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A Comment on "Early morning university classes are associated with impaired sleep and academic performance"

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No. 251
I4R DISCUSSION PAPER SERIES

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Finn Luebber

July 2025

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A comment on "Early morning university classes are associated with impaired sleep and academic performance"

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Abstract

Yeo et al. (2023) examined the relationship between early university classes, and sleep and academic performance in a large-scale observational study. They hypothesized lower attendance, shorter sleep, and poorer academic achievements coming with earlier classes. To test their hypotheses, the authors tracked students' Wi-Fi connections, Learning Management System logins, and grades and collected actigraphy data. In line with their hypotheses, they found that earlier classes predicted lower attendance, grades and shorter sleep.

Due to inaccessibility of other data, this reproduction project focuses solely on the actigraphy data. Here, the authors found that students attend earlier classes to a lower degree since they tend to oversleep, that the frequency of naps is associated with earlier class start times, and that students sleep shorter on nights preceding earlier classes.

In this recreate reproducibility project, which uses partly cleaned data, all these claims are successfully reproduced. However, there are some numerical inconsistencies of unclear origin in some results.

Introduction

(Yeo et al. 2023) found that earlier university classes are correlated with lower attendance, shorter sleep, and poorer academic performance. Furthermore, they monitored Wi-Fi logins in classrooms and found lower attendance for earlier classes. Additionally, using actigraphy data in a different sample, they found that students more frequently slept too long to reach class on time for earlier classes, and also had more naps on days with earlier class start times. Next, the authors used Learning Management System (LMS) login and activity data and the actigraphy data to estimate sleep times and found that these were also correlated with the class start time in the hypothesized direction. These effects were mostly driven by morning events (i.e., earlier wake time, onset of LMS login activity) than by evening events (sleep onset, offset of LMS login activity). Finally, the authors found that course grades were slightly higher when all classes of a student took place in the afternoon compared to all classes taking place in the morning. Additionally, students grade point average was negatively correlated with the number of days per week that they had early morning classes.

The Wi-Fi data, the LMS data, and the grades data were collected by the university and stored on the National University of Singapore (NUS) Institute for Applied Learning Sciences and Educational Technology (ALSET) Data Lake. The authors used data from multiple semesters and multiple years with sample sizes greater than 20,000 unique students. Due to problems regarding data access as researcher external of NUS, these data could not be included in this project.

Thus, this report only includes reproductions of the results involving the actigraphy data the authors themselves collected, and the basic demographic variables. The actigraphy data were collected from 202 undergraduate students (18 – 25 years) over the course of six weeks each across two academic semesters in 2019. After excluding some of the participants, the final dataset consisted of 181 students and 7,329[1] nocturnal sleep recordings (p. 511). Data were originally collected in 30-s epochs and analyzed using Actiware software (v.6.0.9). Aggregated data could be shared and are used in this report. More specifically, the corresponding author, Joshua Gooley, shared six datasets:

- For each subject and day, the sleep-wake related variables time of sleep and rest, bedtime, wake up, activity, and waketime as scored by actigraphy (data not used in the present reproduction)
- For each subject and day, the activity counts binned in 15-min intervals (henceforth “activity”)
- For each subject and day, the light exposure binned in 15-min intervals (not used in the present reproduction)
- For each subject and day, the compiled sleep variables total sleep time, time in bed, sleep onset, sleep offset, midpoint of sleep, travel time to class, and class start time (“starttime”). Here, missing or unused days were removed.
- For each subject and day, the same compiled sleep variables but additionally separated by night sleep and naps (“sleep”)
- The demographic information (“demo”)

[1] As a clarification by Joshua Gooley: This is the number of nights with valid actigraphy scoring before filtering by class start time. Also includes one subject who did not submit his timetable.

With these data, I tried to computationally reproduce as many results and figures as possible. There were no analysis scripts, preregistrations or other published information outside the main publication and its supplement available to base the analyses on. However, Joshua Gooley was very supportive and facilitated the reproduction by promptly answering questions concerning the data and analyses. All claims were reproduced concerning direction of effects and significance, however, not all results were numerically identical (table 1).

