

Nap routine in Japanese nursery schools: Developmental change of diurnal naps in children and their effects

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Abstract

During the preschool period, the number of children who take afternoon naps decreases, and finally almost no children take naps at the time of entrance to elementary schools. **Study 1:** We conducted actography monitoring of nursery school children. In many Japanese nursery schools, children were forced to take long afternoon naps regardless of their age. The children with lengthy afternoon naps showed clear delayed nocturnal sleep onset. **Study 2:** In nursery schools run by Adachi city in Tokyo, obligatory naps were discontinued after 2011. We compared children's nighttime sleep before and after the cessation of routine naps. The children's bedtime was significantly advanced after the nap cessation. The children fell asleep more easily after the nap cessation. **Study 3:** National Sleep Foundation (2004) surveyed American children's sleep and found 43% of age 3, 74% of age 4, 85% of age 5, and 98% of age 6 take no naps. We conducted a survey on the sleep of 2,573 children of age 3 to 6 living in Tokyo, and found more children take no naps during the preschool period (i.e., about 70% of age 3, 80% of age 4, 90% of age 5, and 95% of age 6), when asked if the children take naps by their own natural need, not by preschool's daily routine. The difference between the two surveys was thought to be attributed to the difference in the question asked. The American survey asked the parent whether their children take naps or not. They are not necessarily the percentage of the nap from the children's own needs. **Conclusions:** Lengthy naps should not be taken by children who could maintain their wakefulness during the daytime.

Key words: Developmental process, Diurnal naps, Preschoolers, Cessation of routine naps

Study 1

Newborn babies sleep a total of approximately 16 to 17 hours per day, with sleep and wake evenly distributed over time without distinction between day and night (Parmelee & Stern, 1972). In the case of full-term babies, the sleep-wake rhythm changes discontinuously after about the seventh week after birth (46 weeks after conception), exhibiting a pronounced sleep-wake circadian rhythm (Fukuda & Ishihara, 1997; Takaya *et al.*, 2009), and then sleep gradually becomes concentrated in the nighttime during infancy. While nighttime sleep itself changes little during the preschool period

As of November 30, 2022

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(3 to 6 years old), daytime naps change markedly (Fukuda & Sakashita, 2002). Around the age of one year, by the age of one and a half years, morning nap disappears, while afternoon nap persists (Fukuda *et al.*, 2021). Thereafter, the proportion of toddlers who do not take naps increases gradually from ages 2 to 5. By the age of 6, most children no longer take naps (National Sleep Foundation, 2004, Fukuda *et al.*, 2021).

In Japan, however, nursery schools have a routine of an average of 90 min nap in the afternoon. As a result, even at the age of 5, when most kindergarten children do not take naps, nursery school children are taking an average of 90-minute naps on weekdays, which has resulted in bedtime delays (Fukuda & Sakashita, 2002). Furthermore, it has been shown that this nocturnal lifestyle continues, even the differences between ex-kindergartners and ex-nursery school children reduces considerably, for several years after entering elementary schools, even the obligatory nap routine already ended (Fukuda & Asaoka, 2004).

These previous studies were conducted by means of questionnaire surveys. The purpose of this study was to examine the effects of napping on biological rhythms more objectively and in detail by using a continuous activity recording device (Actiwatch®) to obtain a more objective measure of the rhythm of activity.

Methods

Participants: Participants were recruited from four nursery schools, two of which conducted afternoon nap routine. Fourteen children (9 girls and 5 boys, mean age: 4 years and 7 months) attended the nursery schools where nap routine was conducted, while 8 children (4 girls and 4 boys, mean age: 4 years and 10 months) were recruited from the other two nursery schools, where nap routine was not employed. All the children attended 'middle-grade classes' where children aged 4 years at the beginning of the academic year; the Japanese academic year commences in April.

