Does working beyond the statutory retirement age have an impact on health and functional capacity? The Finnish Retirement and Aging cohort study

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1. **What is already known about this subject?**
    - The study of difference in health and functional capacity among those retired on statutory basis and those who extended their employment beyond that was the focal point of previous studies

    - Previous studies reported a short-term better health status among those who continued working after the age of 65 years compared to those who retired at the age of 65, but the better health was transitory and there was no difference in health status after 6 years of retirement

2. **What are the new findings?**

    - No substantial changes in the prevalence of suboptimal self-rated health and psychological distress or in the mean level of physical functioning difficulties were observed either in the no-extension or in the extension group during the follow up

    - Analysis of the repeated data using the propensity score matching found no evidence that voluntarily extending the working career beyond retirement age would pose a risk to health and physical functioning among aging workers

3. **How might this impact on policy or clinical practice in the foreseeable future?**
    - These finding strengthen previous findings that extended working lives may not have long-lasting effects on health and functional capacity
    - Working beyond the statutory retirement ages based on voluntary decisions could be an important solution to secure labor supply and balance the increasing dependency ratio, as the world population is ageing.

ABSTRACT

Objectives: This study aimed to compare the development of self-rated health, psychological distress and physical functioning between those retired on time and those who continued working beyond the individual retirement age.

Methods: The study population consisted of 2,340 public sector employees from the Finnish Retirement and Aging Study. Participants were categorized into no-extension of employment (retired at the individual retirement date or <3 months past) and extension (≥12 months). Propensity score matching (1:1 ratio) was used to identify comparable group of participants in the no-extension (n=574) and extension group (n=574) by taking into account pre-retirement characteristics and their interactions.

Results: Prevalence of suboptimal self-rated health and psychological distress changed little among extension group during the follow up from 1 year before (**T1**) to 18 months (**T2**) and 30 months **(T3)** after individual pensionable date. Compared to no-extension, the risk of having suboptimal self-rated health in the extension group was 0.89 (95% CI 0.68–1.17) at T1, 1.16 (0.88–1.53) at T2 and 0.96 (0.68–1.37) at T3. For psychological distress, the corresponding RRs were 0.93 (0.65–1.32), 1.15 (0.78–1.69) and 1.04 (0.61–1.79).The mean differences in number of physical functioning difficulties between extension and no-extension groups were 0.06 (-0.16–0.29) at T1, 0.05 (-0.18–0.27) at T2 and -0.11 (-0.39–0.17) at T3.

Conclusions: This study found no evidence that voluntarily extending the working career beyond retirement age would pose a risk to health and physical functioning among aging workers.

Keywords: Extended employment; Health; Mobility limitations; Psychological distress; Propensity score matching

INTRODUCTION

The upsurge in life expectancy has indicated the need for extension of working careers into older ages. Extended working lives could be a solution to ensure labor supply in the job market as well as balance the challenge for national economics. A large number of European countries have introduced policies to encourage the labor force to make voluntary decisions of working beyond the state based pensionable age[1]. In Finland, for example, pension reform in 2005 introduced financial advantage for those who continue working beyond the retirement age[2,3] and the extensive pension reform came into effect in 2017 with three months annual rise on retirement date thereafter[4].

Extending working life is subject to a range of drivers including organizational and psychosocial factors at work[5]. The workers in their retirement years vary in their mental and physical capabilities. Therefore, a detailed approach is needed to ensure higher employment participation rate in various occupational sectors[6,7]. Better physical and mental health status is often reported as a decisive indicator for working beyond statutory retirement[2,8–13]. The decision of extension is often reported being also dependent on mental and physical work environment[8].