Table 1

	Fully	Partial	No
Raw data provided			x
Cleaning code provided			x
Analysis data provided		x	
Analysis code provided			x
Reproducible from raw data			x
Reproducible from analysis data		x	

The reproductions were conducted using R version 4.3.0 (R Core Team 2020) on a Windows 10 x64 system. The analysis code is available at https://osf.io/8ebua/.

This report is part of a collaboration between the Institute for Replication and Nature Human Behaviour (Brodeur et al. 2024).

Results

Demographic information

First, I tried to reproduce the demographic information. The demographic data file still contained information from all 202 participants who initially participated of which 13 withdrew, and 8 were excluded by the researchers for a final sample of 181 (p. 511). The demographic data included a variable "Status" with levels "Completed" (n = 183) and "Withdraw" (n = 19). The "starttime" data contained 181 unique subject codes, while the "sleep" data and the "activity" data both contained 182. At first glance this looks like the latter three were already partially cleaned compared to the "Completed" demographic data. However, a closer inspection revealed that additionally there was one subject with actigraphy data but without demographics.[2]

For the individual observations, the cleaned datafile is supposed to include 7,329 entries. However, the "starttime" data included only 7,129. The "sleep" data, filtered for night sleep, and with the one participant removed who was in here but not in "starttime" (presumably the participant who was excluded for not handing in their class time table), had 7,292

[2] After consultation with Joshua Gooley, the discrepancy arose since one subject listed as "Withdraw" in the demographic data actually participated in all parts necessary for the present study. They did not participate in a final series of tests which were however irrelevant for the analyses presented here. Thus, there were actually 184 completed data sets in the demographics, of which three were excluded, two for poor data quality and one for the missing timetable. The latter was still included in the "sleep" and "activity" data. Ultimately, all clean data tables included 181 subjects.

observations.[3] Thus, it was not possible to reproduce the exact number of observations, which probably influences downstream parts of the project (see also below).

For the information regarding age, sex, ethnicity, and class years (p. 511), the information on the latter in the manuscript leads to the assumption that the already cleaned activity data was used (first-year, n = 57; second-year, n = 59; third-year, n = 29; fourth-year, n = 35; missing data, n = 1 adds up to 181). Using this data, demographic data can be reproduced exactly.

Waking up by class start

The first analysis using the actigraphy data in the study by Yeo et al. concerned the question whether students were absent from early classes because they were sleeping (last paragraph, p. 503). Using the starttime data and filtering out all missing data regarding travel time to classrooms and sleep offset values, I obtained the correct number of 6,546 observations in n = 174 participants. Next, I successfully reproduced the latestatus variable of the data which coded whether the participant was on time (0), woke up before class but could not make it in time (1) or woke up after class start (2) (not shown here).

With these data, I was able to reproduce the two reported chi-square tests (p. 503): A test for different frequencies of waking up after the class start time by class start time, and a test for different frequencies of waking up too late to reach class on time by class start time. I also successfully reproduced the accompanying figures 2 b-d (Fig. 1). However, it was only possible to compare them visually, so I cannot exclude minor deviations due to apparently slightly different plotting options for the original fig. 2 b, and difficulties to extract numerical values from fig. 2 c and d.

Naps

The next question was about whether students took more naps on days with earlier classes (first paragraph, p. 504). Importantly, the published paper actually does not seem to analyse the number of days with naps, but the number of naps. This leads to slight discrepancies as some participants took more than one nap on some days. Thus, I first tried to reproduce the numbers from the paper (using the number of naps), followed by the same analyses with the number of days with naps.

I could reproduce the number of naps on school days (336) and the number of naps per school day, but the number of naps per non-school day were slightly different (see Tab. 2 for the latter two).

