

**Permanent night workers' sleep and psychosocial factors in hospital work.**

**A comparison to day and shift work.**

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**Permanent night workers' sleep and psychosocial factors in hospital work. A comparison to day and shift work.**

**ABSTRACT**

We aimed to study sleep and psychosocial factors at work in hospital employees. The participants (n=9 312, 92% females, average age 45 years, most commonly nurses and departmental secretaries) were day workers (DW, n= 2 672), shift workers (SW, n= 6 486) and permanent night workers (PNW, n= 154). The Finnish Public Sector survey responses from six hospital districts from 2012 was combined to payroll data from 91 days preceding the survey. The data was analysed using Pearson  $\chi^2$ -test, one-way ANOVA and multinomial logistic regression analysis. The PNWs reported slightly longer average sleep length than the SWs or the DWs (7:27 vs. 7:13 and 7:10h,  $p<0.001$ ). The PNWs reported least often difficulties in maintaining sleep ( $p<0.001$ ) compared to the SWs and the DWs. The PNWs reported most often difficulties to fall asleep and fatigue during free-time ( $p$ -values  $<0.001$ ). The DWs and PNWs experienced less often work-life conflict than the SWs (25 and 26 vs. 38%,  $p<0.001$ ). The PNWs were more often satisfied with working autonomy at work and appreciation and fair treatment by colleagues than the DWs or the SWs ( $p<0.001$ ). The SWs and PNWs reported remarkably higher occurrence of verbal ( $p<0.001$ , OR 3.71 95% CI 3.23–4.27 and OR 7.67 95% CI 5.35–10.99, respectively) and physical workplace violence ( $p<0.001$ , OR 9.24 95% CI 7.17–11.90 and OR 28.34 95% CI 16.64–43.06, respectively) compared to DWs. Conclusively, PNWs reported contradictory differences in sleep quality compared to DWs and SWs. PNWs are more often satisfied with their colleagues and independent work than DWs or SWs but face workplace violence remarkably more often.

KEYWORDS fixed night shift, payroll data, health care professional, job satisfaction

## INTRODUCTION

Shift workers are exposed to constant circadian disruption, when required to stay awake during biological night and sleep during biological day. Shift work in general, but especially night shift work, increases the risk of various chronic diseases (Kecklund & Axelsson, 2016). In addition to the health risks, different groups of shift workers have also more often unfavourable factors in their work environment than day workers. These factors include, for example, lower job control and higher risk for conflicts or harassment at work (Bøggild et al., 2001, Nabe-Nielsen et al., 2009).

In population studies, permanent night workers compose few percent of employees. In Danish Work Environment Cohort study, 3.6% of employees reported working permanent nights (Bøggild et al., 2001). In a large interview study in USA, 4% of wage-earners classified themselves as permanent night shift workers compared to 24% of rotating or other type of shift workers (Grosswald, 2003). In a population sample from one state in USA 2% reported doing permanent night work whereas 25% reported other kind of non-day work (Ohayon et al., 2010). However, among health care sector, permanent night workers can comprise a larger group, e.g., 19% in a US study (Burch et al., 2009).

Studies of health effects of permanent night work are rather scarce. Various trade unions and health and safety authorities (Health and Safety Authority, 2012, Health and Safety Executive, 2006, Rosa & Colligan, 1997, Royal College of Nursing, 2012, Safe Work Australia, 2013) recommend to avoid working permanent night shifts. The previous research provides some evidence that permanent night work may have larger detrimental effects on safety, health and well-being than rotating shift work (Chung et al., 2009, Flo et al., 2013, Hansen & Stevens, 2012, Ohayon et al., 2010). Among the negative effects are, e.g., shortened (Cheng & Cheng, 2017, Pilcher et al., 2000) or short sleep duration (<6h), which is

more prevalent (OR 1.9) among night and rotating shift workers than in other workers (Ohayon et al., 2010), and higher occurrence of emotional exhaustion (Shamali et al. 2015). Permanent night workers also have more often insomnia during days off (Flo et al., 2013). Working permanent night shifts is also associated with increased risk for driving events in a field study (Ftouni et al., 2013), and driving accidents during the previous 12 months (Ohayon et al., 2010).