Research on the difference in health and functioning of those who extend and those who do not extend is a vital to increase our understanding of the consequences of extension; however, such studies are rare. An UK study reported no beneficial or detrimental health effects of working beyond the statutory retirement age[10]. The finding was attributed to the fact that most of the extenders already had better health during the transition to retirement[10]. Three different studies from Sweden[14–16] compared the health status of those retired at 65 years and those who continued working after the age of 65. Hagen (2108) reported that the extenders preserved a healthy lifestyle more often compared to those who retired at a statutory basis, but there was

no variation in utilization of overall health care[15]. Anxo and colleagues reported a short-term better health status among those who continued working after the age of 65 years compared to those who completely left the labor market at the age of 65, but the better health was transitory[14]. Eyjólfsdóttir and colleagues reported that working beyond the retirement resulted better health outcomes (self-rated health, climbing stairs, ADL limitations and musculoskeletal pain) for a short term compared to physical health status at the age of statutory retirement, however it did not last after 12 years of retirement[16]. Previous studies have mainly focused on differences between extension groups, but less is known about the health development within groups shortly after retirement.

Therefore, this study aimed to compare the development of self-rated health, psychological distress and physical functioning among those retired on time vs. those who continue working beyond the individual retirement age. The rationale behind using three different outcomes is to examine the changes across various health indicators and to increase robustness of the conclusions if similar changes are observed in different health indicators. The change and difference of three periods were examined: 1 year before individual pensionable date, to 18 and 30 months after individual pensionable date. To reduce bias related to health-related selection for retirement timing we used propensity score matching.

METHODS

Study population

The study population consisted of aging public sector employees from the Finnish Retirement and Aging Study (FIREA) which was established in 2013[17,18]. The eligible population for the FIREA study included public sector employees whose individual statutory retirement date was between 2014 and 2019, and who were working in one of the 27 municipalities in Southwest

Finland or in one of the selected nine cities or five hospital districts around Finland in 2012. Information on the estimated individual retirement date was obtained from the institute for public sector pensions in Finland. The participants reported the actual retirement date in survey questionnaires.

The eligible participants were contacted 18 months before their individual pensionable date by mailing them a questionnaire (n=10,629). By the end of 2019, 6783 (64% of the eligible sample) cohort members had responded at least once. The follow up questionnaire was sent annually at least four times and the participants have responded on average 3.9 (SD 1.0) times to the surveys. Those participants who had reported their actual retirement date or were working beyond the pensionable age (minimum of 1 year) and had answered to the questionnaire at least once before the pensionable date were included in the present study (n=4,013). Furthermore, the outcome was derived from the survey two years after pensionable age and thus 2,836 participants who had responded were selected and those who worked more than 3 months and less than a year after individual retirement date were excluded from the selected sample (n=496) to get the final study population (n=2,340). Further, the propensity score matching resulted in the end sample of 1,148 persons (574 non-extenders and 574 extenders) for statistical analysis. Informed consent was obtained from the participants, the ethics committee of Hospital district of Southwest Finland approved the study, and FIREA was conducted in line with the declaration of Helsinki.

Timing of retirement

In Finland, the Public Sector Pensions Act regulates the retirement ages of the public sector employees. From 2005 onwards, public sector employees can retire on a statutory basis after aged 63 years but at the latest before the age of 68 years. Following a pension reform in January 2017, each age group has their own retirement age, which is tied to the life expectancy,

although the general rule of 63 to 68 years still applies. The institute for public sector pensions in Finland has calculated an individual pensionable date for each employee accordingly. Postponing retirement from this date will accrue pension income level.

We classified participants into two categories by calculating the time between pensionable date and actual retirement date. The two categories represented 1) those who did not extend their employment or extended it less than three months beyond the pensionable date (no-extension, n=1,745), and 2) those who extended their employment for at least one year (extension, n=595). Those who extended their employment from three months to one year (n=496) were not included in the analysis in order to prevent any overlap between no-extension and extension groups and to maximize the contrast between the groups.

Health and functioning outcomes

The current study has three health outcomes, self-rated health, physical functioning difficulties and psychological distress.

Self-rated health was assessed by asking participant to rate their overall health status on a 5-point scale (1=good, 2=rather good, 3=average, 4=rather poor, 5=poor). For the analyses dichotomized (good: good and rather good; sub-optimal: average, rather poor and poor) variable was used. We have used dichotomized self-rated health as it is commonly used and to allow comparison to other studies[17].

