Changes in Sleep Duration During Transition to Statutory Retirement: A Longitudinal Cohort Study

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ABSTRACT

Study Objectives: This study examined whether sleep duration changes during the transition from full-time work to statutory retirement and, if this were the case, which pre-retirement factors, including sociodemographic, work, lifestyle and health factors, predict these changes.

Methods: Data from repeated surveys of the Finnish Public Sector study, linked to records of retirement, were used. The study population consisted of 5,785 participants who retired on a statutory basis in 2000–2011 and who had responded to surveys on sleep duration at least once immediately before and after their retirement (mean number of repeat study waves 3.6). Linear regression analyses with generalized estimating equations were used to examine changes in sleep duration around retirement.

Results: Before retirement there was a slight decrease in sleep duration. During the four-year retirement transition, sleep duration increased from 7 hours 0 minutes (95% Confidence Interval [CI] 6 h 54 min to 7 h 6 min) to 7 hours and 22 minutes (95% CI 7 h 16 min to 7 h 27 min); thus, mean increase being 22 minutes. Increase in sleep duration was greatest in those who were short sleepers, heavy drinkers or had sleep difficulties. After the retirement transition, sleep duration remained at approximately the same level, as no significant changes were observed.

Conclusions: This longitudinal study suggests that transition from full-time work to statutory retirement is associated with an increase in sleep duration.

Keywords: Aging, sleep duration, retirement, longitudinal study

STATEMENT OF SIGNIFICANCE

Retirement from work gives an opportunity to sleep more, and these results of increased sleep duration after retirement suggest that this opportunity is indeed used. Most profound increases in sleep duration after transition to retirement were observed among those who had a short sleep duration, sleep difficulties, and heavy alcohol use before retirement. Adequate sleep is important, as short sleep has been associated with several adverse health outcomes, such as increased risk of cardiovascular diseases, diabetes, and mortality. Further studies are needed to confirm these results with an objective measurement of sleep duration.

INTRODUCTION

The population is aging across Western countries and the large baby-boomer generations are moving into retirement. Retirement is regarded as a major life transition that may have an effect on people's time availability and daily routines[1] and, as a consequence, on sleep. However, relatively little research has been conducted on the possible impact of retirement on sleep.

The focus of the few existing studies has mostly been on the impact of retirement on sleep disturbances.[2,3] In the longitudinal GAZEL study, for example, a substantial decrease in sleep disturbances (assessed with a 1-item survey question concerning the occurrence of sleep disturbances during the past 12 months) was observed following retirement.[2] It was suggested that this decrease is at least partly attributable to removal of work-related stressors, such as high psychological and physical job demands and low job satisfaction. Findings from another longitudinal cohort study, the Aging, Health & Work study, suggest that, from the different types of sleep problems, especially premature awakenings are reduced after retirement.[3]

To date, it is unclear whether retirement transition is also associated with changes in sleep duration. We are aware of only one study, the Retirement and Sleep Trajectories (REST) study,[4] that has addressed this question. Changes in sleep duration, bedtimes and wake times over a maximum of a three-year time period were compared between those who retired and those who stayed at work. Transition to retirement was associated with later bed times and later wake times, and as a result, to 15, 16 and 22 minutes longer sleep durations 1, 2 and 3 years after retirement, respectively, than those who continued working. As the follow-up period of the REST study was relatively short (up to three years post-retirement) and the focus on post-retirement changes, a wider picture of the changes in sleep duration around retirement transition is still lacking.

The aim of this study was to examine the changes in sleep duration around retirement, by using repeated self-reports on sleep duration before, during, and after the retirement transition. As sleep duration is associated with various sociodemographic, lifestyle and health factors,[5-7] we additionally examined the role of these factors before retirement as predictors of changes in sleep duration during the retirement transition.

METHODS

Study Population

The study population consisted of participants of the Finnish Public Sector (FPS) study, an ongoing prospective occupational cohort study. The eligible population included all employees who had been working for a minimum of six months in the target organizations, which included ten towns and six hospital districts, between 1991 and 2005 (n = 151,901).[8] All those who were employed at the time of the surveys or had left the organizations after participating in an earlier survey were included in nested survey cohorts. For this study, we used data from repeated surveys performed for current employees in 2000–2002, 2004 and 2008 and for leavers in 2005, 2009 and 2013. The survey data were linked to employers' records (birth date, gender and occupational title) and the national health registers (diseases and medications) by using personal identity codes, which are assigned to all citizens in Finland. For the analyses, anonymized data without the identity codes were used. The FPS study was approved by the Ethics Committee of the Hospital District of Helsinki and Uusimaa.