Physiologically, only a few percent of permanent night workers had a completely adjusted endogenous melatonin rhythm to night work, and less than one in four workers evidenced sufficiently substantial adjustment to benefit from it (Folkard, 2008). On the other hand, factors other than reorientation of the circadian system may be more important for tolerance to night work, including, e.g., evening chronotype, flexibility in sleeping patterns, less domestic disruption and influence on working times (Tamagawa et al., 2007, Burch et al., 2009).

On the contrary, it is expressed that the health risks of permanent night workers may be lower than the health risks of employees working in traditional rotating three-shift schedules due to maximized circadian adjustment when employees remain permanently in the night rhythm (Folkard, 2008). Whereas willingness to work shifts is a pre-requisite for certain jobs (Petru et al., 2005), e.g., in the health care sector, working permanent night shifts is mainly a voluntary decision. Majority of permanent night shift workers (81%) but only one fifth of rotating shift nurses had chosen to work in their present shift system (Barton, 1994). Therefore it is not surprising that permanent night workers report a higher satisfaction (Barton, 1994) or tolerance (Burch et al., 2009) with their shift system compared to other shift systems. Individual factors play a role too; evening chronotypes choose to

work nights more often than morning types (Petru et al., 2005). Additionally, higher pay is also appreciated (Petru et al., 2005, Camerino et al., 2008, Burch et al., 2009).

Permanent night work may have various effects to psychological and social aspects of work and have an influence on organization of work in the workplaces. Permanent night workers have been reported to be on average younger (Bøggild et al., 2001, Ohayon et al., 2010) and more often males (Ohayon et al., 2010) than other shift workers. Permanent night workers generally report poorer health, more absenteeism and less job satisfaction than day workers (Burch et al., 2009). Permanent night shift nurses have significantly lower co-worker cohesion compared to rotating day and evening shift workers (von Treuer et al., 2014).

In this epidemiological study of hospital employees, we aim to study sleep and psychosocial factors at work among permanent night workers by comparing them to day workers and three shift workers. Objective working hour data allowed defining the shift schedules precisely. We hypothesized that permanent night shift workers would have more sleep complaints than day workers, but less than rotating shift workers. Secondly, we expected permanent night workers to report less often work-life conflict than day workers or rotating shift workers, and to be more often satisfied with their job.

## METHODS

### Study sample

This cross-sectional study is part of the Finnish Public Sector (FPS) cohort study of employees of 10 towns and six hospital districts in Finland. The 2012 FPS survey data (response rate 71%) of all hospital employees from the six hospital districts with current contract of employment and using Titania® shift scheduling software was included (Härmä et al., 2017).

The survey responses were linked to payroll data of working hours from the 91 days prior to answering the questionnaire. To be included in the final data, the employees had to work on a period-based contract (114:45h/3 weeks), have at least 31 work shifts in the payroll data during the previous 91 days prior to answering the questionnaire in 2012. Physicians (n= 723) were excluded due to on-call work. (Figure 1.)

[Insert Figure 1. here]

### Working time data

The payroll-based daily working hour data was retrieved using the shift scheduling program Titania® (CGI Finland Ltd, Helsinki, Finland). Titania® is a Windows-compatible software which is used for shift planning and payroll in majority of public sector organizations in Finland. The sampling software (by CGI Finland Ltd) was used to retrieve all the data from the saved rotas. The methodology we used to retrieve and analyse the raw working hour data is valid, for more details see Härmä et al. (2015).

To classify work shifts based on the shift starting and ending times, the sampling software scored the working hours into the following categories: early morning shift (starts before 06:00 and is not categorized as a night shift), morning shift (starts 06:00–07:00), day shift (starts after 07:00 and ends no later than 18:00), evening shift (starts after 12:00 hours

and is not categorized as a night shift), night shift ( $\geq 3$  hours between 23:00–06:00, according to the Finnish Working Hours Act (Ministry of Employment and Economy, Finland, 2011).

The inclusion criterion for permanent night work was at least 80% of shifts during preceding 91 days were night shifts. The group of shift workers included both including 2- and 3-shift work. The day workers were current day workers, i.e., former shift workers in currently employed in day work were also included.

In addition to the working times, the data also included occupational titles from the employers' records.

