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The Relationship Between Shift Work Schedules and Spillover in a Sample of Nurses

Jonas Rønningsdalen Kunst
Gøril Kvamme Løset

Department of Psychology, University of Oslo, Oslo, Norway

Daniel Hosøy

Department of Psychosocial Science, University of Bergen, Bergen, Norway

Bjørn Bjorvatn

Department of Public Health and Primary Health Care, University of Bergen, Bergen, Norway
Norwegian Competence Center for Sleep Disorders, Haukeland University Hospital, Bergen, Norway

Bente E. Moen

Department of Public Health and Primary Health Care, University of Bergen, Bergen, Norway

Nils Magerøy

Occupational and Environmental Medicine, University of Bergen, Bergen, Norway

Ståle Pallesen

Department of Psychosocial Science, University of Bergen, Bergen, Norway
Norwegian Competence Center for Sleep Disorders, Haukeland University Hospital, Bergen, Norway

*The aim of the present study was to estimate spillover effects between the work and the family sphere in a sample of nurses (*N = *2058). Hierarchical regression analyses investigated whether shift work schedules were associated with negative or positive spillover, both from family to work and vice versa, controlling for demographic factors, job demands and decision latitude. With daytime work as a reference group, all types of shift work (day and evening shift, night shift only and rotating 3 shift) were associated with higher negative work–to–family spillover. Night work was associated with significantly less negative family–to–work spillover. None of the different shift work schedules were related to any type of positive spillover. The results indicate that working outside of daytime hours is less compatible with workers' family lives, compared to working ordinary day shifts. On the other hand, working night shifts only was associated with reduced negative family–to–work spillover.*

work–family spillover nurse strain stress rotating shift shift work

1. INTRODUCTION

There is an increasing trend towards a 24/7 society, with many services being available at all hours, 7 days a week [1, 2]. This is reflected by an increase in shift and night work, which often entails changes in the traditional role allocation in relationships and families that could lead to difficulties in balancing work and family responsibilities [3]. In this regard, the term *spillover* is central; denoting the process in which events in one life arena interfere with, or have an impact on, other life arenas [4]. In contemporary literature, spillover is defined as the transfer of mood, energy and skills from one sphere to another [5]. It is assumed that spillover can operate in both

Correspondence should be sent to Jonas Rønningsdalen Kunst, Department of Psychology, Postboks 1094, Blindern 0317 Oslo, Norway. E-mail: j.r.kunst@psykologi.uio.no.

directions (e.g., work–to–family and family–to–work) [6] and that spillover can be negative (work–family conflict) as well as positive (work–family facilitation) [7]. Shift work has been defined as any working hours which deviate from the usual working standards of a specific country [8] and can be subdivided into several categories, including night shift, evening shift and rotating shifts. Evening shift is normally defined as a working schedule in which at least half of the working hours are between 16:00 and midnight, and night shift as a working schedule in which at least half of the hours are between midnight and 8:00. Furthermore, rotating shifts are defined as working schedules with hours changing regularly between night, evening and day shifts [9], and should as Perucci, MacDermid, King et al., note "not be confused with flexible schedules, which involve varying the times of arrival and departure from the workplace" (p. 601) [10]. In Norway, approximately 34% of all workers experience some type of shift work [11]. Estimates indicate similar patterns in many European countries [12].

Research has found support for both positive and negative spillover being associated with shift work. On the one hand, shift work can cause negative spillover effects on workers' social life [13] including marital instability and divorce [14], difficulties forming relationships [15], dissatisfactory relationships with their children [16] and difficulties organizing family activities [17]. Further, these negative effects on family life seem to correlate with the length [18] and the irregularity of the working schedule [19]. In addition, one study noted that family functioning was poorer when both parents worked nonstandard hours, compared to the situation where this applied for only one or neither of the parents [20]. Shift workers also seem to experience more negative family–to–work spillover compared to those working ordinary day time schedules [21].

On the other hand, some studies have demonstrated advantages of shift work. It has been suggested that shift work promotes the opportunity for the shift working spouse to stay at home and take care of their children, while the other spouse is at work [22, 23]. Another study found that the majority of nurses who permanently were working night shift preferred this schedule since it allowed them to spend more time at home with their younger children [24]. It seems as most studies concerning the relationship between work schedules and spillover effects have focused on negative spillover and very few studies have consequently investigated the relationship between positive spillover and shift work.

