

Changes in Health Habits of Female Shift Workers

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Abstract: Changes in Health Habits of Female Shift Workers: Shin-ya KANEKO, *et al.* Department of Hygiene & Preventive Medicine, School of Medicine, Fukushima Medical University—This paper examines the effects of shift work on the lifestyles of female factory workers. As an indicator of healthy lifestyle habits, we used a scoring system (referred to below as the 'health score') based on Lester Breslow's health habits. The 'health score' of the women was higher than that of the men, but the shift workers' score was lower than that of the non-shift workers ($p < 0.01$). In addition, the score of workers who had changed from non-shift work to double-shift work was remarkably low ($p < 0.01$). These results suggest that, while the female shift workers manage to maintain relatively healthy lifestyles in comparison with the males, they have more difficulty maintaining these habits than do female workers who do not perform shift work. It can be concluded that, in addition to heightening women's consciousness of their own health, surrounding entities such as the work environment, the home, and the community in general need to pay due care to Japan's female shift workers.

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Key words: Female factory workers, Regular day workers, Shift workers, Health habits, Breslow

Various papers have examined the effects of shift work on the health of workers. The adverse physiological effects of shift work are considered to be a result of changes in the worker's circadian rhythm¹. Workers cannot easily adapt themselves to changes in this life rhythm, and this places a burden on the worker's body.

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Shift work, however, is now indispensable in many factories and offices, and the number of workers engaged in shift work is increasing every year². Many researchers have reported the problem of the health of female shift workers, especially nurses^{3,4}. Because more and more women are entering the workforce and the number of female shift workers is increasing⁵, further research about the health and life style of female shift workers is needed.

It has generally been thought that there are no gender-specific differences in the burdens faced by female and male labourers engaged in shift work or night work¹, but since female workers bear the additional responsibilities of housework, child rearing and the like, it is impossible to properly evaluate effects on women's health by considering the burdens of labour alone. Therefore, the research herein simultaneously examined, from the standpoint of health promotion and labour health, the effects of shift work on both the health and lifestyles of female workers.

Through a comparison of fixed-hour, 'regular' labourers and labourers working irregular shifts, this research examined the effects of shift work on worker lifestyles.

Materials and Methods

For the purposes of this research, we conducted a three-year 'lifestyle survey' (conducted at the time of the workers' annual health inspection) among workers at a certain electronics factory. This field survey consisted of a self-report questionnaire on height, weight, breakfast ingestion, smoking, drinking, exercise and sleep patterns. The questionnaire was distributed to the workers before the day of their medical examination, and was collected on examination day. In addition, the questionnaire was distributed after obtaining the full consent of the workers to participate in this research.

In the first survey year (2000), replies were received from 542 of 565 workers (318 men, average age +/-

standard deviation; 38.3+/-8.0 yr old, and 224 women, 37.5+/-7.0 yr old)—a recovery rate of 95.9%. From among the responders, we selected the 488 workers that completed the questionnaire in full to be the final research targets. Among these, there were 325 ‘regular’ day work labourers (179 males, 37.6+/-7.1 yr old, and 146 females, 37.2+/-6.7 yr old), 61 consecutive shift labourers (males only, 35.4+/-7.1 yr old), 31 two-shift labourers (20 males, 35.5+/-8.3 yr old, and 11 females, 32.9+/-6.2 yr old), 33 daytime consecutive shift labourers (females only, 36.4+/-6.6 yr old) and 38 night work labourers (males only, 43.1+/-6.6 yr old).

The actual working hours of each of the above categories breaks down as follows: The ‘regular’ day work was from 8:15AM to 4:50PM, while consecutive shift work ran on a cycle from 6:30AM to 6:30PM on the first work day, and 6:30PM to 6:30AM on the second, followed by two days off. This cycle is repeated, inclusive of Saturdays and Sundays. Two-shift work runs on a repeating weekly cycle, with work being between the hours of 6:30AM and 2:30PM during the first week, and between 2:30PM and 10:30PM during the second. Daytime consecutive shift labourers worked between 6:30AM and 6:30PM for two consecutive days. This was followed by two days off. This schedule also repeats, inclusive of Saturdays and Sundays. Night shifts ran between 4:35PM and 11:00PM, 11:00PM and 8:30AM, and 4:35PM and 1:45AM.