Of the FPS cohort members, individuals who were at work and responded to at least one survey in 2000–2002, 2004 or 2008 were first identified (n = 81,587). Of those employees, 19,058 were awarded their first pension by December 31, 2011, and of these, 9,787 persons had responded to at least one survey before and after retirement. We included those persons who had retired at the statutory retirement age (statutory retirement i.e. old age retirement) as their first awarded pension scheme (n = 5,898). Thus, participants that had retired on a part-time or disability retirement were excluded from this study.

For the analysis, we centered the data around the actual retirement date. There were three possible study waves before retirement ($wave_{-3}$, $wave_{-2}$, $wave_{-1}$), and three possible waves after retirement ($wave_{+1}$, $wave_{+2}$, $wave_{+3}$). Each successive wave was on average four years apart from each other. To be included in this study, the participants had to report their sleep duration in at least two surveys, one immediately before and after the transition to statutory retirement (i.e., in $wave_{-1}$ and $wave_{+1}$) (n = 5,785). Each participant may have taken part in a maximum of four study waves and, on average, participants provided data on sleep duration at 3.6 (range 2–4) waves during a follow-up of 8–12 years. The relation of the survey years to the study waves around retirement is demonstrated in supplemental material (see Table S1 in supplemental material).

Assessment of Retirement

The Finnish Centre for Pensions coordinates all the earnings-related pensions for permanent residents in Finland[9] and was thus able to provide data on each participants' retirement. All gainful employment in Finland is insured in a pension plan and accrues a pension. The start dates for pension were obtained for all participants from 2000 through 2011, irrespective of the participants' employment status or workplace at follow-up.

According to the public sector Employees' Pension Act, the statutory retirement age was generally 63 to 65 years until the end of 2004 and 63 to 67 years from 2005 onwards. However, some employees had kept their earlier retirement age from the previous pension act in which pension ages were below 63 years in some occupations (e.g. 60 years for primary school teachers). In Finland, a part-time pension or a disability pension on health grounds may also be granted.

Assessment of Sleep Duration

In each study wave, sleep duration was assessed with an identical question by asking participants how many hours they usually sleep per 24 hours. The question had the following nine response alternatives: 6 hours or less, 6.5 hours, 7 hours, 7.5 hours, 8 hours, 8.5 hours, 9 hours, 9.5 hours and 10 hours or more. For the calculation, these response alternatives were counted as hours, and at the extremes of the scale, 5.5 hours and 10.5 hours, were assigned to categories "6 hours or less" and "10 hours or more", respectively. The results of the analyses are shown as hours and minutes. For some analyses, participants' sleep duration before retirement was categorized into three groups according to the last questionnaire preceding retirement (wave$_{-1}$): short (6.5 hours or less), mid-range (7–8.5 hours) and long (9 hours or more).

Assessment of Covariates

All covariates were measured at wave$_{-1}$. The participants' gender and occupational title were obtained from the employers' registers and their marital status and whether they did shift/night work from the survey responses. Marital status was categorized into two groups: married (married or cohabiting) and not married (other). Occupational status was categorized into three groups on the grounds of occupational titles by the last known occupation preceding retirement: upper-grade non-manual workers (e.g. teachers, physicians), lower-grade non-manual workers (e.g. registered nurses, technicians) and manual workers (e.g. cleaners, maintenance workers). Doing shift/night work was categorized into "no" and "yes", the latter consisting of shift work with or without night shifts, regular night work, and other irregular work.

The lifestyle factors, which in this study were alcohol use, smoking and physical activity, were obtained from the survey. Alcohol use was categorized into none, moderate, and heavy according to habitual frequencies of beer, wine and spirits consumption reported by participants. The limit for heavy alcohol use was set as >16 drinks/week for women and >24 drinks/week for men, as these limits correspond with the lower limit for heavy use of alcohol set by the Finnish Ministry of Health and Social Affairs.[10] Smoking was categorized into three groups: never, former and current. Physical activity was assessed by asking participants to estimate their average weekly hours of leisure-time physical activity (including commuting) within the previous year in walking, brisk walking, jogging, and running, or their equivalent activities.[11,12] The time spent on activity at each intensity level in hours per week was multiplied by the average energy expenditure of each activity, expressed in metabolic equivalent (MET). Physical activity was categorized into four groups: inactive (<7 MET hours/week), low (7–14 MET hours/week), medium (14–30 MET hours/week) and high (≥30 MET hours/week), corresponding to the Physical Activity Guidelines for Americans.[13]