Physical functioning difficulty was assessed by 10 self-reported items of physical functioning section of SF-36 questionnaire[19]. Following items were included: 1) vigorous activities, such as running, lifting heavy objects, participating in strenuous sports; 2) moderate activities, such as moving a table, pushing a vacuum cleaner; 3) lifting or carrying groceries; 4) climbing several flights of stairs; 5) climbing one flight of stairs; 6) bending, kneeling or stooping; 7) walking about two kilometers; 8) walking about a half kilometer; 9) walking about

100 meters and 10) bathing or dressing yourself. The respondents were asked whether they have any difficulties in performing those physical functioning tasks and the responses were collected using a 3-point response alternative (yes limited a lot, limited a little and not limited at all). In this analysis, the responses on all 10 items were dichotomized into no limitations "0" and at least some limitations "1" and then summed up to get a continuous score of "0-10".

Psychological distress was assessed measured with the 12-item version of the General Health Questionnaire (GHQ-12)[20], which gives a total score ranging from 0 to 12. GHQ was developed as a screening tool to identify minor psychiatric disorder in the general population and we have applied suggested cut point 4/12 and used it as a dichotomized (psychological distress: yes (≥4 points) and no (<4 points)) variable.

Sociodemographic and work-related factors

Information on participant's sex and occupational status was obtained from the institute for public sector pensions in Finland. The occupational titles of the last occupation preceding retirement were coded according to the International Standard Classification of Occupations (ISCO) and categorized into three groups: high (ISCO classes 1-2 e.g., teachers, physicians), intermediate (ISCO classes 3-4 e.g., registered nurses, technicians), and low (ISCO classes 5-9 e.g., cleaners, maintenance workers). Physically heavy work ('yes' and 'no') was based on job exposure matrix (JEM) linked to ISCO codes[21]. To control for differences in the pension schemes, participants were divided into two groups based on their individual pensionable age: old (<63 years) and new scheme (≥63 years). Marital status was collected in five categories (never married, cohabitation, married, divorced or separated and widowed) and it was dichotomized into currently married/cohabitated (yes) and non-married/non-cohabiting (no). Work ability was assessed by asking participant to rate their current workability compared to

their life's best on a scale of 0-10 ('0'-worst – '10'-best). In the present study, it was classified into three groups: good (9-10), moderate (7-8) and poor (0-6) work ability[22].

Statistical analysis

We used a propensity score matching approach to identify a relevant group of non-extenders for comparison. Propensity score matching is a counterfactual-based method for estimating an average treatment effect from observational data[23]. We calculated a propensity score by accounting for the pre-retirement characteristics in the baseline survey one year before individual pensionable date that predicted timing of retirement based on previous literature[24]. This score was used to match extenders and non-extenders. Propensity score is the conditional probability ranging from '0–1' of being assigned to "treatment" (in this case employment extension), based on the observed covariates. The propensity score approach thus attempts to construct a randomized experiment-like situation in which groups are comparably matched for observed prognostic factors.

To calculate the propensity score, we grouped participants into no-extension (n=1,745) and extension group (n=595), and fit a logistic regression model for extending employment including the chosen pre-retirement factors (sex, occupational status, physically heavy work, pension scheme, marital status, workability, self-rated health, psychological distress and physical functioning difficulties). In addition, the interaction of the above-mentioned factors with gender, occupational status and pension scheme were included in the model.

After estimating the propensity score, we were able to match each extender with one non-extender using SAS macro Greedy Matching Technique according to the predefined caliber width starting from 0.00001 to 0.1 (97.6% of the extenders were matched with at least 0.01 caliber width)[25,26]. The propensity score matching resulted in the end sample of 1,148 persons

(574 non-extenders and 574 long-extenders) for statistical analysis. *Figure **1*** shows the distribution of propensity scores in no-extension and extension group before (A) and after (B) matching. The balance achieved by the matching was studied comparing the pre-retirement characteristics between no-extension and extension group by using the Chi Square test for categorical variables and analysis of variance for continuous variables.

