

## Reasons to Leave Shiftwork and Psychological and Psychosomatic Complaints of Former Shiftworkers

Michael Frese  
University of Pennsylvania

Klaus Okonek  
Bundesgesundheitsamt, Berlin,  
Federal Republic of Germany

Male blue-collar workers who had previously worked nights and shifts were differentiated into three groups: a group that had left night- and shiftwork because of health reasons; another that left it for various other reasons; and a middle group that had a combination of health and other reasons for leaving. The findings show that the first group had more health complaints than the one that left for other reasons. They were less skilled, have been unemployed less often, and were typically told by their physician to leave shiftwork. They have also stayed in shiftwork longer than the group that left shiftwork for other reasons. It is suggested that studies on former shiftworkers should differentiate between these groups so as not to underestimate the real problems of former shiftworkers who left for health reasons.

In the literature on the relation between health and night- and shiftwork, one often finds the paradoxical result that shiftworkers show fewer health complaints than do nonshiftworkers. It is known from longitudinal studies that shiftworkers are a select group (e.g., Angersbach et al., 1980, Meers, Maasen, & Verhaegen, 1978). Therefore, many studies have investigated the health of those who have once worked in shifts but are now working during the daytime (Aanonson, 1964, Angersbach et al., 1980, Koller, Kundi, & Cervinka, 1978, Taylor & Pocock, 1972). The assumption is that these former shiftworkers have left shiftwork because they were not able to adapt to shiftwork. Therefore, one would expect that this group would show the highest degree of ill health. This appears to be true in most of the studies (Aanonson, 1959, Koller et al.,

1978, Angersbach et al., 1980), but there are important exceptions (e.g., Taylor & Pocock, 1972).

There is, of course, more than one reason to leave shiftwork, for example, personal ones (like changing jobs or location), occupational ones (like better chances of advancement), social ones (e.g., better chances to participate in social events), and, finally, health ones. If one lumps all these groups together on the assumption that they all left shiftwork because of health reasons, one may underestimate the health problems of the group that truly stopped working shifts because of health reasons. Because health problems are the target of this article, we will differentiate between workers who left shiftwork for health reasons versus those who left for other reasons.

Besides this methodological reason for differentiating between these groups, there is a substantive reason as well. The reason why former shiftworkers have been included in cross-sectional studies on night- and shiftwork has been to rule out plausible alternative causal hypotheses for the above-mentioned paradoxical results in this field (the selection problem). Therefore, differentiating between those who left shiftwork for health reasons and those who had other reasons for leaving shiftwork helps us to decide among possible causal hypotheses even in cross-sectional studies. This article examines three conceptualizations on the relationship between night- and shiftwork and ill

---

The data were collected as part of a research project by the *Industriegewerkschaft Chemie, Papier und Keramik* (West Germany), and it was partly supported by research grant 01 F 238-ZA TAP0013 from the *Bundesminister fuer Forschung und Technologie, Projekttraeger "Humanisierung des Arbeitslebens"* that is gratefully acknowledged.

Thanks are due to Robert DeRubeis, Norbert Semmer, Ingrid Waldron, and two anonymous reviewers for commenting on earlier drafts of this article.

Requests for reprints should be sent to Michael Frese, *Institut fuer Humanwissenschaften in Arbeit und Ausbildung, Technische Universitaet, Ernst Reuter Platz 7, 1000 Berlin 10, Federal Republic of Germany.*

health. They are as follows: (a) shiftwork has a direct negative effect on health; (b) the shiftworkers' ill health is a result of constitutional weakness; and (c) a combination of these viewpoints into a vulnerability-stress model.

## Method

### Sample

The sample of former shiftworkers was part of a larger study on the effects of shiftwork. A scientific study group for the chemical labor unions in the Federal Republic of Germany arranged for the distribution of questionnaires in 24 factories that were selected from 69 companies whose local labor union chapters had expressed a willingness to participate in the study. They are representative of the areas in which the labor union "Industriegewerkschaft Chemie, Papier, Keramik" operates. A random sample was not feasible because only labor union members could have been included, and it would have been impossible to specifically approach former shiftworkers. Therefore, shop stewards distributed consent forms to qualified native German blue- and white-collar workers. Their instruction was to make a special effort to approach former shiftworkers and workers who do not belong to the labor union. Workers who returned the consent forms received the questionnaire, which they were asked to return anonymously to the local labor union in a closed envelope. Each factory was allotted a certain number of consent forms so that 15% of all the shiftworkers and 5% of the nonshiftworkers were sampled. The minimum number of consent forms distributed to each factory was 100. This led to an oversampling in the smaller factories.

