7. Olofsson 1996b.

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Patterns of occupational injury among older workers in Australia

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Introduction

A study of older workers was carried out in 1995, commissioned by the Consultative Committee on Ageing, New South Wales State Government, Australia (10). Older workers were defined as those aged 40+ years and of particular interest were men aged 55+ years, women and workers from a non-English speaking background (NESB). The research project addressed three issues: absenteeism, rates of occupational injury and the health status of older workers. The overall objective was to examine the attitudes of employers and employees towards older workers as well as the influence of stereotypes of older workers as more prone to absenteeism, occupational injury and health problems.

A major aim of the study was to investigate the patterns of occupational injury among older workers; this paper reports on that aspect of the research. A review of the literature and analyses of Australian workers' compensation statistics indicated that the injury and disease rates vary by age, gender, ethnicity and occupation with the incidence of fatalities from occupational disease increasing with age and the average time off work due to injury increasing with age for both men and women (12, 13).

Official workers' compensation statistics published by the WorkCover Authority of New South Wales (NSW) provide an overview of the extent and nature of occupational injury based upon the number of new cases in a twelve month period. These do not include all new cases, only those deemed to be of a severe nature, that is, resulting in death or permanent incapacity, or a temporary disability where five or more days were paid for total incapacity. These statistics do not necessarily provide data on the full extent of occupational injury, but they give an indication of the patterns occurring in the categories of age, gender, occupation, industry, type of injury, time lost and costs. Studies have shown that under-reporting of occupational injury, particularly musculo-skeletal and back conditions, is high among older workers and NESB workers (9, 6).

The 1991 National Health Survey (3) showed that proportionally more males than females reported illness or injury due to accidents, 16.3% for men compared to 11.8% for women. For both men and women, the highest proportion of people reporting accidents was in the middle aged groups; 21% of men were aged 55-64 years and 15.1% of women were aged 45-54 years. For those reporting that their accident occurred in the workplace, the 45-64 year age range had the highest rate.

Early studies reported a negative relationship between age and absence from work (5). However, more recent studies have suggested that the relationship is not

linear. Drago and Wooden (7) found that absence first declined until 45 years and then increased with age. This, they suggested, may be due to younger workers exhibiting little commitment to the job, while older workers experienced lengthy absences for health-related reasons. Allen (2) and Leigh (11) also reported a curvilinear effect. However, workers past retirement age (65 years) had low absence rates.

Method

Multiple research techniques were used to produce both qualitative and quantitative data. These included secondary data analysis of workers' compensation data from NSW, semi-structured individual interviews, focus groups and a mailed questionnaire. Three case study sites were used for the individual and group interviews: a local government area; hospitals (acute care and long-term care); and a pharmaceutical factory. Individual interviews with Human Resources Managers (HRMs) and Health and Safety Officers (HSOs) were undertaken to explore their attitudes towards older workers concerning work performance, occupational health and rehabilitation. Twelve focus group sessions were held with workers from the case study sites to explore the perceptions of older and younger workers towards issues of occupational health and injury experience.

Questionnaires (N=237) were mailed out to HRMs employed in local government areas and public hospitals and to fifty randomly selected pharmaceutical and food manufacturing companies within New South Wales. The response rate was 42.6%. The questionnaire requested demographic data on employees (age groups, gender, non-English speaking background) and probed the attitudes of HRMs towards older workers regarding employment practices, absenteeism due to illness or injury, work performance and personal attributes relevant to performance and productivity. The respondent organizations represented a total of 63,046 employees; the majority of respondents (75%) were large scale organizations with 100+ employees.

Results

Workers' compensation statistics: Analysis of the official 1993-1994 New South Wales' workers' compensation statistics (12) indicated that age was not a major factor in the number of workers' compensations claims made for workplace injuries. In the age groups of interest to the study (45+) only workers in the 55-59 years age group incurred injuries at a higher rate than their employment share, although workers in the 25-34 age range also incurred injuries at a higher rate than their employment share (Table 1). However, age was a factor in the number of claims made for occupational diseases. The 45+ age group made up 29% of the workforce yet accounted for 60% of fatalities, 65.5% of permanent disabilities, 38% of long-term temporary disabilities and 32% of short-term temporary disabilities associated with occupational diseases. This pattern can be explained by the slow onset nature of many occupational diseases; workers' compensation claims for disability are likely to be made in the middle-to-late stages of working life.

Gender differences were apparent in the workers' compensation data. Women (45+ years) experienced a greater proportion of permanent and temporary disabilities from workplace injuries than men. Men in the 45+ age group had a 31.2%

employment share and accounted for 24% of fatalities, 34.1% of permanent disability, 29.65% of temporary disability (>6 months) and 26.8% of temporary disability (<6 months). In comparison, women in the same age group had a 25.7% employment share; there were no fatalities but they experienced a much greater proportion of permanent disabilities (42%), temporary disability (>6 months) (42.6%) and temporary disability (<6 months) (30.7%) than their employment share. However, the incidence rate and outcomes (fatal, permanent and temporary disability) for occupational diseases were higher for men in all categories and age groups.

Table 1. Workplace injuries, NSW, 1993-1994: persons**.**

	Fatal	Permanent disability	Temporary disability		Total cases	Total cases	As % of employed persons in NSW
Age	n	n	n	n	n	%	(a)
			>6 Months	**<6 Months**			
15-19	3	208	85	1.839	2.135	5.4	7.0
20-24	8	467	250	4,350	5,075	12.9	12.8
25-34	18	1,290	627	8,668	10.603	26.9	25.7
35-44	17	1,308	678	7,991	9,994	25.4	25.6
45-54	11	1,210	577	6,018	7,816	19.9	19.8
55-59	2	388	172	1,835	2,397	6.1	5.2
60-64	1	207	81	785	1,074	2.7	2.4
65+	0	27	12	141	180	0.	51.5
Total	*60*	*5,119*	*2,485*	*31,643*	*39,307*	*100.0*	*100.0*

Source:WorkCover Authority of New South Wales. (1994:44).
(a) New South Wales workforce, August 1994 (4).

Workers' compensation data published in NSW do not include information on the ethnic background of workers, therefore it was not possible to provide a detailed analysis. Studies which addressed issues associated with NESB work-related injury found that NESB workers were over-represented in high-risk industries such as construction, manufacturing and health services and concentrated in the high-risk occupations of labourers/related workers and tradespersons. Additional factors such as language and lack of information about safe work practices may exacerbate the injury experience of NESB workers (6, 1, 8). The Australian Bureau of Statistics (ABS) Disability and Handicap Survey, 1988 (cited in 1, p156) showed that 42.5% of primary disabling conditions experienced by NESB persons resulted from injuries at work. For Australian-born workers it was 24.7% and 37.9% for those from other English-speaking countries.

The amount of time off work for workplace injuries varied between men and women and between age groups (Table 2). The average time lost for men was 7.1 weeks and for women, 8.7 weeks. For men, the average amount of time lost showed a slight increase with age while women in the 40+ age groups experienced higher than average number of weeks off work. A similar pattern based on age and gender was evident for occupational disease (Table 2). The average time lost for men was 10.7 weeks (median 4.6 weeks) and for women, 12.4 weeks (median 4.4 weeks). Men in the age bracket 35-59 years had an above average amount of

time off work, compared to workers under 30 years, peaking at 15.2 weeks for the 50-54 age group. However, men in the 60+ years group had less than the average period of time off work. For women, two peak periods of time off work occurred in the 40-44 and 60-64 years age groups: these groups took approximately five weeks longer than the average to return to work. Women aged 50-54 and 65+ years had below average periods off work due to occupational disease.

Table 2. Time lost through workplace injury (weeks): temporary disability of less than three years' duration.

	Workplace Injury		Occupational Disease	
Age Group	Males	Females	Males	Females
Under 30	< 6.8	< 7.5	< 8.4	< 8.7
30-34	7.1	8.9	10.8	14.3
35-39	7.3	9.1	12.2	14.8
40-44	7.6	10.1	11.3	16.7
45-49	7.6	10.4	11.5	12.3
50-54	7.4	11.2	15.2	11.1
55-59	7.5	11.2	11.7	13.2
60-64	8.8	10.0	9.8	17.8
65+	8.8	10.7	9.1	4.4

Source: WorkCover Authority of New South Wales. (1994:44).

Questionnaire: The questionnaire completed by HRMs contained two questions of specific interest to this paper: perceptions of patterns of absenteeism, sickness and injury and rates of work-related injury by age, occupation and gender. The responses of HRMs in relation to perceptions of absenteeism, sickness and injury of older male and female workers and NESB workers indicate that, in light of their own experience, there is very little perceived difference between the health status, injury profile and absence patterns of these categories of workers. Only 5.4% of HRMs agreed that NESB workers had more injuries than other workers, with 44.6% neutral and 50% rejecting the statement. There was an overwhelming disagreement that older workers (65.5%) and women (68.1%) had higher rates of absenteeism, sickness or injury than younger workers or male worker respectively.

Analysis of the responses on rates of work-related injury produced limited results due to the incompleteness of the data. Comparison of the age groups and rates of injury by gender were inconclusive. The patterns evident in a comparison of occupational categories and gender showed marked differences between men and women. For men, the highest numbers of work-related injury were in the categories labourers/related workers, plant and machine operators/drivers and tradespersons. This pattern was similar to that found in official workers' compensation statistics. The pattern for women was inverted with clerks, professionals and managers/administrators having the highest numbers. This pattern differed from official workers' compensation statistics: in NSW the occupations with the highest incidence were labourers/related workers (32.6), tradepersons (18.4) and para-professionals (16.0) (12, p40). A possible explanation for the difference with the women was that respondents may have included certain occupations under a different classification. For example, in the Australian Standard Classification of Occupations' categories nurses are included under para-professionals whereas the respondents may have included them under the professional category. It could also

be that those who did respond were representative of male-dominated occupations and industries where women were more likely to be employed in clerical and administrative positions.

Interview data: Content analysis of the interview and focus group data indicated that managers and focus group participants generally did not consider that occupational injury was age-related. Some of the managers did express concern about the risk-taking behaviour of younger male workers and its potential for injury. Both managers and workers agreed that injury was more likely to occur among workers doing manual work or work with a significant physical component. Managers agreed that successful rehabilitation depended on the worker's age and general level of fitness and the nature of injury.

Younger male workers in the focus groups were more open in discussing work-related injury and rehabilitation than older male workers; it is possible that the older men were reluctant to acknowledge injuries or the longer periods of rehabilitation for fear of being seen as 'too old' or less fit than younger workers. Managers believed that younger workers were more likely to respond quicker and achieve a more complete rehabilitation following an occupational injury. Older workers had equal access to occupational rehabilitation but the managers expressed the opinion that, due to accumulated insult and reduced incentive when approaching retirement, not all benefited equally. Younger workers also felt that they 'carried' older workers, especially in areas of heavy physical work (manual work, nursing). During rehabilitation and return to work on light duties, additional strain was placed on co-workers leading to significant pressure being felt by older, injured workers and those with chronic conditions to permanently leave the workplace.

Conclusions

This study of patterns of occupational injury in the local government, hospital and pharmaceutical sectors was part of a larger study investigating absenteeism, occupational injury and health status among older workers. Official workers' compensation statistics indicated that older workers did not have higher rates of workplace injury than their employment share. However, they did experience higher rates of occupational disease and longer than average time off work due to injury and disease. Gender differences indicated that women over 45 experienced a greater proportion of permanent and temporary disabilities from workplace injuries than men in the same age range. With occupational diseases, the incidence rate and outcomes (fatal, permanent and temporary) were greater for men in all categories and age groups.

The patterns that emerged from questionnaire responses on rates of workplace injury showed similarities and differences with official workers' compensation data. However, the questionnaire responses should be treated with caution. The respondents were asked to indicate the occupations (by age and gender) in which the highest rate of work-related injury occurred. While there were patterns evident in the responses, the incompleteness of the data does not allow for direct comparison with official statistics and makes findings inconclusive. Respondents reported numbers of injuries in each category and several either filled in multiple boxes or left them blank. Possible explanations for this are that the relevant data were not

readily available, occupational categories were not relevant to some industries (e.g., salespeople in local government and hospitals), HRMs were not the appropriate personnel to provide such data or it was just too difficult and time-consuming to collect the data (e.g., from insurers). Comments from respondents were enlightening but problematic:

No statistics available.
No work related injuries so far!
Zero work related injury or illness in the past twelve months.
Our system is not set up to provide information in this manner.
We have not experienced any work related injury or illness for years.

Such comments indicate that there may be a lack of awareness both of the legislative policies and required reporting procedures and also of the extent and nature of work related injuries in some workplaces. There was more awareness and concern about rates of work-related injury evident in the case study interviews from both managers and workers.

In the interviews occupational injury was generally not seen as age-related; however successful rehabilitation was linked to age. Individual characteristics and underlying standards of health were identified as important determinants of successful rehabilitation and younger workers were perceived to be more likely to respond quickly and achieve a more complete rehabilitation. Should workers not respond to rehabilitation within the time frame specified in the relevant legislation, their employment can be terminated. If managers are correct in their view that older workers' rehabilitation is slower, termination due to unsuccessful rehabilitation is more likely to affect older workers. Further research is required in the area of age and rehabilitation outcomes.