Nurses represent a profession in which shift work is very common. Still, few studies have investigated work–family spillover in this occupational group [21, 25]. So far, no previous study has investigated the relationship between shift work and both negative and positive work–to–family and family–to–work spillover in nurses. Against this background the aim of the present study was to investigate to what extent various types of shift work schedules could explain variance in positive and negative spillover from work–to–family and from family–to–work compared to ordinary day shift schedules. Factors such as decision latitude and job demands, which are often used as a determinant for work–family conflict, were controlled for [26]. We also controlled for various demographic variables.

2. METHOD

2.1. Sample

The data used in this study were obtained from the cross-sectional study "The survey of sleep, shift work and health" (SUSSH) which was conducted in the period from December 2008 to March 2009 among nurses in Norway. The population consisted of registered members of the Norwegian Nurses Organization (NNO) which includes most of the nurses working in Norway today. In January 2009, the NNO had 87 083 registered members. A stratified sample ($N = 6000$) in total comprising five strata, each containing 1200 nurses holding at least a 50% work position [1], was randomly selected from the organization's member register. The different strata were created based

[1] Work position (%) indicates the form of employment, e.g., 50% is a half-time job.

on time elapsed since graduation, in this case 0–11 months (stratum 1), 1–3 years (stratum 2), 3.1–6 years (stratum 3), 6.1–9 years (stratum 4) and 9.1–12 years (stratum 5). Each nurse in the sample received a questionnaire by post, while an internet based version of the questionnaire was available for those who preferred to complete the questionnaire online. A reminder was sent out once in February 2009. Of the 6000 letters sent out a total of 600 was returned due to wrong addresses. As a consequence, the survey sample consisted of 5400 nurses, of which 2058 participated in the survey, yielding a response rate of 38.1%.

Questions covered respondents' background pertaining to their age, gender, marital status and whether they had children living at home. The questionnaire asked for the type of working schedule the nurses were assigned to, rotating three shift (including day, evening and night shifts), day only, evening only, night only or day and evening (two shift system) schedules. Information in average number of work hours per week, their percentage work position (50%–75%, 76%–90% or >90%), and how long participants had practiced as a nurse was obtained as well.

As much as 90.8% of the participants were women. Approximately half reported having children living at home and most of the participants were living together with a partner (Table 1). A majority of the sample, 56%, had a work position percentage that exceeded 90%. Rotating three shift schedules were by far the most common shift work schedule followed by rotating two shift schedules, night shift only and day shift only. Workers indicating "evening shift only" and "other work schedules" were excluded, giving a study population of 1975 (Table 1).

The sample included in the analyses varied demographically by working schedule (Table 1). Independent of the type of shift worked, shift working nurses were to a considerable degree more likely not to have children living at home, compared to their day working colleagues ($\chi^2 = 32.7$, $df = 1$, $p < .01$). They were also more likely to report not having a partner ($\chi^2 = 6.5$, $df = 1$, $p < .05$). Furthermore, nurses working shifts were more unlikely to hold a position over 90% ($\chi^2 = 32.4$, $df = 1$, $p < .01$). Nurses working normal day schedules were on average significantly older than their counterparts working shift (normal day schedule = 37 years; shift work = 32 years; $t = 5.8$, $df = 1934$, $p < .01$).

2.2. Measures

The work–family interface scale, developed by Kinnunen, Feldt, Geurts et al. was used to evaluate the four types of work–family spillover [3]. Consisting of 14 items, the scale was designed to measure both negative and positive work–to–family (NWFS and PWFS) and family–to–work spillover (NFWS and PFWS). Four items measured NWFS with questions such as "How often does it happen that your job or career prevents you from spending desired amount of time with your family?". Four items measured NFWS including questions such as "How often does it

TABLE 1. Characteristics of Subjects (%)

Parameter	Day Shift ($n = 149$)	Day and Evening Shift ($n = 512$)	Night Shift Only ($n = 168$)	Rotating Three Shifts ($n = 1146$)	Total ($N = 1975$)
Male	9.5	8.8	13.2	8.5	9.1
Female	90.5	91.2	86.8	91.5	90.9
Children	72.9	49.9	56.8	46.8	50.4
Partner	82.4	72.9	73.5	72.7	73.6
Work position[1]					
>90%	78.4	57.9	14.4	58.4	56.0
76–90%	10.8	13.9	12.0	13.7	13.4
50–75%	8.1	23.1	68.3	26.3	27.6
<50%	2.7	5.1	5.4	1.7	2.9