#### Survey variables

Average sleep length was surveyed with a multiple-choice question "How many hours do you normally sleep during 24 hours?" with response choices from less than 5 hours to more than 10 hours in 30-minute intervals. The cut point for short sleep was set to  $< 6$  hours (Knutson et al., 2010). Sleep difficulties (difficulties to fall asleep, fatigue during work, and fatigue during leisure time) during the last four weeks were asked with a scale from "not at all" to "every day" (Jenkins et al., 1988). The answers were dichotomized as having the sleep difficulty if the frequency was at least 2–4 times per week. The insufficient sleep item was derived from question "Do you sleep enough?" with scale from "yes, always or nearly always" to "seldom or never".

Psychosocial factors included items regarding satisfaction of different aspects of work (leadership style, appreciation and fair treatment by immediate superior, support and guidance by immediate superior, appreciation and fair treatment by colleagues, amount of independent thought and action in the job (hence shortened to autonomy at work), challenges that work offers, and pay and benefits). The items were adapted from Job

Diagnostic Survey (Hackman & Oldham, 1975) and were measured with a 7-point Likert-type scale ranging from very satisfied to very unsatisfied.

The question of workplace violence included four different categories for violence; facing violence towards property, threats or other verbal violence, physical violence and armed violence in the workplace during the past 12 months with dichotomized yes/no answers (Isotalus, 2002). The item for self-rated health was questioned as “What is your health state?” with 5-point Likert-type scale from good to poor (Blaxter, 1987).

The item for work-life conflict was: “How often do you feel that your work takes too much time or energy from your family-life or life?” adapted from Mårdberg *et al.* (1991). The original five-point Likert-type scale ranging from never to very often was dichotomized so that the answers “often” and “very often” were classified as having work-life conflict.

#### Participants

The final sample included a total of 9 312 employees of which 1.7% (n= 154) were permanent night workers, 28.7% (n= 2 672) day workers and 69.7% (n= 6 486) shift workers. The PNWs had worked 94% of their shifts during the night, whereas on average the SWs had 57% morning shifts, 28% evening shifts, 11% night shifts and very few early morning shifts or day shifts.

The participants were 92% females (n=8 558), had an average age of 45 years, and on average 13 years shift work experience. The proportion of men and part-time employees was larger among the PNWs than in the SW or the DW group ( $p<0.05$ ). There were no significant differences between the groups in having small (<7 years) children in the household or in the overall stressfulness of the life situation. See Table 1 for Descriptive characteristics.

[Insert Table 1. here]

The most common occupational titles among DWs were nurse (20%, n=530), departmental secretary (19%, n=506) and laboratory nurse (5%, n=141); among SWs nurse (47% n=2 960), practical nurse (6%, n=404), and hospital cleaner (4%, n=267); and among PNWs nurse (58%, n=87), mental health nurse (13%, n=20) and midwife (10%, n=16).

#### Ethical issues

The Finnish Institute of Occupational Health (FIOH) received written permission from all of the hospital districts to use the employers' working time registries for research. All data was anonymized. The ethics committee of the Hospital District of Helsinki and Uusimaa (HUS) approved this study as part of the FPS study ethical approval (HUS 1210/2016) and international ethical standards were conformed (Portaluppi et al., 2011). Answering to the FPS survey was voluntary and therefore completed questionnaire acted as an informed consent (Ministry of Justice, Finland, 1999).

#### Statistical methods

The statistical analyses were conducted with IBM SPSS Statistics 24 (IBM Corp., Armonk, NY, USA). One-way ANOVA and the Pearson Chi-square test were used to explore the group-level differences between working time regimes. First we conducted unadjusted variance analysis, and then included age, sex and educational level as covariates. For the sleep variables, we also conducted variance analysis including perceived health and overall stressfulness of the life situation as covariates, and for the psychosocial factors age, sex, educational level and workplace as covariates. The odds ratios for the outcome variables were analysed using multinomial logistic regression analysis with day work as reference category and including the above-mentioned covariates. A p-value of <0.05 indicated a statistically significant result throughout the study.