Summary

A study of older workers (40+ years) in New South Wales, Australia addressed issues of absenteeism, rates of occupational injury and health status. Official workers' compensation data for New South Wales indicate that age was not a factor in the number of compensation claims made for workplace injuries, but it was a factor in claims for occupational diseases. Gender differences were apparent in that women experienced a greater proportion of permanent and temporary disabilities from workplace injuries, but rates of occupational diseases were higher for men. Interviews and focus groups in three case study sites (hospitals, local government and pharmaceutical company) indicated that work injury was not considered to be age-related, but succesful rehabilitation was linked to the age of the injured worker. A survey of Human Resources Managers (HRMs) in related industries revealed that HRMs did not perceive older workers as having higher rates of absenteeism, occupational injury or sickness than younger workers or female workers as having higher rates than male workers.

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Role of experience in a cold rolling mill quality control

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Introduction

The French steel industry faced the 1974 crisis by restructuring itself through early retirement measures, among others (1977-1991). The corollary was that no young people were hired. Between 1986 and 1990, staff was cut in the company at an annual rate of 9% pratically always by way of early retirements. The crisis was overcome and the measures stopped. At present the wage-earner population in this sector is concentrated in the 35 to 50 years age group, and the number of workers in their 50's bound to rise rapidly. Since 1991, cuts in staff have slowed (the present rate is approximately 2,5% per year). Moreover the system of retirement at 50 has ended and it is most unlikely to reappear in our contry's present social and economic context, and because the company was recently privatisated.

Furthermore the aims this industry has set in terms of quality are increasingly ambitious. It is implementing a strategy for labour qualification and establishing the basis for a skill-enhancing organisation and a qualifying training to build "the steel industry for year 2000".

What are the conditions for these two strategies to be compatible with the extension of an aging population in the context of constant technological change?

Central to the uncertain outcome is the following question: in view of the differences in age, generations and trajectories, technical and organisational systems, how can one "efficiently" build on experience and professional skills (in order to set up strategies, to use efficient know-how)? Indeed experience may increase efficiency, offer means of compensation, broaden and enrich decision criteria, and allow to circumvent certain difficulties. But, it will only be possible if technical means are designed and work is organised in such a way as to develop, use and invest this experience throughout the entire professional career.

Method

The study is conducted at an iron and steel works in the Pickling - (cold) Rolling mill unit on a production line. 4 teams (25 operators per team) are working on this line in alternating schedules (5 am/1 pm, 1 pm/9 pm, 9 pm/5am); the wage earner population is concentrated in the 35 to 50 years age group. During the first stage, we investigated the different assignments on workstations along the line by interviewing the operators on the line, the foremen and the unit manager, and observing the overall work activity at the various stations. We thus gathered historical data on technical, organisational and human resources management aspects, and

attempted to detect constraints potentially selective with regard to age. During the second stage, which we mainly refer in this paper, we concentrate more specifically on observing the operating modes of several steel-workers with different ages and seniority in the on-the-line control task (testing the quality of spools rolled out of the mill). For each of them, we gathered the following information : the incidents occured, the communications (oral and gestual), postures, movings, how tasks are distributed in a group between ”young” and ”old”, their differents operations, etc. We didn’t use some video, because it was particularly difficult to choose an acceptable place to observe, so we took some note, and made ”continually”, as soon as possible, exploratory interviews.

The control involves quality checks and many constraints: heavy time pressure, pace constraints, contradictory constraints between quality and quantity, etc. This task is achieved in alternating schedules, following very strict procedures of Quality Assurance, established to homogenise job practices and meet customer demands, whereas the process development requires quick decisions.

Results

The observation of operators at work, (8 operators with ages ranging from 28 to 47, all experts, and 3 young operators in their training period) has shown that they do not only carry out controls in compliance with procedures (stipulated by Quality Assurance) but also regulate, by managing drifts, preventing them, anticipating defects, etc. This is all the more the case for senior (and older) operators. Due to their professional experience, their background, their knowledge of the tool and its evolution, they develop strategies to regulate and anticipate, and also coordinate with the following steps along the line and also negociate with the Metallurgy Quality department. This way the senior workers are particularly mindful of the product’s quality and the production system’s overall reliability .

In that context, we can note how and to what extent senior workers gather different data all along the workstation, on various media and in different ways, all the more diversified when operators are experienced. The consistency of the ”story of production” is driven by concerns that possible drifts may emerge in the process parameters, but can also be attributed to the diagnoses and prognoses (elaborated over the years) on the product and/or the state of the tools. Therefore, the alarm and regulation functions are ”performed”, particularly by the senior operators (who consider them to be essential). Besides they try to anticipate and take preventive action to avoid incidents and emergency situations. These emergency situations are particularly jeopardizing for senior workers who find it more difficult than the young ones to ”dash into emergencies”. This allows us to understand how experience can also be a ”health” preserving factor.

We are going to give an example derived from our observations which illustrates how the older operators, thanks their experience, gather information over time in order to make system reliable, follow drifting parameters, but also train their younger fellow-workers and keep on learning whenever there is a chance to.

In this example, as soon as the operator starts on his job at 1. p.m., he is concerned with quality: there is something wrong in the rolling-mill’s lubrication, causing a defect that is unacceptable when the quality demands of clients increase, which is the case here.

The operator is following the drifting parameter (lubrication) on the steel coils rolled previously: his diagnosis is confirmed by the Metallurgy Quality man (MQ man) who guarantees the quality on the site. This person is in charge of performing audits and also helps the teams in terms of quality.

In Table 1, the first column indicates the code of production cycles, the second column, the time, and the third column specifies how the operator is going to gather information and handle the parameter causing concern during the different stages. One extra point: a production cycle is a unit we determined after interwiewing operators: as each coil is generally validated by computer at the end of the control process, we considered a cycle was limited by two computer validations. A cycle can therefore comprise the processing of several coils all validated together.

Our close scrutiny observations start when a coil is divided into 3 pieces.

Table 1. Strategies used by a senior worker to follow a drifting parameter : role of experience.

Cycles	Time	Strategies
1	2.49. pm	Long and thorough control of steel strip: • Applies stone on the surface to detect potential defects • Uses shadows and light to ”read the relief” • Gathers tactile information *First diagnosis*
	2.53. pm	Discussions to inform about the drift: ”There are still slight slag lines frame 5”.
2	3.03. pm	Discussions revealing that the operator wants the MQ man to check ”The controller is here which is lucky; an analysis is required because there is a 5 T piece of scrap.”
	3.05. pm	Thorough checking of coil: visual, tactile controls, scrutinising from all angles with the MQ.
	3.09. pm	Gathering information on the rolling mill. That completes the static control. *Fine-tuned diagnosis*
	3.10. pm	Training the young worker in this aspect. Confronting diagnosis with MQ man
	3.11. pm	Discussion over quality and production issues: • anticipating consequences • weighting qualitative against quantitative aspects
	3.12. pm	Information rolling technician Negociation
3		Negociation
	3.13. pm	Thorough control: wiping off the strip with the cloth to better detect its defects.
	3.15. pm	Gathers information on the rolling mill, in this way he is establishing links, he is learning, and he is enriching and confirming diagnosis.
4	3.33. pm	Collection of visual & tactile information on the roll ”causing” the defect, during the interruption phase. Exchanging points of view and information with a younger roller.

Cycle 1:

- The operator carries out a particularly thorough and long control: 3 minutes are devoted to this single phase which is more than what entire cycles may take in this process. During this control, the operator is going to implement strategies in order to fine-tune and secure his diagnosis on the drift in the parameter he is concerned with.

The strategies are the following:

- slide a stone over the surface of the steel to detect potential defects. Naturally, how and where the stone is applied is important ;
- bend by the uncoiled strip to play with light and shadow effects of lighting (which brings out the relief elements indicating an aggravation of the defect we are interested in, that is the slag lines) ;
- touch the coil.

- Conversations follow between people present in the control room to share the information gathered during the control and on the drift in the process.

Cycle 2:

for the next coil the MQ person is present ; he is concerned with the quality (slag lines, cutting of the 3 coils, overpickling, ...).

According to the operators, in the case of overpickling, like here, the strip is coarse and rough; the surface control doesn't give the same information, the reading of the strips becomes more complex.

- We note that even if the operator already knows that the coils in question will not be statisfactory for production, he is going to examine them thoroughly to fine-tune his quality diagnosis, in relation to potentially driftings with regard to the characteristics of pickling. To do so he is going to use the MQ's expertise.
- This older worker does a thorough control on the coil which once again consists in gathering and exchanging a whole series of information:

- by examining the uncoiled strip on the control stand provided to that effect,
- by touching it (which gives information on its roughness, relief, cleanliness, homogeneity of lubrication),
- by cooperating with the Metallurgy Quality man and cross-scrutinising it, from different angles,
- by collecting information on frame 5, when it is rolled out at the end of the line (which allows a better detection of the continuous defects, in particular the slag lines and roll frames affected).

- After all this information is collected on the rolling mill it will be exchanged with the MQ man, and the diagnosis resulting from the close scrutiny of the strip, on this cycle and also on previous cycles, will be confronted.
- The discussion continues after a marking operation. The MQ man says: "How much remains to be done?" This question is an attempt to assess production implications and may suggest a possible compromise. On-the line controller answers: "A whole bunch, about 20. We must go and see E -the technician- right away."

He assesses the situation and acts by going to fetch the technician.

Cycle 3:

- Shortly before the next coil to be controlled, there is another discussion-negociation over the diagnosis with the roller (technician) and finally an explanation on the decision is given.
- After another control with thorough examining (operators wipes off with a cloth to collect data on the cleanliness, and therefore on lubrication and so, on slag lines); the explanation given is that: ”There still remains slags even after wiping it off with the cloth, whereas in some cases they disappear”.
- Here, information is given on the situation, which serves two purposes: on one hand, to train the young operator, on the other to validate/confront the diagnosis checking with other people (former head station). In this way, he obtains information on the corrective action to be taken (changing the back-up roll) and also negociates.
- During the interruption he is going to inquire on the rolling mill to confirm his diagnosis and to get additional information, link up data, learn some more.

Cycle 4, the story continues…

In the next part of the observations, even if the parameter is not the prevailing one, the operator explains during the interview how he constructs a case study out of this whole episode, grasping new elements never encountered before nor linked together. This is how experience is wowen on the loom of daily problems that are never identical.

In the accounts given, we focus all along on the functional communication of ”the on line” controllers (their objectives, their wealth of details, the resource networks they offer in terms of action and expertise involved) as they give indications on their experience and how it was developed. These accounts provide an insight as to ”metafunctional activities”, particularly when it comes to the collective solving of incidents, as well as the consolidation and transmission of skills within a work group. In the example we referred to, the operator was able to recall one by one, in, his exploratory interview, the different element that led him to establish new links between the parameters and the tactile, visual and also auditive indications. This was done by way of exchanging information, discussing with other people in the team, over an incident occuring everyday but whose determining factors are not always known.

Perspectives for reflection and action

The bases of our reflection aim at highlighting the room for manoeuvre that the work situation leaves, has left and will leave for the elaboration and use of experience. It is indeed still possible for on the line controlers to do so in the present situation: a tight quality assurance which nonetheless provides for anticipation and action, reduced staff but sufficient to allow for a distribution of tasks, a technical system permitting anticipation, alternative means of action, and reinvestment of previous knowledge and knowhow, to build upon it. However other options may well question this fragile and perfectible balance. We must therefore start reflecting if we really want to talk in terms of enhancing organisation and qualifying training, and relevantly engage in designing means of work required in the context of a deeply changing environment.

Summary

The aim of this study is to understand in view of the differences in age, generations and trajectories, technical and organisational systems, how can one ”efficiently” build on experience and professional skills (in order to set up strategies, to use efficient know-how)? Indeed experience may increase efficiency, offer means of compensation, broaden and enrich decision criteria, and allow to circumvent certain difficulties. But, it will only be possible if technical means are designed and work is organised in such a way as to develop, use and invest this experience throughout the entire professional career.

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Gradual retirement in the OECD countries – main trends and the French experience

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Introduction

Over the last twenty years end-of-career management has essentially taken the form of shortening occupational life and, especially in industry and construction, of exclusion of older workers. While a continuous increase in life expectancy and good health (1) and a steady extension of schooling for the young have been observed, employment has been entered into later and quitted earlier and, as a consequence, occupational life has shrunk considerably. In some countries such as the Netherlands and France, less than 60% of the active male population aged 55-59 and less than 20% of the 60-64 age-group are now at work, and these rates are only slightly higher in Germany and in the UK.

Towards a new consensus?

Indeed, restructuring and modernisation of the means of production, above all in industrial firms, have made possible substantial reduction in the size of the labour force while maintaining, and in most cases increasing even, production levels. Faced with the appearance on the labour market of an army of new-comers benefitting from constantly improved levels of training, enterprise, together with the State and the Unions, has promoted a consensus which has given priority in employment to younger workers to the detriment of employees at end of career. Increasingly early retirement packages have thus been made available on financial terms which, thanks to State aid more often than not in the form of unemployment insurance (e.g. France, Germany) or disability insurance (e.g. Holland), have as a rule been very generous. In some countries where State intervention has been less forthcoming (e.g. UK, USA, Canada), it is frequently the pension funds themselves that have contributed to making early retirement financially viable on admittedly less favourable terms, while a not insignificant proportion of workers have had to rely on social assistance.