In the second survey year (2001), we obtained questionnaire responses from 472 out of 571 workers (256

males, average +/- standard deviation:38.3+/-7.4 yr old, and 216 females, 38.6+/-6.9 yr old)—a recovery rate of 82.7%. From the 472 responders, 5 receptionist staff were eliminated. Of the remainder, we analysed the responses of the 386 workers who had completed the questionnaire in full, making a calculation of their health habits possible. Among these responders, there were 283 regular day workers (154 males, 37.6+/-6.7 yr old, and 129 females, 38.7+/-6.9 yr old), 55 consecutive shift workers (47 males, 36.4+/-7.2 yr old, and 8 females, 42.5+/-4.5 yr old), 20 two-shift workers (8 males, 41.3+/-7.5 yr old, and 12 females, 35.8+/-5.6 yr old), and 28 daytime consecutive shift workers (3 males, 40.7+/-4.9 yr old, and 25 females, 36.5+/-5.6 yr old).

In the third survey year (2002), we obtained questionnaire responses from 394 of 415 workers—a recovery rate of 94.9%. In this survey year, we analysed the responses of 281 regular day workers (154 males,

Table 1. Health Score Criteria

Item	Health Score Criteria (add one point for each positive answer)
BMI	18.5<BMI<25
Breakfast	Taken daily
Smoking	Non smoking
Alcohol drinking	Non drinking, or occasional drinking
Exercise	Over 15 min exercise at least twice a week
Sleep	At least 7 h

Table 2. Age of subjects by gender and by working style

Annual Gender	2000 [488]		2001 [386]		2002 [394]	
	Male [298]	Female [190]	Male [212]	Female [174]	Male [235]	Female [159]
Regular day work (clerical work)	39.5 ± 7.4 ^{*b} [92] ^{*c}	34.2 ± 5.6 ^{**b} [34]	39.8 ± 6.6 [58] ^{**c}	34.7 ± 5.1 ^{**b} [30]	40.3 ± 7.0 [56]	37.9 ± 6.3 [45]
Regular day work (engineering work)	34.2 ± 5.5 [42]	[0]	35.3 ± 5.8 [47]	[0]	36.1 ± 5.3 ^{*b} [43]	[0]
Regular day work (skilled work)	36.8 ± 6.7 [45]	38.2 ± 6.8 [112]	37.2 ± 6.9 [49] ^{**c}	40.0 ± 6.9 [99]	39.4 ± 8.5 [55]	40.3 ± 7.0 [82]
Regular day work	37.6 ± 7.1 [179]	37.2 ± 6.7 [146]	37.6 ± 6.7[154]	38.7 ± 6.9 [129]	38.8 ± 7.4[154]	39.5 ± 6.8 [127]
Consecutive shift work (skilled work)	35.4 ± 7.1 [61]	[0]	36.4 ± 7.2 [47] ^{**c}	42.5 ± 4.5 [8]	38.5 ± 6.7 [69] ^{**c}	34.3 ± 4.9 ^{**b} [22]
Two shift work (skilled work)	35.5 ± 8.3 [20]	32.9 ± 6.2 ^{*b} [11]	41.3 ± 7.5 [8]	35.8 ± 5.6 [12]	35.5 ± 8.5 [4]	34.0 ± 1.4 ^{*b} [2]
Daytime consecutive shift work (skilled work)	[0]	36.4 ± 6.6 [33]	40.7 ± 4.9 [3]	36.5 ± 5.6 ^{**b} [25]	36.5 ± 7.5 [8]	34.0 ± 4.5 ^{**b} [8]
Shift work	35.5 ± 7.3 ^{*a} [81]	35.5 ± 6.6 [44]	37.3 ± 7.3 [58]	37.4 ± 5.8 [45]	38.2 ± 6.8 [81] ^{**c}	34.2 ± 4.6 ^{**a} [32]
Night work (skilled work)	43.1 ± 6.6 ^{**b} [38]	[0]	[0]	[0]	[0]	[0]
Total	37.7 ± 7.4 [298]	36.8 ± 6.7 [190]	37.5 ± 6.9[212]	38.4 ± 6.7 [174]	38.6 ± 7.2[235]	38.4 ± 6.8 [159]

Each value is the mean ± SD and [number of subjects]. a, Comparison with Regular day work; b, Comparison with Regular day work (skilled work); c, Comparison of Male and Female. *and ** represent significant difference at $p<0.05$ and $p<0.01$, respectively.