Disease status was constructed by taking into account all chronic diseases reported in the waves available before retirement ($wave_{-3}$, $wave_{-2}$ or $wave_{-1}$), and participants were considered as having a chronic disease before retirement, if a chronic disease was reported in any of these waves. Information on chronic illnesses was obtained from nationwide registers: asthma, diabetes, rheumatoid arthritis and coronary heart disease based on the Social Insurance Institution of Finland's (SII) Drug Reimbursement Register; depression based on the Finnish Prescription Register kept by SII (ATC code N06A) and cancer based on the Finnish Cancer Registry. In addition, information on osteoarthritis was obtained from the questionnaires. Participants were categorized as having no chronic disease, one disease or two or more diseases.

Other health-related factors, such as the body mass index (BMI), self-reported health, psychological distress and sleep disturbances, were obtained from the last questionnaire preceding retirement ($wave_{-1}$). BMI was calculated from self-reported body weight and height (kg/m^2), and categorized into underweight (<18.5 kg/m^2), normal weight (BMI 18.5–25 kg/m^2), overweight (BMI 25–29.9 kg/m^2) and obesity (BMI ≥30 kg/m^2). Participant reported their state of health on a 5-point scale (1=good … 5=poor), and the self-reported health was then dichotomized by categorizing response scores 1 and 2 as good health and scores 3 to 5 as suboptimal health. Psychological distress was measured with the 12-item version of General Health Questionnaire (GHQ-12),[14] which gives a total score ranging from 0 to 12. A cut-off point of three or more symptoms was used to indicate psychological distress (no vs. yes).

Sleep difficulties were measured with the Jenkins Sleep Problem Scale,[15] in which four individual items address the occurrence of the following sleep problems: difficulty falling asleep, difficulty maintaining sleep during the night, waking up too early in the morning, and nonrestorative sleep. Participants reported the frequency of each of these problems during the past four weeks (never, 1–3 nights per month, 1 night per week, 2–4 nights per week, 5–6 nights per week and nearly every night). Participants were categorized as having sleep difficulties (no vs. yes), if the frequency of the most frequent symptom they reported was higher than 4 nights per week. An additional covariate possibly related to sleep duration is job strain, which was ascertained using questions from the Job Content Questionnaire (JCQ)[16] The FPS study surveys included a job control and job demands scales from the shorter version of the JCQ.[17] The presence of job strain before retirement was defined as having high demands and a low control score based on the median values from the year 2000 survey (no vs. yes).

Statistical Analyses

Changes in daily sleep duration (in hours and minutes) around retirement were assessed using linear regression analyses with generalized estimating equations (GEE). As repeated measurement are used, the GEE model controls for the intra-individual correlation between repeated measurements. The model uses an exchangeable correlation structure and is not sensitive to measurements missing completely at random.[18,19]

In order to study changes in sleep duration around the transition to retirement, we constructed three consecutive periods: the pre-retirement period (from $wave_{-3}$ to $wave_{-2}$), the retirement transition (from $wave_{-1}$ to $wave_{+1}$) and the post-retirement period (from $wave_{+2}$ to $wave_{+3}$). The periods were non-overlapping to allow testing whether the changes in sleep duration differed between the pre-retirement period, the retirement transition, and the post-retirement period; the statistical significance of these changes was tested using a Period x Time interaction term, where Time was treated as a continuous variable. The adjusted mean estimates and their 95% confidence intervals were calculated to represent an average of a 4-year change of sleep duration. The analyses were adjusted for retirement age, gender, occupational status, shift/night work and BMI at the study wave immediately before retirement ($wave_{-1}$), number of chronic diseases before retirement, and time-dependent lifestyle factors, that is, alcohol use, smoking and physical activity.

We also examined whether sociodemographic and work factors (gender, retirement age, marital status, occupational status, shift/night work and job strain), lifestyle factors (physical activity, alcohol use and smoking) and health factors (number of chronic diseases, BMI, self-reported health

and psychological distress) as well as sleep difficulties and sleep duration before retirement (wave$_{-1}$) predicted changes in sleep duration during the retirement transition and/or the post-retirement period. For these analyses, the contrast statements in the GEE models were used while adjusting for retirement age, gender and occupational status.