## RESULTS

### Self-reported sleep

The PNWs reported slightly longer average sleep length than the SWs or the DWs (7:27 vs. 7:13 and 7:10h, both unadjusted and adjusted  $p < 0.001$ , adjusted with age, sex and education). The PNWs reported least often difficulties in maintaining sleep (18.4% vs. 22.6% in the SW and 24.8% in the DW group,  $p < 0.033$ , adjusted  $p < 0.001$ ) compared to the other working time regimes. The PNWs reported most often difficulties to fall asleep (15.7% vs. 13.6% in the SW and 11.5% in the DW,  $p < 0.015$ , adjusted  $p < 0.001$ ) and fatigue during free-time (23.2% vs. 19.9% in the SW and 14.1% in the DW,  $p < 0.001$  adjusted  $p < 0.001$ ) (Figure 2). The odds for fatigue during free time were 1.53 (1.34–1.75) for the SWs and 1.86 (1.22–2.86) for the PNWs.

There were no significant differences between the working time regimes in fatigue during work (mean 30.2%,  $p = 0.204$ ) in the unadjusted analysis, but after adjustment for age, sex and education the difference emphasized ( $p < 0.001$ ). The additional adjustment for perceived health and overall stressfulness of the life situation yielded same results for all the sleep difficulties (all the  $p$ -values  $< 0.001$ ).

[Insert Figure 2. here]

Insufficient sleep was reported by 24.7% of the DWs, 24.2% of the SWs and 15.9% of the PNWs ( $p = 0.053$ ). There were no significant group level differences in proportion of short sleepers either (mean 3.0%,  $p = 0.253$ ).

### Psychosocial factors

The DWs and the PNWs experienced less often work-life conflict than the SWs (25.4% and 25.5% vs. 37.7%,  $p < 0.001$ , OR for SW 1.78 95% CI 1.59–1.98). The PNWs reported significantly higher occurrence of verbal and physical workplace violence than the SWs or

the DWs (50.0% vs. 31.1% and 10.3%, and 46.2% vs. 20.9% and 2.5%, respectively, p-values <0.001). The odds ratios for workplace violence were remarkably higher in both verbal (SW OR 3.71 95% CI 3.23–4.27 and PNW OR 7.67 95% CI 5.35–10.99) and physical workplace violence (SW OR 9.24 95% CI 7.17–11.90 and PNW OR 28.34 95% CI 16.64–43.06).

The PNWs were more often satisfied with challenges that work offers (86.3% vs. 78.7% and 81.3 %, unadjusted  $p < 0.009$ , adjusted both models  $p < 0.001$ ), and appreciation and fair treatment by colleagues than the DWs or the SWs (85.0% vs. 75.6% and 77.4%, unadjusted  $p < 0.013$ , adjusted both models  $p < 0.001$ ). Autonomy at work was especially appreciated by PNWs (83.7% vs. 79.5% and 78.6%, unadjusted  $p < 0.048$ , both adjusted models  $p < 0.001$ ). The PNWs were least often satisfied with leadership style (50.7% vs. 57.3% and 59.5%, both adjusted models  $p < 0.001$ ), support and guidance by immediate superior (51.0% vs. 61.2% in both DW and SW, adjusted model 1  $p = 0.006$  and adjusted model 2  $p < 0.001$ ) as well as pay and benefits (24.3% vs. 27.4% and 28.4%, both adjusted models  $p < 0.001$ ) compared to DWs and SWs. There was no statistically significant difference between the working time regimes in appreciation and fair treatment by immediate superior ( $p = 0.125$ ). (Table 2.)

[Insert Table 2. here]

## DISCUSSION

We aimed to study permanent night workers' sleep and psychosocial factors at work compared to shift workers and day workers. The main result shows that the PNWs face both verbal and physical workplace violence remarkably more often than day or rotating shift workers. The PNWs reported more difficulties to fall asleep and more fatigue during free time. However, sleeping mostly during daytime was not associated with problems of interrupted sleep or shorter 24-hour sleep length. Of the studied psychosocial factors at work, PNWs reported highest occurrence of appreciation and fair treatment by colleagues, but were least satisfied with leadership style and support and guidance by immediate superior.

Previously, as high or even higher proportions of employees working partly or permanently night shifts have faced workplace violence than the employees in this study. In Denmark, nearly every second PNW had faced threats, but somewhat fewer violence (Nabe-Nielsen et al., 2009) during a similar time frame than this study used. Among Italian nurses, a lifetime prevalence of verbal or physical violence was slightly lower (Magnavita & Heponiemi, 2011). In this study, larger proportion of employees in the PNW group were actual nursing staff than in groups of SWs or DWs. Additionally, the group of mental health nurses was larger in the PNW group than in the other groups, which may have an effect to the results. Suggestively, especially physical violence towards health care staff is associated with patients' alcohol use or intoxication and miscommunication (Kamchuchat et al. 2008). Minimizing the risk of working alone has been found to be the most important way in anticipating or dealing with workplace violence (Morken et al. 2015).

