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Original Article

Effects of modifications to the health and social sector's collective agreement on the objective characteristics of working hours

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Abstract: This study aimed to evaluate the effects of an intervention on objective working-hour characteristics. The intervention involved making modifications to the collective agreement that would limit employees' entitlement to time off as compensation. The intervention group consisted of 493 and the control group of 2,303 health and social care shift workers, respectively. We analysed the objective pay roll-based working-hour data for 2012–2013, which we obtained from employers' records, using the repeated measures mixed model. The changes in objective working-hour characteristics were small, but systematic. The intervention had some positive effects: the amount of short recovery periods (<28 h) after the last night shift decreased from 5% to 3%, and the amount of working weeks of over 48 h decreased from 19% to 17%. The realization of employees' shift preferences increased from 18% to 20%. However, in contrast, consecutive work shifts and the number of scheduled absences increased and days off decreased, suggesting less time for recovery and thus a negative trend in shift ergonomics. When planning shifts, nursing management should avoid regulations that promote specific unhealthy shift characteristics, that is, consecutive work shifts and less days off.

Key words: Shift work, Working hours, Intervention, Nurses, Collective agreement

Introduction

Today's rapidly evolving 24/7 society has increased night shift work[1, 2] and irregular working hours, and 15% to 30% of Europe's workforce currently works in shifts[3]. Night shift work is a recognized major risk factor in the present-day work environment, although specific unhealthy shift characteristics (i.e. shift ergonomics) are still under debate. For an employee, the risk of increased fatigue and chronic diseases arising from (night) shift work may be due to specific shift work characteristics, circadian dysrhythmia, disturbed sleep, or psychosocial or behavioural mechanisms[4–7]. From an organizational perspective, the scheduling of shift work hours has to take into account the needs of service production as well as individual preferences. Legislation and collective agreements[8–11], which define working hours, also influence working-time arrangements and employee well-being.

A basic approach to investigating the effects of changes in working hours is organizational-level interventions. These may aim to, for example, reduce shift length (in particular the length of night shifts), redesign shift work schedules (either to follow ergonomic criteria or to increase working-time flexibility) or improve working conditions (e.g., the European Union's Working Time Directive)[12–14]. Organizational-level interventions often lead to significant

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changes in well-being[12, 13, 15, 16]. National working-time acts, based in Europe on the European Union's Working Time Directive and collective agreements[8–11], are the main sources of regulating working-hour characteristics on the organizational level. These legal regulations aim to protect employees from the potential health hazards of night shift work and long working hours, both together and separately[12]. The working-hour regulations applied in Nordic countries by national legislation are rather similar, and are defined in more detail by collective agreements, which are often applied at municipal or hospital levels[8–11]. To the best of our knowledge, research on the changes in national collective agreements that regulate shift work hours has been rare; international publications on such changes are indeed lacking[17, 18]. For example, a recent systematic review identified 25 articles that assessed the impact of different types of technological and organizational interventions on working-hour regulations in 2003–2012[19], but none of these interventions evaluated changes in national or international working-hour regulations.

AIMS

This study aimed to evaluate the effects of an intervention that involved making modifications to the collective agreement for health and social sector employees that would limit their entitlements to compensation in the form of time off. We specifically investigated the intervention effects on objective working-hour characteristics and sick leave.

Subjects and Methods

Design

In November 2012, the Local Government Employers for Municipalities in Finland (KT) and the unions of public sector wage earners made an agreement concerning a one-yr intervention to test new regulations on period-based working hours. For KT, the reported target was to determine whether these regulations would be useful for promoting operations, the availability of personnel and well-being at work. In practice, the changes in the collective agreement restricted taking time off as compensation for overtime, and limited time off as compensation for scheduled absence days to the standard shift length. Hence the intervention was expected to influence not only employees, but also the participating organizations, and to provide unions with further knowledge. It took place between November 1st 2012 and November 1st 2013, in five voluntary departments of the municipal health and social sector.

The modifications to the regulations were intended to add clarity to shift scheduling in the municipal health care and social sector. Our hypothesis was that they would result in less individual flexibility in working hours as they limited possibilities for time compensation. We also expected absences from work to increase and opportunities for recovery to decrease, due to the change in objectively measured working hours. Therefore we evaluated the objective working-hour characteristics and sickness absences both before and during the intervention involving specific modifications to the collective agreement. Data collection was limited to 10 months before (January 1st–October 31st 2012) and during (January 1st–October 31st 2013) the intervention, to assure annual-level comparability between the two measurement periods.