Finally, we conducted a sensitivity analysis among those whom data on sleep duration was available from all four measurements (n = 4,356). This was done to address the question on whether those participants who had missing data in one or two measurement points biased the results. In addition, we examined whether the results on the categorized sleep duration before retirement were biased due to regression to the mean (the tendency of extreme values in the first measurement point being followed by measurement closer to the mean in repeated samples). This was done by defining sleep duration before retirement as the average of sleep duration in wave$_{-2}$ and wave$_{-1}$, rather than using data from wave$_{-1}$ only. Participants' sleep duration was categorized into three groups: short (6.5 hours or less), mid-range (7–8.5 hours) and long (9 hours or more) and analyses were repeated using this categorization. All analyses were conducted using the SAS 9.4 Statistical Package (SAS Institute Inc., Cary, NC).

RESULTS

The characteristics of the study population at pre-retirement are shown in Table 1. The majority of this population were women (80%), had an upper-grade non-manual occupation (38%), and were married (74%). The average age at retirement was 61.9 (SD 2.0) years.

Changes in Sleep Duration around Retirement

Figure 1 shows average sleep durations before retirement, during the retirement transition and after retirement adjusted for gender, retirement age, occupational status, shift/night work, time-dependent lifestyle factors, BMI and chronic diseases. The average sleep duration in wave$_{-3}$ was 7 hours 4 minutes (95% Confidence Interval [CI] 6 h 59 min to 7 h 10 min). The magnitude of change in sleep duration differed between the pre-retirement, retirement transition and post-retirement periods (Period x Time interaction $p < .0001$). During the pre-retirement period, there was a slight decrease of 3 minutes in sleep duration in wave$_{-2}$. In the study wave immediately before retirement (wave$_{-1}$), the average sleep duration was 7 hours 0 minutes (95% Confidence Interval [CI] 6 h 54 min to 7 h 6 min). During the retirement transition period, sleep duration increased by 22 minutes to 7 hours and 22 minutes (95% CI 7 h 16 min to 7 h 27 min). During the post-retirement period, there was no statistically significant change in sleep duration.

Predictors of Change in Sleep Duration

Table 2 presents average sleep duration before retirement (wave$_{-1}$) and mean estimates of a 4-year change during retirement transition by characteristics of the study population before retirement. Being female (vs. male), retirement age of under 60 years (vs. retirement age of 60–64 or retirement age >64), having an upper grade non-manual occupation (vs. lower grade non-manual or manual occupation), not having shift/night work (vs. having shift/night work), having no job strain (vs. having job strain), having low physical activity (vs. medium physical activity), no alcohol use (vs. moderate alcohol use), having never smoked (vs. current smoker), good self-reported health (vs. suboptimal), having no psychological distress (vs. having psychological distress) and having no sleep difficulties (vs. having sleep difficulties) were associated with longer sleep duration before retirement. During the retirement transition, the greatest increases in sleep duration were found among those with heavy alcohol use, short sleep, and sleep difficulties during pre-retirement. Being male (vs. female), retirement age of 60–64 (vs. retirement age <60), being married (vs. not being married), having an upper grade non-manual occupation (vs. manual occupation), having job strain (vs. no job strain) and psychological distress (vs. no psychological distress) were also associated with a greater increase in sleep duration during the retirement transition. During the retirement transition, sleep duration decreased only among long sleepers, that is, those with a sleep duration of over 9 hours per 24 hours at pre-retirement.

Although no change in sleep duration was observed during the four-year post-retirement period (from wave$_{+2}$ to wave$_{+3}$) when all the participants were considered, statistically significant decreases in sleep duration were found in some individual groups. Sleep duration continued to decrease among pre-retirement long sleepers by 16 minutes per four years (95% CI −31 to −1 min) during the post-retirement period. Also, a decrease in sleep duration was found among men (−3 min, 95% CI −5 to 0 min), persons with an upper grade non-manual occupation (−3 min, 95% CI −7 to 0 min), those with no job strain −3, 95% CI −5 to 0 min) and those who were overweight (−5 min, 95% CI −8 to −1 min) during the post-retirement period.

Finally, the analyses of sleep duration were repeated so that only participants with data on sleep duration from all four possible study waves were included (n = 4,356). Results from these analyses were very similar to those of the actual analyses with only minor differences in the estimates of the associations between pre-retirement factors and changes in sleep duration during retirement transition. The results for this sensitivity analysis is shown in supplemental material (see Table S2 in supplemental material). An additional sensitivity analysis, in which the participants' sleep

duration was categorized according to the average sleep duration in wave$_{-2}$ and wave$_{-1}$, showed essentially the same results as the main analysis with sleep duration defined from wave$_{-1}$ (see Table S3 in supplemental material). This suggests that bias due to regression to the mean phenomenon is an unlikely explanation to our results.