More recently, however, the greying of the work force, prospects regarding the future financing of retirement and recognition by the State and enterprise of the high cost of early retirement have forced policy-makers to take a second look at what is happening. Indeed, a new consensus (2) is beginning to emerge about deferring the effective age of retirement and about the need for a new design of end of career and of the transition from full career into full retirement. This non-explicit consensus is supported by all partners.

The State is concerned to reduce the cost of retirement. As early as 1983, the USA passed a law providing for a future rise in the official retirement age from 65 to 67. Most countries have followed suit by increasing either the pension age

(Germany, Japan, Italy, the UK, Austria) or the number of contribution years to social security (France) or both.

Enterprise, for its part, concerned to improve the age management of the work force, is slowly becoming wise to the fact that jettisoning older employees is sometimes to incur an irreparable loss of skills and corporate expertise. It is seen as no more than a short-term solution to the problem of an aging work force. In the UK for example, some employers are beginning to articulate a 'business case' for employing older workers. This consists of five main components:
Return on investment, Preventing skill shortages, Maximising recruitment potential, Responding to demographic change, Promoting diversity (Walker Alan, 1996).

Trade unions are also becoming aware that the needs of the employee in the service economy are different from those of the worker in manufacturing, and that, with entrenched aging of the work force, continuing training and adjusted work conditions are also issues to be addressed. As for older workers themselves, surveys show that they often desire some kind of transition between a full-time career and full retirement.

The solution which many countries are beginning to adopt is to encourage 'gradual retirement' also known as phased, partial or part-time retirement. This provides a transition period between a full-time career and complete rest.

The worker, instead of working full time one day and fully retiring the next, can reduce work hours according to graduated and agreed schedules while drawing part-time pay and in some cases some form of partial pension. Many formulae for workload downsizing exist and the transition periods during which this occurs can run for anything from one to ten years. Approximately five years is the transition period most commonly encountered in the OECD countries. Several EU Member States passed legislation facilitating gradual retirement (Denmark, France, Germany, Luxembourg, Spain and Italy) while the three new Members (Sweden, Finland and Austria) had already done so. Public policies to stem early retirement have been launched in most countries, but, where not securely articulated into company policies, they have not necessarily produced the expected results. Moreover, in France, Germany, Austria, Finland and Denmark, present government policy is to exert pressure in order to reverse the trend towards early retirement, and gradual retirement is being used as a replacement for full early retirement.

It should be understood that gradual retirement can be used to reduce working life as well as to extend it. In Sweden, where the retirement age has long been relatively late at 65 years, gradual retirement was originally designed to facilitate a shortening of working life. However, most countries want to use it as a kind of part-time early retirement in place of full early retirement. It is, in fact, my contention that gradual retirement constitutes a flexible extension of work life. Often, at present, a bridge between the official and the effective retirement age, it is, I believe, destined to become the standard mode for extension of working life beyond any notional or reference retirement age.

Comparative research on gradual retirement in seven OECD countries

In 1994 and 1995 Lei Delsen (University of Nijmegen, Holland) and myself were involved in surveys of gradual retirement undertaken by experts in seven OECD countries with the support of the European Commission (2). The countries sur-

veyed were Sweden, France, Germany, the UK, Holland, Japan and the USA. We focussed on company as well as on public policies, and identified examples of best practice. The survey findings enabled us to define four main approaches:

- The Swedish (Nordic) approach: Almost one half of workers between 60 and 65 are in gradual retirement on generous financial and professional terms. Availability of part-time jobs, a good partnership between government and employers, and the high replacement rate of partial pensions have ensured success for two decades. However, reforms to the pension system were introduced in June 1994 and will make gradual (partial) retirement less attractive financially. Finland and Denmark are now developing gradual retirement models on similar lines.
- The Japanese approach: A large number of workers continue to work on after the pension age of 60 (3), frequently up to 65 if not later, mostly part-time, often in a subsidiary firm of their previous employer. The financial and professional conditions they are offered are not as generous as previously, but their income from this work is additional to the pension which for many is still too low. Moreover, Japanese workers value the social ”inclusion” that this type of employment after pension age confers. A government-led global policy and strong state incentives encourage enterprise to extend working life in a land whose life expectancy in good health is one of the highest in the world.
- The continental approach: This is exemplified by France, the Netherlands and Germany. Public policies to encourage flexibility and phasing have been launched recently, and there are the beginnings of a trend away from early retirement.

In Germany (4), recent legislation of 1992 on gradual retirement has had only a limited impact due to labour-market difficulties arising from reunification and perhaps to the lack of sufficiently strong and flexible incentives. However, since February 1996, there has been a general ”pension compromise” which basically means: a stop to early retirement and the substitution of part-time work for older employees instead of early retirement. The main features of this compromise are:

- From 1997 onwards, the age limit for early retirement, which is currently 60, will be raised in annual steps to 61 (end of 1997), 62 (end of 1998) and 63 (end of 1999). While it will still be possible to retire up to three years early, this will relate to a higher normal retirement age (63 in 1999) and with pension reductions of (as actuarially calculated) 3.6 percent per year of early retirement. For retirement three years ahead of the normal age, this will mean a permanent pension loss of almost 11%.
- With immediate effect, it will be possible for people on reaching the age of 55 to change to part-time work - provided, of course, that appropriate jobs are available, there being no statutory requirement on firms to offer such jobs. By way of initial assessment, experts see precisely the absence of such statutory obligation as the crucial shortcoming in the new scheme. As a material incentive to employees, it is planned to top up the reduction in income due to part-time work from unemployment insurance funds for a limited period of five years (from 1996 to 2001). The top-up payment means that, for 50 percent working time, employees will receive around 70 percent of their last net full-time pay.

In Holland, collective agreements have recently been concluded (the Philips Agreement in Spring 1996 is an example) and there is a growing trend away from early towards gradual retirement. A major obstacle to any real progress, however, is that fact that pension funds often remain final-salary based. Other EU Member states such as Austria, Finland and Denmark have recently launched similar policies.

- The anglo-saxon approach where no strong public policies exist, but where flexibility is common. In the USA downsizing has meant that many employees in their fifties have been losing their jobs. Between the ages of 55 and, hopefully (but all too rarely in practice), 65 when they can draw a pension, they have had to take 'bridge jobs' which are often part-time, frequently pay less, and almost always provide lower levels of protection than previous employment. And yet, there are several well-known organisations, such as the Travelers, where working conditions for 'retirees' are excellent. Other examples can be found in banks, insurance companies, town administrations, colleges and supermarkets but the conditions in such cases are not always representative of average conditions. In the UK the idea of gradual retirement has yet to gain the same prominence as in continental Europe. This is partly because early retirement, while significant, has not been so pronounced as in countries such as France and the Netherlands. The other discouragement has been the nature of pensions themselves. Clearly, final salary schemes make it necessary to maximise salaries during the last 10 years. Moreover, Inland Revenue rules effectively prevent people from drawing part of their pension while working part-time. However, this may soon be changed. Research conducted by the two authors (5) of the chapter on the UK shows that a majority of employers are in favour of some sort of anti-age discrimination legislation since they feel that the current active persuasion policy has not been as effective as was hoped.

The example of gradual retirement in France

One of the best examples of a country using gradual retirement to combat early retirement is France. Since 1987, and increasingly since 1993, there have been a number of laws and measures taken to reverse what had become, over 20 years, a massive swing towards early retirement.

First, early retirement has been made more difficult by increasing its cost and the age at which it becomes possible; in particular, a 1993 law pushed up the cost of the public insurance scheme which pays pensions to early retirees, leaving many firms unable to afford its cost. At the same time financial incentives are being provided for gradual retirement. The government adds a further 25% to the half salaries of workers on half time, provided the firm fills the vacated time with new employees. The government has also supported continuing training of employees aged 45 and over and exempts companies from paying social costs, such as pension and health insurance costs, for workers between 50 and 60; this is a huge incentive, since the social costs of employment are very high in France.

Part-time work is promoted mainly through a 1993 law which provided tax incentives for employing part-timers and gave them the same legal rights as full-timers.

Finally the pension reform in 1993 kept the retirement age at 60 but required 40 contribution years instead of 37.5 to qualify for a full pension.

Between 1993 and 95 many contracts were concluded between the social partners (enterprise, the government and trade unions) to keep employees in the firm until the legal retirement age but to offer them several alternatives for reducing work hours. However, it is not always easy to convince workers who have been used to the idea of leaving early of the virtues of a flexible extension of working life. By the end of 1995, over 50,000 workers were benefiting from gradual retirement, and another 25,000 entered such a scheme in 1996. Full early retirement appears now increasingly confined to exceptional firms or regions. Examples of firms having adopted GR schemes are: in the manufacturing sector, Rhône-Poulenc, Aérospatiale, Total, Framatome, Hewlett-Packard; in services, Crédit Agricole, UAP, AXA, many hospital and care institutions, many catering companies. I will refer briefly to four examples of firms I visited in Spring 1995 for our survey.

- Rhône-Poulenc: Part-time early retirement has been growing rapidly since 1987 with positive results. Early in 1995 around 1,000 workers had chosen gradual retirement - of which 70% were qualified and unqualified blue-collar workers and 10/15% professional workers. Between 2,000 and 2'500 workers have been concerned in the 3 years from 1994 to 1996. The scheme is voluntary and, on the whole, has proved more popular with manual workers than professionals. Workers are over 55 and benefit from this measure during the 3 years before full retirement. Work flexibility depends on the job to be done. With the possibility of annualising work time, there is a new trend to work 80% of the time the 1st year, 50% the 2nd year and 20% the 3rd year. Positive effects have been rejuvenation of the age-pyramid and of human resources and greater flexibility in work patterns, and of course the opportunities for workers and management afforded by a real transition from work to retirement.
- In 1993 the Crédit Agricole, a very large bank, concluded with the government an interesting GR agreement which breaks new ground in the banking sector. The bank in implementing the agreement has a threefold purpose: to rejuvenate the age-pyramid, stagger exits into retirement and promote part-time work. In 1994/95 more than 600 employees entered the scheme enabling the bank to take on more than 300 new recruits, many of them new apprentices or job-seekers. One of the more interesting features of this scheme they call the 'contract for progress' is that it creates a positive link between GR on the one hand and training on the other through the active role of partial retirees in training new recruits.
- UAP (Union des Assurances de Paris): In 1994 this company negotiated a very interesting contract to cover gradual retirement during the five years before full retirement (which occurs between 60 and 65). Employees of all categories can work half-time for a year with the work load being spread over the year for a salary of 60%, retaining all rights in the firm and social benefits paid as if full-time. Moreover the UAP has launched a four-day week for qualified mature employees and professional workers with a view to creating new jobs for qualified younger people seeking employment. The new contract also includes a new work-year based on the academic year. The philosophy here is to share employment in a new way since it is believed that further growth will not create enough jobs to reduce significantly the rate of unemployment.

- The insurance company AXA releases its workers aged 55 and over (with the requisite number of contribution years and having worked at AXA for fifteen years at least), from regular work and calls on them when they are needed. The idea is to offer this voluntary scheme to employees during the last three or four years before they are entitled to full pension. The employees receive 65% of their salary, and remain members of the staff. They retain all their welfare benefits, and do not have the right to take on another job. The company has the option to call them back when the need arises: a sudden increase in the work load, replacement of staff on leave, expertise in a specific area, training or supervision of a new recruit. The employee then works in the same or similar job as before and receives 100% of his salary in proportion to the time he spends back in the company.

Conclusions

Even if to say so may seem self-evident, it is nevertheless crucial that the whole issue of gradual retirement be viewed in the context of the current and far-reaching changes occuring in the work environment.

The rigid, linear, three-phase life cycle - youth and training, adult life and full-time employment, and withdrawal from the work-place into full retirement - that has predominated throughout the period of mature industrial society is today, in the service economy, gradually being replaced by a cycle which is less certain, less predictable and of necessity more creative. This new cycle is characterised, among other things, by more flexible work patterns, more training throughout professional life, periods of unemployment and sabbatical leave, and more active retirement. Gradual retirement is in this sense an inevitable but important outcome of some of these life-cycle changes and should be approached as such.

Workers retiring over the last twenty years had usually begun at an early age what proved a long and arduous working life. They have been part of a long pattern of economic growth and, while largely benefitting from exceptional material conditions, they have often had little or no time to devote to activities outside the workplace. For them, retirement comes as a well earned rest, a golden period with time to enjoy the leisure a good pension makes possible. And yet many surveys have aleady revealed that overnight or 'couperet' retirement has proved a difficult experience for many retirees who have had no time to adjust before entering it. If only for this reason, a fair proportion of workers wish to continue to enjoy the mental alertness and social inclusion that contact with the workplace provides.

People retiring in 2000 and beyond will, for the most part, have enjoyed much longer periods of education and training. Their working life will almost certainly have been interrupted by bouts of unemployment and by part-time employment. Most of them will have experienced much more flexible work patterns than their parents' generation. Since their youth, this generation will have had two or three different careers (Gaullier, 1992). When these workers, the baby-boomers, are questioned about their wishes with regard to retirement, many - particularly if they are qualified - would wish to keep a foot in the occupational door for some years after the legal retirement age. A majority of them, however, would wish to alter their work rythm and view part-time work as part of a gradual withdrawal from full-time employment (Sheppard in Delsen and Reday-Mulvey, 1996).