The Finnish Institute of Occupational Health (FIOH) obtained permission to access working-hour and sickness absence data (excluding medical information), along with complementary employment information from all municipal health and social sector institutions participating in the study. Since these data comprised employer-owned employment information with no access to diagnosis-specific sickness absences, ethical approval was not required for the study.

Participants

The municipal health and social sector departments that volunteered for this study employed 668 shift workers altogether. The final analytical sample was based on the employees in the departments and excluded those who worked as substitutes, on an hourly basis, or who had no unique personal number stored in the data. Hence, the final analytical sample for the intervention group (hereafter referred to as the intervention group) consisted of 493 employees who had at least one working day in both 2012 and 2013. The intervention group consisted of employees in a laboratory unit (n=35 employees), a health and social service centre (n=21), a senior home organization, a home care unit, a day care unit (n=131), local hospital departments (n=225), and a health centre (n=81).

The control group consisted of employees who worked in a large hospital district and matched those in the intervention group as regards age, sex and occupation. The inclusion criteria for the control group was a work contract for period-based working hours, at least one working day in both 2012 and 2013, and a full-time work contract.

Data Collection

Working-time data

In Finland, the municipal health and social sector's collective agreement currently sets working hours at 114 h 45 min per each three-wk period. The shifts are planned by head nurses or others responsible for shift planning. Working hours are characterized by irregular rotation and are mostly eight-hour work shifts, except for night shifts. Payroll-based daily working-hour data were retrieved using the shift scheduling programme Titania® (CGI Finland) – Windows-compatible software that is used for shift planning and pay-roll in the municipal health and social sector in Finland. The working-time data consisted of the starting and ending times of daily working hours, the scheduled absences (sick leave, maternity leave, annual leave etc.) that are planned into the scheduling programme for each three-wk period, and sudden absences that occured for different reasons (mainly sickness, but also care of a child or other dependent due to their sickness, etc.). The data also included information on the age, sex, occupational title, working-time contract (full-time vs. part-time), and shift systems of both the intervention and control groups, and the work unit and department of the intervention group[20]. The participants could work 20% to 97% full-time for at least one three-wk period during the registration period (10 months). We calculated the mean part-time percentage of the ten-month registration period.

We evaluated the objective changes in the working-hour characteristics every 10 months/yr to determine the characteristics of working hours, working days, days off, and scheduled absence days. The working-hour characteristics were averaged over all three-wk periods in the 10 months before (2012) and during (2013) the intervention. In addition, we calculated the average amount of sickness absence days per 10 months (i.e. only absences due to sickness). Information on working days, days off, and scheduled absence days were available directly from the Titania® shift-scheduling programme, based on the standard coding of daily working hours. We also divided both study years' objective annual working-time characteristics into four major working-hour domains, as has been described in detail earlier[20]: 1) the length of the working hours, including four variables describing annual, weekly or daily working hours; 2) shift intensity, including four variables related to consecutive work shifts; 3) recovery, including time between the shifts; and 4) the social aspects of working hours, including seven variables related to the distribution of days off, the irregularity and predictability of the working hours, and employees' control over working time (Table 1).

Statistical analyses

We used a multilevel mixed-effect linear regression model to test the associations between group (intervention vs. control) and time (before and during the intervention), while accounting for the effect of age (continuous) and the nesting of employees within different work units (five units in the intervention group and one unit in the control group). The outcomes in the regression model were the working-hour characteristics described in Table 1 and working days/three-wk period, days off/three-wk period, scheduled absence days/three-wk period, and sickness absence d/yr. Since we expected sex and part-time work to influence the associations between group and time, the effect was tested by adjusting the models for sex and dichotomous part-time work (yes vs. no: the yes option included part-time work applied to a full work year consisting of 18 three-wk periods, hence the part-time percentages were between 50% and 99%). As the adjustments did not inflate the associations, we chose not to present the adjusted models. The effect of the intervention was considered substantial if the interaction between group and time was significant when we controlled for the effect of working units and age. We used Stata SE version 13.1 (StataCorp, College Station, Texas, USA) for the analyses.

Ethical consideration

No formal ethical scrutiny was required, as only employer-owned working-hour data were used for this study.