DISCUSSION

In a large cohort of Finnish public sector employees, a notable increase in sleep duration was observed following transition from full-time work to statutory retirement. Sleep duration increased in almost all groups categorized by pre-retirement sociodemographic, work, lifestyle, and health factors. Increase in sleep duration was particularly pronounced among heavy alcohol users, short sleepers and those with sleep difficulties before retirement. The only group with a decrease in sleep duration during the transition to retirement was the group with a long sleep duration (≥9 hours/24 h) before retirement; the sleep duration of this group also decreased after the retirement transition. The findings of increased sleep duration during the retirement transition are important, as self-reported short sleep duration is associated with several adverse health outcomes, including decreased cognitive functioning[20] and increased risk of hypertension,[21] type 2 diabetes,[22] and mortality.[23,24]

Changes of Sleep Duration around Retirement

Our results showing increased sleep duration during retirement transition are in line with the only previous study we are aware of examining changes in sleep duration during the transition to retirement.[4] We found sleep duration to increase on average by 22 minutes during the 4-year retirement transition. Interestingly, a similar result was found in the REST study, where retirees reported 15, 16 and 22 minutes longer overall sleep durations 1, 2 and 3 years post-retirement, respectively, compared to those who continued working full-time over the same period.[4] Our study expands previous knowledge by providing more detailed information on sleep duration changes around the retirement transition, as aging workers were followed from final working years well into retirement, the follow-up time extending up to 12 years.

Our study design including repeated measurements helps distinguishing the effect of retirement from the effects of aging. The sharp increase in sleep duration during the retirement transition suggests retirement rather than aging is driving sleep change, especially as there seems to be a decreasing trend in sleep duration both within the pre-retirement and within the post-retirement period. Previous meta-analysis of quantitative sleep parameters reported sleep duration of healthy

adults to decrease with age, but plateau after 60 years of age.[25] Findings from the American Time Use Survey, on the other hand, suggest sleep duration to start to increase in people aged ≥ 60 years.[7] According to our results sleep duration did not change substantially among our population during the years preceding retirement, as only a slightly decreasing trend of sleep duration was observed. After increasing during the retirement transition, sleep duration remained at approximately the level it had reached throughout the post-retirement period up to eight years after transition to retirement. These results suggest that this increase in the amount of sleep is sustained for a fairly long after the transition to retirement.

Retirement from work enables people to devote more time to sleeping, and our results imply that this indeed seems to happen. There is evidence from previous studies that during normal working days people sleep less than they prefer to.[26] This is often referred to as the concept of "social jet lag" – the misalignment between a person's circadian and social clocks (measured as the difference in hours at the midpoint of sleep between work days and days off).[27] During the weekends, or other times when people have more leisure time, sleep duration is longer[26] and sleep deprivation over the week may be compensated for.[27] During retirement, people may begin to sleep more, when there is no need to wake-up for work at a certain time in the morning.[4,7]

Pre-retirement Factors as Predictors of Changes in Sleep Duration

To examine why sleep duration increases during retirement transition, we examined how this increase depended on pre-retirement factors. This may help us to understand the underlying mechanisms of how retirement brings about the positive changes in sleep duration. Previous studies have focused only on the associations of gender, age, mental health status, and circadian preference with changes in sleep duration during the transition to retirement.[4] Information has been lacking on how various other correlates of sleep duration, such as poor self-rated health,[6] alcohol use,[20] and smoking,[5,26] are associated with the changes in sleep duration during the retirement transition.