38.8+/-7.4 yr old, and 127 females, 39.5+/-6.8 yr old), 91 consecutive shift workers (69 males, 38.5+/-6.7 yr old, and 22 females, 34.3+/-4.9 yr old), 6 two-shift workers (4 males, 35.5+/-8.5 yr old, and 2 females, 34.0+/-1.4 yr old), and 16 daytime consecutive shift workers (8 males, 36.5+/-7.5 yr old, and 8 females, 34.0+/-4.5 yr old).

As a health indicator, we used a scoring system based upon the health habits advocated by Lester Breslow⁶⁾(Table 1). When the habits of the worker corresponded with one of the six items regarded as healthy habits, one point was given. Where these habits did not correspond, no points were given. The total points were

then taken as the worker's 'health score'. The Unpaired Student's T-Test or the Mann-Whitney U-Test was utilized in comparing male and female workers and when making comparisons in terms of shift type. Score comparisons over three years were made with Friedman's test. The significance level was set at less than 5%.

Results

The age of the participants in each year according to gender and type of work is indicated in Table 2. When observed on the whole, no differences along gender lines are apparent, but significant differences according to gender can be observed among the regular day workers

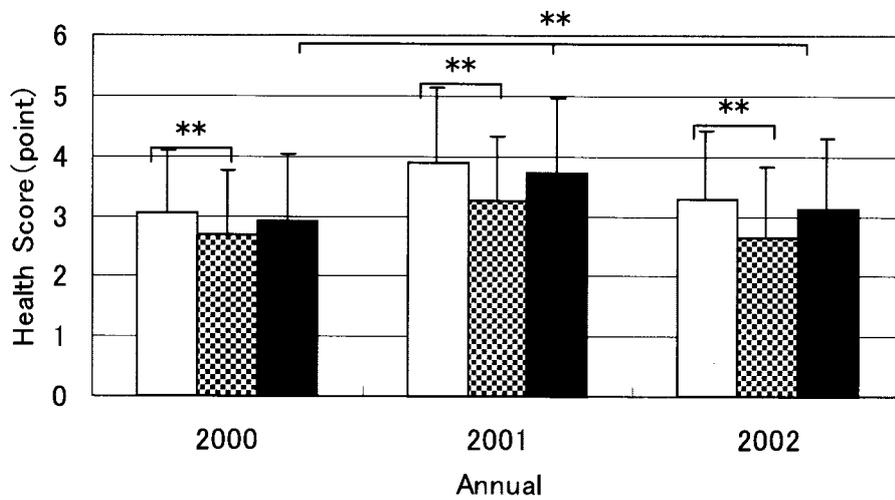


Fig. 1. Annual transition of Health Score of subjects. □, regular day work; ▨, shift work; ■, total ***p*<0.01

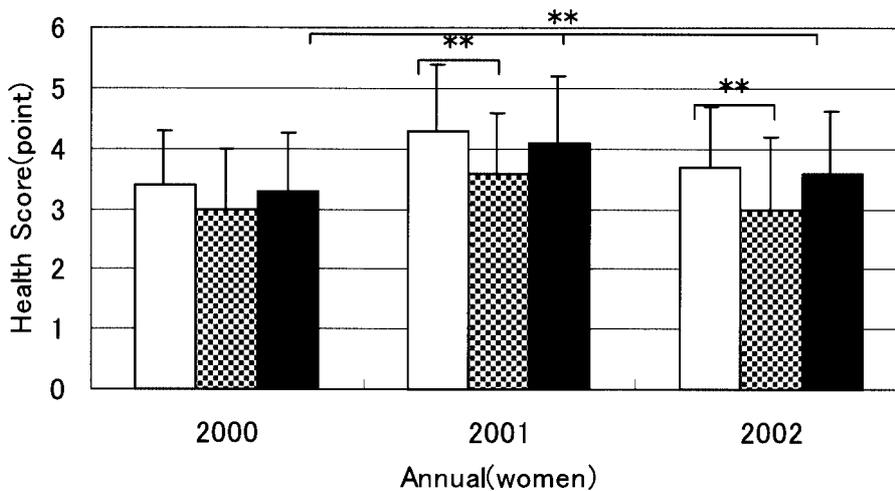


Fig. 2. Annual transition of Health Score of women subjects. □, regular day work; ▨, shift work; ■, total ***p*<0.01