Procedure: Continuous 24-hour recording of activity levels was performed on nursery school children for approximately one week. In conducting the study, the parents of the subjects were asked to sign a consent form after the purpose of the study was explained to them. A watch-type actogram device (Actiwatch®) was attached to the children's wrist of his/her non-dominant arm. The sampling rate of the actogram devices was set at 30 sec. After recording, the activity data were downloaded to a computer using the interface software. All the data were converted into 15-min average. All subsequent processing was based on the 15-min average values.

Results and Discussion

Fig. 1 shows the changes in activity over a 24-hour period for the middle-grade class nursery school children who had a daily nap (nap) and the middle-aged children who did not have a daily nap (no nap). In the case of the middle child with a nap, the activity level decreased in accordance with the time of nap, indicating that the activity level data clearly reflects the state of sleep. In contrast, for the children without naps, there was no drop in activity volume at that time of day, and the activity volume pattern confirms that they do not take naps.

The patterns in the figure indicate that the time of falling asleep at nighttime, as indicated by the drop in activity, is one to two hours later for the children with naps than for the children without

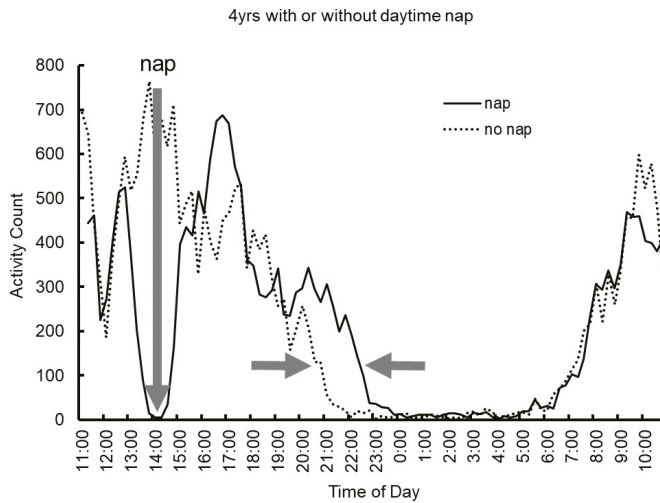


Figure 1 Activity patterns of children with or without a routine daytime nap

naps (indicated by two horizontal arrows). This means that the data on activity level clearly shows that the naps imposed in nursery schools are one of the main causes of delayed nighttime sleep.

Study 2

Our studies suggest that routine lengthy (about 90min) afternoon naps employed in many Japanese nursery schools are a major strong factor that delays nocturnal sleep onset (Fukuda & Sakashita, 2002; Fukuda & Asaoka, 2004; Study 1 in this investigation). We conducted a large-scale intervention survey to investigate the effects of discontinuation of a routine of a long afternoon nap in nursery schools. Adachi city daycare nursery division was interested in our research and asked us to advise on the nap routine of nursery schools in Adachi city. Adachi city is one of the cities in the metropolitan Tokyo area. Adachi city is located on the east side of the metropolitan Tokyo area, holding about 600 thousand populations. Adachi city daycare nursery division made a decision of discontinuing nap routines in elderly grade (5 to 6 years) classes in nursery schools operated by Adachi city government. We compared the data concerning sleep before and after nap routine discontinuation.

Methods

Participants: Parents of 1243 nursery school children answered the questionnaire concerning sleep habits and related behaviors in June 2010. The children were in middle-aged grade (4 to 5 years) class at the time, and they have a routine of taking naps during the afternoon (around 13:00 to 15:00) period. One year later, the children entered into elderly grade (5 to 6 years) class in June of 2011. As the Japanese academic year begins in April, the questionnaire was administered after about 2 months after class started. After the year of 2011, the nursery schools of Adachi city discontinued