Although sleep duration increased in all demographic groups during the retirement transition, the increase was slightly greater among men (vs. women), those with a retirement age of 60–64 years (vs. those with a retirement age < 60 years), those who were married (vs. single, divorced or widowed) and those with an upper-grade non-manual occupation (vs. manual occupation). A somewhat greater increase in sleep duration was observed in those with job strain or psychological distress before retirement compared to those with no job strain or no distress. These results were expected, as removal of work-related exposures has been suggested to be a potential mechanism explaining a substantial improvement in sleep quality and mental health shortly after retirement.[1,2]

Unexpectedly, sleep duration before retirement differed only slightly between those doing shift/night and those with regular work schedules, and the increase in sleep duration during retirement transition was similar in both groups. As shift work is shown to cause circadian misalignment and is associated with sleepiness and insomnia,[28] it is possible that people who are able to tolerate shift working until retirement are a highly selected group and those shift workers with health problems may have changed to day work years before retiring.[29]

Of the lifestyle factors, only alcohol use before retirement was associated with changes in sleep duration. Heavy drinkers before retirement had a considerably greater increase in sleep duration during retirement transition compared to those who did not use alcohol. These results may imply that, during their working years, the participants with heavy alcohol use did not get enough sleep or had to wake up earlier than would be "natural" to them, but after retirement they were able to sleep more. Alcohol use has previously been associated with greater degrees of "social jet lag",[30] to which working schedules may expose individuals. It is, however, unclear whether the greater increase in sleep duration seen in pre-retirement heavy alcohol users is due to reduction, continuation or even increasing alcohol use after retirement. Heavy drinking also disturbs sleep.[31] In our study, those respondents with self-reported sleep difficulties before retirement had remarkably shorter sleep duration before retirement and a greater increase in sleep duration during the retirement transition than those without sleep difficulties before retirement. Retirement has been found to decrease the prevalence of sleep disturbances[2] and especially the prevalence of premature awakenings.[3] The decrease in sleep disturbances may contribute to the increase of sleep duration during the transition to retirement.

Long working hours and early morning start times are possible reasons for short sleep duration during the working years. Results from the American Time Use Survey suggest working to be one of the main activities traded off for sleep in short sleepers (<6 h/ 24 h), whereas long sleepers (> 11 h/ 24 h) tended to spend less time working compared to mid-range sleepers (6–11 h/24 h).[7] In addition, those who were retired obtained more sleep, were less likely to be short sleepers, and more likely to be long sleepers compared to private sector employees. In our study, the most pronounced increase in sleep duration was found among those retirees who reported short (≤6.5 hours/24 h) sleep duration before retirement. The dramatic increase in sleep duration might imply that, during their working years, these respondents did not sleep as much as they needed or wanted to. The only exception to the finding on increased sleep duration during the retirement transition was observed in those who were long sleepers (>9 hours/ 24 h) before retirement; in this group sleep duration decreased on average by 46 minutes during the retirement transition and continued to decrease

during the post-retirement period. Long sleeping can be related to medical conditions, such as depressive symptoms and mood disorders.[32,33] As health may improve[34] and depressive symptoms reduce[35] following retirement, the need for long sleep may be reduced after retirement. However, as long sleepers comprised only 3% of our study sample, caution must be taken when interpreting these results.

Strengths and Limitations

The main strengths of our study include a large sample with repeated measurements of sleep duration linked to the participant's actual date of retirement; thus enabling us to trace changes in sleep duration before, during, and after the retirement transition. The follow-up period of 8–12 years in this study, allowed us to examine whether the changes observed during the retirement transition were persistent long after the transition. Pre-retirement information on various sociodemographic, lifestyle and health factors associated with sleep allowed the examination of possible predictors for changes in sleep duration, and it was possible to control many possibly confounding factors.

The main limitation of this study is the reliance on self-reported sleep duration. However in each survey, respondents were asked to estimate in the same way and at the same time of the calendar year how many hours they usually sleep per 24 h. Thus, differences, for example, in the amount of light or in the wording of the question between the study waves are unlikely to confound the results. Accelerometers might be a feasible method for a more accurate and objective assessment of sleep duration, and the simultaneous use of both subjective and objective measurements of sleep duration has been recommended in particular.[36] An additional limitation to this study is the lack of information on respondents' chronotypes or circadian preferences, which may modify the association between retirement and sleep duration.[4] Additionally, this study may underestimate the possible instant effects in sleep duration that may be seen immediately after retirement, as there was an approximately four year gap between the study waves preceding and following retirement. Further research using objective measurements with shorter measurement intervals is needed to examine this. Finally, our data come from a large cohort study of a relatively healthy female-dominated public sector employees of European origin in a Scandinavian welfare state with a relatively generous retirement scheme. Future research is needed to examine whether our findings are generalizable, as to other working sectors, cohorts, countries and retirement types other than statutory retirement.

Conclusion

Transition from full-time work to statutory retirement is associated with an increase in sleep duration. During the 8-year follow-up, sleep duration remained at the level it had reached during the retirement transition, suggesting that this increase in sleep is sustained long after retirement. The increase of sleep duration during retirement transition was most pronounced in those with short sleep duration, sleep difficulties, and heavy alcohol use before retirement. These results suggest that after retirement from work, and thus, after gaining more leisure time, people begin to sleep more.