We are not aware of any other study that would have published odds ratios for workplace violence among the PNWs. Our results show remarkably higher odds in SW and

even higher odds for both verbal and physical workplace violence in PNW compared to day work. The risk of workplace violence should be highlighted in connection with night work. Risk of violence reduces job satisfaction and increases turnover intentions (Heponiemi et al., 2014), and it is an important occupational safety issue in the health care sector (Edward et al., 2014).

Earlier studies have found shortened sleep among either PNWs (Cheng & Cheng, 2017, Pilcher et al., 2000) or among PNWs and rotating shift workers (Ohayon et al., 2010) compared to other shift systems. In this study, the self-reported average sleep length, however, was slightly longer in the PNWs than in the SWs or the DWs. This result might be explained by earlier results pointing that late chronotypes tend to choose PNW (Petru et al., 2005, Chung et al., 2009) and therefore would be able to sleep longer during daytime. Another possible explanation is that in this study, the PNWs had over 90% of their shifts during the night, resulting possibly to better adjustment to sleeping during daytime.

On the other hand, sleep length was not inquired specifically in association with night shifts. It is thus possible that the increased need of recovery sleep during days off after night shifts -as indicated by fatigue during free-time increased the estimation of average sleep length. This finding is supported by a Norwegian study (Flo et al. 2013) where the PNWs had also the highest occurrence of difficulties to fall asleep and fatigue during free time.

The comparisons to earlier studies in the psychosocial factors is rather challenging, as different measures for, e.g., job satisfaction and leadership style have been in use. In general, over 80% of the studied employees were satisfied with the challenges that their work offers. The proportion of satisfied employees was, however, highest among the PNWs, a result which is parallel to result of satisfaction with autonomy at work. The PNWs and DWs also reported less often work-life conflict than SWs. To the best of our knowledge,

there are no previous studies comparing the same working time regimes than this study, but there is previous research showing that work including evening work is disruptive for work-life balance (Greubel et al., 2016, Karhula et al., 2017).

In this study, the PNWs reported highest occurrence of appreciation and fair treatment by colleagues, whereas earlier, PNWs have experienced the co-worker cohesion being lower than other employees (von Treuer et al., 2014). Assuming that our result of high appreciation by colleagues is at least partly due to PNWs doing most of the night work, the difference in the results is explicable.

The PNWs reported being least satisfied with leadership style and support and guidance by immediate superior compared to SWs and DWs. This is likely explained by fewer direct contacts to the immediate superior. A similar result of low support from leaders has previously been reported by both permanent evening and permanent night workers in elderly care (Nabe-Nielsen et al., 2009).

In this study the satisfaction with pay was in general low, but lowest among the PNWs. In other countries, PNWs have reported higher satisfaction with pay (Camerino et al., 2008, Petru et al., 2005,) and even that higher pay is the main motivation for being a night worker (Burch et al., 2009, Chung et al., 2009). In Finland, night work is often compensated as free time or alternatively with 30–40% extra pay per hour worked during the night. It is likely, that compensation of night work results in larger increase in total income in the other studied countries.

#### Strengths and limitations

A large epidemiologic data enabled us to investigate PNWs, which are as a small employee group often excluded from shift work studies. An important strength is the objective assessment of shift work, which allowed us to determine the exact proportion of,

e.g., night shifts during the past three months. The methodology used to retrieve data and analyse the raw working hour data is valid (Härmä et al., 2015). Many earlier studies have used a single multiple choice question to classify employees into different working time regimes, although survey is more prone to bias than objective registry data (Härmä et al., 2017).

Previous studies have most often relied on self-reports where participants classify themselves to night workers, without information on what proportion of shifts in realized rosters actually had been night shifts. We are not aware of any other study with precise proportion of night shifts as a criteria for being a permanent night worker. The criterion for being a night shift worker was set to night shifts >80% of all the shifts, to reduce likelihood of erroneously excluding night workers due to occasionally participating in staff meetings or continuing training during daytime or for irregularly substituting a colleague in a day or evening shift.