Because in most OECD countries for twenty years now there has existed a very strong consensus about incresingly early withdrawal from the work force, it would seem that, if later and more gradual retirement is to reverse the trend of that consensus, public policy will have to play a key part. Experience in Sweden, Japan, and more recently in France - as our description above has shown in some detail - appears to confirm this. However, as recent events in France have also shown, even with overall legislation and good incentives for companies and employees this new trend is by no means a forgone conclusion. For, while it appears to be gaining ground in most OECD countries, a conflict of interest between companies and public authorities still persists. The outcome of very recent (1996) legislation in Germany, for example, should prove revealing in this respect.

If we leave aside Japan and Sweden which until recently have had a tradition of working late in life and a late age of retirement, in Europe it is those countries where people in their late fifties and early sixties have had low participation rates in the labour market that are now trying to reverse the trend - France, the Netherlands, Germany, Finland and Austria. In these latter countries the next few years will be crucial for the success of gradual retirement.

When we compare OECD countries, at least the seven selected, some aspects of end-of-career management appear especially important. One is continuing training until end of career. In Sweden the extent of training is impressive and there seems to be very little discrimination towards older workers. For example, in 1994, 36% of workers aged 55-64 took part in training over the last 6 months while the average figure for workers overall was 38% (6). In France, especially in bigger companies, the same policy is to be found. In 1992, workers aged 45 and above represented 24% of all workers and 21% of trainees in firms of more than 10 employees (7).

Another crucial aspect appears to be company pension conditions. It is obvious that final-pay pension schemes, such as exist in the UK, the Netherlands and the USA, do not promote gradual retirement. In France and several Nordic countries, however, it was found that average-pay schemes are dominant.

Finally, such countries and companies as have developed flexible work conditions or well-protected part-time work have already fulfilled one essential precondition for introducing gradual retirement schemes successfully. In this respect, the Nordic countries and the Netherlands have already had long experience. Countries traditionally not open to part-time work, such as France, have had to provide legal provision for the equal treatment of part-time and full-time workers. The Netherlands also passed such legislation in 1996. Germany and France are both attempting to use gradual retirement to make part-time work more widely accepted among qualified workers.

In conclusion, gradual retirement seems to stand at the crossroad of two important issues:

- the need to extend working life for very sound reasons which have to do with the financing of pensions and the proper management of HR and skills; and
- the need to develop well-protected and regular part-time work not only as a transition from full employment to full retirement, but also as a bridge towards a socially proper division of ”full” employment whose redefinition is now long over-due (Giarini Orio, 1996).

Summary

After twenty years of early retirement in most OECD Countries, there is an emerging consensus to reverse this trend, raise the effective retirement age and reorganise end of career. This paper first describes the main trends of gradual retirement in the seven selected countries according to four different approaches: the Nordic approach (based on the Swedish experience), the Japanese, the Continental (Germany, France and the Netherlands) and the Anglo-Saxon (USA and UK). Secondly, this paper describes recent French experience of gradual retirement and provides some examples of best practice in industry and services. Finally, it shows that gradual retirement is part of a new approach of the life cycle and stresses the need to integrate company policies into public policies in promoting gradual retirement.

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Footnotes

*The International Association for the Study of Insurance Economics (called the ”Geneva Association”) is a small non-profit centre financed by insurance companies to promote research in insurance economics including social security and welfare policy, and to organise seminars and publish material in these areas. In 1987, an international research programme on Work and Retirement (called the ”Four Pillars”) was launched and has since resulted in a number of publications especially on the flexible extension of working life. G. Reday-Mulvey coordinates this programme and edits twice yearly a Research Bulletin entitled ”The Four Pillars” which is free of charge for researchers. The address is: The Geneva Association, 18 chemin Rieu, 1208 Geneva, Switzerland. Tel: +41 22 347 09 38. Fax: +41 22 41-22-347 2078.

The work load during waste collection and meat cutting among workers in different age groups

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Introduction

Physical work capacity decreases with age. As a consequence, the relative work load, defined as the absolute work load in percentage of the maximal work capacity, increases with age if the demand at work is unchanged. We have investigated this problem focusing on the cardiovascular load in different age groups in two different work types. One group was waste collectors who performed dynamic work with a high energy demand, and the other group was meat cutters who performed repetitive, monotonous arm work in a standing posture (1) and with a lower energy demand compared to the waste collectors. Our hypothesis was that the relative work load will increase with age since the external work demand is not decreasing in parallel with the decrease in work capacity. Since the local load on the arm muscles is very different during the two kinds of work, the second aim of the study was to compare the changes in the maximal handgrip muscle force with ageing in the two groups.

Methods

Job demands

Eightythree waste collectors and 37 meat cutters were followed during at least one whole working day. The waste collectors were working in teams of two or three workers. Containers with 2 or 4 wheels, waste bins as well as bags, were used for waste collection. After a defined amount of work had been performed, the workers were allowed to go home. The meat cutters were working at piecework deboning either ham, shoulders, or belly pork. An active working period was defined for both groups as the whole working day subtracted breaks longer than 5 min. For the waste collectors, the periods with driving the collection vehicle were also subtracted.

Relative work load

The mean heart rate (HR) during the active working period was taken as a measure of physical work demand and was measured continuously during the working day with the Polar system-Sports tester and recorded every 15 sec. The relative HR (HR%) was taken as a measure of the relative work load, i.e. the relation between physical work demand and physical work capacity. This HR% was calculated as $(HR_{work} - HR_{rest})/(HR_{max} - HR_{rest}) \cdot 100$, where HR_{rest} was set at 60 beats•min^{-1} and HR_{max} at (220 - age(years)) beats•min^{-1}. Further, the period with a HR% above 40% was calculated. The variation in work intensity was expressed as the HR value exceeded during 90% ($P_{0.1}$), 50% ($P_{0.5}$) and 10% ($P_{0.9}$) of the active

working period. The difference between $P_{0.1}$ and $P_{0.9}$ was taken as a measure of the variation in the cardiovascular load.

Maximal handgrip force

The maximal isometric handgrip force for 38 waste collectors and 48 meat cutters was measured before work using the mechanical Jamar dynamometer. The best of three trials was used as the maximal value. None of the workers had arm or hand symptoms on the testing day.

The level of significance was $p < 0.05$. T-test for non paired samples was used for comparisons between groups. The results are given as mean ± SD.

Results

The mean age in the group of meat cutters was 34 (range 19-54) years. The total working time was 8 hours with an active working period of approx. 6 hours. In the group of waste collectors, the mean age was 36 (range 21-58) years. The total working time was approx. 5 hours and the active working period with waste collection was approx. 3.5 hours.

Relative work load

Meat cutters

The mean HR during the active working period was 103 (±14) beats•min^{-1} among the meat cutters, and the HR% was 35 (±10)%. No correlation between age and HR or HR% was found. By dividing the group of meat cutters in those below and those above 40 years it was found that HR% was highest in the older group, 40% (±10) compared to 34% (±10) in the younger group, but the difference was not significant (p=0.09).

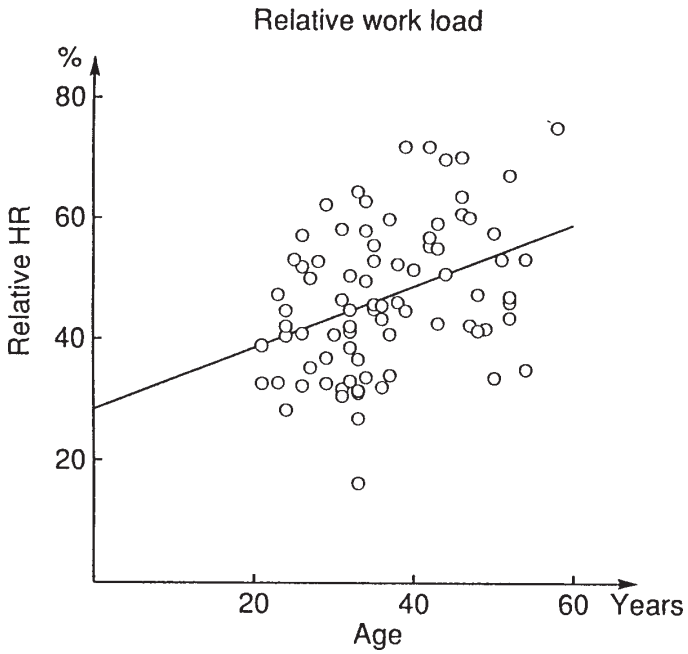

Figure 1. Relationship between relative HR, HR% and age in the whole group of waste collectors (n=83).

Waste collectors

The mean HR and HR% was significantly higher in the waste collector group compared with the meat cutter group. A positive correlation was found between age and HR% (Y = 28.361+ 0.508X, p< 0.01, R=0.39) (figure 1). The HR% was significantly higher in the group above 40 years compared with the age group below 40 years (table 1). The duration of the active working period was the same in the age groups below and above 40 years, but the time spent with a HR% above 40% was significantly higher in the group above 40 years.

Table 1. Mean HR, HR% and $P_{0.1}$, $P_{0.5}$, and $P_{0.9}$ during the active working period for the waste collectors are given as mean±SD. The %time with HR% above 40% is given as median value and ranges.

	Whole group (n=83)		< 40 years (n=56)		≥40 years (n=27)	
	HR beats•min^{-1}	HR %	HR beats•min^{-1}	HR %	HR beats•min^{-1}	HR %
Mean	117±15	47±12	115±15	43±11	121±13	54±11*
P 0.1	101±15	34±13	100±16	32±12	103±14	38±12*
P 0.5	117±15	47±13	117±16	45±12	118±14	52±12*
P 0.9	132±15	59±13	132±16	56±16	132±14	64±12*
Active work period, min	209±46		213±49		200±41	
% time above 40%	65 (1-100)		56 (1-100)		83 (14-100)*	

* significantly higher value in the group ≥ 40 years.

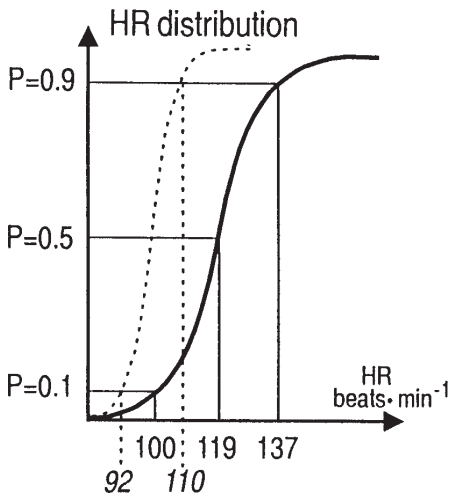

Figure 2. The HR distribution curve for one representative meat cutter (broken line and numbers in italics) and for the whole group of waste collectors (full drawn line).

The waste collector work had a high degree of variation compared with the meat cutting work as illustrated on figure 2. The variation in the waste collection work in the two different age groups is illustrated on figure 3. It was found that the absolute HR distribution curve was nearly identical for the two age groups, so the difference between the $P_{0.1}$ and the $P_{0.9}$ HR values was not different in the two age groups. The distribution curves for relative HR load, HR%, for the two age groups are shown on the right part of the figure (figure 3) and it is seen that the curve for the older workers is shifted to the right.

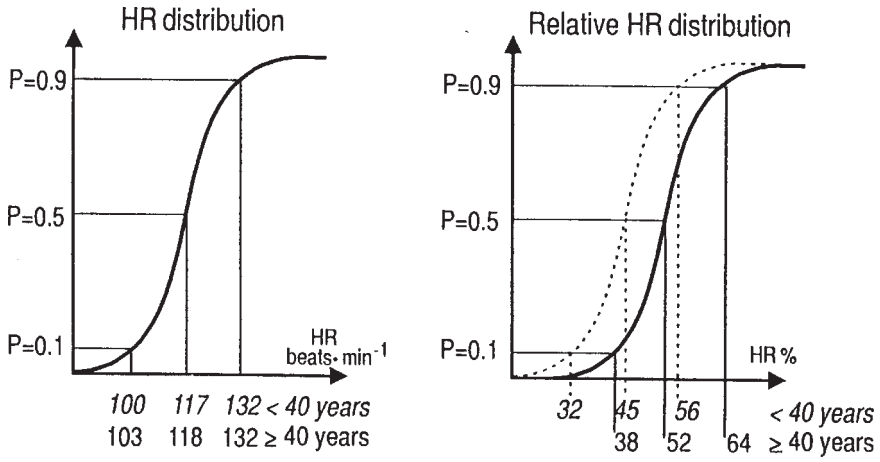

Figure 3. The HR (left) and HR% (right) distribution curves for the two groups of waste collectors. The values at the x-axis are results from the two different age groups.
Broken line and italics numbers: age group < 40 year.
Full drawn line: age group ≥ 40 year.

Waste collectors

The maximal handgrip force of the waste collectors was 594 (±75) N, which was significantly higher compared to the meat cutters and to an age matched control group consisting of a random sample of the Danish male population (n=198)(550 (±106) N). No correlation was found between age and handgrip force.

Meat cutters

For the meat cutters the maximal handgrip force was 518 (±78) N, which was significantly lower compared to the control group and the waste collectors. A negative correlation was found between age and maximal force (figure 4).