The change in self-rated health, psychological distress and number of physical functioning difficulties from 1 year before individual pensionable date (T1, n=2,340) to 18 months after individual pensionable date (T2, n=2,340) and 30 months after individual pensionable date (T3, n=1,298) were examined. To examine the change among matched no-extension and extension groups, we used linear mixed models for the categorical and continuous outcomes. We conducted an additional analysis with self-rated health and psychological distress using them as continuous outcomes to examine whether this has an influence on the findings. Results for the change in self-rated health and psychological distress are presented as prevalence and 95% Confidence Intervals (CIs), and as mean level and 95% CIs for number of difficulties in physical functioning. Results for the difference are presented as Risk Ratios (RRs) and 95% CIs for categorical outcomes and mean difference and 95% CIs for continuous outcomes. The interaction of retirement timing (no-extension, extension) vs. time (T1, T2 and T3) was also checked. In order to examine whether the health effects of an extended employment differs by pre-retirement health and functional status we conducted sensitivity analyses. The change in health and functioning was examined separately among those who had good and suboptimal health and functioning at T1. To examine these changes among no-extension and extension groups, we used linear mixed models adjusted for pre-retirement characteristics. All the statistical analysis were conducted in SAS V.9.4 statistical package (SAS Institute).

RESULTS

Baseline characteristics of the study population

Characteristics of the matched non-extenders and extenders before retirement are shown in *Table **1***. The propensity score matching appeared to have been successful since there were no visible differences between non-extenders and extenders before retirement. Pre-retirement characteristics of study population by retirement timing before matching are shown in e*Table **1***.

Changes in self-rated health and psychological distress within the groups

*Figure **2*** illustrates the changes in the prevalence of self-rated health (part A) and psychological distress (part B) among no-extension and extension groups from 1-year before of the pensionable date (T1), to 18 months (T2) and up to 30 months after the pensionable date (T3). The prevalence of suboptimal self-rated health at T1 was 15% among non-extension and 13% among extension group. There was no marked change in prevalence of suboptimal health within no-extension and extension group during the follow up. The prevalence of psychological distress in no-extension group was decreased slightly during the follow-up at T2 and T3 (T1: Prevalence 11%, 95% CI 8%–13%; T2: 8%, 6%–10%; T3: 8%, 5%–12%). The extension group had almost constant prevalence throughout the time points (T1: 10%, 8%–13%; T2: 9%, 7%–11%; T3: 8%, 6%–12%).

Differences in self-rated health and psychological distress among the groups

The difference in self-rated health and psychological distress among the no-extension and extension groups at different time points are presented in *Table **2.*** The interaction of retirement timing (no-extension, extension) and time (T1, T2 and T3) was not significant for self-rated health (p=0.16) and psychological distress (p=0.63). Among the extension group the likelihood of having suboptimal self-rated health was almost similar with the no-extension group at T1

(RR 0.89, 95% CI 0.68–1.17), T2 (RR 1.16, 95% CI 0.88–1.53) and T3 (RR 0.96, 95% CI 0.68–1.37). Likewise, the likelihood of having psychological distress among the extension group was not significantly different from the no-extension group at T1 (RR 0.93, 95% CI 0.65–1.32), T2 (RR 1.15, 95% CI 0.78–1.69) and T3 (RR 1.04, 95% CI 0.61–1.79). We conducted an additional analysis with self-rated health and psychological distress using them as continuous outcomes to examine whether this has an influence on the findings. The results are presented in *eFigure **1*** showing similar findings as with the dichotomous outcomes.

Change and difference in difficulties in physical functioning

The results on difficulties in physical functioning among no-extension and extension group (expressed as mean difference and 95% CIs) are presented in *Table **2** and Figure **3***. The interaction of retirement timing (no-extension, extension) and time was not significant (p=0.40) and no difference between groups was observed at any time point. The mean number of physical functioning difficulties in no-extension group remained stable from T1 (mean 1.50, 95% CI 1.34–1.65 to T2 (1.51, 1.35–1.67), and to T3 (1.73, 1.53–1.94), similarly no change was observed in the extension group.The corresponding coefficients and *p*-values (supplement for *Figure* **3**) for main effects and interaction effects are presented in *eTable **2***.