Notes. 1 = work position (%) indicates the form of employment, e.g., 50% is a half-time job.

happen that the demands of your family or spouse/partner interfere with your work-related activities?". PWFS and PFWS were each measured by three items. Questions such as "How often does it happen that you take your responsibilities at work more seriously because you are required to do the same at home?" and "How often does it happen that you fulfill your domestic obligations better because of the things you have learned at work?" are examples of items of PWFS and PFWS, respectively. The responses were graded by a frequency based on a 1–5 Likert scale, with alternatives ranging from *never* to *very often*. Cronbach's α values for the four spillover subscales were .82 for NWFS, .77 for NFWS, .60 for PWFS and .59 for PFWS.

In order to measure the psychological work environment of the participants, two subscales from The Swedish demand–control–support questionnaire were administered, namely 'psychological work demands' (five items) and 'decision latitude' (six items) [27]. Of the latter six items, three concerned skill discretion while the other three assessed decision authority. The response categories for all 11 items referred to the frequency of occurrence on a 1–4 Likert scale, ranging from 1 (*yes, often*) to 4 (*no, almost never*). Cronbach's α values for the two subscales were .80 for psychological work demands and .55 for decision latitude.

In order to estimate whether type of shift work explained a significant part of the variance in the four different spillover dimensions, hierarchical multiple regression analyses were conducted. One separate analysis was carried out for each type of spillover and the analyses consisted of three steps. In order to control for the demographical variables, age, gender, present percent work position, marital status and living with children or not were entered in the first step (step 1). In the next step (step 2), "job demands" and "decision latitude" were added. Finally, in the last step (step 3), the type of shift worked was added in terms of dummy coded variables representing "day and evening shift", "night shift only" and "rotating three shift", while "day shift" constituted the reference group for all these three dummy codings. Further, Pearson correlations between the different spillover subscales were analyzed.

3. RESULTS

Across the different work schedules, all participants reported some degree of all four types of spillover (Table 2). The degree to which the participants reported positive spillover did not differ across the different work schedules. However, analysis of variance (ANOVA) indicated differences for the negative spillover dimensions, NWFS: $F(3, 1942) = 13.57$, $p = .00$; NFWS: $F(3, 1945) = 3.98$, $p = .01$. Specifically, participants working normal day shifts reported lower degrees of NWFS than those working day and evening shifts and those working rotating shifts. Furthermore, participants working rotating shifts indicated significantly higher NWFS than participants working any of the other work schedules. In regard to NFWS, the mean for respondents working normal day shifts was significantly lower than the mean for participants working one of the other schedules.

As shown in Table 3, both measures of the negative and both measures of the positive spillover dimension were moderately and positively correlated. A moderate negative correlation was found between the two spillover dimensions of WFS.

TABLE 2. Spillover Variables for Different Shifts ($N = 1975$)

	NWFS		NFWS		PWFS		PFWS	
Shift	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Normal day ($n = 149$)	9.73	3.60	7.46	2.92	8.89	2.08	9.32	2.16
Day and evening ($n = 512$)	10.72	3.66	6.79	2.82	8.63	2.19	8.83	2.36
Night only ($n = 168$)	10.45	3.76	6.41	2.23	8.38	2.24	9.05	2.29
Rotating ($n = 1146$)	11.41	3.45	6.78	2.73	8.57	2.04	8.83	2.17

Notes. NWFS = negative work-to-family spillover, NFWS = negative family-to-work spillover, PWFS = positive work-to-family spillover, PFWS = positive family-to-work spillover.

Moreover, the results showed a small positive correlation between PFWS and NFWS.

For NWFS (Table 4) the first step (age, gender, percentage position, marital status, children living at home) explained 2.5% of the variance. Step 2 (adding job demands and decision latitude) explained 16% of the variance. The third and final step (comprising the different work schedules) explained 1% of the variance. Respondents living with a partner reported significantly greater

TABLE 3. Pearson Correlation Between Different Types of Spillover (*N* = 1975)

Spillover	NWFS	NFWS	PWFS	PFWS
NWFS	—	.375**	.206**	.086**
NFWS	.375**	—	.055*	.191**
PWFS	–.206**	.055*	—	.368**
PFWS	.086**	.191**	.368**	—

Notes. Data for normal day shift. *$p < .05$, **$p < .01$. NWFS = negative work-to-family spillover, NFWS = negative family-to-work spillover, PWFS = positive work-to-family spillover, PFWS = positive family-to-work spillover.