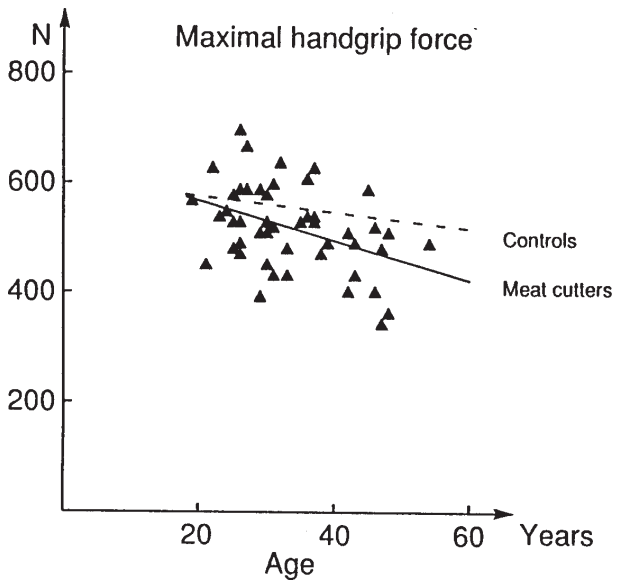

Figure 4. Relationship between handgrip force and age in the meat cutter group (full drawn line). All the individual values (triangles) are results from the meat cutter group.
Broken line: Regression line for the control group (no individual values).

In figure 4 the regression line for the control group is added, and it was found that the difference between the meat cutters and the control group increased with age. The meat cutters above 40 years (n=12) had a significantly lower force, 461 (±73) N, compared to the group below 40 years (n=36), 538 (±70) N. In the group above 40 years, the force was significantly lower than for the waste collectors and for the controls. For the group below 40 years, no difference was found between the meat cutters and the controls. Age and seniority was highly correlated in the meat cutter group.

Discussion

In this study it was found that the absolute HR was not related to age during the two different types of work, which indicates that the physical work demand is not decreasing with increasing age. Among the waste collectors, the relative work load increased significantly with age and the relative work load was significantly higher in the age group above 40 years of age than in the age group below. These findings are in contrast to results from a study on Dutch waste collectors (2). They found an unchanged relative work load with age and explained it by a decrease in collection rate with age. The explanation for the different findings in the two countries may be that the work organization among waste collectors in Denmark and Holland is different. In Denmark, the waste collectors work in teams of 2-3 workers and they are allowed to go home when a defined amount of work is performed. Therefore, the consequence could be that the youngest worker with the highest work capacity is setting the speed. When the older workers are not able to follow the speed, they have to leave the team and change to time wage payed work.

The National Institute of Occupational Safety and Health in USA, NIOSH, (3) has recommended limits for the energetic load of 30%, 40%, and 50% for lifting tasks lasting 8, 2 and 1 hour, respectively, without breaks. If these values are used for the HR%, the 40% value should be used as a limit for the waste collectors since they are typically working approx. 2 hours without a break. Compared to these limits it is clear that the older workers have a far too high relative load, 54%, and the 40% was exceeded in 83 % of the working period. The relative load in the younger group, 43%, is however close to the recommended limit.

Among the meat cutters, the relative work load was lower, 35%, than in the waste collector group and not significantly higher in the oldest age group. An explanation for this finding could be that the older meat cutters are working with a higher net efficiency. Furthermore, at this low HR level, the HR is influenced by other factors than energy demand.

The load during work is not only dependent on the mean intensity but also on the variation in the work intensity. The waste collector work had a high degree of variation compared with the meat cutting work since the HR distribution curve for the meat cutter was steeper than the curve for the waste collectors. In the waste collection work the absolute working HR from the two age groups nearly falls on the same distribution curve, indicating that the variation in the waste collection work is independent of age. This finding is in accordance with the finding that the absolute workload is the same in the two groups. These results illustrate that no consideration of age is taken in the work organisation and therefore workers in different age groups are performing the same amount of work independent of the decrease in work capacity with age. This means, however, that the distribution

curve for the relative HR load, HR%, for the older workers is placed at a very high level and the $P_{0.5}$ for the older age group is only a little below the $P_{0.9}$ for the younger group. This implies that the HR% exceeded in half of the active working period for the older worker is only exceeded in 10% of the working period for the younger worker.

In this study, the HR and the HR% level is taken as a measure of the cardiovascular load. Since the maximal HR is not measured, the calculation of HR% is subjected to some uncertainty for the individual worker and is only valid on a group level. Further, the relative HR level may not be the same as the relative aerobic load, since the relation between HR and oxygen consumption is dependent on the type of muscular work. During meat cutting, the work is mostly static contractions with the arms giving a higher HR at a given oxygen consumption compared to waste collection, where the work is dominated by dynamic work with the legs.

The maximal handgrip force was only found to be lower in the old meat cutter group compared to the control group. Since the seniority increases with age, this low force among older meat cutters could be a result of the exposure during work. During meat cutting, the muscles in the hand and forearm are producing high forces when holding the knife in the hand all the time and when cutting through the meat. Further, the work is performed with a high degree of repetitiveness. So, among the meat cutters, the normal decrease in maximal muscle force found with ageing is accentuated by the work performed. If the work demand is unchanged during the working life, the consequence of this may be a vicious circle, since the decrease in the maximal muscle force results in an increase in the relative local load on the muscles, which results in a further decrease in the maximal muscle force, and so on.

Conclusion

The relative work load increases with age among waste collectors. The work demand should be reduced in the older age group so the decrease in capacity with age is followed by a decrease in work demand. The work organisation should be changed in a way that the older workers are working at a lower pace, e.g. by driving the car more frequently during the working day and/or by collecting less waste. Among meat cutters, the decrease in handgrip force normally found with ageing is accentuated by the work done.

Summary

The relative load during a whole working day was investigated during waste collection (n=83) and meat cutting (n=37) in different age groups. No correlation between age and HR or HR% was found among the meat cutters. The mean HR and HR% was significantly higher in the waste collector group, 117 beats•min^{-1} and 47%, and in this group a positive correlation was found between age and HR%. The waste collector work had, independent of age, a high degree of variation compared with the meat cutting work, but the older workers above 40 years had a far too high relative work load, 54%, compared to recommended limits. The conclusion is that the work demand has to be reduced in the older age group. Further, the maximal hand grip force was measured and the waste collectors (n=38) had a significantly higher force, 594 (±75) N, compared to the meat cutters

(n=48), 518 (±78) N. Only for the meat cutters a negative correlation between age and maximal force was found and the difference between the meat cutters and a control group increased with age. The conclusion is that the meat cutting work results in a faster decrease in the arm muscle force with age.

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Acknowledgement

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Work ability among Chinese ageing workers

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Introduction

Like other developed countries, China is facing on greying of the population. In the recent half century, the mean life expectancy in China has doubled (from 35 years to more than 70 years). This, combined with a fall in fertility, has brought huge demographic changes in characteristics of the population. Data from a survey on the Chinese aged population (10) showed that by 2000, the population of the aged over 60 years old will be 132 million, accounting for 11%. By 2050, the number of the aged will amount to 373 million, or 26% of the total population.

The increase in elderly workforce caused by population ageing is particularly marked in China. The issues related to ageing, work and work capacity are becoming more and more critical. There is only very limited information available in China about ageing and work. The aim of the present study was to acquire baseline information about the work capacity of Chinese ageing workers and to test empirically the applicability of the occupational health instrument called Work Ability Index (WAI) (11) in China.

Methods

The subjects were 657 male and 379 female workers representing physical, mental and mixed physical and mental work content groups (Table 1). The classification of work content groups used in this study were based on job analysis made by the German AET method in the Chinese field (4)(8). The mean age was 48.1 (SD 4.6) years for the men and 46.5 (SD 4.2) years for the women. The age range for all subjects was 40-60 years.

Table 1. Subjects by gender and work group.

Work content	Male	Female	All
Physical	192	91	283
Mixed physical and mental	152	69	221
Mental	313	219	532
All	657	379	1036

Work ability was measured with the WAI developed by the Finnish Institute of Occupational Health. The WAI includes seven items (Table 2). After pre-test of 200 Chinese workers, some background questions, like marriage status and educational background, were modified because of cultural differences between Finland and China. All the seven items in the WAI kept the same contents and scales as the Finnish ones. The index is expressed as a numeric value ranging from 7 to 49. In this study, values from 7 to 27 were classified as poor, 28-36 as moderate, 37-43 as good, and 44-49 as excellent work ability.

Table 2. Items and scales of WAI questionnaire.

Item	Description	Scale	Explanation
W1	Subjective estimation of present work ability compared with the lifetime best	1-10	1 = very poor 10 = very good
W2	Subjective work ability in relation both to physical and to mental demands of the work	2-10	2 = very poor 10 = very good
W3	Number of diagnosed diseases	1-7	1 =5 or more diseases 2 = 4 diseases 3 = 3 diseases 4 = 2 diseases 5 = 1 disease 7 = no disease
W4	Subjective estimation of work impairment due to disease	1-6	1 = fully impaired 6 = no impairment
W5	Sickness absence during past year	1-5	1 =100 days or more 2 = 25-99 days 3 = 10-24 days 4 = 1-9 days 5 = 0 day
W6	Own prognosis of work ability after two years	1,4,7	1= not able to work 4 = not sure 7 = fairly sure
W7	Psychological resources (enjoying daily tasks, activity and life spirit, optimistic about the future)	1-4	1 = very poor 2 = very good

Statistical analysis of the questionnaire data, based on the percentage and frequency distributions, was mostly descriptive. The differences between the various groups were tested with the analysis of variance or chi-square test. The effects of age and work content on work ability were studied by the two-way analysis of variance.

Results

Work ability index of men and women by age

The average score of the WAI declined from 37.5 to 35.7 throughout the age range 40-60 years. The decline was similar for both men and women (Table 3).

Comparing the group of 40 years old and the group of 60 years old, the percentages of average WAI decrease were 7.1% for men and 7.5% for women. The WAI of all women was higher than that of all men (37.6±5.8 and 36.3±6.5, P<0.05).

Table 3. WAI in age and gender groups (M±SD).

Age	Men	Women	All
40-49	37.1±6.5	38.1±5.8*	37.5±6.
50-59	35.7±6.3	36.2±6.1*	35.7±6.

* compared with men, P<0.01

Work ability index of men and women by age and work

The WAI values differed significantly (P<0.001) in the three job content groups: 34.6±6.8 for physical, 36.1±6.4 for mixed physical and mental, and 38.2±5.5 for mental work (Table 4). Physical workers were younger than mental workers, but the work ability score of physical workers was lower than that of mental workers.

Table 4. Mean Age and WAI in work content groups.

Work	N	Age*	WAI*
Physical	283	46.0±4.4	34.6±6.8
Mixed work	221	46.2±5.0	36.1±6.4
Mental	532	48.4±5.2	38.2±5.5

* one way ANOVA, P<0.0001

For males, the physical work groups had lower work ability and the mental groups had higher work ability score in most age groups. For females, there were no differences among age groups and among different work content groups (Table 5).

Table 5. WAI scores by age and work content (M ± SD).

Age/Work	40-44	45-49	50-54	55-60	Total
*Male**					
Physical	34.8±7.	32.3±6	34.4±5.	31.2±6.	33.6±6.
Mixed work	37.0±6.	36.2±5.	32.2±6.	34.2±6.	35.4±6.
Mental work	40.0±5.	38.6±5.	37.4±5.	37.0±5.	38.4±5
Female					
Physical	37.4±5.	36.2±8.	36.5±5.	31.0±5.	36.7±6.
Mixed work	38.0±5.	38.0±4.	34.5±7.	32.0±6.	37.5±5.
Mental work	38.8±5.	38.5±4.	36.0±6.	37.4±4.	37.9±5.

* two way ANOVA, P<0.001

The lowest work ability scores were found among both men and women 50 years old in mixed work groups. The results of two way ANOVA indicated that the age and work content were main factors and that their interaction affected WAI among men.

The proportion of reduced work ability of the subjects in physically demanding jobs (16.9%) and in jobs requiring mixed physical and mental demands (12.7%) were higher than that of the subjects in mentally demanding jobs (3.9%) (Figure 1). The highest prevalence of poor work ability was found among men in physical work (21.4%). There were no differences in the prevalence rates of poor work ability among women in different work content groups (Figure 2).

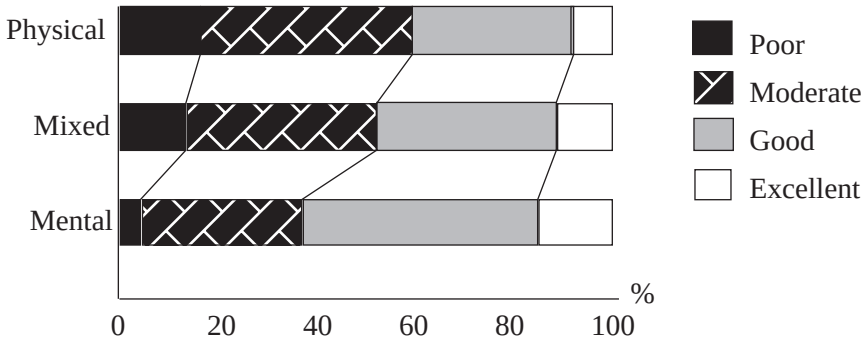

Figure 1. Classification of WAI by work.