Of those who received the questionnaire, an average of 61.5% returned it (total  $N = 5448$ , former shiftworkers  $N = 764$ ). The return rate was the same for shiftworkers and for nonshiftworkers. The return rate ranged from 27% to 100% across the different factories. As is true of other research in the applied area, it is difficult to estimate the "real" refusal rate, because workers could refuse to sign the consent form. Thus, we could only ascertain the rate of people who did not return a completed questionnaire after they had signed the consent form. In order to keep cultural, social, and work place influences equal, the following steps were taken to homogenize the sample for this report: White-collar employees and women were excluded. Furthermore, only former shiftworkers were included who had previously worked nights. This reduced the sample of former shiftworkers to 261. Slight additional reductions of the sample size arise in the analyses because of missing data.

Three groups of former shiftworkers were determined by the answer to the question whether they had left shiftwork for health reasons. Those who said that this was *very true* or *predominantly true* are considered members of the "former shiftworkers due to health reasons" (abbreviated HR;  $N = 122$ ); those who answered *not at all true* or *a little true* are members of the "former shiftworkers for other reasons" (OR;  $N = 96$ ); and those who checked the middle category (*is partly true*) are called "middle group" (MR;  $N = 43$ ).

## Instruments

All of the scales have been tested in pilot studies (Projekt Schichtarbeit, 1980). The items typically have a 5-point answer scale and an equidistant item format (taken from Rohrmann, 1978) was used to insure interval scaling.

The following scales were used<sup>1</sup>: (a) Environmental stress (10 items, developed by Semmer, 1982, e.g., "How much are you stressed by noise on your work place?"), Alpha = .84; (b) psychological stress (Semmer, 1982, 6 items, e.g., "How often are you under time pressure in your work?"), Alpha = .80; (c) psychosomatic complaints (9 items, e.g., "Do you have headaches?"), Alpha = .84; this is a short form of the "Freiburger Beschwerdeliste" by Fahrenberg (1975) (slightly adapted by Mohr, 1984); it is similar to English scales of somatic complaints like the one used by Caplan, Cobb, French, Harrison, & Pinneau, 1975; (d) irritation/strain (Mohr, 1984, 4 items, e.g., "Are you rather nervous when you come home tired from work?"), Alpha = .88; (e) a summation index on health complaints of the last 2 years (10 items, e.g., "I had an illness in the stomach or bowels within the last 2 years"; Mohr, 1984). All of the other variables relating to reasons for entering and leaving shiftwork, improvements after leaving shiftwork, skills, and type of shiftwork system are single items (see Table 1).

## Results and Discussion

### Health Differences

The means and one-way analyses of variance (ANOVAs) of health complaints are given in Table 1. On all three indicators of ill health—psychosomatic complaints, irritation/strain, and health complaints of the last 2 years—the group HR shows the highest values.<sup>2</sup> This is similar to the results reported by Aanonson (1964). The results suggest that studies that do not differentiate between different groups of former shiftworkers along the variable "leaving for health reasons" tend to underestimate the true situation of the relevant group of former shiftworkers: the ones who really left because of health reasons.

### Other Differences

Although the three groups do not differ in regard to the reasons for going into shiftwork, their reasons for leaving shiftwork are clearly

<sup>1</sup> The wording of the items and the psychometric data on these items (like item-total correlations) are available from the authors.

<sup>2</sup> The differences are due to the extreme groups. The Scheffé test ( $p < .05$ ) does not differentiate the MR group from the former shiftworkers due to health reasons.

*Ferratum: not 36 but  $N = 96$*

different (as displayed in Table 1). The MR and the OR group gave mainly positive reasons that attracted them to day work (like better chances to advance), whereas the HR workers left shiftwork because of medical and adjustment reasons and because they were counselled to do so. The HR group is also less well skilled

than the other two groups. It is interesting that the HR workers were less often unemployed than the other two groups. In addition, the HR group spent about 10 years in shiftwork, whereas the other two groups worked only an average of 6 years in shifts. However, there are no significant differences in the time span since

