

Power Analysis of Electroencephalogram Exploring How Light Exposure Affects Sleep among Shift Workers*

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Abstract— We investigated whether light exposure during sleep affects the sleep quality of shift workers. Our finding suggests that when shift workers sleep during the daytime, exposure to light can degrade the quality of sleep in the late sleep cycle.

Clinical Relevance— This study amplifies clinical attention to shift workers that are exposed to light during daytime sleep because their sleep quality can be impaired.

I. INTRODUCTION

There are always concerns about night-shift workers, who make up 3.3% of the whole working population, regarding a variety of health issues[1]. In the current study, we aimed at uncovering how exposure to light affects sleep quality of shift workers, by employing both EEG and hypnogram to measure differences of sleep patterns among shift workers. Our analysis yielded promising outcomes which are essential for further studies on sleep quality assessment in relation to light exposure, as well as clinical utility, while aiding shift workers to improve their environment during sleep.

II. METHODS

31 shift female workers with 12h rotating shifting schedules who had slept at daytime were enrolled in the experiment at the Samsung Medical Center in Korea (mean of age 27.0 ± 3.06 years). Two sets of standard PSG data were collected in random order from these subjects, one with light

on (150 lux), the other with dim light (< 150 lux). Data preprocessing was then performed ahead of sleep cycle partition. In the final part, we calculated the relative power based on sleep cycles.

III. RESULTS

TABLE I. RELATIVE POWER AND T-TEST RESULTS

Channel	N2 (Sigma Wave)		p-value	N3 (Slow Wave)		p-value
	Light	Dim Light		Light	Dim Light	
C3	0.054	0.034	***	0.028	0.036	**
C4	0.054	0.034	***	0.029	0.038	**
O1	0.049	0.033	***	0.025	0.032	**
O2	0.043	0.031	***	0.024	0.031	*
F3	0.051	0.033	**	0.030	0.039	**
F4	0.052	0.033	**	0.030	0.039	**

*: $0.05 < p < 0.1$; **: $0.01 < p < 0.05$; ***: $p < 0.01$.

Abbreviations: Light: shift group with light. Dim Light: Shift group with dim light

Our t-test results showed that for N2 sleep significant group differences were mainly found in sigma waves and for N3 sleep, they were mainly found in slow waves (table 1).

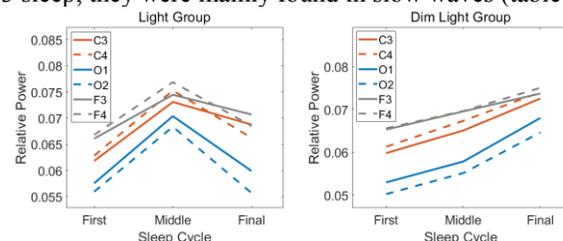


Figure 1. SLOW WAVE CHANGES THROUGHOUT SLEEP CYCLES.

We plotted EEG-relative power changes throughout sleep cycles in Fig. 3. Both regular and dim light sleep presented the similar pattern of increases in slow wave power during the first half of sleep. During the second half of sleep, the regular light sleep displayed a reduced power to a level nearly the same as the first sleep cycle, while the slow wave power in the dim light sleep increased.

IV. DISCUSSION & CONCLUSION

We revealed that exposure to light during daytime sleep for shift workers was not associated with initial sleep, but can deteriorate the quality of the late cycle sleep.

REFERENCES

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