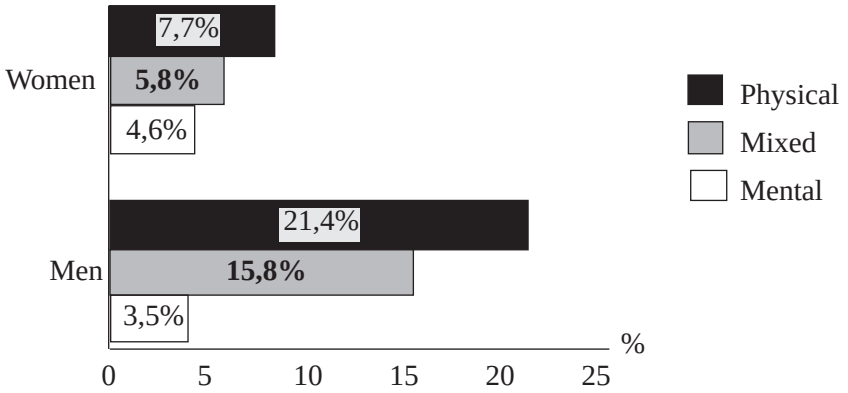

Figure 2. Poor WAI by work and gender (Chi-square: male P<0.0001, female P=0,583).

From the seven single items of WAI, no differences were found in health and disease related items (W3, W4 and W5) between men and women (Table 6). The result of two way ANOVA showed that the work content and age had no effect on these health related items and that no interactions ocurred either. The scores of the items on work demands and mental resources (W1, W2, W6 and W7) were significantly higher in the mental work group than in the physical work group.

Table 6. The scores of seven single WAI items by gender (M ± SD).

Item	Male	Female
W1	6.9±1.6	7.3±1.5**
W2	6.8±1.6	7.1±1.3**
W3	4.6±2.0	4.6±2.1
W4	4.8±1.1	5.0±0.9
W5	4.6±0.8	4.6±0.8
W6	5.8±1.6	6.1±1.5**
W7	2.6±0.8	2.9±0.8*

Compared with male, * P<0.05, ** P<0.01

Discussion

Work ability describes the worker's health and functional resources in regard to his/her job demands. The conceptual definition for work ability is represented by the question: "How good is the worker at present, in the near future, and how able

is he or she to do his or her work with respect to work demands, health and mental resources?" (5) The work ability index takes into consideration the physical and mental demands of work and the worker's health status and resources. Because the main items and their scales were not changed, the Chinese version of the WAI is comparable to the Finnish one. The result shows that the WAI is a feasible occupational health care instrument for Chinese workers aged 40 to 60 years old.

There was a continuously decline in work ability by ageing between 40 and 60 years of age both in men and in women. This result indicates a similar tendency of declinie of WAI by ageing as Ilmarinen's previous studies (5). But the decline of the work ability among Chinese ageing workers (7.3 percent) was much lower than that of Finnish ageing workers (about 25 percent). The reasons might be that this was a cross-sectional study with a relatively small sample while Finnish results were from ten year follow-up studies with a larger sample size. Anther reason was that Chinese ageing workers in this study were 5 years younger than those in Finnish studies. This uncertainty suggests that further follow-up and larger sample studies in China are needed.

The decreases of work ability might mainly follow by the decrease of physical capacity. The results of Finnish studies showed a decline in cardiorespiratory (6) and musculoskeletal capacity (7) by ageing. Studies have reported that the incidences of some diseases like cardiorespiratory and musculoskeletal diseases were higher among ageing populations (1)(3). Cecil reported that the incidence of musculoskeletal diseases among ageing workers over 55 years old was more than 50 percent (2).

Some differences in work ability were found when work content was taken into consideration. Mean work ability was the lowest in physical work and the highest in mental work both among men and women in the age range 40-60 years. The reasons that mental workers have better work ability than other work content groups might be higher education level, light physical load, and better work environments.

Although the work ability declined by ageing among all three different work content groups, the decline in mixed work groups seemed quicker than in other work groups. Workers 50-54 years of age in mixed work groups had the lowest WAI scores both in men and women. A similar result was found among Finnish men in mixed work (5). The reason might be that there were both physical demands and mental demands for the workers of mixed work in age 50-54 groups. The increase of age might cause mental and physical stresses at work. More studies are needed to confirm this result.

The proportions of subjects having poor work ability is the most important index when planning preventive measures at the work place. Physical and chemical hazards and heavy physical loads in physical demanding work have been reported (4)(9). The highest prevalence rate of poor work ability was found especially among men in physical and mixed works (Figure 2). A similar distribution of poor work ability index was found among women, but no statistic difference in work groups. This result was different from Finnish studies (5). The unpublished Chinese AET job analysis study indicated that the physical demands among Chinese female physical workers were much lighter than demands among male physical workers. Over two thirds of male physical workers had heavy physical loads.

Age and work content were the main predictors of the WAI. There were also significant interactions between these two factors. The effects were more signifi-

cant in males than in females. For promotion of work ability of ageing workers the redesign of work demands and improvement of work environment are important.

Previous studies suggested that the health status and existing diseases were main factors to reduce the work ability (6)(7)(12). By analysis of the single items of work ability index among Chinese ageing workers, no significant differences were found in health related items in the work content, age, or gender groups. The items on work demands and mental resources were significantly higher in the mental work group than in the physical work group. This suggested that the main reasons affecting the decline in work ability of Chinese ageing workers might be improper physical and mental demands, and lower mental resources. Further research on this point is needed.

Conclusion

The Work Ability Index (WAI) is a feasible and applicable occupational health care instrument for Chinese ageing workers aged 40-60 years.

Generally, both work content and age had a significant main effect on work ability, especially among male ageing workers. Chinese physical workers had the lowest work ability index and the highest proportion of poor work ability. The results indicated that further research and follow-up studies of work ability among Chinese ageing workers are needed. Studies of measures to maintain and promote work ability of Chinese ageing workers, especially of physical workers are needed.

From the single items of work ability index, no differences were found in health related items between the work content or gender groups. This suggests that the main reasons affecting the decline in work ability of Chinese ageing workers might be improper physical and mental demands, and lower mental resources.

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Work environment and early exit from work

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Introduction

During recession and rising unemployment rates in the 1980-ies many countries introduced early retirement arrangements resulting in excessive rates of early exit from work. Both governments and the public are increasingly concerned about the funding of pension schemes, and some of the early retirement arrangements are reversed. There is also a concern about the welfare of elderly workers who wish to remain at work, and about possible consequences for companies of an increasingly young and age homogenous work force.

Even if early retirement options are less developed in Norway than in many other countries, a recent government report (3) suggests restrictions in early retirement benefits. Prevailing ideology leans to the attraction model of early retirement; attractiveness of early retirement benefits is seen as a main reason for individual decisions to retire early. The other part of the picture, factors related to work (the expulsion model), is given less attention in policy documents and public debate.

The aim of the study reported here, is to identify exposure factors in work environment contributing to early exit from work. Studies with global measures of work environment (absence due to illness or health risk in occupations) show significant contributions to early exit (2,4,6). Studies with more detailed information on work environment, indicate that monotonous work and repeated movements (5), climatic factors, noise, chemicals, physical demands, stress and monotony (9) increase the risk of early exit.

Method

Data are from The Norwegian Surveys of Level of Living; a panel study from 1980 to 1991, conducted by Statistics Norway, and made available through The Norwegian Social Science Data Service. The main analyses compare predictor variables in 1980 with exit from work during the period 1980 to 1991. The sample for these analyses consists of 214 gainfully employed persons aged 40 - 55 years in 1980, which means they are 51 - 66 years in 1991. They have not reached the pensionable age (67) of the National Insurance Scheme. Employment is defined as; ‘at least one hour of work (or temporary absence) last week’, and exit means employment in 1980 but not in 1991.

During the observation period of 11 years there is a considerable dropout from the study (30,2 per cent). However, calculated effects of dropouts on the dependent variable (employment status 1991) are small, and the analyses are accordingly conducted without correction for skewed dropout.

The variables included in the analyses are of five categories:

- Work environment variables: (Exposure to climatic problems/polluted air, Exposure to ergonomic problems, Hectic and stressful work, Variation in tasks, Collaboration with colleagues, Contact with clients/customers, Autonomy, Influence on decisions).
- Occupational variables (Occupation, Professional training, Income).
- Leisure activity (Leisure physical activity, Leisure entertainment attendance, Leisure cultural activity, Memberships in associations, Activity in associations, Posts in associations).
- Disease (Cardiovascular disease, Musculoskeletal disease, Nervous conditions, Reduced work ability due to illness).
- Demographic variables (Age, Gender).

Results

Bivariate analyses show that among work environment variables, little variation in tasks, and rare exposure to hectic and stressful work, predispose for early exit (Table 1).

Table 1. Exit from work 1980-1991 among 214 workers aged 40-55 years in 1980. Work environment predictor variables in 1980. Percentage (N). Significance tested by chi-square. Correlations: phi for dicotomous variables, Cramér's V for polytomous variables. *p: <.05, **p: <.01, ***p: <.001

Work environment variables 1980 (Exit 80-91)	%	(N)	phi/V
Climatic problems/polluted air			
Not exposed	20.7	(111)	
Exposed to one problem	11.8	(34)	
Exposed to two problems	20.8	(24)	
Exposed to three or more problems	31.1	(45)	.14
Ergonomic problems			
Not exposed	13.8	(87)	
Exposed to one problem	27.3	(44)	
Exposed to two problems	24.4	(45)	
Exposed to three or more problems	29.0	(38)	.16
Hectic and stressful work			
Seldom/never	40.5	(42)	
Periodically	18.4	(136)	
Daily	8.8	(34)	.25 ***
Variation in tasks			
Little	51.1	(45)	
Some	16.2	(74)	
Much	11.6	(95)	.38 ***
Collaboration with colleagues			
Seldom/never	36.1	(36)	
Periodically	15.2	(46)	
Daily, less than half the day	8,5	(47)	
Daily, more than half the day	25.9	(85)	.23 **
Contact with clients/customers			
Little/never	33.3	(81)	
Some	8.7	(46)	
Much	17.2	(87)	.24 **
Autonomy			
Little	14.3	(42)	
Some	32.4	(37)	
Much	20.8	(120)	.14
Influence on decisions			
No influence	29.2	(48)	
Some	16.1	(62)	
Much	18.8	(69)	.13

Collaboration with fellow workers, and contact with clients show curvilinear relationships, indicating that both an isolated job situation and frequent exposure to social interaction increase the risk of early exit. Autonomy (control over own work-pace and priority of own working tasks) and influence on decisions (as to investments, plans, kind of work to do oneself, composition of own team) show no significant effect on exit.

Indexes of exposure to climatic problems/polluted air (based upon: -draught, -high temperature, -cold, -moisture, -suspended particulates, -smoke from welding, -gas from thinners, -other kinds of polluted air, -poor ventilation), and exposure to ergonomic problems (based upon: -heavy shakings, -inadequate lighting, -heavy lifts, -strenuous working postures, -monotonous movements) show no strong effects on early retirement. Among the 14 variables constituting the indexes, there are only two significant effects. The few workers exposed to high temperature (N=15) and to suspended particulates in the air (N=25) has an increased risk of early exit. None of the variables indicating ergonomic problems produce significant effects. However the tendency is in the expected direction, especially for monotonous movements and heavy lifting. In our sample of 214 subjects the tendency is not strong enough to reach significance, which of course does not establish that ergonomic conditions are of no importance for early exit.

I addition to work environment variables, occupation, low professional training, low income, working part-time (Table 2), disease, especially reduced working capacity due to disease, mental health problems (Table 3), low leisure activity (Table 4), and age (Table 5), are significant predictors of early exit. Gender effects are not significant.