Table 1  
*Differences Between the Three Groups of Former Shiftworkers*

Variable	Mean or percentage			F or $\chi^2$
	HR	MR	OR	
<b>1. Demographic variables</b>				
Age (years)	45.2	39.2	40.6	$F(2, 252) = 9.63^{**}$
Unemployment (yes)	1%	7%	7%	$\chi^2(2, N = 253) = 6.14^*$
Membership in labor union				$\chi^2(4, N = 257) = .70$
Function in labor union	35%	32%	38%	
Member without function	57%	57%	55%	
Not member	8%	11%	7%	
Return rate				$\chi^2(2, N = 261) = .11$
Low	55%	52%	55%	
High	45%	48%	45%	
How long shiftwork (years)	10.43	6.42	6.31	$F(2, 252) = 11.20^{**}$
How long ago stopped shiftwork (years)	9.85	8.68	10.54	$F(2, 251) = .80$
<b>2. Skills</b>				
How much skill necessary in present job <sup>a</sup>	3.52	3.72	3.83	$F(2, 254) = 3.59^*$
Length of on the job training (Median; present job)	4.27	6.75	5.85	$\chi^2(16, N = 257) = 24.2$
Formal skills				$\chi^2(2, N = 258) = 8.83^*$
Semiskilled	56%	35%	39%	
Skilled	44%	65%	61%	
<b>3. Ill Health</b>				
Psychosomatic complaints <sup>a</sup>	2.68	2.42	2.03	$F(2, 249) = 15.46^{**}$
Irritation/strain <sup>a</sup>	2.92	2.85	2.06	$F(2, 249) = 13.11^{**}$
Health complaints of last two years <sup>b</sup>	3.30	3.14	2.51	$F(2, 255) = 6.38^{**}$
<b>4. Stress at present work place</b>				
Environmental <sup>a</sup>	2.65	2.70	2.66	$F(2, 237) = .07$
Psychological <sup>a</sup>	3.45	3.48	3.51	$F(2, 254) = .26$
<b>5. Reasons for leaving shiftwork</b>				
More time for family <sup>a</sup>	3.01	3.83	2.63	$F(2, 243) = 7.61^{**}$
Better leisure time possibilities <sup>a</sup>	3.04	3.77	2.90	$F(2, 244) = 4.04^{**}$
Could not adjust to the constant changes in shifts <sup>a</sup>				$F(2, 245) = 24.36^{**}$
Wanted to work in my occupation <sup>a</sup>	3.43	3.74	2.26	$F(2, 241) = 5.8^{**}$
Better chances to advance <sup>a</sup>	1.55	2.74	1.88	$F(2, 241) = 5.92^{**}$
More interesting work <sup>a</sup>	1.61	2.08	2.19	$F(2, 244) = 1.70$
Better possibilities to further education <sup>a</sup>	2.83	3.31	3.14	$F(2, 243) = 1.64$
Reasons related to company policy <sup>a</sup>	2.13	2.56	2.37	$F(2, 245) = 5.0^{**}$
Physician counselled change (yes)	1.85	2.47	2.52	$\chi^2(2, N = 253) = 116.4^{**}$
Would go back to shiftwork	75%	21%	4%	$\chi^2(4, N = 253) = 10.67^*$
In any case	5%	2%	6%	
Only if I had no other choice	29%	48%	49%	
In no case	66%	50%	45%	

Note. HR = former shiftworkers due to health reasons; MR = middle group, OR = former shiftworkers for other reasons.

<sup>a</sup> Five-step scale.

<sup>b</sup> Summation index, lowest = 1, highest = 9.

\*  $p < .05$ . \*\*  $p < .01$ .

they had left shiftwork. Thus, it appears that the OR and MR groups are more highly skilled, have positive reasons to leave shiftwork, and leave it much earlier than is true for HR. Furthermore they seem to risk unemployment more readily.

#### *The Vulnerability-Stress Model*

With regard to conceptualizations of the relationship between night- and shiftwork and ill health, the results given so far could be interpreted as being consistent with the hypothesis that shiftworkers become sicker the longer they work in shifts. However, the correlations between years of shiftwork and current ill health are essentially zero for all former shiftworkers and for each of the three subgroups. Furthermore, there are no significant correlations between the question "how long ago did you stop working shifts" and ill health. A reasonable interpretation is that HR workers have worked nights and shifts up to their biological/psychological breaking point<sup>3</sup> (vulnerability-stress model). Some break down earlier, some later. Once this breaking point is reached there are strong signs of ill health, which persist even after shiftwork is abandoned. Why do the shiftworkers stay up this point? The most important reason given by nearly all of the workers for going into shiftwork is the financial one,<sup>4</sup> although the three groups do not differ significantly for the respective item. Apparently, financial incentives lead one to persist in shiftwork as long as one does not have adequate alternatives. Because of their higher skills, special circumstances (e.g., changes in the company), and greater willingness to risk unemployment, the OR workers conceive of and have more alternatives to shiftwork and therefore change to day work earlier, in contrast to the HR members, who stay in shiftwork until the physician warns them to leave. Thus, the OR workers do not typically approach their breaking point. It is obvious from the data in Table 1 that this reasoning is more clearly substantiated for the two extreme groups than for the MR group, which has high skills and unemployment on the one hand and relatively high ill health on the other.

