

Supplement Q1

Please respond with regards to your child's average situation over the past few days.

Strongly Agree, Agree, Somewhat Agree, Somewhat Disagree, Disagree, Strongly Disagree

Excessive daytime sleepiness

- 1 Feeling sleepy during the day
- 2 Lacking energy during the day
- 3 Dozing off while with family members
- 4 Falling asleep at school or during cram school
- 5 Sleeping later than 11PM
- 6 Waking up more than 2 times at night
- 7 Sleep and wake up times are inconsistent

Daytime activity

- 1 Restless during the day
- 2 Trouble concentrating during the day
- 3 Violence towards friends and siblings
- 4 Irritable during the day

Morning symptoms

- 1 Waking up in the morning takes time
- 2 Getting out of bed in the morning takes time
- 3 Poor mood upon awaking in the morning

Insomnia/Rhythm

- 1 Unable to attend school due to inability to wake up
- 2 Late for school due to oversleeping
- 3 Day and night are reversed

Weekend Sleep Rhythm

- 1 Staying up 1 hour later before a weekend night
- 2 Sleeping in 1 hour later on a weekend

Supplement Q 2

For the following questions, please circle the number that best describes your child. Make your decision based on your child's behavior over the past few days. Note that there is no “right” or “wrong” answer.

Question 1: How difficult is it to wake up your child in the morning?

1. Not difficult/don't have to wake up child
2. Slightly difficult
3. Rather difficult
4. Somewhat difficult
5. Quite difficult
6. Very difficult

Question 2: How awake is your child during the first 30 minutes after waking up in the morning?

1. Extremely awake
2. Quite awake
3. Fairly awake
4. Somewhat awake
5. Slightly awake
6. Not awake at all

Question 3: What time does your child get tired and sleepy?

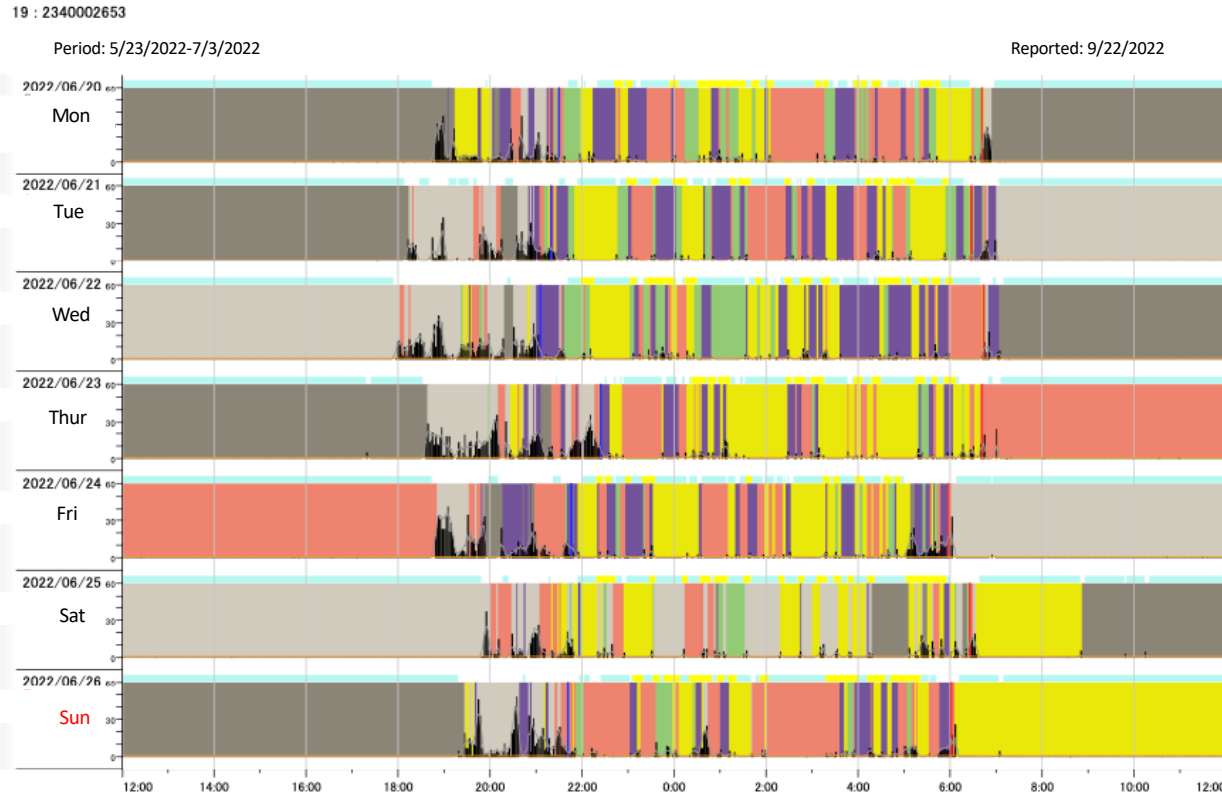
1. Before 6:30PM
2. Between 6:30PM and 7:14PM
3. Between 7:15PM and 9:29PM
4. Between 9:30PM and 10:14PM
5. Between 10:15PM and 11:29PM
6. After 11:30PM