Table 3. Health Score of subjects by gender by working style

Annual Gender	2000 [488]		2001 [386]		2002 [394]	
	Male [298]	Female [190]	Male [212]	Female [174]	Male [235]	Female [159]
Rebular day work (clerical work)	2.9 ± 1.1[92]	3.3 ± 0.9 [34]	3.5 ± 1.4 [58]**c	4.5 ± 1.1 [30]	2.9 ± 1.0 [56]**c	3.8 ± 0.9 [45]
Regular day work (engineering work)	2.6 ± 1.0 [42]	[0]	3.7 ± 1.2 [47]	[0]	2.9 ± 1.3 [43]	[0]
Regular day work (skilled work)	2.8 ± 1.1 [45]**c	3.4 ± 0.9 [112]	3.5 ± 1.3 [49]**c	4.2 ± 1.1 [99]	3.0 ± 1.2 [55]**c	3.7 ± 1.0 [82]
Regular day work	2.8 ± 1.1[179]**c	3.4 ± 0.9 [146]	3.6 ± 1.3 [154]**c	4.3 ± 1.1 [129]	2.9 ± 1.2 [154]**c	3.7 ± 1.0 [127]
Consecutive shift work (skilled work)	2.5 ± 1.1 [61]	[0]	3.1 ± 1.0 [47]*c	4.0 ± 0.8 [8]	2.4 ± 1.1**b[69]	2.9 ± 1.2**b[22]
Two shift work (skilled work)	2.4 ± 1.2 [20]	3.0 ± 1.3 [11]	2.6 ± 1.1 [8]	3.4 ± 1.3 [12]	2.5 ± 1.3 [4]	3.5 ± 2.1 [2]
Daytime consecutive shift work (skilled work)	[0]	3.1 ± 1.0 [33]	2.3 ± 0.6 [3]*c	3.6 ± 0.9* ^b [25]	3.3 ± 1.4 [8]	3.4 ± 1.2 [8]
Shift work	2.5 ± 1.1**a[81]**c	3.0 ± 1.0 [44]	3.0 ± 1.0**a[58]**c	3.6 ± 1.0**a[45]	2.5 ± 1.1**a[81]*c	3.0 ± 1.2**a[32]
Night work (skilled work)	2.6 ± 1.1 [38]	[0]	[0]	[0]	[0]	[0]
Total	2.7 ± 1.1[298]**c	3.3 ± 1.0 [190]	3.4 ± 1.2 [212]**c	4.1 ± 1.1 [174]	2.8 ± 1.2 [235]**c	3.6 ± 1.0 [159]

Each value is the mean ± SD and [number of subjects]. a, Comparison with Regular day work; b, Comparison with Regular day work (skilled work); c, Comparison of Male and Female. *and ** represent significant difference at $p < 0.05$ and $p < 0.01$, respectively.

Table 4. Change in health score between 2000 and 2001 of women subjects who were all regular day skilled wokers in 2000 in 1 yr follow up

N	2000	2001	Working sytle in 2001
81	3.4 ± 0.9	4.2 ± 1.1	Regular day skilled work Consecutive shift skilled work Two shift skilled work Daytime consecutive shift skilled work
3	3.0 ± 1.0	4.0 ± 1.0	
5	2.8 ± 0.8	2.8 ± 0.8	
15	3.9 ± 0.7	3.9 ± 0.7	
104	3.4 ± 0.9	4.1 ± 1.1	Total

Each value is the mean ± SD and number of subjects. ** represents significant difference at $p < 0.01$.

(clerical workers) in 2000, the regular day workers (both clerical and skilled workers) and the skilled consecutive shift workers in 2001, and the skilled consecutive shift workers and the shift workers as a group in 2002.

The subject groups' annual 'health score' is shown in Fig. 1. Among the three research years, the health score for 2001 was remarkably high. In addition, the health score of the shift work group was lower than that of the regular day work group in each of the research years. The annual shift in the health score of the female workers is indicated in Fig. 2. Among the three research years, the health score for 2001 was remarkably high. In addition, the health score of the shift work group was lower than that of the regular day work group in 2000 and 2001.