Results

The mean age in the intervention group was 45.9 yr (SD 12.4) and in the control group 43.2 yr (SD 12.4). The slight difference between the mean ages was due to the difference between the oldest and youngest age groups: the amount of employees aged under 30 was higher in the control group, whereas the proportion of employees aged over 60 was higher in the intervention group. The intervention group consisted of 4% men and the control group 8% men. In the intervention group, the amount of those who worked part time for at least one three-wk period/10 months was 22% in 2012, and 25% in 2013. In the control group, the amount of part-time work was 6% in both 2012 and 2013. Those who worked part time worked 50%–99% full-time/10 months and their percentages or duration of part-time work

Table 1. Description of working-hour characteristics used in this study (modified from Härmä *et al.* 2015 and applied for 10 months/yr)

Working-hour characteristics	Description
Length of working hours	
Weekly working hours (h)	Average weekly (from Monday 00:00 to Sunday 24:00) working hours during the year. Calendar weeks with no work, i.e. paid or non-paid leave, were excluded
% of long (> 40 h) working weeks	Proportion (%) of long working weeks: proportion of calendar weeks of > 40 weekly hours of all calendar weeks of work during the year
% of long (> 48 h) working weeks	Proportion (%) of long working weeks: proportion of calendar weeks of > 48 weekly hours of all calendar weeks of work during the year
Shift length (h)	Average length of all shifts during the year in hours
Shift intensity	
Number of consecutive working days	Average number of consecutive daily work shifts (with no days off) during the year (starting from and ending on a day off or other absence from work)
% of long spells of work shifts	Proportion (%) of > 6 consecutive daily work shifts (without days off)/all spells of consecutive daily work shifts)
Number of consecutive night shifts	Average number of consecutive night shifts during the year (participants with no night shifts were excluded)
% of long spells of consecutive night shifts	Proportion (%) of > 4 consecutive night shift spells during the year of all spells of consecutive daily night shifts
Recovery	
Time between shifts (h)	Average time between work shifts (h) during the year (time between shift and day off or other absence were excluded)
% of short shift intervals	Proportion (%) of shift intervals of ≤11 h during the year of all shift intervals
% of short recovery periods after last night shift	Proportion (%) of < 28 h recovery periods after last night shift during the year of all recovery periods after last night shift
Social aspects of working hours	
% of annual leave days	Proportion (%) of annual leave days of annual contract days
% of weekend work	Proportion (%) of Saturday and/or Sunday work of all weekends
% of single days off	Proportion (%) of single days off of all days off
Variability of shift starting times	The mean absolute deviation (MAD) of shift starting times. MAD is the average distance of the dataset from its mean, calculated as the mean of the absolute deviations from the data's mean[32)]
% of realized shift plans	Proportion (%) of all realized annual shifts of all planned shifts (based on comparison of planned and realized shift plans)
% of preferred shifts	Proportion (%) of preferred shifts of all shifts
% of realized shift preferences	Proportion (%) of realized shift preferences of all shifts

in 2012 and 2013 were the same.

Differences between the intervention and control groups before and during the intervention period

The intervention effect ($p=0.017$ or less, Table 3) on the working-hour characteristics of the three-wk periods was evident in the reduced average number of days off (from 5.8 to 5.3), and in the increased average number of scheduled absence days (from 6.5 to 6.9), as shown in Table 2. All the four characteristics of shift intensity increased significantly from pre-intervention to intervention, although the effect was small (1% or 0.1 days, p values <0.01, Table 3). Among the three recovery-related working-hour characteristics, only the percentage of short recovery periods after the last night shift decreased, from 5% to 3% ($p=0.003$). The social aspects of working hours changed significantly, i.e. the percentage of single days off ($p=0.05$), the variability of shift starting times ($p=0.023$), and the percentage of shift preferences realized ($p=0.001$), all rose, although in comparison to the period from pre-intervention in 2012 to during the intervention in 2013, the increase detected was small, at 1% or 0.1 mean absolute deviation.

Discussion

The present study is among the first to investigate the effects of changes in collective agreements on the objective (pay-roll based) characteristics of shift work hours. In this case, the change focused on limiting employees' entitlement to time off as compensation. The intervention resulted in some clearly negative effects, such as a decrease in the number of days off and an increase in the number of scheduled absence days. The proportion of single days off increased, as did the variability of shift starting times.