Question 4: When your child wakes up in the morning, how long does it take to be fully awake?

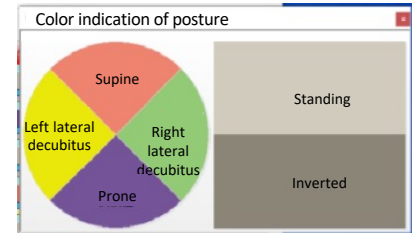
1. 0 minutes (immediately)
2. 1-4 minutes
3. 5-10 minutes
4. 11-20 minutes
5. 21-30 minutes
6. 31 minutes or more

Figure S1.

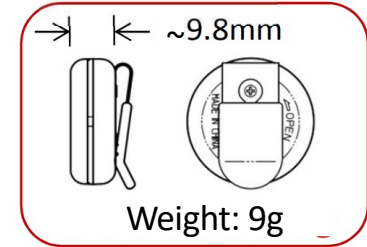
a



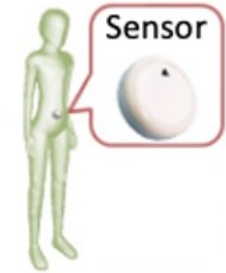
b



c



d



Total Sleep Time (TST), Sleep Latency, (SL), Wake After Sleep Onset (WASO), Number of Awakening (NOA), Sleep Efficiency (SE), Average Awakening, Duration Awakenings, Longer Than 8 Minutes, Number of Position Changes, Into-Bed Time, Sleep-Onset Time, Final Wake Time, Out-of-Bed Time, Sleep Period Time (SPT), Total Time in Bed (TIB), and Bed Out Latency (BOL) were calculated.

Figure S1. Sleep Assessment Report. (a) actigraph data printout (b) body position color key (c) size and weight of clip (d) sensor placement points. Posture sensing enables us to precisely score Into-Bed Time and Out-of-Bed Time, and therefore sleep phase of the subjects.

Table S1: Analysis of Week 1 sleep actigraph data between Non-filter and Filter groups.

		Total Sleep Time (TST)			Sleep Latency (SL)			Wake After Sleep Onset (WASO)			Number of Awakenings (NOA)			Sleep Efficiency (SE)		
Mean±SEM	Non-Filter	354.00	±	7.95	14.17	±	1.74	122.64	±	7.96	15.23	±	0.55	71.25	±	1.57
	Filter	356.55	±	7.52	14.19	±	1.64	126.79	±	8.29	15.43	±	0.62	70.91	±	1.66
p-value	wilcoxon	0.59			0.65			0.27			0.56			0.64		

		Average Awakening Duration			Awakenings Longer Than 8 Minutes			Number of Position Changes			Into-Bed Time			Sleep-Onset Time		
Mean±SEM	Non-Filter	7.85	±	0.34	6.95	±	0.50	25.51	±	1.31	22.2	±	0.1	22.4	±	0.1
	Filter	7.94	±	0.33	7.10	±	0.50	26.93	±	1.46	22.1	±	0.1	22.3	±	0.1
p-value	wilcoxon	0.74			0.49			0.10			0.1			0.3		

		Final Wake Time			Out-of-Bed Time			Sleep Period Time (SPT)			Total Time in Bed (TIB)			Bed Out Latency (BOL)		
Mean±SEM	Non-Filter	6.35	±	0.12	6.47	±	0.12	476.65	±	5.70	498.43	±	6.10	7.61	±	0.68
	Filter	6.39	±	0.11	6.52	±	0.11	483.34	±	4.80	505.41	±	5.98	7.88	±	0.79
p-value	wilcoxon	0.50			0.37			0.26			0.22			0.67		

No significant differences were observed between the Non-Filter and Filter groups in Week 1.