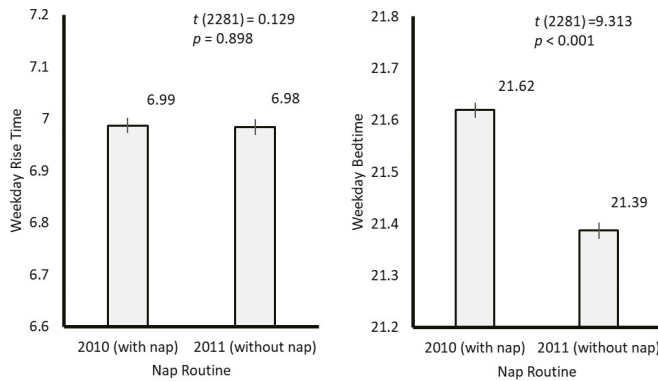


Figure 2 Rise time (left panel) and bedtime (right panel) of the children before and after cessation of the routine nap. Time was shown in decimal value. Error bars are standard errors.

the nap routine in the elderly grade classes. In the 2011 survey, parents of 1040 children participated in the survey.

Questionnaire: We devised a questionnaire containing questions; 1) weekday bedtime, 2) weekday rise time, 3) how easily the child falls asleep, and 4) how easy to lull the child to sleep. The parents of the children were asked to answer the questions.

Results and Discussion

Bedtime and rise time with or without routine nap: Figure 2 shows the weekday rise time (left panel) and bedtime (right panel) of the children. Weekday rise time was not different between the two samples (with routine naps in 2010) and (without routine naps in 2011), while weekday bedtime was significantly different between the two samples, the bedtime of the children without routine naps was significantly earlier than that of the children with routine naps ($t(2281) = 9.313, p < .001$). The cessation of routine naps caused the advance of bedtime for the children. There is a children's age difference between the two samples, however, the bedtime and rise time of the children in these preschool periods (3 to 6 years old) does not change or are fairly constant (Fukuda & Sakashita, 2002). The significant change in bedtime from 2010 to 2011 data should be attributed to the cessation of routine naps.

How does your child fall asleep: Figure 3 shows the answer of the parent to the question "how does your child fall asleep?". In 2010, when routine naps were still employed, about one-third (32.98%) of the parent answered their children go to sleep by themselves, while 61.25% of them answered they have to lull the children to fall asleep. In 2011, the distribution of the answers changed, more parents (46.47%) answered that their children to go sleep by themselves, while fewer parents (47.92%) answered they lull their children to fall asleep. The distribution of the answers was significantly different between the two years ($\chi^2 = 44.281, df = 2, p < .001$).

Figure 4 shows the distribution of answers of the parents to the question "how easy do you lull

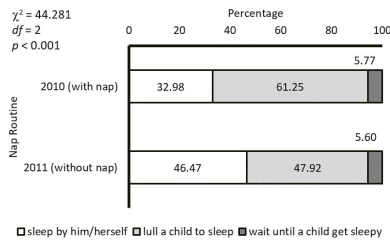


Figure 3 How does your child fall asleep?

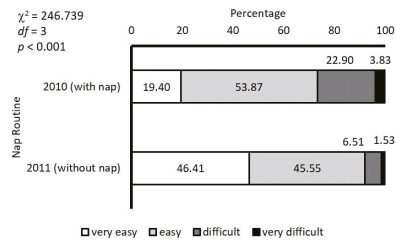


Figure 4 How easily do you lull your child to get to sleep?

your child to get to sleep?”. The percentage of parents who answered their children were very easily lulled to get to sleep increased over twice from 2010 (19.40%) to 2011 (46.41%). The percentage of parents who answered their children were lulled with difficulty getting to sleep decreased one third from 2010 (22.90%) to 2011 (6.51%). The distribution of the answers was significantly different between the two years ($\chi^2 = 246.739$, $df = 3$, $p < .001$).

These data suggest that the cessation of routine naps made the children fall asleep very easily at night.

Study 3

National sleep foundation is conducting surveys (Sleep in America Polls) every year. They conducted a survey on children’s sleep in 2004. Participants are parents who have a child living in their home aged 10 and younger and are the primary caregiver or share equally in the childcare. Among them, the parents who have children who are classified as preschoolers (3 to 6 years of age and did not enter elementary schools) are 2456 in number. The interview was conducted by telephone, and the sample was determined randomly. In Figure 5, the results of the survey conducted by National Sleep Foundation were shown as the dotted line. Only 43% of 3-year-aged children do not take daytime naps, then the percentage abruptly rose up to 74% at the age of 4 years. Between the years 3 and 4, there seems to be a kind of discontinuous change in nap behavior. We conducted a similar survey in Japan (in the Tokyo area) to find out whether there is a similar gap between the ages of 3 and 4 years.