Stratified analysis based on baseline health and functioning (sensitivity analysis)

As a sensitivity analyses, we examined the difference in self-rated health, psychological distress and physical functioning difficulty at T2 and T3 between no-extension and extension group separately for those with good and suboptimal health and functioning at T1 (*eTable **3)*** in order to examine whether the health effects of an extended employment differs by pre-retirement health and functional status. The interaction of timing of retirement (no-extension, extension) and time (T2 and T3) was not significant for any of the health outcomes suggesting that no difference in self-rated health, psychological distress or physical functioning was

observed independent of baseline health and functioning status. Only those with suboptimal health before retirement had higher likelihood of having suboptimal health at T2 in the extension group (RR 1.37, 95% CI 1.10–1.71) compared to the no-extension group, but no difference between groups was observed at T3.

DISCUSSION

This study examined the development of self-rated health, psychological distress and physical functioning of those who extend their employment beyond the statutory retirement age compared to those who retired at their statutory retirement age. We used propensity score matching approach to take into account the health-related selection for retirement timing. The results of this study suggest that working beyond the retirement has neither positive nor negative effect on self-rated health, psychological distress and physical functioning. This was also confirmed by additional analysis showing extenders had a higher likelihood than non-extenders to still have suboptimal self-rated health at 18-month follow up, but not after 30-month follow up among those with suboptimal health before retirement. Additionally, there were no substantial changes in health and functioning within each group from 1-year before individual pensionable date to 30 months after individual pensionable date.

Our findings on health consequences of extended employment are in line with the findings from the previous studies[10,14–16]. Most of these studies reported no difference in health status of those who extend their employment beyond the statutory retirement age. We found that extension of employment was associated with a short-term risk of sustained suboptimal health among those with suboptimal health before retirement. This is important addition to the previous studies, which have not conducted separate analysis for working beyond retirement by pre-retirement health status. One study examined changes in health associated with

transition to retirement and found improvement in health especially among those with poor self-rated health[27]. These differences could be attributed to the selection of participants and methodological approaches used. In our study, those who worked one year or more after individual retirement age were included in the extension group, whereas previous studies have used either six months[14] or one year[16] to define extended employment.

We found no visible difference in the level of psychological distress among the extenders, which is comparable to the previous finding on self-reported depressive symptoms by Anxo and colleagues[14]. However, we used general health questionnaire to assess the level of psychological distress and the aforementioned study used depression scale to assess self-reported depression. Furthermore, in line with the previous studies we found no negative or positive changes in number of physical functioning difficulties among our study subjects. Although there were no negative impact on health and functioning among those who voluntarily extended their working life, it is possible that the impact of health is different among those who extend their working life involuntarily[10].

Anxo and colleagues used sickness absence days between 59 to 64 years as a proxy for individual health before retirement[14], which helped to control the selection of only healthy people in the extension group. The approach used by them is widely used and helps to minimize health related selection bias by an extent, however, we believe that propensity score matching is more robust method as it takes into account the confounders and help to find a precisely matched control for treatment[25,26]. Eyjólfsdóttir and colleagues applied the propensity score matching technique separately to different outcomes[16], whereas we calculated the propensity scores together for every outcomes, as all of the outcomes were health and functioning related. Additionally, we considered the use of interaction of the control variables in the propensity score calculation.

In addition, to compare non-extenders and extenders, it is equally important to examine the changes in health and physical functioning within the groups to track changes in health over time. The previous studies lack the information on changes in health and functioning within the groups that extended and did not extend. In addition to the previous studies, we have taken into account the pre-retirement health and functioning status and presented the estimates separately for those who had good and for those who had suboptimal health and functioning before retirement in our additional analysis. Our approach to present the change and difference in health and functioning of three periods (1 year before individual pensionable date, to 18 and 30 months after individual pensionable date) is a first of its kind. We believe that these analyses complement the previous findings related to consequences of extending the working life. Apart from the listed differences, our study findings are comparable with the findings from these studies[14,16] as the study subjects belong to the country with practically similar pension system.