There are limitations to address as well. Likewise to most of the other studies with large sample size, the measure of sleep length was based on self-report. Although sleep length is comparable between groups, measuring total sleep time subjectively may lead to systematic over-reporting (Lauderdale et al., 2008). Sleep difficulties were measured with Jenkins Sleep Scale (Jenkins et al., 1988), which has the deficit for shift workers of using the term night-time sleep, as shift workers sleep also during daytime. Therefore we excluded the items concerning waking up several times during the night and tiredness after waking up after a regular night sleep.

The risk of violence was surveyed in different types of violence, but there was no information about the perpetrator nor the frequency of the workplace violence situations. According to a review (Edward et al., 2014) the perpetrators of verbal or physical violence

are most often patients and their relatives, and less often colleagues. This, as well as the actual frequency of the workplace violence situations, remains to be clarified in further studies.

Even though we had the objective working time data and knew the exact proportion of each shift type, it is basically possible, even very unlikely that there would be employees that have changed, e.g., from permanent night work to night shift work last 91 days before the questionnaire. It is also possible that the reported violent situation(s) have occurred outside the range of collecting working hour data, as the time range for workplace violence was during the last 12 months and the time range for collecting the objective working hour data was 91 days. This time range was chosen as a compromise to gather also the changes in sleep quality.

Including former shift workers into the day workers could be regarded as a limitation too. We decided to include the former shift workers to the day work group because in this case we studied the current psychosocial work conditions and short-term effects on health (sleep and fatigue) that are likely to change soon after shifting to day work. We could not, however, differentiate the employees that possibly had changed to day work due to health reasons.

It is possible that there are measured and unmeasured factors that could have had an effect to the results. To somewhat tackle this limitation, we analyzed the data with a number of covariates in two different models and the results were similar. The data did not enable us to use other employers' registers, including, e.g., information on sickness absences.

Conclusively, this cross-sectional survey data found out that permanent night workers report more difficulties to fall asleep and more fatigue during free time than shift workers or

day workers. However, their 24-hour sleep length was not shortened. The psychosocial working conditions are experienced somewhat differently by employees in different working time regimes. Especially the risk of workplace violence should be highlighted in association with permanent night work in hospitals.

## CONCLUSION

Compared to day and shift workers, permanent night workers report no major deviation in sleep. Permanent night workers are more often satisfied with their colleagues and autonomy at work than day or shift workers but face workplace violence remarkably more often.

## DECLARATION OF INTEREST

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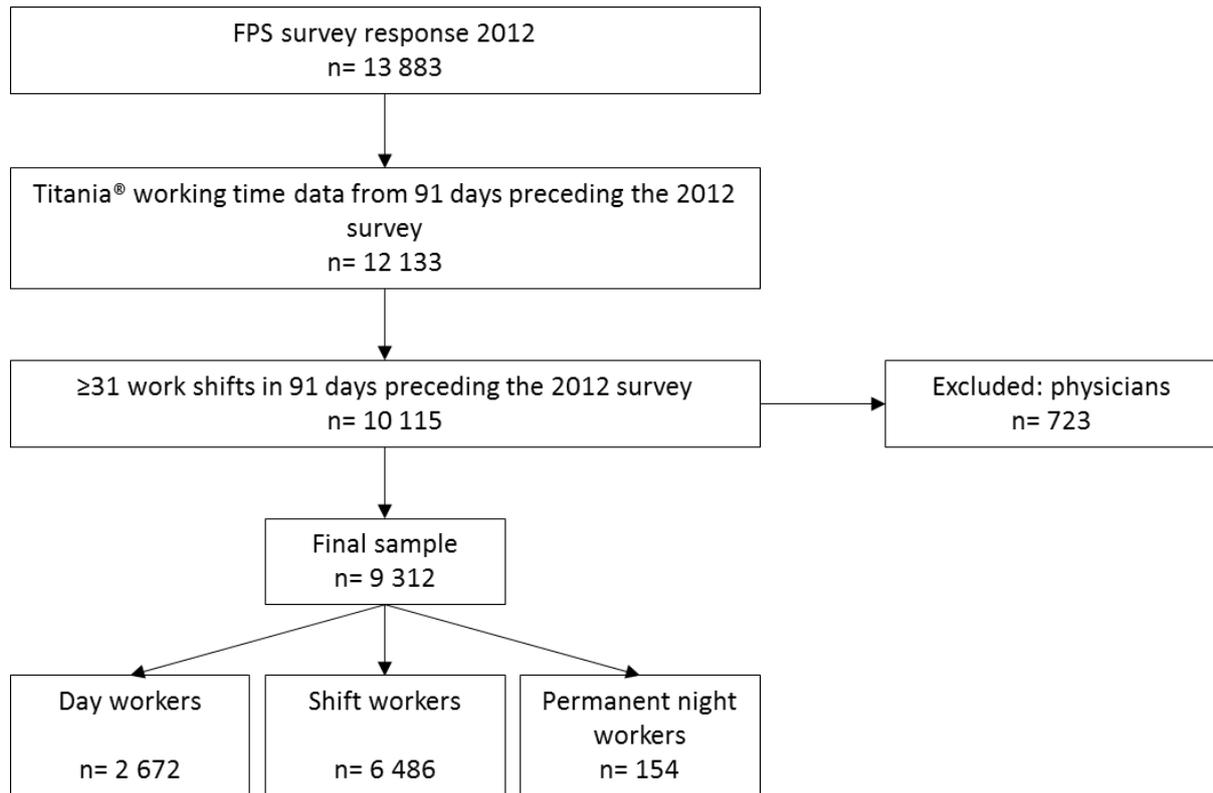