The health score of the workers according to gender and working style is indicated in Table 3. In terms of gender-based differences, the health score of the female workers was, on the whole, higher than that of the males in each of the given years. This gender-based tendency remained the same when comparisons were carried out among the regular day workers' group and the shift workers' group. When the genders were analyzed separately, the males in 2000, the males and females in 2001 and the males and females in 2002 showed a lower health score among the shift workers than among the regular day workers. When compared, the health score of skilled female daytime consecutive shift workers was lower than that of the regular day workers in 2001. In addition, the health score of skilled female labourers

engaged in consecutive shift work was lower than that of the regular day workers in 2002. Furthermore, we paid special attention to 112 female employees who were engaged in regular day work in 2000. The health score of those workers who continued in regular day work was compared with those who moved on to other forms of shift work (Table 4). Among these, the score of those employees who had moved on to two-shift work was particularly low ($p < 0.01$).

Discussion

The advance of women into the workplace is being accompanied by a rise in the number of organizations which employ women in shift-work roles. Nevertheless, it is impossible to state with certainty that current social conditions in Japan provide for a sufficient support structure for these workers. In the current research, we noted that, while females have established more healthy lifestyle habits than males, female shift workers enjoy less healthy habits than do their regular day work counterparts.

Saito *et al.*⁷⁾ report that when married women perform even a minimal amount of overtime, rest and sleep time suffer due to existing housekeeping duties, and recovery from fatigue becomes difficult. It is possible to conclude, then, that the situation facing women engaged in shift work needs to be considered.

In order to bring about improvements in shift-work employment conditions, it is important to take as a starting point the recognition that, while the employee may seem able to adjust to shift work in the short term, physiological and social realities state that there is a limit to long-term adaptation. In order to move in the direction of shift-work condition improvement, 1) restrictions on the introduction of shift work, 2) improvements in the shift work system itself, 3) health services and 4) support for lifestyle adjustment are thought to be important⁸⁾. In terms of Point 1 above, we think it important to restrict shift work only to areas in which it is socially indispensable, and to choose carefully which employees will be engaged in shift work. In cases where shift work would bring health-related and social detriments to female workers, the suitability of shift work for such employees should be reexamined. The ability of workers to adapt to shift work is thought to be determined by the mutual influences of the circadian rhythm factor, the sleep factor, and the societal/home factor⁹⁾.

In research on the circadian rhythm for which night shift work was performed for 21 consecutive days¹⁰⁾, it was noted that, since alignment in body temperature took two weeks, the realignment of body rhythms takes more time. It is thought that misalignments in this and other physiological rhythms cause adverse effects in the body and mind. Of 112 females employed as skilled regular day workers in 2000, we analyzed 104 who continued

their employment into the following year. As a result, it was noted that the 2001 health score of those workers who went on to work as two-shift labourers was considerably lower than that of the employees who remained regular day workers. This is thought to be due to the fact that, although complete realignment of the physiological rhythm takes 1–2 wk¹¹⁾, by the time their physiological rhythms have caught up to their new life patterns, the two-shift workers have again been put on completely different work schedules with no time allowed for their bodies to adjust. This brings about various lifestyle aggravations that result from misalignment in physiological rhythms and unfavourable physical and mental conditions. On the other hand, the health score of the consecutive shift workers and the daytime consecutive shift workers were not significantly low when compared with the score of the skilled regular day workers. Since these types of shift work repeat on a short 4-day cycle, it is thought that the physiological circadian rhythms of these workers does not differ greatly from those of the skilled regular day workers. That is to say, this type of work does not produce significant ‘gaps’ in the workers’ internal rhythms^{12, 13)}. It is thought that neither misalignment in internal physiological rhythms nor the resulting poor mental and physical conditions affected these workers; rather, they were affected only by the irregular working times. Moreover, although the ‘night shift’ was officially abolished at the target factory in 2000, since half of the workers performing consecutive shift duties are, in fact, working the night shift, we believe that due consideration needs to be paid to the consecutive shift workers’ situation. As mentioned above, since consecutive shift work runs on a short cycle, it does not bring about the disruptions in internal rhythms and the worsened physical and mental states that two-shift work is thought to cause. Nevertheless, since it is impossible for the circadian rhythm to fully adjust to a night-work schedule—no matter how long such work is performed¹⁴⁾—man cannot physiologically adapt completely to night work. This being the case, workers engaged in night work need to be observed closely.