Table S2: Analysis of Week 2 sleep actigraph data between Non-filter and Filter groups

		Total Sleep Time (TST)			Sleep Latency (SL)			Wake After Sleep Onset (WASO)			Number of Awakenings (NOA)			Sleep Efficiency (SE)		
Mean±SEM	Non-Filter	358.53	±	7.67	7.67	±	1.98	120.30	±	7.34	15.16	±	0.47	71.81	±	1.43
	Filter	356.03	±	6.70	13.65	±	1.70	127.67	±	7.70	15.76	±	0.56	70.78	±	1.51
p-value	wilcoxon	0.68			0.48			0.13			0.26			0.26		

		Average Awakening Duration			Awakenings Longer Than 8 Minutes			Number of Position Changes			Into-Bed Time			Sleep-Onset Time		
Mean±SEM	Non-Filter	7.78	±	0.30	6.85	±	0.46	25.69	±	1.13	22.13	±	0.09	22.36	±	0.10
	Filter	7.93	±	0.30	7.15	±	0.48	26.63	±	1.34	22.03	±	0.08	22.26	±	0.08
p-value	wilcoxon	0.38			0.28			0.25			0.040*			0.041*		

		Final Wake Time			Out-of-Bed Time			Sleep Period Time (SPT)			Total Time in Bed (TIB)			Bed Out Latency (BOL)		
Mean±SEM	Non-Filter	6.35	±	0.11	6.47	±	0.11	478.83	±	5.09	500.40	±	5.69	7.46	±	0.54
	Filter	6.32	±	0.09	6.45	±	0.10	483.69	±	3.87	505.05	±	5.17	7.70	±	0.69
p-value	wilcoxon	0.74			0.84			0.11			0.09			0.85		

A significant advancement in Into-Bed Time and Sleep-Onset Time was observed between Non-Filter and Filter groups in Week 2.

Table S3: Analysis of Week 1 sleep questionnaire data between Non-filter and Filter groups.

		JSQC1_1 SLEEPINESS			JSQC1_2 FATIGUE			JSQC1_3 DOZING AT HOME			JSQC1_4 DOZING AT SCHOOL			JSQC1_5 BEDTIME AFTER 11PM			JSQC1_6 WASO >2		
Mean±SEM	N-average	1.6	±	0.1	1.9	±	0.2	1.3	±	0.1	1.2	±	0.1	1.5	±	0.1	1.6	±	0.1
	F-average	1.8	±	0.2	2.0	±	0.2	1.3	±	0.1	1.2	±	0.1	1.5	±	0.1	1.6	±	0.2
p-value	wilcoxon		0.28			0.89			0.66			1.00			0.61			0.91	
		JSQC1_7 REGULAR SLEEP			JSQC2_1 TIME RESTLESSNESS			JSQC2_2 CONCENTRATION			JSQC2_3 SILENT BEHAVIOR			JSQC2_4 TIME IRRITABILITY			JSQC3_1 TROUBLE AWAKENING		
Mean±SEM	N-average	2.5	±	0.2	2.2	±	0.2	2.4	±	0.2	2.3	±	0.2	2.3	±	0.2	2.7	±	0.2
	F-average	2.3	±	0.2	2.2	±	0.2	2.6	±	0.2	2.2	±	0.2	2.3	±	0.2	2.6	±	0.2
p-value	wilcoxon		0.56			0.89			0.51			0.77			0.42			0.59	
		JSQC3_2 TROUBLE GETTING OUT OF BED			JSQC3_3 POOR MOOD UPON AWAKENING			JSQC4_1 UNABLE TO ATTEND SCHOOL			JSQC4_2 LATE FOR SCHOOL			JSQC4_3 DAY AND NIGHT REVERSAL			JSQC5_1 >1 HR LATER SLEEP TIME ON WEEKENDS		
Mean±SEM	N-average	2.5	±	0.2	2.2	±	0.2	1.2	±	0.1	1.2	±	0.1	1.0	±	0.0	3.4	±	0.2
	F-average	2.5	±	0.2	2.1	±	0.2	1.1	±	0.1	1.1	±	0.0	1.1	±	0.0	3.6	±	0.3
p-value	wilcoxon		1.00			0.77			0.08			0.16			0.57			0.47	
		JSQC5_2 >1 HR LATER AROUSAL TIME ON WEEKENDS			C-1 DIFFICULTY WAKING IN MORNING			C-2 ALERTNESS UPON WAKING			C-3 TIME OF INITIAL DROWSINESS			C-4 TIME UNTIL FULL ALERTNESS					
Mean±SEM	N-average	3.0	±	0.2	1.9	±	0.2	2.1	±	0.2	4.2	±	0.1	2.5	±	0.2			
	F-average	3.0	±	0.2	1.8	±	0.2	2.0	±	0.1	4.3	±	0.1	2.7	±	0.2			
p-value	wilcoxon		0.99			0.23			0.91			0.35			0.57				