TABLE 4. Summary of Hierarchical Regression Analyses for Variables Predicting Different Types of Spillover

	NFWS		NFWS		PWFS		PFWS	
Variable	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step 1		.025		.123		.024		.027
age	–.034		–.011		.132**		.021	
gender[a]	–.011		–.066**		.020		.059**	
work position	.052*		.019		–.047*		.019	
marital status[b]	.065*		–.071**		–.028		.046	
children living at home[c]	.128**		.373**		.038		.122**	
Step 2		.160		.010		.072		.012
age	–.003		–.007		.103**		.013	
gender	–.036		–.073**		.022		.053*	
work position	.045*		.015		–.056*		.012	
marital status	.053*		–.073**		–.019		.047	
children living at home	.145**		.377**		.031		.122**	
job demands	.384**		.102**		–.112**		.043	
decision latitude	–.107**		.015		.242**		.104**	
Step 3		.010		.002		.004		.003
age	.004		–.011		.107**		.013	
gender	–.033		–.077**		.019		.056*	
work position	.062**		.000		–.068**		.023	
marital status	.055*		.075**		–.020		.049*	
children living at home	.157**		.375**		.032		.118**	
job demands	.382**		.098**		–.131**		.053*	
decision latitude	–.094**		.007		.243**		.107**	
Type of shift[d]								
day and evening shift	.169**		–.030		–.015		–.044	
night shift only	.117**		–.066*		–.033		.024	
rotating three shifts	.186**		–.048		.042		–.045	

Notes. a = 1 = male, 2 = female; b = 1 = single, 2 = partner; c = 1 = no, 2 = yes; d = data for normal day shift. *$p < .05$. **$p < .01$. NWFS = negative work-to-family spillover, NFWS = negative family-to-work spillover, PWFS = positive work-to-family spillover, PFWS = positive family-to-work spillover, β = standardized regression coefficient, ΔR^2 = explained variance for each step.

NWFS than respondents not having a partner. Similarly, respondents with children living at home reported significantly more NWFS than respondents with no children at home. Percentage position and job demands were both positively and significantly related to NWFS, whereas decision latitude was negatively and significantly related to NWFS. Nurses working day and evening shift, night shift only or a rotating three shift schedule all reported significantly more NWFS than respondents working day shift only.

For NFWS (Table 4) the first step accounted for 12.3% of the variance and step 2 accounted for 1% of the variance. The third step explained only 0.2% of the variance. Males reported significantly more NFWS than females. Further, nurses living without a partner reported significantly more NFWS than those living with a partner. Moreover, respondents with children living at home reported significantly more NFWS than respondents with no children living at home. Job demands were positively and significantly related to NFWS, while night shift only was negatively and significantly related to NFWS.

For PWFS (Table 4) the first step explained 2.4% of the variance, while step 2 explained 7.2% of the variance. The third and final step accounted for 0.4%. Age and decision latitude were both positively and significantly related to PWFS, while percentage position and job demands were both negatively and significantly related to PWFS. The different shift work schedules were not significantly related to PWFS

For PFWS (Table 4) step 1 explained 2.7% of the variance, whereas step 2 accounted for 1.2%. Step 3 composed only 0.3% of the variance. Females reported significantly more PFWS than males. In addition, respondents living with a partner reported significantly more PFWS than respondents living without a partner, and respondents with children living at home reported significantly more PFWS than respondents without children living at home. Decision latitude and job demands were positively and significantly related to PFWS. The different shift schedules were not significantly related to PFWS.

4. DISCUSSION

In the present study, shift work was associated with NWFS. This finding is consistent with other studies in regard to shift work and NWFS in general [4, 13, 28] and to studies concerned with shift work and NWFS in nurses in particular [19, 21, 25, 29]. As a result, irrespective of the type of profession, it seems as if working outside of ordinary daytime hours negatively interferes with family life, although the explained variance is small.

Further, working night shifts only was also significantly related to less NFWS than working normal day shift. This may be due to the fact that nurses with younger children may have chosen to work night shifts as a coping strategy in order to be able to spend more time at home with their younger children and to divide childcare responsibilities with a non-shift working partner [23, 24, 30].