Table 2. Characteristics of working days, days off, scheduled absences, sickness absence days, length of working hours, shift intensity, recovery, and social aspects of working hours in intervention and control groups in 2012 (for 10 months) preceding the working-hour intervention, and during the intervention year 2013 (for 10 months)

Working days, days off, scheduled and sickness absence days	Intervention group (n=493)				Control group (n=2,303)			
	2012		2013		2012		2013	
	mean	range	mean	range	mean	range	mean	range
Working d/3-wk period	10.0	0–15	9.6	0–15	10.3	0–16	10.0	0–15
Days off/3-wk period[1]	5.8	0–13	5.3	0–12	5.8	0–11	5.6	0–10
Scheduled absence d/3-wk period[2]	6.5	1–11	6.9	1–11	6.3	1–11	6.8	1–11
Sickness absence d/yr[3]	6.7	0–154	7.0	0–129	11.5	0–275	14.5	0–286
Amount of sickness absence	%		%		%		%	
None at all	32		30		24		23	
1–3 d	29		28		23		20	
4–31 d	36		38		43		45	
32 d or more	3		4		10		12	
Length of working hours								
Weekly working hours (h)	33.4	8.0–40.8	33.6	5.3–40.9	34.9	8.0–49.3	34.8	4.0–50.5
% of long (> 40 h) working weeks	24	0–60	25	0–75	26	0–100	27	0–100
% of long (> 48 h) working weeks	4	0–38	5	0–35	5	0–58	5	0–100
Shift length (h)	8.2	5.1–10.5	8.2	4.8–10.5	8.5	5.7–12.4	8.6	4.0–13.1
Shift intensity								
Number of consecutive working days	4.7	2.0–7.3	4.8	2.0–7.0	4.7	2.0–7.0	4.7	2.0–6.9
% of long spells of work shifts	3	0–20	4	0–19	4	0–19	4	0–19
Number of consecutive night shifts	3.9	2.0–7.3	4.0	2.0–6.8	4.0	2.0–6.7	4.0	2.0–7.0
% of long spells of consecutive night shifts	4	0–29	4	0–33	4	0–37	4	0–35
Recovery								
Time between shifts (h)	15.7	12.4–22.9	15.7	10.5–19.4	15.5	12.0–19.9	15.4	0.5–20.5
% of short shift intervals	18	0–67	18	0–60	21	0–58	21	0–100
% of short recovery periods after last night shift	5	0–100	3	0–100	4	0–100	5	0–100
Social aspects of working hours								
% of annual leave days	12	0–57	13	0–82	11	0–44	12	0–94
% of weekend work	38	0–100	37	0–100	43	0–100	42	0–100
% of single days off	18	1–100	19	1–100	18	1–100	18	1–100
Variability of shift starting times	2.7	0–6.2	2.8	0–6.1	3.4	0–6.8	3.3	0–6.5
% of realized shift plans	92	40–100	92	15–100	91	0–100	91	0–100
% of preferred shifts	18	1–100	20	1–100	7	1–100	7	1–100
% of realized shift preferences	7	0–55	8	0–49	3	0–53	3	0–52

[1] Days off are scheduled days off (but not annual leave or anything else) within a three-wk period

[2] Scheduled absences (sick leave, maternity leave, annual leave etc.) are planned into the scheduling programme for each three-wk period

[3] Sickness absence days include all days of absence (sudden or scheduled) due to sickness

On the other hand, there were some significant, even very minor improvements in working-hour characteristics: short recovery periods after the last night shift decreased, showing improved recovery. The intervention also increased the realization of employees' shift preferences by 2%.

A decrease in the number of days off and an increase in the proportion of single days off may push both recovery and the work-life balance in the direction of compromise or even difficulties[21–23], which may be interpreted as clearly negative from the shift ergonomics perspective. The results suggest that the changes in days off were due to the modification to the collective agreement that limited entitlement to take time off as compensation for overtime or, for example, night work. In contrast, the realization of employees' own preferences as regards shifts can be regarded as positive in terms of shift ergonomics, due to the known association between self-scheduling of shift work and satisfaction, health and well-being[12, 24]. The new collective agreement fixed total working hours and stressed the importance of avoiding scheduled overtime and keeping to the limits of the fixed working hours, which was intended to support good shift ergonomics. However, many of the consequences of the new regulations were still negative in terms of recovery time.