The conceptualization that ill health is only due to constitutional weakness does not seem

to be a viable alternative. Shiftworkers in at least the larger West German corporations are usually medically screened before becoming employed. Thus, the more healthy workers are already selected. Nevertheless, shiftworkers show signs of ill health similar to the HR group (Frese, 1983). Furthermore, the constitutional weakness model cannot readily explain the higher skill and unemployment level in OR and the long time the HR group has worked in shifts (up to 29 years). Therefore, the vulnerability-stress model accounts better for the data.

#### *Problems of Interpretation*

Two possible objections still have to be dealt with that relate to sampling problems and to questionnaire research on ill health. One would argue that having shop stewards distribute questionnaires or consent forms leads to sampling problems. Two kinds of difficulties might arise: Workers who want to influence the public or the labor union could be more motivated to participate and would therefore be over-represented in the sample, or shop stewards' selection of subjects could lead to biased results. It is not completely possible to rule out these potential problems. It seems likely that they should lead to differences between active labor union participants, passive members, or nonmembers. One would assume that active members paint a bleaker picture of the situation of shiftworkers in accordance with the labor union policy in order to convince the public that their situation needs special attention. Furthermore, the return rate of a certain factory could be affected by the way shop stewards have approached potential participants of this study.

It is possible to study the effect of these variables in this study. Additionally it seems useful to control for stress in the present job and for age. Therefore a three-way analysis of covariance was run with the following variables

<sup>3</sup> There is the additional question, of course, whether or not different coping strategies with shiftwork may be an even more important factor determining the breaking point than the biological constitution. We are not able to pursue this idea in this article, however.

<sup>4</sup> The bonus for night- and shiftwork typically constitutes between one fifth to one third of the income of shiftworkers in West Germany.

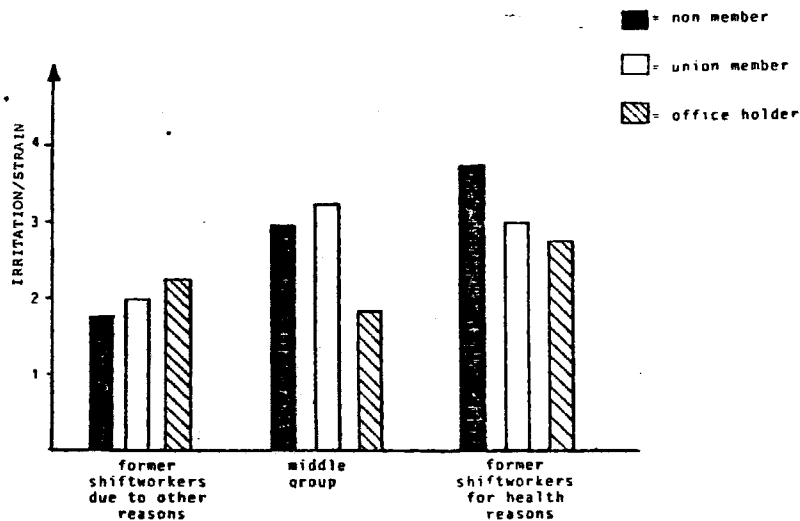


Figure 1. Interaction of union membership and groups of former shiftworkers.

(the sums of squares were adjusted for all other effects because of unequal  $N$ s in the cells): groups of former shiftworkers, membership in the labor union, and return rate (with two levels of return rate, higher than 70% and lower than 70%). Age and environmental and psychological stress were employed as control variables. The variables denoting membership in the labor union and return rate do not show any significant main effects. There are significant main effects of the variable denoting groups of former shiftworkers on irritation/strain,  $F(2, 209) = 9.09, p < .01$ , and psychosomatic complaints,  $F(2, 209) = 6.66, p < .01$ . Thus the results of the one-way ANOVAs shown in Table 1 are reproduced for two of the health measures, irritation/strain and psychosomatic complaints, but not for the variable health complaints of last two years. Additionally, there are some unexpected significant interaction effects of the variables denoting groups of former shiftworkers and membership in the labor union on irritation/strain,  $F(4, 209) = 3.18, p < .05$ , and on psychosomatic complaints,  $F(4, 209) = 2.41, p = .05$ . However, in no case do the results lend support to the interpretation that persons active in the labor union show a higher level of ill health or that HR workers who are active in the labor union show higher ill health (compare the example displayed in Figure 1). In all, the potentially confounding effects do not

seem to account for the differences in irritation/strain and psychosomatic complaints between the different groups of former shiftworkers.

