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by [Härmä M](#)

Affiliation: Centre of Expertise on Human Factors at Work, Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, FI-00250 Helsinki, Finland. mikko.harma@ttl.fi

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Shift work among women—a century-old health issue in occupational health

Shift work among women was a public health issue even a century ago. In 1877, shift work became forbidden among women in Switzerland, and, by the end of 1914, it was forbidden already in 10 different countries (1). The prohibition of night work among women in Europe was revoked later for mostly political reasons—restrictions for only women were felt to be unequal. There has also been insufficient evidence indicating specific health risks for shift work among women.

In this issue of the *Scandinavian Journal of Work, Environment & Health*, a systematic review is published on the association of shift work with breast, prostate, and colorectal cancer (2). The study concludes that there is limited evidence for a causal association between nightshift work and breast cancer among women. The conclusions of the review are well in line with the recent decision of the expert panel of the International Agency for Research on Cancer (IARC) (3), which concluded that “shift-work that involves circadian disruption is probably carcinogenic to humans” (Group 2A). Although both reviews mention deficiencies in the scientific literature, they also point out that the observed associations are unlikely to be explained by chance, bias, or confounding. Since about 20% of the working population in developed countries works in shifts, even a low risk may have a high potential health significance (4, 5).

Although women have a lower risk for coronary heart disease (CHD) until menopause than men do, they are exposed to increased CHD risk due to shift work. According to Alfredsson et al (6), women have an elevated standardized mortality ratio (SMR) of 152 when compared with day workers. Similarly, an odds ratio of 1.7 was reported by Knutsson et al (7), and Kawachi et al (8) found a relative risk of 1.3 for American female nurses. The risk estimates for men are similar—shift work increases the risk of CHD by 30–40% even when other traditional risk factors and social class are controlled (9–11). In addition, female shift workers are more likely to report menstrual irregularities and longer menstrual cycles than nonshift workers are (12). Shift work is also associated with preterm delivery (13). However, no signs of teratogenic risk have been found.

The most probable pathway from shift work to ill health is circadian disturbance, caused by exposure to light at night. Disruption of circadian rhythms is also associated with disturbances in menstrual function, melatonin production, and even with the production of other reproductive hormones (14, 15). There is, however, little evidence that the speed of circadian adjustment to night work would differ (16). Women still report slightly more sleep complaints than men, and they sleep somewhat longer (17), indicating a higher sleep need. Occupational accidents related to shift work do not seem to show gender differences, however (18).

Although the health effects of shift work are widely acknowledged (19), the results of individual studies have been surprisingly inconsistent. Could gender differences contribute to discrepancies in the scientific literature? Among women, at least three factors could influence the inconsistencies of the different shiftwork studies, differences in the studied shift systems, differences in home work and domestic responsibilities, and, finally, the variations in the possibilities to self-select and influence workhours.

With respect to the differences in shift systems, the existing epidemiologic literature provides limited information on the choice of “healthy” shift systems. We especially lack studies on good shift systems for women. At least one intervention study among nurses and nurses’ aides showed that increased ergonomic scheduling with more-regular and more-predictable shift schedules was associated with favorable changes in triglyceride and high-density lipoprotein cholesterol levels (20). After decades of intensive research on shift systems, it was burdensome to read the conclusions of a systematic review on the

neurobehavioral and physiological effects of different shift rotations and shift lengths (21). The authors concluded that “overall there is insufficient evidence to support definitive conclusions regarding any of the studied factors [p 83]”. Most of the studies had to be excluded due to methodological problems. Luckily, the authors shed a little light for readers by adding that “the analysis provides support for the use of forward-rotating shift systems in preference to backward-rotating shift systems [p 83]” (21).

The gender differences in domestic work and other responsibilities depend on national and social class traditions, as well as on the number and age of children in the household (22). A European survey on work conditions showed that 32% of women, but only 7% of men, work part-time in Europe (23). Men have longer workhours, but women do more household work. Probably, for that reason, there is still no evidence concerning any major gender differences in the frequency of reported work–home imbalance (22). Domestic responsibilities may also not be directly related to differences in fatigue and recovery (24).

Employee control of workhours is associated with better worklife balance and health (19, 22, 25). In Europe, men can have more influence on the beginning and end of their workhours (23). Since women do more household chores, it could be hypothesized that they would actually benefit more than men from better worktime control. Indeed, in a prospective study, women with a low level of worktime control had a 1.9 times higher odds ratio for poor self-rated health, a 1.4 times higher odds ratio for psychological distress, and a 1.5 times higher risk of medically certified sickness absences than women with a high level of worktime control (25). The beneficial effects of worktime control on health were less clear among the men. For both genders, the beneficial effects of good worktime control were the most evident for workers with children.

After 100 years, shift work among women has again become a new health issue in occupational health. We should not forget the biological differences between men and women in relation to the work-related risks for breast cancer and reproductive health. New “healthy” workhours for women should be explored and taken into use. Especially, we need better possibilities to influence workhours to optimize the work–home balance.

