

Are Students with a Negative Impression on Shift Work Morning-Typed?

Kiyoko Kawasaki¹, Kai Wada¹, Miyo Nakade², Hitomi Takeuchi¹, Tomoko Wakamura³ & Tetsuo Harada¹

¹Laboratory of Environmental Physiology, Graduate School of Integrated Arts and Sciences, Kochi University, Japan

²Department of Nutritional Management, Faculty of Health and Nutrition, Tokai-Gakuen University, Japan

³Department of Human Health Sciences, Graduate School of Medicine, Kyoto University

Correspondences: Tetsuo Harada, Laboratory of Environmental Physiology, Graduate School of Integrated Arts and Sciences, Kochi University, Kochi 780-8520, Japan. E-mail: haratets@kochi-u.ac.jp

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Abstract

This study explores whether morning-typed persons are aware that they are maladapted for shift-work. An integrated questionnaire was administered to 637 students aged 18-35 yrs attending university or physical therapy training school in May, June and October, 2012. A total of 617 participants (97%) answered the questionnaire that included questions on sleep habits such as bedtime, the diurnal type scale by Torsvall and Åkerstedt (1980), questions on mental health (irritation, anger, feeling out of control, depression) and meals content and timing, and questions on experience with and attitude towards shift work, including the question, "Would you be able to mentally and physically withstand doing shift work for one year, if given the chance?" Participants that answered "Absolutely never" to this question (DIFFICULT Group) showed significantly higher scores on the diurnal-type scale (more morning-typed) ($p=0.005$) and subjectively evaluated themselves as "more morning-typed persons" ($p<0.001$) than those that chose other answers (EASIER Group). The DIFFICULT Group showed significantly earlier bedtimes ($p=0.017$) and earlier sleep onset times ($p=0.016$), and tended to show earlier wake-up times ($p=0.119$) than the EASIER Group. The DIFFICULT Group had breakfast ($p<0.001$) and dinner ($p=0.047$) at more regular times than the EASIER Group and had nutritionally well balanced breakfast with higher frequency than the EASIER Group ($p=0.023$). These results may support the hypothesis that persons with a negative attitude to rotating shift work are more morning-typed than those without such a negative attitude towards shift work.

Keywords: consciousness, adaptability to shift work, circadian typology, Japanese students aged 18-35yrs

1. Introduction

The work schedules for most people are at fixed timed of the day, mostly in the daytime. In contrast, shift workers work a rotated schedule consisting of daytime, evening and midnight shifts, for example (Inoue & Hayashi, 2012). The adverse effects of shift work on health have been well documented (Pietrousti et al., 2006; Haupt et al., 2008; Knutsson, 2008). Problems in alertness, performance, and safety (Åkerstedt et al., 1991; Keller, 2009), interference with social and personal life (Volger et al., 1988), disruption of physiological processes such as the sleep-wake cycle (Dumont et al., 2001), and impaired physical and psychological health (Åkerstedt, 1990), are some of the adverse effects of shift work. Long-term shift work has been associated with a higher risk of some types of cancers, such as breast cancer, in comparison to day time workers (Davis et al., 2001; Schernhammer et al., 2001; Haous & Smolensky, 2012).

Exposure to a complex combination of environmental zeitgebers (time cues: e.g., light, meals and temperature) can promote a shift in the circadian phase of shift workers and also de-synchronization of the two circadian oscillators (Golombek et al., 2013). The core body temperature at the minimal level (nadir) and dim-light melatonin onset (DLMO) have been commonly used as indicators of circadian phase. Using these indicators,

light has been regarded as the most powerful phase modulator of circadian clocks in shift workers (Eastman, 1992) based on simulated (laboratory) night-shift studies (Eastman, 1992; Czeisler et al., 1986; Crowley et al., 2004; Smith, 2008; Smith, 2009; Burgess & Eastman, 2008), as well as in field night-work studies (Roden et al., 1993; Sack et al., 2007a; Sack et al., 2007b). Serious disturbance of the circadian phase mainly due to complex light exposure can induce de-synchronization of the two circadian oscillators in the course of the phase shifting. This de-synchronization worsens the mental health of the shift-workers including a high risk of acquiring affective disorders.

Two theoretical methods maybe considered for solving these health problems. One is shifting the phase of the circadian clock to coincide with each shift. However, this method is impossible to use, because shifts can only change from one to another every three or four days at the longest (Åkerstedt, 2003). The circadian clock cannot follow such a quick shift, because the main clock in humans has a period of 24.3-25.5 hours and the circadian phase can only be delayed by 0.3-1.5 hours each day (Wever, 1980). Another method is to fix the circadian clock phase in regular life, although night shifts can easily disturb this regular phase. To minimize the damage due to night shifts, a strategy to retain the circadian phase would be needed. For example, “anchor sleep” of about 2 hours at around 11:00 p.m. would be helpful for fixing the regular circadian phase.