Strength and limitations

Information on both the individual retirement age and the actual retirement age as well as the use of repetitive yearly measurements among an established cohort for a comprehensive period is a major strength of this study. The use of propensity score matching on a wide set of pre-retirement characteristics and the fact that we were able to find matches for almost all extenders support causal inference. The level of suboptimal self-rated health and psychological distress among extenders and non-extenders during the baseline was similar, which we believe is an additional forte in terms of tracking development of health and functioning over time. An additional strength of this study is that we conducted analyses separately among those who had good and suboptimal health and functioning, which partly takes into account the health-related selection bias. Further, the use of extension based on duration of working one year beyond the individual pensionable age have minimized the bias due to positive effect of retirement. The salient limitation of this study is that these findings could be generalizable only to those

countries who have similar pension systems as it is in Finland. In addition the results should be cautiously generalized to male workers, since majority of our participants were women, reflecting the gender distribution in public sector. The other limitations could be that all three outcomes were based on self-reported measures, however, they were previously used and validated[19,20].

Conclusions

The longitudinal analysis of the repeated data using the propensity score matching showed no evidence that voluntarily extending the working career beyond retirement age pose a risk to health and physical functioning among aging workers. Overall, the finding strengthen previous findings that extended working lives may not have long-lasting effects on health and functional capacity. Working beyond the statutory retirement ages based on voluntary decisions could be an important solution to secure labor supply. These policy implications need a careful consideration, and future studies with cohorts from several countries with added dimensions of health and functioning outcomes and longer follow-up of working beyond retirement are warranted.

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Table 1: Pre-retirement characteristics in the no extension and extension groups after matching

Pre-retirement characteristics	**Total (N=1,148)**		**No-extension**	**Extension (n=574)**	**p-value[a,b]**
	n	**%**	**%** (n=574)		
Propensity score, mean SD	0.44±0.12		0.44±0.12	0.44±0.12	0.95
Gender					0.66
Men	244	21	22	21	
Women	904	79	78	79	
Age(mean ± SD)	62.68±1.19		62.64±1.13	62.72±1.25	0.27
Pension scheme					0.93
Old (<63 years)	173	15	15	15	
New (≥63 years)	975	85	85	85	
Married / cohabited					0.50
Yes	765	69	70	68	
No	337	31	30	32	
Occupational status					0.74
High	543	47	48	46	
Intermediate	328	29	28	29	
Low	277	24	24	25	
Physically heavy work					
No	1,038	90	90	90	1.00
Yes	110	10	10	10	
Workability					0.62
Good	541	51	50	51	
Moderate	504	46	47	45	
Poor	34	3	3	4	
Self-rated health					0.45
Good	939	84	83	84	
Suboptimal	184	16	17	16	
Psychological distress					0.66
No	1,011	90	89	90	
Yes	115	10	11	10	
Number of physical functioning difficulties(mean ± SD)	1.52±1.97		1.49±1.91	1.55±2.03	0.58

Note: SD, Standard Deviation; [a]Chi square for categorical variables; [b]Analysis of variance for continuous variables

Table 2: Difference in self-rated health, psychological distress and physical functioning between matched non-extenders and extenders during different points at follow-up.

Timing of retirement	**Follow–up period**						***p*–value***
	T1		T2		T3		
Suboptimal self–rated health	RRs	95% CIs	RRs	95% CIs	RRs	95% CIs	0.16
No–extension (ref)	1.00	–	1.00	–	1.00	–	
Extension	0.89	0.68–1.17	1.16	0.88–1.53	0.96	0.68–1.37	
Psychological distress	RRs	95% CIs	RRs	95% CIs	RRs	95% CIs	0.63
No–extension (ref)	1.00	–	1.00	–	1.00	–	
Extension	0.93	0.65–1.32	1.15	0.78–1.69	1.04	0.61–1.79	
Difficulties in physical functioning	Mean[a] Difference	95% CIs	Mean[a] Difference	95% CIs	Mean[a] Difference	95% CIs	0.40
No–extension (ref)	0.00	–	0.00	–	0.00	–	
Extension	0.06	-0.16–0.29	0.05	-0.18–0.27	-0.11	-0.39–0.17	

Note: RRs, Risk Ratios; CIs, Confidence Intervals; T1= 1 year before individual pensionable date; T2= 18 months after individual pensionable date; T3= 30 months after individual pensionable date; *p–value for interaction between extension group and time (T1, T2 and T3); [a]positive mean difference indicate increased physical functioning difficulties