ABBREVIATIONS LIST

BMI = Body Mass Index
CI = Confidence Interval
GEE = Generalized Estimating Equations
JCQ = Job Content Questionnaire
MET = Metabolic Equivalent
SD = Standard Deviation
SII = Social Insurance Institution of Finland
GHQ = General Health Questionnaire

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DISCLOSURE STATEMENT

None

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TABLES

Table 1 – Characteristics of the study population (n = 5,748) before retirement.

	n	***%***
Gender		
Men	1168	20
Women	4617	80
Retirement age		
<60	683	12
60–64	4251	73
>64	851	15
Marital status		
Married	4253	74
Not married	1461	26
Occupational status		
Upper grade non-manual	2201	38
Lower grade non-manual	1538	27
Manual	2017	35
Shift/night work		
No	3993	70
Yes	1703	30
Job strain		
No	4299	75
Yes	1406	25
Physical activity		
Inactive	1126	20
Low	1293	23
Medium	1681	29
High	1647	29
Alcohol use		
None	915	16
Moderate	4399	77
Heavy	435	8
Smoking		
Never	4214	75
Former	942	17
Current	498	9
Number of chronic diseases		
0	2945	51
1	2273	39
>1	567	10
Body Mass Index		
Underweight (<18.5 kg/m^2)	26	0.5
Normal weight (18.5–24.9 kg/m^2)	2373	43
Overweight (25–29.9 kg/m^2)	2277	41
Obese (≥30 kg/m^2)	892	16
Self-reported health		
Good	3637	63
Suboptimal	2117	37
Psychological distress		
No	4399	76
Yes	1361	24
Sleep duration before retirement		
Short (≤6.5 hours/24 h)	1735	30
Mid-range (7–8.5 hours/24 h)	3897	67

Long (≥9 hours/24 h)	153	3
Sleep difficulties before retirement		
No	3978	69
Yes	1796	31

Table 2 – Mean sleep durations at the study wave immediately before retirement and mean changes in sleep duration during the retirement transition period by pre-retirement characteristics.

	Study wave before retirement[a]			Retirement transition[b]		
	Mean sleep duration	95% CI		Mean change (min)	95% CI	
All	7 h 0 min	6 h 54 min	7 h 6 min	22	20	23
Gender						
Men	7 h 1 min	6 h 59 min	7 h 4 min	24	21	26
Women	7 h 6 min	7 h 5 min	7 h 8 min	21	19	22
Retirement age						
<60	7 h 10 min	7 h 6 min	7 h 14 min	17	13	20
60–64	7 h 4 min	7 h 2 min	7 h 6 min	23	21	24
>64	7 h 2 min	6 h 58 min	7 h 5 min	19	16	23
Marital status						
Married	7 h 5 min	7 h 3 min	7 h 6 min	23	21	24
Not married	7 h 4 min	7 h 1 min	7 h 7 min	19	16	21
Occupational status						
Upper grade non-manual	7 h 7 min	7 h 5 min	7 h 9 min	24	22	26
Lower grade non-manual	7 h 3 min	7 h 1 min	7 h 6 min	21	19	24
Manual	7 h 3 min	7 h 1 min	7 h 6 min	19	17	21
Shift/night work						
No	7 h 6 min	7 h 4 min	7 h 8 min	22	21	24
Yes	7 h 2 min	6 h 59 min	7 h 4 min	20	18	22
Job strain						
No	7 h 6 min	7 h 4 min	7 h 7 min	21	19	22
Yes	7 h 0 min	6 h 57 min	7 h 3 min	24	21	27
Physical activity						
Inactive	7 h 4 min	7 h 0 min	7 h 7 min	20	17	23
Low	7 h 7 min	7 h 4 min	7 h 10 min	22	20	25
Medium	7 h 4 min	7 h 1 min	7 h 6 min	22	20	25
High	7 h 5 min	7 h 2 min	7 h 7 min	21	19	24
Alcohol use						
None	7 h 9 min	7 h 5 min	7 h 13 min	17	14	21
Moderate	7 h 4 min	7 h 2 min	7 h 5 min	22	21	23
Heavy	7 h 6 min	7 h 1 min	7 h 11 min	26	21	31
Smoking						
Never	7 h 6 min	7 h 5 min	7 h 8 min	22	20	23
Former	7 h 3 min	6 h 59 min	7 h 6 min	22	18	25
Current	6 h 58 min	6 h 53 min	7 h 2 min	21	17	26
Number of chronic diseases						
0	7 h 6 min	7 h 4 min	7 h 8 min	22	20	24
1	7 h 3 min	7 h 0 min	7 h 5 min	22	20	24
>1	7 h 6 min	7 h 1 min	7 h 11 min	18	13	22
Body Mass Index						
Underweight (<18.5 kg/m^2)	7 h 3 min	6 h 42 min	7 h 25 min	14	−2	30
Normal weight (18.5–24.9 kg/m^2)	7 h 5 min	7 h 3 min	7 h 7 min	22	20	24
Overweight (25–29.9 kg/m^2)	7 h 5 min	7 h 3 min	7 h 7 min	21	19	23
Obese (≥30 kg/m^2)	7 h 4 min	7 h 0 min	7 h 7 min	21	18	24
Self-reported health						
Good	7 h 7 min	7 h 6 min	7 h 9 min	21	19	23
Suboptimal	7 h 0 min	6 h 58 min	7 h 3 min	23	20	25
Psychological distress						
No	7 h 8 min	7 h 6 min	7 h 9 min	21	19	22
Yes	6 h 54 min	6 h 51 min	6 h 57 min	25	22	28
Sleep duration before retirement						
Short (≤6.5 hours/24 h)	6 h 4 min	6 h 3 min	6 h 6 min	45	43	48
Mid-range (7–8.5 hours/24 h)	7 h 27 min	7 h 26 min	7 h 28 min	14	12	15
Long (≥9 hours/24 h)	9 h 9 min	9 h 5 min	9 h 12 min	−46	−56	−37
Sleep difficulties before retirement						
No	7 h 11 min	7 h 9 min	7 h 13 min	20	18	21
Yes	6 h 50 min	6 h 47 min	6 h 53 min	25	23	28

