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Effects of a sleep hygiene education program on children in a Japanese elementary school

Michitaka YOSHIMURA — *Department of Psychiatry, Shiga University of Medical Science*

Momoko KITAZAWA — *Department of Nursing-2, Aino University Junior College*

Junichi MURAKAMI — *Department of Psychiatry, Shiga University of Medical Science*

Naoto YAMADA — *Department of Psychiatry, Shiga University of Medical Science*

Abstract

Our objective in this study was to evaluate the effects of a Sleep Hygiene Education Program (SHEP) on sleep quality in students aged 9 to 11 in a Japanese elementary school. In the SHEP we gave a 75-minute lecture to the students. Both before and after the program, we distributed sleep-related questionnaires to 110 students and then collected and analyzed them. Three items concerning sleep quality; *'Time of going to bed'*, *'Feeling upon waking up'* and *'Who wakes you up?'* were statistically analyzed using McNemar's Test. The results showed that there was no significant change in the items *'Time of going to bed'* and *'Who wakes you up?'* comparing before and after the program. However, the item *'Feeling upon waking up'* showed a significant positive change after the program. These results suggest that SHEP has the potential for improving sleep quality even in young students.

Key words: sleep hygiene, sleep education, health care, elementary school student

Introduction

Sleep is important for both mental and physical states. Previous studies of sleep hygiene demonstrated that short sleep duration causes deteriorated cognitive functions such as memory and concentration and exacerbates the psychotic state (Chang PP et al. 1997; Ford DE et al. 1989; Kim K et al. 2000). People with insufficient sleep have also been reported to be at high risk for metabolic syndrome (Knutoson, K.L. et al. 2008; Van CE et al. 2008). Chronic partial sleep loss increased the risk of obesity and weight gain (Leproult R et al. 2010). Short sleep duration and delayed sleep time have also affected and aggravated academic performance in children (Wolfson, A.R. et al. 1998). Obese children were reported likely to experience sleep problems, and the combination of shorter sleep duration and the more variable sleep patterns found in those children was associated with adverse metabolic outcomes (Spruyt K et al. 2011).

Recently, the duration of sleep has diminished with the diversification of lifestyles in Japan as in other developed countries (Matricciani L et al. 2012; OECD 2009; Williams MA et al. 2013). The average sleep duration for Japanese children decreased by about one hour from the 1970s to the 1990s (Ishihara K. 2002). Therefore SHEP is particularly needed for children so as to improve their sleep quality and thus improve both mental and physical condition and academic performance.

Education in sleep hygiene has been carried out for adults, both employed people and university students (Brown FC et al. 2002; Kakinema N. 2008; Nishinoue N et al. 2012). However, the number of studies adopting a SHEP for younger students is very small when compared to the number of such studies for adolescents (Evan T et al. 2012). We therefore aimed at evaluating the effects of a SHEP for elementary school children while excluding older students.

Methods

One hundred and nineteen students aged 9 to 11 in the upper grades of a Japanese elementary school were enrolled in this study. Before starting the SHEP, we distributed to the subjects the sleep questionnaire, which included the three items: *'Time of going to bed'*, *'Feeling upon waking up'* and *'Who wakes you up?'*

After collecting the questionnaire from the students, we conducted a 75-minute SHEP. The program was carried out by the student healthcare staff, with 10 staff members for each class of students. The staff had been instructed on the SHEP by the school nurse for two weeks prior to the program.

The content of the SHEP included information about stimulus control before going to bed, the importance of a stable sleep-wake schedule, exercise habits during the day and exposure to morning sunshine. We emphasized that a regulated lifestyle and sleeping well could lead to good academic performance and physical growth. To help the students better understand the lecture, they were shown a role-play performed by the healthcare staff. The staff performed in the role of a person in a state of emotional instability and the role of someone suffering memory loss due to lack of sleep. After the lecture, all students discussed their own current sleep-wake rhythm and the ideal sleep-wake rhythm. They were then given a chance to ask the school nurse questions related to sleep. Two months after the program, the students were asked to reply again to the same original questionnaire.

Results

Questionnaires with missing values were excluded from further analysis. As a result, the data from 110 students were analyzed. The frequency of the responses to the items *'Time of going to bed'*, *'Feeling upon waking up'* and *'Who wakes you up?'* is shown in Table 1.