As pointed out by other studies [31, 32], autonomy over one's own working schedule seems to be linked with lower negative spillover. Therefore, one might assume that nurses working night shift only to a higher degree might voluntarily have chosen this shift schedule, as compared to nurses who work a rotating three shift schedule.

Our results provide no empirical grounds for establishing a connection between shift work and positive spillover. The lack of findings may explain the nearly absence of published studies focusing on positive spillover, and is analogous to the results of the study conducted by Davis, Goodman, Piretti et al. [28]. Although the participants in the present study did report a certain degree of positive spillover, it did not differ in regard to the different work schedules. In terms of PWFS this may reflect that the positive elements of the job (e.g., social support, coping with the job tasks at hand) are equal across shifts. This interpretation seems reasonable as all workers in the current sample were nurses, and work by and large in similar work settings. The fact that PFWS was not related to the different work schedules implies that positive experiences in the home environment do not seem to transfer differently to the work setting across shifts. This can reflect that

the level of positive experiences in the home environment in general does not differ across nurses working different shifts, and/or it may reflect that the transference of positive experiences from home to work is equal across shifts. It should however be noted that the reliabilities for the positive spillover scales were lower than for the negative spillover scales, which would make it more difficult to find significant relationships for the former compared to the latter scales.

The spillover scales were significantly correlated. As a result, high scores in one negative domain predict high scores in the other negative domain and vice versa, something that also seems to apply to the relationship between the two positive dimensions. The correlation coefficients between the different spillover dimensions found in the present study are consistent with those of other studies [3].

The present study seems to contribute to a deeper understanding of shift work's influence on spillover, above all, for nurses as the population of interest. Rotating three shifts, rotating two shift and night shift only were all associated with greater NWFS as compared to day shift schedule. Working night shift only predicted less NFWS compared to day shift. This finding supports the notion that working outside of ordinary daytime hours may interfere with the workers' family life, while family life seems to be more compatible with working night shift only compared to ordinary daytime work in this group of nurses. Concerning this latter finding it should be noted that working only nights normally relates to positions for which one applies specifically, whereas rotating shifts more or less are standard work schedules for nurses. As self-imposed work schedules are associated with less stress than external imposed work schedules [37], this can explain why working only nights is inversly related to NFWS compared to day shifts.

4.1. Strenghts and Limitations

Even though the results indicated that shift work was associated with NWFS, the different shift work schedules could only explain 1% of the variance. The sample of the present study was composed of a high number of subjects, thus ensuring high statistical power. Furthermore, the sample comprised exclusively nurses which makes comparison across the different shift schedules less problematic than samples comprising workers from several different professions. Another strength of our study was that not only demographics, but also job demands and decision latitude were controlled for before calculating any potential associations between shift work and spillover. It could be argued however that job demands and decision latitude are inherent properties of different working schedules, for this reason controlling for these factors may underestimate the real relationship between shift work and spillover. Moreover, it might be useful to measure to what extent nurses experience autonomy in choosing their working schedule, a fact which seems to have importance for spillover effects [31, 32]. Unfortunately, this aspect of the working schedule was not assessed in the present study.

Controlling for marital status and children living at home can be regarded as an advantage, although ideally we could have paid more attention to spouses' work arrangements and the specific number and age of children living at home, as this seems to be relevant according to other research [20, 21]. Further, the reported Cronbach's α coefficients for the subscale measuring decision latitude indicated a low internal consistency. This was also the case for the positive family–to–work spillover and work–to–family spillover subscales. Low Cronbach's α coefficients may have lead to lowered estimates of associations between the major variables in this study. Furthermore, our study only had a response rate of 38.1%, which is quite low, and may have impacted the generalizability of the results.

A healthy-worker effect might have been present in our study [33, 34]. It has been suggested that workers who choose to remain as shift workers might have better health and coping abilities for these types of schedules than those who choose or are forced to quit as shift workers due to negative outcomes related to family or health [35, 36]. This is supported by the fact that ordinary day shift workers in the present study on average were older and had children living at

home more frequently compared to the other shift workers. This makes it likely that a healthy-worker effect is present here, and potential negative spillover related to shift work can be assumed to be underestimated, particularly in a cross-sectional study such as the present one. For future research on the topic, we recommend using longitudinal designs. This would make it possible to control for the healthy-worker effect, with following-up on nurses who have switched their working schedule from shift work to normal daytime work (ex-shift workers).

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