



## Gender differences in actual and preferred nocturnal sleep duration among Finnish employed population



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### ABSTRACT

**Objective:** Sufficient sleep is essential for health and working capacity. Shorter sleep duration on workdays is often compensated by sleeping longer during leisure days. Gender dissimilarities in sleep quality are acknowledged. Our aim was to study the less known gender differences in sleep duration.

**Methods:** A population based study with a total of 1049 middle-aged regularly working women (n = 524) and men (n = 525). A questionnaire of sleep durations on workdays and leisure days, preferred sleep duration, with health-related quality of life and health behavior.

**Results:** Women slept 14 min longer on workdays (p < 0.002) and 27 min longer on leisure days (p < 0.002) and had 32 min longer preferred sleep duration (p < 0.001) than men. Compared to workdays, women slept 1 h 57 minutes longer and men 1 h 42 min longer on leisure days (gender p < 0.001). On workdays, both women and men slept less than their preferred sleep duration and again, with more extensive difference in women (gender-interaction p < 0.001). On leisure days the excessive sleep time did not differ between genders (p = 0.346). None of the explanatory variables explained the gender differences in sleep durations.

**Conclusions:** Sleep loss on workdays is presumably more pronounced in women, since despite their longer sleep on workdays, the gender differences persist in both sleep duration on leisure days and in preferred sleep duration.

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### 1. Introduction

Assessment of sleep duration is clinically relevant given the previous reports that both too short and too long sleep durations are associated with health problems [1–5]. Most of the previous studies [6–8], but not all [9,10], suggest that, compared to men, women have longer sleep duration. Women report also more sleep problems and disturbances across all ages [11]. In a large ‘Finnish Health 2000’—Survey [8] 13% of women and 17% of men were short sleepers ( $\leq 6$  h), whereas 16% of women and 11% of men were long

sleepers ( $\geq 9$  h). Over 10% of the subjects in a Norwegian study reported sleeping less than 80% of their sleep need [7]. In a Finnish study, 20% of subjects reported sleeping one hour shorter than they would desire [12].

Although sleep duration is partly genetically determined [13], many environmental, lifestyle, and socioeconomic factors also play a role [13,14]. Elderly subjects, subjects with low education [7,8,14–16], with low income [14,15], unemployed [14] and physically inactive subjects [8] are more often either short sleepers or long sleepers. Furthermore, alcohol consumption [15] and smoking are dose-dependently associated with shorter sleep duration [15]. Additionally, poor self-rated health and lower quality of life are associated with both short and long sleep [14,17].

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On workdays sleep quality may be disturbed and sleep duration shortened, which might be compensated by sleeping longer on leisure days [6,17,18]. In order to evaluate this, a study on sleep durations on workdays and leisure days was warranted. The previous literature is limited to only a few studies assessing gender differences [7,9,10,16]. Hence, we aimed to study gender differences in self-reported actual sleep duration on workdays and leisure days. We compared actual sleep duration to preferred sleep duration and thus evaluated sleep loss on workdays and excessive sleep time on leisure days. We hypothesized that sleep durations are similar in both genders. Further, associations of health-related quality of life (HR-QOL) and health behavior on sleep durations were evaluated.

## 2. Material and methods

### 2.1. Subjects

Our study was part of the long-term, prospective follow-up project Finnish Family Competence (FFC) study. One of the aims of the FFC study was to follow health behavior and HR-QOL in families. Altogether, 1443 families were randomly sampled from the general population of the Province of Turku and Pori in South-Western Finland [19]. Families expecting their first child were recruited at their first visit to a public maternity health clinic. In Finland, more than 99% of mothers use the public maternity health care clinic services during pregnancy [20]. The data of the present study was based on follow-up questionnaires 15 years after the baseline study. A total of 855 women and 695 men returned an adequately completed questionnaire and constitute the final study sample. In order to exclude the effect of shift and irregular working hours on the sleep-wake cycle and their confounding effect on the circadian clock [21], only regular full-time workers were included, while shift workers, part-time workers, unemployed, students, housewives, and house husbands were excluded. Thus, altogether 524 women and 525 men formed the study population (Fig. 1.). The characteristics of the subjects are described in Table 1.