Notes: The model with all participants ("All") was adjusted for retirement age, gender, occupational status, shift/night work, number of chronic diseases and BMI before retirement and time-dependent alcohol use, smoking and physical activity. All other models were adjusted for gender, retirement age and occupational status. [a]Study wave before retirement = $wave_{-1}$. [b]Retirement transition = from $wave_{-1}$ to $wave_{+1}$, where change is estimated over four years of time and reported in minutes. CI = Confidence Interval

FIGURE CAPTIONS

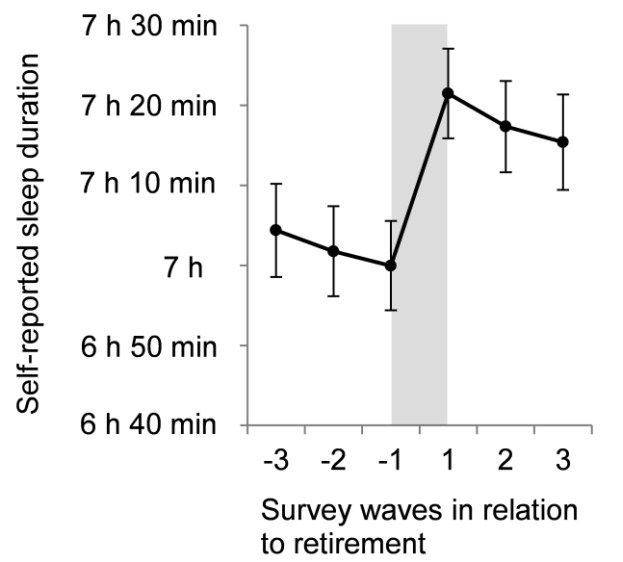

Figure 1 – Average sleep duration per 24 hours. The period of retirement transition is shown in grey. Adjusted for retirement age, gender, occupational status, shift/night work, number of chronic diseases and BMI before retirement and time-dependent alcohol use, smoking and physical activity.

SUPPLEMENTARY MATERIALS

Table S1 – Study design. Survey years, their relation to the study waves around retirement and the construction of the pre-retirement, retirement transition and post-retirement periods.

Table S2 – Mean sleep durations at the study wave immediately before retirement and mean changes in sleep duration during the retirement transition period by pre-retirement characteristics among participants with four observations (*n* = 4,356).

Table S3 – Mean sleep durations at the study wave immediately before retirement and mean changes in sleep duration during the retirement transition period by categories of average sleep duration before retirement.