The second objection is that questionnaires measure health complaints but do not adequately measure existing physiological and psychological disturbance: the HR group consists primarily of "lamenting" persons, who report more ill health or reconstruct the reasons for their leaving shiftwork in this light. It is not possible to extensively deal with this argument here, but this interpretation would also suggest that there are differences between the groups on reported stress in the present job. This is not the case (cf. Table 1). Furthermore, the strong correlations of the reported physician's advice to leave shiftwork with the indexes of ill health bolster this interpretation because it is unlikely that the physician was completely dependent on "lamenting" for his or her advice. The point biserial correlations ( $r$ s) are .39 ( $N = 247, p < .001$ ) with psychosomatic complaints, .33 ( $N = 247, p < .001$ ) with irritation strain, and .29 ( $N = 253, p < .001$ ) with health complaints of the last 2 years. Finally, Meltzer and Hochstim (1970) have shown that there is a larger number of false negatives than false positives in questionnaire answers, that is, more people will underestimate their ill health than will overestimate it in comparison to medical ratings.

In summary, it is profitable to differentiate between different groups of former shiftworkers, so that the true situation of the relevant group of former shiftworkers—the ones who left because of health reasons—is not underestimated. The recommendation is, therefore, to routinely differentiate between these groups in future research. Furthermore, the differences between the three groups of former shiftworkers are compatible with the hypothesis that the HR group is less skilled and takes fewer risks of unemployment and therefore stays longer in jobs with night- and shiftwork. Thus, they may come to the breaking point, where the physician has to advise them to leave shiftwork.

### References

- Aanonson, A. (1964). *Shiftwork and health*. Kopenhagen: Universitet forlaget.
- Angersbach, D., Knauth, P., Loskant, H., Karvonen, M. J., Undeutsch, K., & Rutenfranz, J. (1980). A retrospective cohort study comparing complaints and diseases in day and shift workers. *International Archives of Occupational Environment and Health*, 45, 127-140.
- Caplan, R. D., Cobb, S., French, J. R. P., Jr., Harrison, R. V. & Pinneau, S. R., Jr. (1975). *Job demands and worker health*. Washington, DC: National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Safety.
- Fahrenberg, J. (1975). Die Freiburger Beschwerdeliste FBL. (The Freiburg complaint list FBL). *Zeitschrift fuer Klinische Psychologie*, 4, 79-100.
- Frese, M. (1983). *Night and shiftwork, stress at work, and psychological and psychosomatic complaints: A comparison between shiftworkers, nonshiftworkers and former shiftworkers and between different shiftwork schedules*. Unpublished manuscript, available from the author.
- Koller, M., Kundi, M., & Cervinka, R. (1978). Field studies of shiftwork at an Austrian oil refinery (I): Health and psychosocial wellbeing of workers who drop out of shiftwork. *Ergonomics*, 21, 835-47.
- Meers, A., Maasen, A., & Verhaegen, P. (1978). Subjective health after six months and after four years of shiftwork. *Ergonomics*, 21, 857-860.
- Meltzer, J. W., & Hochstim, J. R. (1970). Reliability and validity of survey data on physical health. *Public Health Report*, 85, 1075-1086.
- Mohr, G. (1984). *Die Erfassung des psychischen Befindens bei Arbeitern*. (Measuring psychological well-being in blue collar workers). Unpublished manuscript, Freie Universitaet, Department of Psychology, Berlin.
- Projekt Schichtarbeit (1980). *Entwicklung und Erprobung von Vermittlungskonzeptionen zur Umsetzung von arbeitswissenschaftlichen und arbeitsorganisatorischen Erkenntnissen im Bereich Schichtarbeit*. (Development and test of a conceptualization of teaching knowledge regarding work sciences and work organization on shiftwork). Zwischenbericht No 2.
- Rohrmann, B. (1978). Empirische Studien zur Entwicklung von Antwortskalen fuer die sozialwissenschaftliche Forschung. (Empirical studies for the development of answering scales for social science research). *Zeitschrift fuer Sozialpsychologie*, 9, 222-245.
- Semmer, N. (1982). Stress at work, stress in private life, and psychological well-being. In W. Bachmann, I. Udriș, & J. Daniel (Eds.), *Mental load and stress in activity: European approaches*. Berlin: Deutscher Verlag der Wissenschaften, and Amsterdam: North Holland.
- Taylor, P. J., & Pocock, S. J. (1972). Mortality of shift and day workers, 1956-68. *British Journal of Industrial Medicine*, 29, 201-207.

Received October 7, 1983

Revision received February 3, 1984 ■