### 2.2. Methods

The sleep questionnaire (dependent variables) consisted of questions about actual and preferred sleep duration and sleep latency during the past three months. The subjects reported their bedtimes and wake up times separately on workdays and on leisure days. Sleep latencies (minutes) were also enquired separately for workdays and for leisure days. Sleep durations were calculated from these times [Sleep duration = awakening time – (bed time + sleep latency); hours, minutes]. An estimation of preferred sleep duration was asked by the question: “How long do you need to sleep per night (if you could sleep as long as you would like; hours, minutes)?” An additional general sleep duration question “How many hours do you usually sleep per night (hours, minutes)?” was assessed to control the reliability of the workday and leisure day sleep duration questions. Consequently, six women and two men with unreliable sleep duration data were excluded. To estimate possible sleep loss on workdays, the difference between preferred sleep duration and actual sleep duration on workdays was calculated. Further, to estimate excessive sleep time on leisure days, the difference between preferred sleep duration and actual sleep duration on leisure days was calculated.

Predictors in the associations between gender and sleep variables included age, body mass index (BMI, kg/m<sup>2</sup>), physical exercise (no/yes), existence of chronic diseases (no/yes), use of regular medication (no/yes), smoking (never/has smoked ‘x’ years but has stopped smoking ‘x’ years ago/smoking ‘x’

cigarettes per day inside/smoking ‘x’ cigarettes per day outside), use of alcohol (none/rarely/one to three times a month/once or twice a week/more often) and four health-related quality of life (HR-QOL) factors. HR-QOL factors included somatic health (healthy-sick), vitality (vital-stressed/tired), mental stability (balanced-unbalanced), and mood (satisfied-melancholic) rated on a scale from 1 (best) to 5 (worst).

### 2.3. Statistical analysis

The data are presented as percentages or means and standard deviations. Associations between sleep variables and gender were analyzed with linear models, and the differences between actual and preferred sleep durations with linear mixed models using the measure (actual workday, actual leisure day, or preferred sleep duration) as within-subject repeating factor. The mixed models included also gender × repeat-factor interaction terms. All models were further adjusted with the potential covariates (age, smoking, alcohol consumption and HR-QOL factors). Smoking was considered as dichotomized: those who had never smoked and those who had stopped were considered as non-smokers, and all others as smokers. Consumption of alcohol was considered in three categories: 1) none or rarely, 2) one to three times a month, 3) at least once a week. In HR-QOL factors the categories 4 and 5 were merged due to sparse data. Sleeping latencies were log-transformed for the analyses and the data is given as geometric mean with 95% confidence interval (CI). P-values less than 0.05 were considered as statistically significant. Statistical computations were performed using SAS system for Windows, release 9.4 (SAS Institute, Cary, NC, USA).

## 3. Results

### 3.1. Sleep and gender

Actual and preferred sleep durations are described in Table 2. Women slept 14 min longer on workdays and 27 min longer on leisure days than men. Preferred sleep duration was 32 min longer in women than in men. Differences in actual and preferred sleep durations are described in Table 3. Women slept 1 h 57 min longer on leisure days compared to workdays, while in men the sleep duration on leisure days was 1 h 42 min longer than on workdays. This increase in sleep duration between leisure and workdays was 15 min greater in women than in men. On workdays, both genders slept less than their preferred sleep duration and again, with more extensive difference in women (sleep loss for women 1 h 16 min and for men 57 min). On leisure days, the actual sleep duration exceeded the preferred by 46 and 41 min in women and men, respectively, with no difference between the genders ( $p = 0.314$  for gender × repeat-factor interaction). All results remained similar on covariate adjusted multivariable analyses. Sleep latencies did not differ between the genders either on workdays or on leisure days (workdays geometric mean [95% CI] 8.3 [7.5–9.4] and 8.2 [7.2–9.4] minutes among women and men, respectively,  $p = 0.958$ ; leisure days 7.7 [6.8–8.9] and 7.2 [6.2–8.3],  $p = 0.391$ ).

### 3.2. Sleep and health behaviour

Age was positively associated with sleep duration on workdays: the older the subjects, the longer sleep duration. A ten-year increase in age prolonged sleep duration by 13 min. Smokers slept 21 min less on workdays and reported 9 min shorter preferred sleep duration than non-smokers. Sleep duration on workdays was not associated with alcohol consumption. Those who used alcohol one to three times a month slept 16 min longer on leisure days than those who did not use alcohol at all or used it rarely. However,

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