Table 2. Exit from work 1980 - 1991 among 214 workers aged 40-55 years in 1980. Occupational predictor variables in 1980. Percentage (N). Significance tested by chi-square. Correlations: phi for dicotomous variables, Cramér's V for polytomous variables. *p: <.05, **p: <.01, ***p: <.001

Occupational variables 1980 (Exit 80-91)	%	(N)	phi/V
Occupation (NYK-code)			
0. Professional, technical, etc.	5.4	(37)	
1. Administrative, managerial	9.1	(22)	
2. Clerical	10.0	(20)	
3. Sales	30.0	(20)	
4. Agricultural, forestry, fishing	4,0	(25)	
6. Transport, communications	33.3	(15)	
5,7-8. Mining, manufacturing	32.6	(46)	
9. Service	48.2	(27)	.38 ***
Professional training			
None	33.3	(75)	
High school level	21.3	(94)	
University level	2.3	(44)	.27 ***
Income (G 1980 = NOK 16.100)			
- 1.99G	32.5	(40)	
2G - 3.99G	22.6	(53)	
4G - 5.99G	19.5	(77)	
6G -	5.3	(38)	.21*

Table 3. Exit from work 1980 - 1991 among 214 workers aged 40-55 years in 1980. Disease predictor variables in 1980. Percentage (N). Significance tested by chi-square. Correlations: phi for dicotomous variables, Cramér's V for polytomous variables. *p: <.05, **p: <.01, ***p: <.001

Disease variables 1980 (Exit 80-91)	%	(N)	phi/V
Cardiovascular disease			
No	19.2	(193)	
Yes	42.9	(21)	.17*
Musculoskeletal disease			
No	18.3	(169)	
Yes	33.3	(45)	.15*
Nervous conditions			
No	15.2	(158)	
Yes	9.3	(56)	.26 ***
Reduced work ability due to illness			
No	12.9	(163)	
Yes	49.0	(51)	.38***

Table 4. Exit from work 1980 - 1991 among 214 workers aged 40-55 years in 1980. Leisure predictor variables in 1980. Percentage (N). Significance tested by chi-square. Correlations: phi for dicotomous variables, Cramér's V for polytomous variables. *p: <.05, **p: <.01, ***p: <.001

Leisure variables 1980 (Exit 80-91)	%	(N)	phi/V
Leisure physical activity			
No or small activity	27.4	(113)	
Some or high	14.9	(101)	.15 *
Leisure entertainment attendance			
No or small activity	25.6	(160)	
Some or high	14.8	(108)	.16 *
Memberships in associations			
0 - 2 memberships	29.2	(113)	
3 or more	12.9	(101)	.20 **
Activity in associations			
No very active memberships	26.6	(143)	
One or more very active memberships	11.3	(71)	.18*
Posts in associations			
None	29.6	(115)	
One or more posts	12.1	(99)	.21**

Table 5. Exit from work 1980 - 1991 among 214 workers aged 40-55 years in 1980. Demographic predictor variables in 1980. Percentage (N). Significance tested by chi-square. Correlations: phi for dicotomous variables, Cramér's V for polytomous variables. *p: <.05, **p: <.01, ***p: <.001

Demographic variables 1980 (Exit 80-91)	%	(N)	phi/V
Age			
40-44 years	7,9	(63)	
45-49 years	23,0	(61)	
50-55 years	30,0	(90)	.23**
Gender			
Male	17,1	(123)	
Female	27,5	(91)	.13

In the bivariate analyses we find the highest risk of early exit among those who in 1980 have little variation in tasks, those who have a reduced work ability due to illness, and those working in the service sector. In all these three groups about 50 per cent are out of work in 1991, compared to 21,5 per cent in the total material. The lowest risk of early exit we find among those with high professional training, high income, with professional/technical occupation (NYK 0), and those working in the primary industries (NYK 4). In all these groups 5 per cent or less are out of work in 1991.

Logistic regression (8) was first done with inclusion of all the 23 variables presented in the bivariate analyses. However, three of the variables created some problems and are excluded from the analysis presented in Table 6. The variables 'autonomy' and 'influence on decisions' are excluded because of a considerable number (25 per cent) of missing observations. When included in the analysis, they did not give any significant independent contribution to early exit, and were excluded in order not to reduce the already limited size of the sample.

Occupation was extracted from the main analysis and changed to 8 variables, one for each occupation, and analysed separately. Logistic regression with 8 models including the same 20 variables as in Table 2 and one occupational category for each model, showed that only the model with service industries left occupation with a significant independent contribution. Occupation in the service sector increases the risk of early exit. Because of the limited size of the sample we are only able to analyse broad categories of occupation. Within each category there is a considerable variation at least in disability pensioning (1). In the service sector disability pensioning is especially high among women in cleaning and serving occupations. In this sector there is also some occupations with a low pensionable age, as police and firemen.

In the bivariate analysis primary industries (NYK 4) showed the lowest risk of early exit, while logistic regression leaves NYK 4 without independent contribution. This may be due to a weakness of the logistic regression method. The variable NYK 4 has a high regression coefficient and standard error resulting in a low Wald-value. In such cases a significant contribution may be overlooked, due to the weakness of the method. An alternative approach is to do the analysis with and without this variable. This shows a significantly better prediction with this variable than without ($p < .001$). This means that occupations in the primary industries contribute to improved prediction; such occupations reduce the risk of early exit. This may be related to the fact that the majority (about 80 per cent) in primary industries are self-employed and may choose to work part-time, even if they receive disability pension.

Logistic regression was performed stepwise with 20 variables in five blocks. The final step (Table 6) leaves nine variables as significant predictors of early exit; -reduced working capacity due to disease, -frequent collaboration with colleagues, -high age, -low professional training, -nervous conditions, -rare exposure to hectic and stressful work, -little variation in tasks, -poor climatic conditons/polluted air, and -low activity in associations outside work. Altogether the model reduces uncertainty in prediction of the outcome variable with 42 per cent ($R^2_L = .42$), which is a considerable contribution indicating that the model includes variables of high relevance.

Of the four significant work environment variables, *frequent collaboration with colleagues* has the strongest effect on early exit. Bivariately this variable showed

a curvilinear relation to early exit; both those cooperating seldom or never and those cooperating more than half the day were out of work early. The effect of rare cooperation disappears in the multivariate analysis, especially through correlation with low professional training and reduced work ability due to illness. The effect of frequent cooperation on early exit indicates that there is a limit to positive effects of cooperation. In this material more than half the day in cooperation increases the rate of early exit, while daily cooperation less than half the day seems to counteract early exit.

Table 6. Exit from work 1980 - 1991. Logistic regression with Wald statistics, correlation (R) and one-tailed significance (*p: <.05, **p: <.01, ***p: <.001) for 20 predictor variables 1980. Model contribution to reduction of uncertainty in prediction of exit ($R2_L$). (N= 206).

Variables	Wald	R	p
Climatic problems/polluted air	4.262	.13	*
Ergonomic problems	1.635	.00	
Hectic and stressful work	5.022	-.15	*
Variations in tasks	4.523	-.14	*
Collaboration with colleagues	8.894	.23	***
Contact with clients/customers	0.129	.00	
Professional training	7.602	-.21	**
Income	0.381	.00	
Leisure physical activity	0.161	.00	
Leisure entertainment attendance	0.794	.00	
Leisure cultural activity	0.019	.00	
Membership in associations	0.119	.00	
Activity in associations	3.976	-.12	*
Posts in associations	0.115	.00	
Cardiovascular disease	0.236	.00	
Musculoskeletal disease	1.912	.00	
Nervous conditions	5.030	.15	*
Reduced work ability due to illness	8.770	.23	***
Age	8.229	.22	**
Gender	0.972	.00	
R^2L		.42	***

It is surprising that *hectic and stressful work* counteracts early exit. One interpretation may be that hectic and stressful work is an indication on attachment to work, and how demanded and needed the worker is. In this material elderly workers (above about 50) experience less hectic and stressful work. This may be a result of negative attitudes towards elderly workers. Employers' attitudes towards elderly workers are often ambivalent with both negative and positive elements. However, the negative elements tend to predominate behavior, as in recruiting young workers (10). Workers above 50 may be written off rather than invested in, and less included in further education and changes or new challenges. A study by Lahn (7) indicates that elderly workers more often are protected from, or keep away from, conflicts at work, which may be part of a more general expulsion or withdrawal process, eventually leading to exit.

Elderly workers are probably more often left in peace with the same tasks as before. In this material workers above 45 experience less *variation in tasks*, and as expected, variation in tasks counteracts early exit. There is a positive correlation

between hectic work and variation, but the two variables also have independent effects on early exit.

Of other variables *reduced working capacity due to disease* is as expected, an important predictor of early exit. Since the majority (61 per cent) of early exit in this material is through disability pension, this variable could be expected to have even stronger effect on early exit. Apart from nervous conditions, specific diseases, such as *musculoskeletal and cardiovascular diseases* do not have an independent effect on early exit. Such diseases only increase the risk of early exit whenthey reduce working capacity, while *nervous conditions* (index of four variables: heavy heartbeats without physical exertion, nervousness/anxiety/restlessness, depression, use of psychoactive drugs) have a separate effect, independent of how it affects working capacity (according to the respondents subjective evaluation of working capacity).

High age of course increases the risk of early exit, while there is no significant effect of *gender*. Low *professional training* has a strong effect on early exit, while *income* has no independent effect.

Finally there is an effect of *low activity in associations outside work.* This indicates that recreation and interests outside work may protect against early exit. However, it is also possible that activity both at work and outside work share a common activity factor that counteracts early exit. If so, taking up activities outside work may not function as a general protector against early exit.

Conclusions

The variables included in this study improve prediction of early exit to a considerable extent, even if a number of variables of probable importance not are included. Such variables are expulsion factors like the labour market situation and changes in industries, attraction factors in the social security system, and individual factors like coping style and work orientation. Thus we are unable to establish the relative importance of expulsion factors versus attraction factors.

Among the variable blocks included, work environment variables, disease variables and occupational variables have the strongest effects on early exit. In addition, there are significant effects of activities outside work and of age.

In order to improve the options for elderly workers to remain at work to pensionable age, or beyond, measures to prevent reduced working capacity of course is of importance. This study does not add any new information on effective prevention of disease and reduced working capacity. Concerning prevention of early exit, the results indicate that interventions in work environment and work organisation should focus on psycho-social aspects. Cooperation at the work place is important, but only to a certain limit. Both rare and too frequent cooperation (more than half the day) predict early exit. Workers seem to need variation between cooperation and concentration on own tasks. Variation is important also as change between different tasks. The organisation of work should open options for variation, and in addition, secure the inclusion of elderly workers in the daily challenges, stress, changes and education at the work place. This would increase the experience of work as hectic and stressful, which seems to prevent early exit. With increasing age, work is experienced as less hectic and stressful, which may be part of an expulsion and/or withdrawal process when retirement age is approaching.

Probably chronological age has too much of an impact upon employers', fellow workers', and aging workers' own attitudes towards aging and work. Employers seem to be prepared to write elderly workers off years before retirement. Investing in elderly workers would probably be an advantage even for the companies.

Summary

The aim of the study reported here, is to identify exposure factors in work environment contributing to early exit from work. The analyses compare predictor variables in 1980 with employment status in 1991 for 214 gainfully employed persons aged 40 - 55 years in 1980. Logistic regression leaves 10 variables as significant predictors of early exit; -reduced working capacity due to disease, -frequent collaboration with colleagues, -high age, -low professional training, -occupation in the service sector, -nervous conditions, -rare exposure to hectic and stressful work, -little variation in tasks, -poor climatic conditons/polluted air, and -low activity in associations outside work.

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Selection effects, differed effects, interaction effects: concerns arising from quantitative investigations on age-work-health relationships

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Introduction

This paper is based on three quantitative investigations, chosen among studies completed at different dates over the past ten years. The purpose here is not to describe precisely the methods and results of each study, but to stress two major concerns in statistical approaches on age-work-health relationships: 1) such relationships cannot be relevantly elicited by simple cause-effect analyses at a given time; 2) in this complex set of interactions, the presence of the ”age” variable can help structure the interpretation of results (5).

It is known that relations between work and health are hard to explain in terms of a single cause producing a single effect. There are a few examples of univocal relationships (in studies on certain cases of exposure to toxic substances, for example), but these cases are rare. In general the same job characteristic has several implications for health, the same deterioration of health results from a combination of several occupational causes, and the health condition itself is going to affect the way one works.

Things become even more complicated when the time dimension is taken into account. The effects of work on health are often different over time. Furthermore the state of health can determine how people will remain or not in their job. It entails a selection mechanism, known otherwise as the ”healthy worker effect” (2). In this context, by taking age into consideration one is both adding a difficulty and using it as a means to organise the relationships studied. This is what the following three examples will try to illustrate.

Selection effects and differential ageing

The first study was conducted in a large iron and steel enterprise, in collaboration with the occupational physicians of the enterprise (3). The study referred to three groups of wage-earners: clerks, assembly line workers, and casters. All of them were men between 30 and 50 years, with a total of 160 to 170 individuals in each group.

During the compulsory annual medical visit in 1984, each worker was examined and interviewed by doctors, who gathered in this way some sixty parameters. The data included morphological, functional and psychotechnical parameters, as well as information on housing conditions, food patterns, and extra-occupational activities. The initial idea was to include these parameters, considered as ”independant” variables, in an econometric model applied to the set of the three groups, with age being considered as the ”dependant” variable. The coefficients thus calculated were then used to assess the ”functional age” of each individual. The purpose was then to compare for each category of wage-earners, the differences between actual age and ”functional age” and how such differences change with age.

At first, the differences between actual age and ”functional age” appeared to be markedly negative for the group of casters, negative as well for the assembly line workers, and markedly positive for the group of clerks (figure 1). Therefore it could be said that casters ”look older” than their age, and clerks ”look younger”.

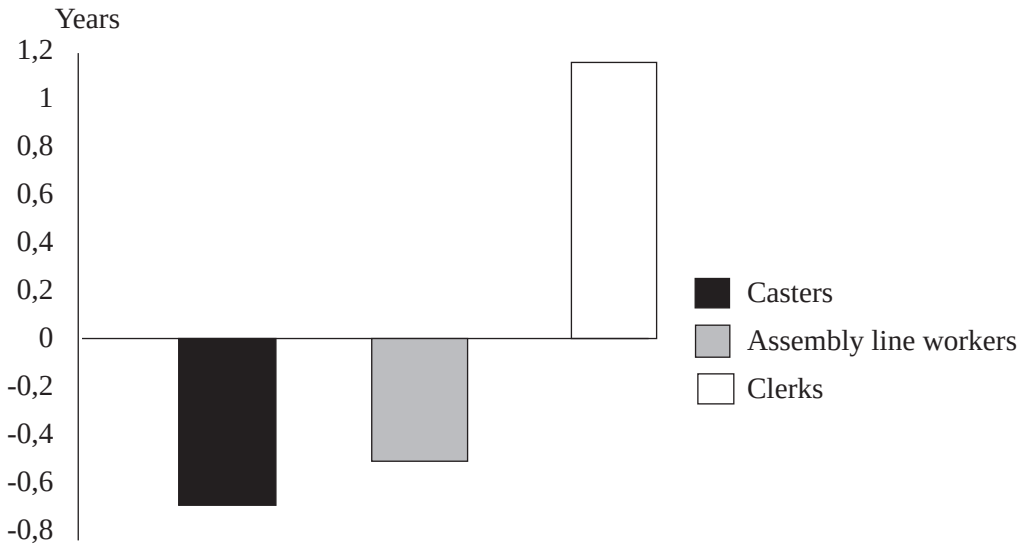

Figure 1. Difference between actual age and ”functional age” for three categories of workers.