Table 3. Effects (coefficients with standard errors [SE] and *p*-values) of group, time and group*time interaction on characteristics of working days, days off, scheduled absences, sickness absence days, length of working hours, shift intensity, recovery, and social aspects of working hours in intervention and control groups

Working days, days off, scheduled and sickness absence days	Group effect		Time effect		Interaction	
	Coeffcient (SE)	*p* value*	Coeffcient (SE)	*p* value*	Coeffcient (SE)	*p* value*
Working d/3-wk period	**0.36 (0.12)**	**<0.001**	**−0.34 (0.11)**	**<0.001**	0.05 (0.12)	0.665
Days off/3-wk period[1]	0.08 (0.39)	0.533	**−0.49 (0.07)**	**<0.001**	**0.28 (0.08)**	**<0.001**
Scheduled absence d/3-wk period[2]	−0.27 (0.23)	0.227	**0.21 (0.11)**	**<0.001**	**0.28 (0.12)**	**0.017**
Sickness absence d/yr[3]	**6.51 (1.16)**	**<0.001**	**1.33 (1.25)**	**0.002**	1.66 (1.38)	0.227
Length of working hours						
Weekly working hours (h)	1.36 (0.84)	0.141	0.18 (0.15)	0.581	−0.27 (0.16)	0.107
% of long (> 40 h) working weeks	**1.69 (0.64)**	**0.004**	**0.63 (0.56)**	**0.077**	−0.18 (0.61)	0.765
% of long (> 48 h) working weeks	**0.97 (0.32)**	**0.003**	0.26 (0.29)	0.094	0.03 (0.32)	0.922
Shift length (h)	**0.38 (0.13)**	**0.002**	−0.00 (0.02)	0.392	0.02 (0.02)	0.295
Shift intensity						
Number of consecutive working days	−0.01 (0.32)	0.886	0.04 (0.02)	0.440	**−0.07 (0.02)**	**0.005**
% of long spells of work shifts	0.33 (0.56)	0.921	**0.47 (0.14)**	**0.009**	**−0.55 (0.15)**	**<0.001**
Number of consecutive night shifts	0.11 (0.41)	0.905	**0.13 (0.03)**	**0.001**	**−0.13 (0.03)**	**<0.001**
% of long spells of consecutive night shifts	0.69 (1.29)	0.826	**0.84 (0.25)**	**<0.001**	**−0.83 (0.27)**	**0.002**
Recovery						
Time between shifts (h)	−0.19 (0.33)	0.553	−0.02 (0.06)	0.489	−0.01 (0.07)	0.929
% of short shift intervals	1.89 (6.86)	0.782	**−0.45 (0.40)**	**0.044**	0.01 (0.44)	0.973
% of short recovery periods after last night shift	−0.78 (0.86)	0.290	**−2.53 (0.94)**	**0.044**	**3.02 (1.01)**	**0.003**
Social aspects of working hours						
% of annual leave days	0.13 (1.10)	0.966	**1.03 (0.30)**	**<0.001**	−0.36 (0.33)	0.284
% of weekend work	4.28 (7.79)	0.621	**−0.90 (0.68)**	**<0.001**	−0.87 (0.75)	0.245
% of single days off	−1.92 (7.54)	0.752	**1.28 (0.43)**	**<0.001**	**−0.92 (0.47)**	**0.050**
Variability of shift starting times	**0.54 (0.07)**	**<0.001**	0.09 (0.04)	0.056	**−0.10 (0.04)**	**0.023**
% of realized shift plans	**−0.79 (0.39)**	**0.010**	−0.16 (0.37)	0.114	−0.32 (0.41)	0.425
% of preferred shifts	−8.03 (9.43)	0.344	**1.69 (0.50)**	**0.004**	**−1.80 (0.56)**	**0.001**
% of realized shift preferences	−3.42 (3.71)	0.332	0.22 (0.24)	0.761	−0.36 (0.26)	0.163

*Statistically significant *p*-values <0.05 in boldface. [1] Days off are scheduled days off (but not annual leave or anything else) within a three-week period; [2] Scheduled absences (sick leave, maternity leave, annual leave etc.) are planned into the scheduling programme for each three-wk period; [3] Sickness absence days include all days of absence (sudden or scheduled) due to sickness. Group effect reflects the difference between intervention and control group, time effect reflects difference between 2012 and 2013, and interaction is the time*group effect, reflecting the potential effect of the intervention.