Figure 1. Flow chart of the selection of the study participants.

Table 1. Descriptive characteristics of the employees according to working time regime.

	All n=9 312		Day work n= 2 672		Shift work n= 6 486		Permanent night work n= 154		Sig.
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Age (years)	44.9	(11.16)	47.3	(10.18)	43.9	(11.39)	44.1	(11.23)	<0.001 <sup>1</sup>
Shift work experience (years)	12.7	(10.09)	8.1	(8.48)	13.9	(10.09)	17.7	(10.95)	<0.001 <sup>2</sup>
	%	(n)	%	(n)	%	(n)	%	(n)	Sig. <sup>3</sup>
Sex									<0.001
Woman	91.9	(8 558)	94.3	(2 519)	91.2	5 916)	79.9	(123)	
Man	8.1	(754)	5.7	(153)	8.8	(570)	20.1	(31)	
Full-time work									0.033
Yes	83.3	(7 756)	84.4	(2 255)	83.0	(5 382)	77.3	(119)	
No	16.7	(1 556)	15.6	(4 17)	17.0	(1 104)	22.7	(35)	
Marital status									<0.001
Married/cohabiting	75.0	(6 933)	77.9	(2 066)	73.9	(4 759)	71.1	(108)	
Single/divorced/estranged/ widow(-er)	25.0	(2 312)	22.1	(587)	26.1	(1 681)	28.9	(44)	
Children <7 years <sup>4</sup>									0.176
Yes	23.4	(1 421)	22.0	(355)	24.0	(1 044)	19.8	(22)	
No	76.6	(4 649)	78.0	(1 258)	76.0	(3 302)	80.2	(89)	
Children 7–18 years <sup>4</sup>									<0.001
Yes	44.3	(3 251)	48.3	(1 009)	42.9	(2 195)	37.6	(47)	
No	55.7	(4 080)	51.7	(1 080)	57.1	(2 922)	62.4	(78)	
Overall stressfulness of the life-situation <sup>5</sup>									0.294
Burdensome/extremely burdensome	9.6	(891)	9.1	(242)	9.8	(630)	12.6	(19)	

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Not burdensome/not very burdensome	90.4 (8 345)	90.9 (2 408)	90.2 (5 805)	87.4 (132)
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<sup>1</sup> One-way ANOVA, adjusted for sex and level of education