From the point of view of the circadian rhythm, people can be divided into ‘morning types’ and ‘evening types’. Generally speaking, ‘evening’ people are thought to be more suited to shift work¹⁵⁾, since such people have a certain pliability in their sleep patterns and can better put up with sleepiness^{16, 17)}. Although discerning workers’ adaptability to shift labour only in terms of whether they are ‘morning’ or ‘evening’ people is problematic, we deemed this criterion viable in making decisions concerning which workers should engage in shift work¹⁸⁾. In addition, since man tends to move toward a ‘morning’—centred circadian rhythm as he ages, and since reports indicate that fatigue resulting from shift work increases rapidly after age 40¹⁹⁾, we think it

necessary to introduce age restrictions on shift work. There are, however, very few companies in Japan that have age restrictions on shift work²⁰. The age of the workers engaged in varying labour styles probably needs to be examined. With the exception of the consecutive shift workers, the female shift labourers at the target factory in 2001 were young. Although the average age of the 8 female labourers working consecutive shifts at the factory in 2001 was over 40, a prompt personnel shuffle was made, and younger workers took over the consecutive shifts the following year. As workers age and become less adaptable to shift work, flexibility in the assigning of shifts to labourers—such as that shown by this company—is desirable indeed.

In terms of the sleep factor, existing reports²¹ on nurses and other workers suggest that, compared with day workers, shift labourers and nightshift staff complain in greater numbers of insomnia and mental stress. According to Kobayashi's research²², which, like this report, focussed on skilled shift labourers, there is a high rate of insomnia among male nightshift workers and two-shift workers. The rate of insomnia among skilled female shift workers noted here is a topic that will need to be examined in the future.

In terms of the home and societal factors, married women must, as mentioned above, be able to balance both shift work and the domestic responsibilities of child-rearing and household chores. It is feared that this will lead to sleep and the circadian rhythm being sacrificed. Making time to discuss the sharing and assigning of household duties is therefore necessary, both at the workplace and in the home.

In regard to Point 2 above, worker support policies such as the shortening of working hours, finding means to reduce overtime, ample staff acquirement, sleep management policies (including nap times), employment conditions that allow shift labourers to take extended vacations, labour policies that take into account the shift workers' quality of life, career plans for shift workers, and the provision of ample health and welfare facilities must be considered important, as should social support policies such as those regarding housing, commuting and the provision of daycare for children²⁰.

Regarding Point 3, the target factory made health services such as annual checkups and biweekly health consultation available to its workers. Moreover, it is our hypothesis that the high health score noted for 2001 was connected to the physical strength and fitness tests and lifestyle guidance that were offered to workers toward the end of fiscal 2000, some months before our investigations for 2001 took place. Due to various circumstances, these tests and consultations were not performed beyond 2000. Given the high health scores noted in 2001, we consider the resumption of such activity to be desirable. Regarding Point 4, as mentioned, the

average age of the workers performing consecutive shifts at the target factory was high in 2001. The employers, however, made a prompt personnel reshuffle and younger workers were placed on consecutive shifts the following year. Such adjustment made in consideration of the employees' age or life situations is, in our opinion, necessary. Proper distribution of duties among the various employment styles will make possible adjustments in the amount of night-work and consecutive days worked, and make it easier for workers to take extended holidays and rest periods. Moreover, in the long term, flexibility on the part of companies in terms of shifting employees who request it to day-work duties, as well as providing summer and winter holidays, 'down periods' in which factory operations cease altogether, and educational leave to the workers, is desirable⁹.

Now that it is clear that females engaged in shift work have difficulty establishing healthy lifestyle habits, we are concerned for the future health habits of the daytime consecutive shift workers, the two-shift workers and the consecutive shift workers examined in 2002. As mentioned above, we feel that flexible adjustments in the employment conditions are required. That the health score of the female workers was generally higher than that of the males is thought to be related to the fact that Japanese females tend have a higher regard for the role of nutrition and better balanced diets in health maintenance than do males²³, as well as to the fact that females smoke and drink less than males do. The smoking rate for Japanese females is particularly low when compared with that of other advanced nations²⁴. In order to maintain these healthy habits and in the interests of health promotion in general, we conclude that, in addition to heightening women's consciousness of their own health, surrounding entities such as the work environment, the home, and the community in general need to pay due care to Japan's female shift workers.

Conclusion

In each research year, a significant difference in the health score could be seen between the men and women in the regular day work group and in the shift work group. In each year, the women's health score was higher than that of the men.

Of 112 females employed as skilled regular day workers in 2000, we analyzed 104 who continued their employment into the following year. As a result, it was noted that the 2001 health score of those workers who went on to work as two-shift labourers was considerably lower than that of the employees who remained regular day workers. We conclude that due care must be taken in the health management of such workers.

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