Table 2. Number of nap days and non-nap days

Start time	Naps on school days		Non-nap days school		Percentage nap days	
	manuscript	repr.	manuscript	repr.	manuscript	repr.
08:00	88	88	716	722	10.9	10.9
09:00	50	50	436	442	10.3	10.2
10:00	113	113	889	899	11.3	11.2

[3] Joshua Gooley confirmed that 7,292 was actually the correct number after excluding the one person who did not submit their timetable.

11:00	18	18	157	157	10.3	10.3
12:00	45	45	633	634	6.6	6.6
14:00	14	14	388	389	3.5	3.5
16:00	8	8	162	162	4.7	4.7

Note. In the manuscript, the numbers which are reported here as "naps on school days" were reported as school days with naps. repr.: Reproduction

Since the reproduction numbers are always greater or equal than the ones reported in the manuscript (for a total excess of 24 days), it might have been the case that there was an undisclosed data exclusion. Thus, I tried to resolve this discrepancy by counting the non-nap days per participant: While there indeed was a single participant with 24 non-nap days, the number of non-nap days per school start time did not fit the excess values found in the reproduction (e.g., the participant had no class starting at 08:00).[4]

The results of the chi-squared test were successfully reproduced when the non-nap days from the manuscript were used, but were slightly different using the reproduced non-nap days ($\chi^2(6) = 29.7$, $p < .001$).

Next, I repeated the analyses using the number of days with naps rather than the raw nap counts. I obtained the following day counts by class start time: 08:00, 80; 09:00, 42; 10:00, 102; 11:00, 18; 12:00, 43; 14:00, 13; 16:00, 8. Generally, this change does not change the direction or significance of the result. However, the numbers are slightly different for both, the non-nap days taken from the manuscript ($\chi^2(6) = 28.6$, $p < .001$), and the non-nap days as reproduced from the data ($\chi^2(6) = 29.1$, $p < .001$).

Sleep and activity by class start time

Last, the authors analysed the time course of activity across days, and the sleep parameters both separated by class start times (p. 505, last paragraph left column).

First, they display the activity counts against clock time for all class start times, compared to days with no classes (Fig. 2 left, fig. 4a in the paper). The reproduced version of this figure looks similar. However, on closer inspection, there are enough differences to conclude that the original analysis or data must have been different compared to the reproduction. I also tried different aggregation methods (mean vs. median, and across all days for a given time, or first within time and subject, and then once more across all subjects). The median for each time point across all subjects regardless of the number of these particular start times within each subject produced the plot that resembled the original one most closely.

I did not attempt to reproduce fig. 4 b since visual inspection of plot similarity seemed to be especially difficult. Instead, I tried to reproduce the sleep durations printed within the individual bars of this figure. Again, the exact way of aggregation was not described in the manuscript. After trying out a couple of options, the only one that reproduced all numbers (except one) when rounding to one decimal point was to take the median for every subject and class start time, and then taking the mean across all subjects for a given start time. (see table 3)[5]. I tried this approach again for the activity time course of fig. 4a but this did not reproduce the consistent trough of activity during nighttime.

[4] Joshua Gooley stated that he was not aware of any data exclusion that was not reported.

[5] This was indeed the method that was used in the manuscript.

Table 3. Different aggregation methods to calculate total sleep times by class start times

Class start time	n	orig	mean	med	Mean + mean	Mean + med	Med + mean	Med + med
8	103	5.2	5.2	5.2	5.2	5.2	5.2	5
no class	103	6.4	6.3	6.3	6.3	6.3	6.3	6.3
9	61	5.5	5.4	5.3	5.5	5.4	5.5	5.4
no class	61	6.2	6.2	6.2	6.2	6.3	6.2	6.3
10	123	5.6	5.6	5.7	5.6	5.5	5.6	5.5
no class	123	6.3	6.3	6.4	6.3	6.3	6.3	6.3
11	35	5.7	5.9	6	5.8	5.8	5.7	5.8
no class	35	6.2	6.3	6.4	6.3	6.3	6.2	6.3
12	107	6.2	6.2	6.2	6.2	6.2	6.2	6.1
no class	107	6.5	6.4	6.5	6.4	6.4	6.5	6.5
14	71	6	6	6.1	6	6	6	6
no class	71	6.2	6.2	6.2	6.1	6.1	6.2	6.2
16	44	6.4	6.4	6.5	6.5	6.4	6.4	6.5
no class	44	6.6	6.5	6.6	6.5	6.4	6.6	6.5