<sup>2</sup> One-way ANOVA, adjusted for age, sex and level of education

<sup>3</sup> Pearson Chi-Square test

<sup>4</sup> Living in the same household

<sup>5</sup> During the past 12 months

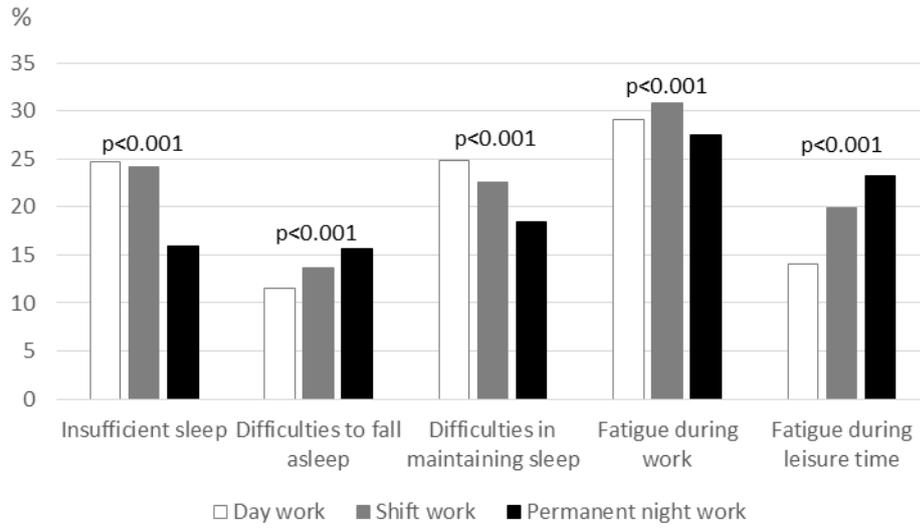


Figure 2. Self-reported sleep disturbances during past 4 weeks at least 2–4 times per week. Adjusted for age, sex, level of education, perceived health and overall stressfulness of the life situation.

Table 2. Psychosocial factors at work and facing violence in different working time regimes.

	All n=9 312		Day work n= 2 672		Shift work n= 6 486		Permanent night work n= 154		Unadjusted model	Adjusted model 1	Adjusted model 2
Satisfied with...	%	(n)	%	(n)	%	(n)	%	(n)	Sig.	Sig.	Sig.
leadership style	57.9	(5 317)	59.3	(1 565)	57.5	(3 675)	50.7	(77)	0.181 <sup>1</sup>	<0.001 <sup>2</sup>	<0.001 <sup>3</sup>
appreciation and fair treatment by immediate superior	67.7	(6 269)	67.7	(1 800)	67.9	(4 378)	59.5	(91)	0.296 <sup>1</sup>	0.125 <sup>2</sup>	<0.001 <sup>3</sup>
support and guidance by immediate superior	61.0	(5 945)	61.2	(1 628)	61.2	(3 939)	51.0	(78)	0.119 <sup>1</sup>	0.006 <sup>2</sup>	<0.001 <sup>3</sup>
appreciation and fair treatment by colleagues	77.0	(7 136)	75.6	(2 014)	77.4	(4 992)	85.0	(130)	0.013 <sup>1</sup>	<0.001 <sup>2</sup>	<0.001 <sup>3</sup>
working independently	79.0	(7 298)	79.5	(2 111)	78.6	(5 059)	83.7	(128)	0.048 <sup>1</sup>	<0.001 <sup>2</sup>	<0.001 <sup>3</sup>
challenges that work offers	80.7	(7 451)	78.7	(2 089)	81.3	(5 230)	86.3	(132)	0.009 <sup>1</sup>	<0.001 <sup>2</sup>	<0.001 <sup>3</sup>
pay and benefits	27.6	(2 558)	28.4	(755)	27.4	(1 760)	24.3	(37)	0.423 <sup>1</sup>	<0.001 <sup>2</sup>	<0.001 <sup>3</sup>
Facing...											
violence towards property <sup>4</sup>	13.1	(1 198)	3.2	(85)	16.8	(1 069)	29.5	(44)	<0.001 <sup>4</sup>	n/a	n/a
threats or other verbal violence <sup>4</sup>	25.4	(2 286)	10.3	(268)	31.1	(1 946)	50.0	(72)	<0.001 <sup>4</sup>	n/a	n/a
physical violence <sup>4</sup>	16.0	(1 449)	2.5	(67)	20.9	(1 346)	46.2	(67)	<0.001 <sup>4</sup>	n/a	n/a
armed violence <sup>4</sup>	1.0	(87)	0.1	(3)	1.3	(83)	0.7	(1)	<0.001 <sup>4</sup>	n/a	n/a

<sup>1</sup> Unadjusted model

<sup>2</sup> One-way ANOVA adjusted for age, sex and educational level

<sup>3</sup> One-way ANOVA adjusted for age, sex, educational level, and workplace

<sup>4</sup> In the workplace, during past 12 months