Wilkinson (1992) reported that the average sleep duration of daytime and nighttime laborers was 7.5 hours and 6.7 hours, respectively, which are both significantly longer than the 5.8 hours reported for shift workers. Many studies showed that morning-typed persons had a higher amplitude of circadian oscillations, as shown by the plasma cortisol secretion peak in the morning, for example (Randler & Schaal, 2010). From a theoretical point of view, morning-type persons may experience several more difficulties in health maintenance than evening-type persons, because the phase of circadian rhythms with a high amplitude is harder to be shift than the phase with a low amplitude that is exhibited by evening-type persons. However, this hypothesis on the relationship between shift work performance and circadian typology has not yet been tested. From a psychological point of view, morning-typed persons may feel more negative about their ability to adapt to shift work physically and mentally.

Shift work may also lead to a lower amplitude of the circadian rhythms. This lower amplitude may be similar to that of evening-typed persons. If they are engaged in rotating shift work, morning-typed persons may suffer more due to a greater reduction in circadian amplitude compared to evening-typed persons, which may in turn cause mental and physical health problems for morning-typed shift workers.

From the view point of health education, health instruction by employers should be provided before shift works to employees, focusing on morning-typed persons in particular. Such instruction can include the detailed working schedules, some possible health problems that may arise due to the shift work, and methods to solve the problems recommended strategies for coping with shift work adjustment (Gumenyuk & Drake, 2011). The relationship between circadian typology and adaptability to rotating shift work can also be incorporated in the instruction to help morning-typed shift workers who are hypothesized to have difficult adapting to rotating shift works maintain their health.

However, this relationship has little scientific evidence. This study explores whether morning-typed persons are aware that they are maladapted to shift work, and is the first step to understanding the relationship between circadian typology and adaptability to shift work.

2. Participants and Methods

This cross-sectional study was conducted in May, June and October 2012, using an integrated questionnaire that was administered to 637 students aged 18-35 yrs (mean age of 19.8 yrs) who attended a university (587) or a physical therapy training school (50), both located in Kochi Prefecture in Japan (33 N). The participants were randomly sampled from a wide majoring field (Faculties of Education, Science, Humans and Literatures, Agriculture, Medical School and Nurses Training School). Responses were received from 617 students (response rate of 97%) and incomplete responses (i.e., age was not filled out or the diurnal preference section was incomplete) were discarded. Classes in the university and the training school start at 8:50 and 8:40, respectively. Saturdays and Sundays are days off for both.

The questionnaire included questions on sleep habits such as bedtime and wake up time on weekdays and holidays, questions on sleep quality such as sleep latency, difficulty at sleep onset and sleep interruptions, the diurnal type scale by Torsvall and Åkerstedt (1980), questions on mental health (irritation, anger, feeling out of control, depression) and meal contents and timing, and questions on experience with and attitude towards shift work.

One of questions on shift work was, “Would you be able to mentally and physically withstand doing shift work for one year, if given the chance?” with possible answers being (1) Absolutely never, (2) Not, (3) Relatively not, (4) Relatively I can, (5) I can, (6) Absolutely I can.

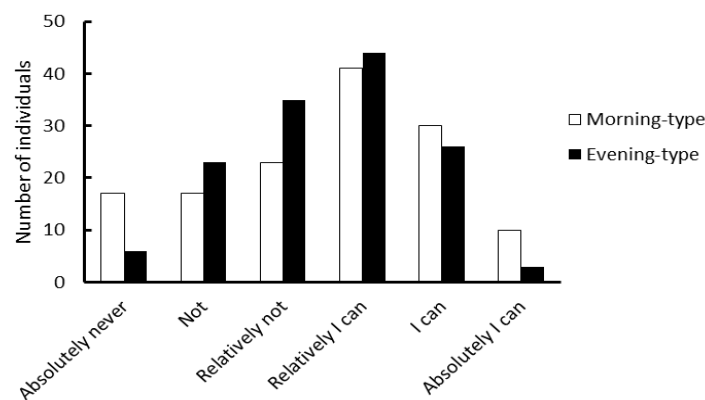
Based on the scores of the Diurnal Type Scales, a morning-type group, medium-type group and evening-type group were defined as the group to occupy the upper 25% (mean scores of 19.6 points), medium 50% (15.1 points) and the lower 25% (10.5 points) of the distribution, respectively. IBM SPSS Statistics Version 20 was used for the statistical analysis. χ^2 -test and Mann-Whitney U-test were performed on categorized variables and continuous variables, respectively. The P-value for significance was 5%.