References

1. Yötyöntekijättärien työ, asunto- ja terveysolot [Occupational, residential and health related circumstances of female night workers]. Helsinki: Suomen virallinen tilasto; 1935. Sosiaalisia erikoistutkimuksia 12.
2. Kolstad H. Nightshift work and risk of breast cancer and other cancers—a critical review of the epidemiologic evidence. *Scand J Work Environ Health*. 2008;34(1):5–22.
3. Straif K, Baan R, Grosse Y, Secretan B, El Ghissassi F, Bouvard V, et al. Carcinogenicity of shift-work, painting, and fire-fighting. *Lancet Oncol*. 2007;8:1065–6.
4. Pukkala E, Härmä M. Does shift work cause cancer? [editorial]. *Scand J Work Environ Health*. 2007;33(5):321–3.
5. Schwartzbaum J, Ahlbom A, Feychting M. Cohort study of cancer risk among male and female shift workers. *Scand J Work Environ Health*. 2007;33(5):336–43.
6. Alfredsson L, Spetz C, Theorell T. Type of occupation and near-future hospitalization for myocardial infarction and some other diagnoses. *Int J Epidemiol*. 1985;14:378–88.
7. Knutsson A, Hallquist J, Reutenwall C, Theorell T, Åkerstedt T. Shift work and myocardial infarction: a case-control study. *Occup Environ Med*. 1999;56:46–50.
8. Kawachi I, Colditz G, Stampfer M, Willett W, Manson J, Speizer E, et al. Prospective study of shift work and risk of coronary heart disease in women. *Circulation*. 1995;92:3178–82.
9. Bøggild H, Knutsson A. Shift work, risk factors and cardiovascular disease [review]. *Scand J Work Environ Health*. 1999;25(2):85–99.
10. Fujino Y, Iso H, Tamakoski A, JACC study group. A prospective cohort study of shift work and risk of ischemic heart disease in Japanese male workers. *Am J Epidemiol*. 2006;163:128–35.
11. Virkkunen H, Härmä M, Kauppinen T, Tenkanen L. The triad of occupational exposures to shift work, noise, and physical workload and risk of coronary heart disease. *Occup Environ Med*. 2006;63:608–16.
12. Baker FX, Driver HS. Circadian rhythms, sleep, and the menstrual cycle. *Sleep Med*. 2007;8(6):613–22.
13. Bonzini M, Coggon D, & Palmer KT. Risk of prematurity, low birthweight and pre-eclampsia in relation to working hours and physical activities: a systematic review. *Occup Environ Med*. 2007;64(4):228–43.
14. Hansen AM, Grade AH, Hansen J. Diurnal urinary 6-sulfatoxymelatonin levels among health Danish nurses during work and leisure time. *Chronobiol Int*. 2006;23:1203–15.
15. Davis S, Mirick DK. Circadian disruption, shift work and the risk of cancer: a summary of the evidence and studies in

- Seattle. *Cancer Causes Control*. 2006;17(4):539–45.
16. Hakola T, Härmä M, Laitinen J. Circadian adjustment of men and women to night work. *Scand J Work Environ Health*. 1996;22(2):133–8.
 17. Kronholm E, Härmä M, Hublin C, Aro A, Partonen T. Self-reported sleep duration in Finnish general population. *J Sleep Res*. 2006;15:276–90.
 18. Dembe AE, Erickson JB, Delbos RG, Banks SM. Nonstandard shift schedules and the risk of job-related injuries. *Scand J Work Environ Health*. 2006;32(2):232–40.
 19. Härmä M. Workhours in relation to work stress, recovery and health [review]. *Scand J Work Environ Health*. 2006;32(6, special issue):502–14.
 20. Bøggild H, Jeppesen HJ. Intervention in shift scheduling and changes in biomarkers of health disease in hospital wards. *Scand J Work Environ Health*. 2001;28(2):87–96.
 21. Driscoll T, Grunstein R, Rogers N. A systematic review of the neurobehavioral and physiological effects of shiftwork systems. *Sleep Med Rev*. 2007;11:179–94.
 22. Albertsen K, Kauppinen K, Grimsø A, Sørensen B, Rafnsdóttir G, Tómasson K. Working time arrangements and social consequences—what do we know? Copenhagen: The Nordic Council of Ministries; 2007.
 23. Kauppinen K, Kumpulainen R, Houtman, I. Gender issues in safety and health at work. Luxembourg: European Agency for Safety and Health at Work; 2003.
 24. Winwood P, Winefield A, Lushington K. Work-related fatigue and recovery: the contribution of age, domestic responsibilities and shiftwork. *J Adv Nurs*. 2006;56(4):438–49.
 25. Ala-Mursula L, Vahtera J, Pentti J, Kivimäki M. Effect of employee worktime control on health: a prospective cohort study. *Occup Environ Med*. 2004;61:254–61.

Mikko Härmä, MD
Centre of Expertise on Human Factors at Work
Finnish Institute of Occupational Health
 Helsinki, Finland