No significant differences were observed between the Non-Filter and Filter groups in Week 1.

Table S4: Analysis of Week 2 sleep questionnaire data between Non-filter and Filter groups.

		JSQC1_1 SLEEPINESS			JSQC1_2 FATIGUE			JSQC1_3 DOZING AT HOME			JSQC1_4 DOZING AT SCHOOL			JSQC1_5 BEDTIME AFTER 11PM			JSQC1_6 WASO >2		
Mean±SEM	N-average	1.8	±	0.2	1.9	±	0.2	1.2	±	0.1	1.1	±	0.0	1.6	±	0.1	1.4	±	0.1
	F-average	1.7	±	0.1	1.9	±	0.1	1.3	±	0.1	1.1	±	0.0	1.5	±	0.2	1.5	±	0.1
p-value	wilcoxon		0.71			0.78			0.15			1.00			0.27			0.15	
		JSQC1_7 IRREGULAR SLEEP			JSQC2_1 DAYTIME RESTLESSNESS			JSQC2_2 LESS CONCENTRATION			JSQC2_3 VIOLENT BEHAVIOR			JSQC2_4 DAYTIME IRRITABILITY			JSQC3_1 TROUBLE AWAKENING		
Mean±SEM	N-average	2.4	±	0.2	2.2	±	0.2	2.5	±	0.2	2.4	±	0.2	2.5	±	0.2	2.6	±	0.3
	F-average	2.3	±	0.2	2.2	±	0.2	2.4	±	0.2	2.1	±	0.2	2.1	±	0.2	2.6	±	0.2
p-value	wilcoxon		0.72			0.42			0.27			0.013*			0.017*			0.79	
		JSQC3_2 TROUBLE GETTING OUT OF BED			JSQC3_3 POOR MOOD UPON AWAKENING			JSQC4_1 UNABLE TO ATTEND SCHOOL			JSQC4_2 LATE FOR SCHOOL			JSQC4_3 DAY AND NIGHT REVERSAL			JSQC5_1 >1 HR LATER SLEEP TIME ON WEEKENDS		
Mean±SEM	N-average	2.6	±	0.3	2.3	±	0.2	1.2	±	0.1	1.2	±	0.1	1.1	±	0.0	2.9	±	0.3
	F-average	2.5	±	0.2	2.0	±	0.2	1.1	±	0.1	1.1	±	0.0	1.1	±	0.0	2.9	±	0.2
p-value	wilcoxon		0.36			0.048*			0.56			0.18			0.16			0.74	
		JSQC5_2 > 1 HR LATER AROUSAL TIME ON WEEKENDS			C-1 DIFFICULTY WAKING IN MORNING			C-2 ALERTNESS UPON WAKING			C-3 TIME OF INITIAL DROWSINESS			C-4 TIME UNTIL FULL ALERTNESS					
Mean±SEM	N-average	2.9	±	0.3	1.9	±	0.2	2.0	±	0.2	4.1	±	0.2	2.6	±	0.2			
	F-average	2.9	±	0.2	1.8	±	0.2	1.9	±	0.2	4.2	±	0.2	2.7	±	1.2			
p-value	wilcoxon		0.88			0.66			0.51			0.16			0.95				

Significant improvements in Violent Behavior and Daytime Irritability, Poor Mood Upon Awakening were observed in the Filter groups.