2.1 Ethical Treatment

This study followed the code of ethical guidelines for a study targeting humans (Portaluppi et al., 2010). All the students attending a University or nurses training school who participated provided informed consent. The committee in the Department of Environmental Physiology, Graduate School of Integrated Arts and Sciences at Kochi University carried out an ethical inspection of the questionnaire and gave permission to administer this epidemiological study to 18 to 30yearold students.

3. Results and Discussion

In the morning-type group, the ratio of participants that answered “Absolutely never” to the question “Would you be able to mentally and physically withstand doing shift work for one year, if given the chance?” was higher than that in the evening-type group (χ^2 -test, χ^2 -value=5.654, df=1, p=0.028) (Figure 1).



“Would you be able to mentally and physically withstand doing shift work for one year, if given the chance?”

(1)Absolutely never, (2)Not, (3)Relatively not, (4)Relatively I can, (5)I can, (6)Absolutely I can

Figure 1. Comparison of awareness of one’s own adaptability to shift work between morning-type and evening-type groups

Participants that answered “Absolutely never” were placed in a DIFFICULT Group and all other participants in an EASIER Group. The DIFFICULT Group showed significantly higher scores on the diurnal-type scale (more morning-typed) (Mann-Whitney U-test: $z=-2.776$, $p=0.005$) than the EASIER Group (Table 1). More participants in the DIFFICULT Group subjectively evaluated themselves as “morning-typed persons” (χ^2 -test, χ^2 -value=18.151, df=3, $p<0.001$) than the EASIER Group. The DIFFICULT Group showed significantly earlier bedtimes and earlier sleep onset time than the EASIER Group (Table 1). The DIFFICULT Group tended to show earlier wake-up times than the EASIER Group (Table 1).

Table 1. Comparison of several characteristics between the DIFFICULT group and the EASIER group

	DIFFICULT-G		EASIER-G		Mann-Whitney U-test	
	n	Mean	n	Mean	Z	P
Diurnal type scale	50	16.4	541	14.94	-2.776	0.005
Weekdays Bedtime	51	24.2	547	24.59	2.392	0.017
Weekdays Sleep onset time	50	24.5	527	24.86	2.417	0.016
Weekdays wake-up time	51	7.07	545	7.34	1.56	0.119
Monroe index	51	4.96	542	5.37	1.944	0.052
Mental health index	51	12	547	12.27	-0.035	0.972
Sleep duration	50	6.62	525	6.49	-0.784	0.433

For sleep quality evaluation, the score by Monroe³⁰ that consists of the total scores for sleep latency, difficulty in sleep onset and frequency of night sleep interruption was used in this study. The DIFFICULT-Group tended to show lower Monroe-scores (meaning higher sleep quality) than the EASIER-Group (Table 1). There were no significant differences in mental health scores between the two groups (Table 1).

The DIFFICULT-Group had breakfast (χ^2 -test, χ^2 -value=22.362, df=4, p<0.001) and dinner (χ^2 -value=9.662, df=4, p=0.047) at more regular times than the EASIER-Group and took nutritionally well balanced breakfasts consisting of carbohydrates, protein, vitamins and minerals with higher frequency than the EASIER-Group (χ^2 -value=9.526, df=3, p=0.023). These results may support the psychological hypothesis that morning-typed persons are aware that they are less adapted for shift-work than evening-typed persons. These results may suggest that adaptability to shift-work can be predicted by examination with the diurnal type scale before doing the shift work. Health instruction for nurses before the employment should be focused on morning-typed persons. Moreover, health support systems for such “morning-typed nurses” are needed during the long employment periods. It is very important that the medical nurses know their own diurnal type scores during normal circadian life to maintain their own health during rotating shift work.

The results of this study suggest that employers should provide health instruction especially to morning-typed rotating shift workers to reduce the occurrence of negative psychological moods such as anxiety to maintain health while performing shift work. Such instruction should include detailed working schedules, some possible health problems due to the shift work, and methods to solve the problems that should be explored in future studies. Gumenyuk and Drake (2011) demonstrated strategies recommended for coping with shift work adjustment that include light treatment, napping, exercise, exogenous melatonin and bright light and pharmacologic treatment of excessive sleepiness in shift-work disorders. Both those predicted to become rotating shift workers (for example, students at nurse training schools) and current shift workers need to be instructed. The relationship between circadian typology and awareness of one’s own adaptability to rotating shift works shown in this study can also be incorporated in the instruction to enable better health maintenance by morning-typed shift workers who may not be as adaptable to rotating shift work.

As a limitation, this study has no data on students attending medical nurse training schools, which could be more powerful data for testing the psychological hypothesis. As a future study, a questionnaire examination on mental and physical health should be given to current shift workers to test the hypothesis that morning-typed persons are less adaptable to rotating shift work than evening-typed persons from mental and physical points of view. It would be important to do further research to see if morning-types persons seek, more than the others, to be very healthy, and this desire for healthy lives leads them to reject shift work, which they know impacts healthiness.

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