Methods

Participants: Parents of preschoolers (3 to 6 years and did not enter elementary schools) participated in the survey. The survey was conducted at Adachi city in the metropolitan area of Tokyo. A questionnaire concerning their sleep habits including nap behavior was distributed to parents through kindergartens and nursery schools in Adachi city. In Japan, kindergartens and nursery schools are run under different regulations by different administrations, i.e., the ministry of education and the ministry of welfare and labor, respectively. Many nursery schools employ obligatory afternoon nap routines, while no kindergartens do. If we ask the parents whether the children take naps or not, almost all the parents of the nursery school children would give

Table 1 Number of Preschool children who participated in the survey

	3 years	4 years	5 years	6 years	Total
Kindergartners (Tokyo)	63	397	384	316	1160
Nursery School Children (Tokyo)	250	376	363	291	1280
National Sleep Foundation (USA) ^a	325	776	748	607	2456

a: The bottom line data refers Sleep in America Poll 2004 conducted by National Sleep Foundation

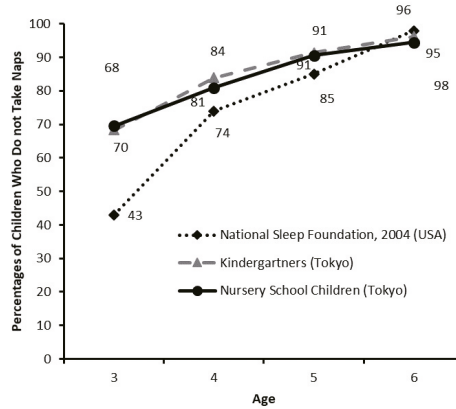


Figure 5 The percentage of children who do not take naps at each age.

affirmative answers. Instead, we asked the parents whether the children take naps for their own needs. Thus, they answered the children’s natural developmental changes of naps. The total number of participants was 2440. Specific characteristics of the participants are shown in Table 1.

Results and Discussion

Figure 5 shows the percentages of children who do not nap at each age. The data of National Sleep Foundation shows a discontinuous jump from 3 years to 4 years, while our data both of kindergartners and of nursery school children shows a rather smooth change over these ages. About 70%, 80%, 90%, and 95% of preschool children do not take naps at 3, 4, 5, and 6 years old, respectively. Especially at 3 years old, the difference (about 30%) between the data of National Sleep Foundation and of ours is striking. What is the reason for the difference? We do not determine the reason for this difference, however, the interview methods may be one of the reasons for the difference. In National Sleep Foundation survey the participants were asked whether their children take naps or not, however, they were not asked whether the nap was urged or occurred naturally. In the United States, there are no obligatory nap routines in preschools, however, there are possibilities that parents urge their children to take naps. There are not a few mothers who are favored for daytime naps. Jones & Ball (2013) surveyed 3years children and their mothers about the children’s napping behavior and the mothers’ attitudes about their children’s napping. Out of 84

families, 25 mothers (29.8%) allow or encourage their children to take naps, while 29 mothers (34.5%) prevent their children from taking naps, and 30 children (35.7%) do not take naps. Roughly about one-third of mothers allow or encourage their 3-year-old children to take naps. About 30% more of the children in National Sleep Foundation survey take naps than the children in our survey. The difference (about 30%) might be attributed to the number of the children whose parents encourage them to take naps.

Conclusions: Obligatory afternoon naps in Japanese nursery schools significantly delay children's bedtime. Cessation of lengthy afternoon naps caused bedtime advance and made the children fall asleep more easily. Even in 3-year-old children, about 70% of them take no naps. Lengthy naps should not be taken by children who could maintain their wakefulness during the daytime.

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