We cannot rule out the possibility that other factors beyond the modifications affected the working-hour characteristics. For example, the concurrent emphasis on and instructions for following good shift ergonomics in the social and health sector in Finland[14, 25] may have played a role in the changes in the period-based shift work hours detected in the working-hour characteristics.

Sickness absence before and during the intervention period

Sickness absences did not change due to the modifications to the collective agreement. In addition, the observed levels of sickness absences were around the same as those found in other studies on shift work[26, 27] and in an earlier report based partially on the same hospital district as that in this study[28]. The intervention group had more employees with no sickness absence days during the two years of this study than the control group. However, since the intervention period was compared to the single preceding year, the study design may have been insufficient for revealing long-term changes in sickness absence.

Strengths of the study

This study has several strengths. First, the individual-level objective day-to-day working-hour data collected from the employers' electronic working-time records provide an exact and unbiased measure of working times[20]. To the best of our knowledge, these kinds of objective working-hour studies are rare. Many shift work-related projects have either used retrospective questionnaires to gather data on shift work characteristics or relied on employer-reported shift system descriptions[19, 29]. Hence, most earlier studies have not been able to evaluate shift work exposure without selection bias and attrition[20, 29], or to capture irregular, complex and changing working-time

patterns. The use of registry data also ensured no losses to follow-up, which are usual in intervention studies due to non-response or exit due to other reasons. Furthermore the repeated measures design included only employees for whom data were available for both years. Third, we were able to account for sex and part-time work in the analyses, as we suspected these may play a role in working-hour characteristics. Fourth, the pragmatic study design provided a powerful real-life tool for investigating organizational-level modifications to shift scheduling, as suggested by earlier studies on organizational-level interventions of case-control design combined with natural intervention, or the quasi-experimental approach[12, 13, 15, 16].

Limitations of the study

The design of this study prevented us from randomizing the departments in the intervention group, which means that the intervention's voluntary departments may have been selection biased. However, the control group was randomly selected from a greater dataset of a large hospital district on the basis of matched selection criteria (including age, sex and occupation). Although the modifications to the collective agreement (which prevented taking time off as compensation for overtime, and limited time off as compensation for scheduled absence days to the standard shift length) implied that weekly working hours or shift length would be affected, we could identify no effects that were based on the calculated annual working-hour characteristics[20]. However, as both the number of days off and the number of scheduled absence days changed between 2012 and 2013, we assume that limiting time off as compensation had at least some effect, albeit minor. It should be mentioned that the overall changes in the objective shift work hour characteristics were minimal, and some characteristics were not affected at all by the intervention. However, we tested the effect of changes to the collective agreement not only on the intervention group, but also in comparison to the control group. This revealed some group effects (Table 3), on characteristics related to the length of working hours in particular, as well as on sickness absence. These may in part reflect differences between the intervention and control groups in terms of the planning of working hours or personnel needs, but may also address the need to evaluate working hours to avoid the accumulation of long weekly working times and the need for efforts to prevent sickness absence.

Implications for practice

The results show that collective ageements that limit employees' entitlement to time off as compensation may result in some negative effects, mostly related to less opportunities for recovery. The results might have wider applicability: at least in Nordic countries, where similar regulations are applied at the municipal or hospital level[8–11]. In addition, our findings regarding working-hour characteristics provide information on the magnitude of the expected effects of these kinds of modifications, even if the effects were somewhat minor. The effects on shift ergonomics were partly negative, and only modifications that promote good shift ergonomics should be applied in the future. When planning shifts, nursing management should avoid regulations that promote specific unhealthy shift characteristics, that is, consecutive work shifts and a reduction in days off. The modifications that merit recommendation for further use are: a) ensuring enough recovery between shifts (also days off), and b) avoiding regular, long working weeks in any shift systems (the benefits of which have been shown in earlier studies in industry and health care[30] and some other sectors[31]).

Conclusions

The modifications to the collective agreement had minor but mostly negative effects on shift work hours. In particular, the modification that limited employees' entitlement to take time off as compensation for overtime appeared to have a negative influence on shift ergonomics (i.e. increased unhealthy shift characteristics).

Conflict of Interest

The authors declare no conflict of interest.

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