The changes in the frequency of each item before and after the SHEP and the statistical analysis using McNemar's test are shown in Table 2.

Results showed a significant difference in the frequency of response in the item *'Feeling upon waking up'* before and after the SHEP. The number of students that changed from "Unrested" to "Good" at *'Feeling upon waking up'* was significantly higher after the program than those who changed from "Good" to "Unrested" ($p<.01$). Figure 1 illustrates the changes in the frequency of the response in the item *'Feeling upon waking up'*. The data imply that *'Feeling upon waking up'* might have changed due to the effect of the SHEP. On the other hand, as shown in Figures 2 and 3, we could not find any significant differences in the items of *'Who wakes you up?'* and *'Time of going to bed'* before and after the SHEP.

The relationship among items according to the

Table 1 Frequency of *'Feeling upon waking up'*, *'Who wakes you up?'* and *'Time of going to bed'* (N=110)

	Before		After	
	N	%	N	%
'Feeling upon waking up'				
Good	19	17.3	47	42.7
Unrested	91	82.7	63	57.3
'Who wakes you up?'				
Awakened by oneself	67	60.9	66	60.0
Awakened by parent	43	39.1	44	40.0
'Time of going to bed'				
Earilier than 22:00	77	70.0	80	72.7
Later than 22:00	33	30.0	30	27.3

Table 2 Changes in *'Feeling upon waking up'*, *'Who wakes you up?'* and *'Time of going to bed'* (N=110)

		After				McNemar's test
		N	%	N	%	
Before	*'Feeling upon waking up'*	Good		Unrested		
	Good	14	12.7	5	4.6	**
	Unrested	33	30.0	58	52.7	
	'Who wakes you up?'	Awakened by parent		A wakened by oneself		
	Awakened by oneself	57	51.8	10	9.1	n. s.
	Awakened by parent	9	8.2	34	31.0	
	'Time of going to bed'	Later than 22:00		Earlier than 22:00		
	Earlier than 22:00	69	62.7	8	7.3	n. s.
	Later than 22:00	9	8.2	24	21.8	