A closer look into these differences showed that they did not change significantly with increasing age. The difference between casters and clerks, based on the ”differential between functional and actual age” in each category, was the same regardless of age. It was as if work, though more difficult in the case of casters, did not stress the gap, nor speed the deterioration of their health with age. One might even have thought that these differences had existed for a long time, even before they all ended up in this or that profession.

Further analysis led to suggest another interpretation, namely a selection mechanism. What had to be determined was whether the older casters did not show particular characteristics, such as a good enough health condition to ”continue” working in their jobs, whereas the less healthy were gradually discarded. Therefore the situation of the same workers was examined five years later, in 1989. As a result of the sector’s restructuring, 40% of the casters had left the enterprise during that period, together with 25% of the assembly line workers and 18% of the clerks.

The question then was whether the casters made redundant from 1984 to 1989 had achieved similar results to those of the other casters or whether they had shown certain specificities.

In fact signs of minor health disorders had appeared more often among the casters who were eventually to lose their jobs in the following five years: a greater need to sleep, lower respiratory volume, few leisure or sports activities, signs of fatigue or psychological suffering, less hand-grip strength, lower performance in certain psychotechnical tests. Of course these criteria had not actually been used by the managers when they had to draw up a list of casters to dismiss, but they appeared to be related to the informal selection processes in each plant shop.

Therefore, if those workers had remained in their job, the functional age of the casters would have drifted further and further away from their actual age. The initial results, like many results concerning differential aging in the enterprise, had to be interpreted in the light of a probability of departure from the company which varied according to age and condition of health.

Differed effects and selection in a long term analysis

The second investigation concerns long term relations between certain work characteristics and the state of health in a sample of wage-earners. This study was based on data from a French survey on living conditions which included questions on health and some indications on past and present work conditions (7). The sample comprised 8000 wage-earners.

The example presented here relates to the effects of shift work or night shifts. A set of morbidity indicators (on the basis of data on chronic diseases, perceived symptoms, sick leaves and hospitalisations) has been established. The values of these indicators were compared for three populations of blue-collar men (age 40 to 64 years): those who were in shift work or night shifts ; those who had been in the past but were at the present time on day shifts ; and those who had always worked on day schedules.

The first result was both paradoxical and a well known fact - since it had already been shown by Aanonsen forty years ago in the case of a metallurgical plant in Norway (1): the population exposed to shifted schedules appears to be the healthiest because it shows the lowest level of morbidity indicators (figure 2). This is due to a selection mechanism whereby the workers whose health deteriorates are the first ones to ask for day schedules, which explains the high level of morbidity among former shift workers.

However the possible role of age in the relations observed remained to be verified. Former shift workers are often older workers, and this age difference in itself could explain the differences in the health indicators. Therefore a linear regression model of the links between age and morbidity was made, choosing successively different thresholds for the morbidity indicator, and calculating the regression for each of the three populations studied previously.

The results (figure 3) first indicate an increase of morbidity with age for each of the three populations. It then appears that ”former shift workers”, whatever their age, show the highest morbidity indicators, which clearly confirms Aanonsen’s hypotheses. What is finally noted is that present shift workers are the ones whose indicators show the slowest progression, which is due to the gradual departure of those who have more health problems.

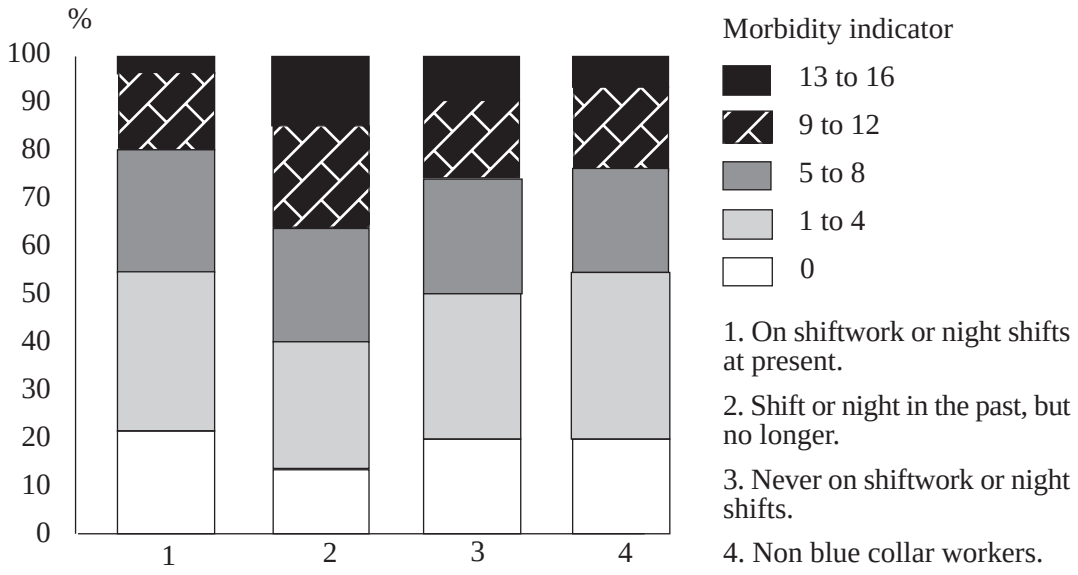

Figure 2. Morbidity in three categories of blue collar men (aged 40 to 64), in relation to their exposure to shiftwork or night shifts.

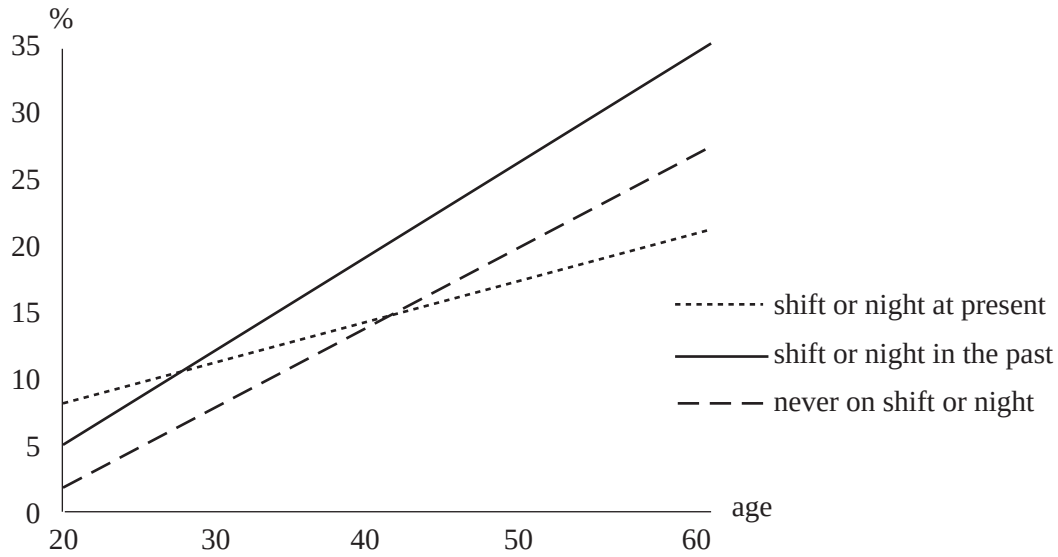

Figure 3. Model of evolution with age, of the ”probability of high morbidity”.

Taking age into consideration here enables us to describe diachronically, on one hand the evolution of health in connection with work schedules, and on the other, the selection mechanisms that come into play in this area.

Interaction effects and difficulties on the job

The third and last example concerns relations between age and the difficulty to perform accurate movements. The difficulties a worker encounters on the job at a given point in time, can be integrated in a pattern of relationships between past, present and future work and health. They can be perceived with regard to certain characteristics of present work, but they can derive from the functional deteriorations caused by the job; or on the contrary, be prevented by means of the experi-

ence acquired at work; they can also announce the appearance of possible selection mechanisms later on. The same applies as to the links between difficulties and the condition of health. A worker's state of health determines part of the difficulties encountered on the job. These difficulties may in turn represent a "cost" for operators, obliging them to demand too much of certain functions or causing them much psychological suffering. These difficulties can also serve as preliminary indicators announcing future health disorders.

For example, difficulties to perform accurate movements at work have been studied (8), on the basis of data provided by a broad survey conducted in France on age, health, and work, the "ESTEV" survey (6). The sample comprises 21.000 wage-earners whose ages were 37, 42, 47, and 52 years in 1990 (the year in which the part of the survey considered in this study was carried out). These workers were asked to respond to a long questionnaire on their past and present working conditions, and their difficulties in their present jobs. They were also submitted to a thorough medical examination (400 occupational physicians volunteered for this study). We will focus here on a specific question: "do you have to perform accurate movements in your work?" and (if so) "is it particularly difficult or painful?"

Approximately a quarter of the wage-earners were required to perform accurate movements in their job. This proportion was slightly higher among men (because blue-collar workers are the main population concerned) and age differences were moderate. But within the population concerned, the percentage of those who consider it "particularly difficult or painful" increased regularly with age: between 37 and 52 years of age it goes from 10% to 19% for men and from 14% to 22% for women.

If one did not go beyond this result, this could be a first conclusion: it becomes harder to perform accurate movements as age increases - this would mean it might be desirable to find jobs without such requirements for aging operators. This of course would raise two problems: first, as the active population is aging it is going to be harder to assign the older workers specific jobs; second, performing accurate movements is not risky or harmful in itself, in many cases it is even part of the qualification, the professional identity. Therefore it may cause a serious problem for the worker to be deprived of this capacity.

It may thus be desirable to consider more closely the effect of other work or health characteristics. For instance when strenuous efforts are performed on tools in the present job, or were performed in the past, the difficulty to accomplish accurate movements appears to increase with age (figure 4). One can even see that where workers were spared strenuous efforts, their difficulty to perform accurate movements changes little with age. A similar result was found as to other constraints such as painful positions, or repetitive tasks with heavy time pressure. Furthermore, we related the difficulty to perform accurate movements with different aspects of the state of health. Certain functional deficiencies had little effect - eyesight deficiencies for example. On the other hand, there was a clear relation with musculoskeletal diseases, especially those affecting the cervical and lumbar region of the spinal column. Studies in psychology (9) as well as our own studies in ergonomics (4) have lead us to interpret this result as follows: as workers age, the adjustment of their posture (choosing and stabilising an appropriate position) in order to achieve the accurate movement becomes a more necessary condition. And this adjustment is hard to maintain for workers experiencing spinal pain.

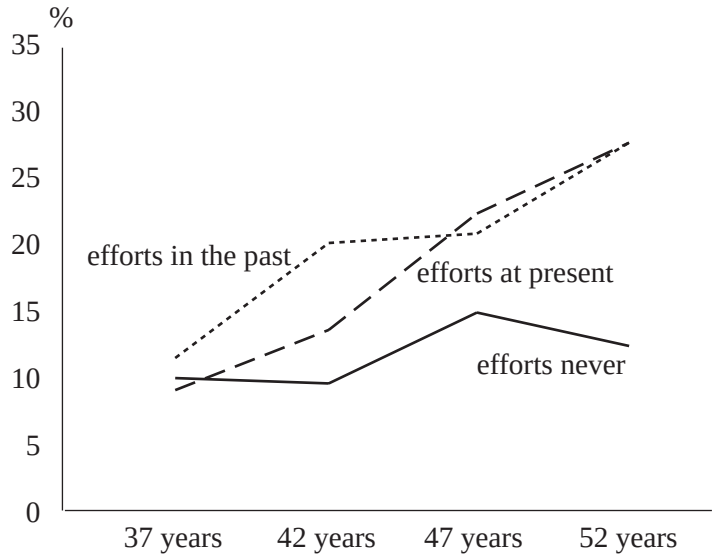

Figure 4. Difficulty in performing accurate movements: variation with age and exposure (past or present) to strenuous efforts on tools.

Conclusion

What we wish to point out in general, through these three examples, is that the interpretation of results on differential aging, or on how difficulty evolves with age, can be much richer when relationships between work and health are integrated in a long term time scale, using the ”age” variable precisely to formalise this integration in time. This requires the construction of instruments of analysis capable of studying such combinations. These instruments may initially rest on cross-sectional analyses, that cannot distinguish generation effects. Nevertheless, they prove to be useful to integrate anticipating strategies when designing work situations, and to take into account the aging of labour force, currently a widespread phenomenon in industrialized countries.

Summary

In presenting a few results of three quantitative investigations (about differential aging in a metal plant; about long term relations between shiftwork and health; and about difficulties in performing accurate movements), this paper intends to show how the ”age” variable can help to structure the interpretation of work-health relationships.

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