** $P<.01$

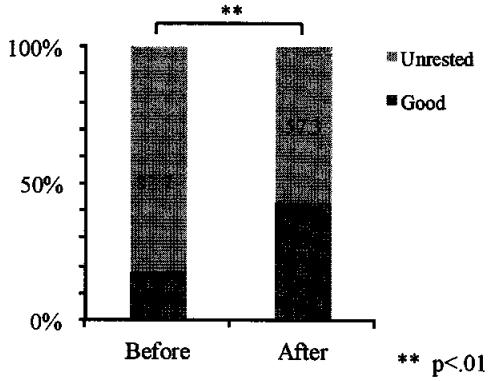

Figure 1 Frequency of *'Feeling upon wakening up'*

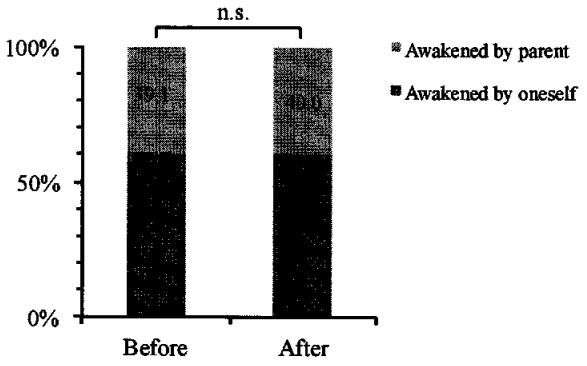

Figure 2 Frequency of *'Who wakes you up?'*

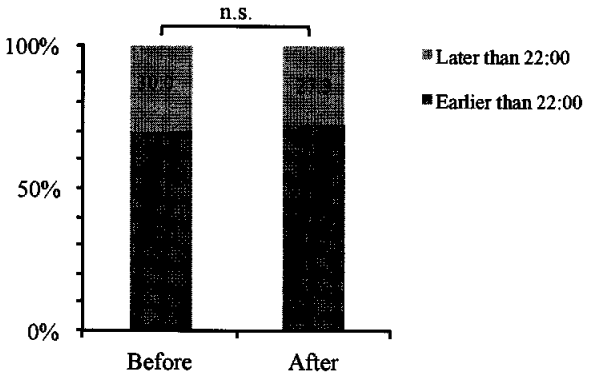

Figure 3 Frequency of *'Time of going to bed'*

Mann-Whitney test is shown in Table 3. There was no significant association between *'Time of going to bed'* and *'Feeling upon waking up'* (before: $\chi^2=0.15$, df=1, n.s.; after: $\chi^2=0.08$, df=1, n.s.). A similar result was observed between *'Time of going to bed'* and *'Who wakes you up?'* (before: $\chi^2=0.66$, df=1, n.s.; after: $\chi^2=1.44$, df=1, n.s.). On the other hand, we found a significant association between *'Who wakes you up?'* and *'Feeling upon waking up'* (before: $\chi^2=5.24$, df=1, $p<.05$; after: $\chi^2=5.21$, df=1, $p<.05$). The value of adjusted residuals showed that the students who woke up by themselves were likely to feel "Good" in the item *'Feeling upon waking up'*, and the students who were awakened by their parents felt more "Unrested" in that item.

Conclusion

This is the first study to evaluate the effects of a SHEP on elementary school students. In our survey, *'Feeling upon waking up'* was significantly improved by a single SHEP, demonstrating that, even with a single lecture, the SHEP had a positive effect on sleep quality of Japanese elementary school students aged 9 to 11. The relatively high response rate (92.4%) obtained in this study allows us to consider our findings as representative of students in general in elementary schools in Japan.

The first point to discuss is the discrepancy in

Table 3 Relationship between *'Time of going to bed'* and *'Feeling upon waking up'*, *'Who wakes you up?'* and *'Time of going to bed'*, *'Feeling upon waking up'* and *'Who wakes you up?'* (N=110)

		Good		Unrested		Earlier than 22:00		Later than 22:00		Awakened by oneself		Awakened by parent		Mann-Whitney test
		N	%	N	%	N	%	N	%	N	%	N	%	
Before	Earlier than 22:00	15	19.2	63	80.8									n.s.
	Later than 22:00	3	9.4	29	90.6									
After	Earlier than 22:00	38	47.5	42	52.5									n.s.
	Later than 22:00	8	26.7	22	73.3									
Before	A wakened by oneself					45	67.2	22	32.8					n. s.
	A wakened by parent					32	74.4	11	25.6					
After	A wakened by oneself					44	66.7	22	33.3					n. s.
	A wakened by parent					34	77.3	10	22.7					
Before	Good									16	23.9	51	76.1	*
	Unrested									3	7.0	40	93.0	
After	Good									34	51.5	32	48.5	*
	Unrested									13	29.5	31	70.4	

*P<.05

the results of the three sleep-related items in this study. Without any change in the time of going to bed, the feeling upon waking up changed positively with the intervention of the SHEP. A possible explanation would be an improvement in sleep efficiency. In the lecture to the students, we emphasized the importance of a stable sleep-wake schedule, exercise habits during the day, and exposure to morning sunshine. These suggestions, carried out, could have improved feelings at the time of waking up.

A second point is the degree of a child's autonomy regarding sleep. There was a significant association between *'Who wakes you up?'* and *'Feeling upon waking up'*, on the one hand, and, on the other, the result that children who woke up by themselves felt better when waking up. This indicates that children with more autonomy in their lifestyles feel better in the morning. We noted in this survey that 60% of the children wake up on their own in the morning.

In addition to the these results, the student's comments on the SHEP were interesting, including, for example, "I have to go to bed early in order to increase my height"; "I go to bed early in order to improve my academic performance". Their comments on the program suggest that the SHEP did indeed have an educational effect, likely helping the children to understand why their parents tell them to go to bed early. Previous studies of sleep hygiene education for children give importance to instruction for caregivers and parents (Spruyt K et al. 2011 ; Tsuji N et al. 2008). Comments by the students in our program, however, indicate an effectiveness of a SHEP given directly to children. Our results show that such a program, directed to Japanese elementary school students aged 9 to 11 (upper grades at elementary school), not only to parents, is worthwhile and necessary.

This study has several limitations. First, our research did not have objective indicators, besides which we used questions that were not standardized. Secondly, there is a possibility that a Pygmalion effect influenced the changes on the item *'Feeling upon waking up'*. A third problem regards control of the survey period. Two months of summer vacation intervened between intervention and post-investigation. It is quite possible that students' lifestyles became unstable during the time of vacation. Additional work is required to identify variables so as to enhance sleep efficiency.

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