Note. Orig: original values from paper; med: median. Last four columns indicate a within-aggregation method followed by a between-aggregation method.

For fig. 4 c (here Fig. 2 right), I also tried different aggregation methods. The authors state in the figure caption that they show paired mean differences. The plot that reproduced their plot most closely, however, used the mean of the median differences of each subject and time. This can also be seen by comparing the reproduced values with the values in supplemental table 5. Here, the mean values are identical (using the procedure of averaging median differences)[6], while the confidence intervals are still slightly different in some cases. Overall, the general message of an upward trajectory with later class start times is independent of choice of the aggregation method.

Regarding the statistical tests, I ran linear mixed-effects models as described in the paper and the supplements (tables 4-8, original supplemental tables 2f-j). Again, the results were very close but not numerically identical. Especially the differences in the degrees of freedom are recognizable and seem to indicate that a different number of participants and observations might explain the slight differences in estimates and *p*-values. As a side note, in the codebook the factor level "2" for ethnicity is supposed to be Malay, and "3" Indian. However, in the supplemental tables 2f-g, the order of them is reversed even though all other factor levels are in the correct order. Furthermore, the estimates are reversed compared to the reproduction as well, indicating an error in the codebook or the tables.[7]

For Extended Data Fig. 4, the results of the reproduced figure looked exactly as the original one (Fig. 3). Again, due to the absence of actual values, the comparison was performed purely visual, and I did not spot deviations between the figures.

In the reproduction of Fig. 4, Extended Data Fig 4. and supplementary table 5, the n for the class start time of 08:00 was consistently at 104 compared to 103 in Yeo et al. Closer inspection revealed that one subject only had one day starting class at 08:00 and all values

[6] It was confirmed that this was the method used in the analyses.

[7] Joshua Gooley confirmed that the error lied in the tables and that the codebook is correct.

were NA. I excluded this subject from the analysis since I assumed this to be the most probable explanation for the discrepancy.

Conclusion

It is reassuring that the chi-squared tests about the association between class start times and oversleeping reproduced perfectly despite the authors using a different software, which is often said to reduce reproducibility. Despite the quite complex analyses and data structures, all other actigraphy results could also be reproduced to a very high degree.

However, as it is often lamented in the open science literature, the published materials were not sufficient to reproduce all results perfectly. Especially the data aggregation methods and outlier exclusion were not clearly specified in the published materials. Here, it would have been very helpful if the original analysis codes were published. This additionally enables checking the analyses to a given degree (e.g., identifying coding errors), even in the absence of open data.

Regarding the inaccessibility of all data, it is understandable that information about students' Wi-Fi logs and grades are protected to a high degree. However, since protected data often offers valuable insights, results of scientific studies using these should also be subject to reproduction and replication. The research community still needs to find the best way forward, since often, reproduction and replication in these cases hinge at the motivation and time commitment of individual researchers. However, in general, there does not need to be a conflict with data privacy. For instance, for every data set of scientific interest, institutions could provide mock data sets with identical data structures but without real demographic information, which external researchers could use to prepare analyses, which then could be run locally at the data-providing institution.

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Yeo, Sing Chen, Clin K. Y. Lai, Jacinda Tan, Samantha Lim, Yuvan Chandramoghan, Teck Kiang Tan, and Joshua J. Gooley. 2023. "Early Morning University Classes Are Associated with Impaired Sleep and Academic Performance." *Nature Human Behaviour* 7 (4): 502–14.

Figures

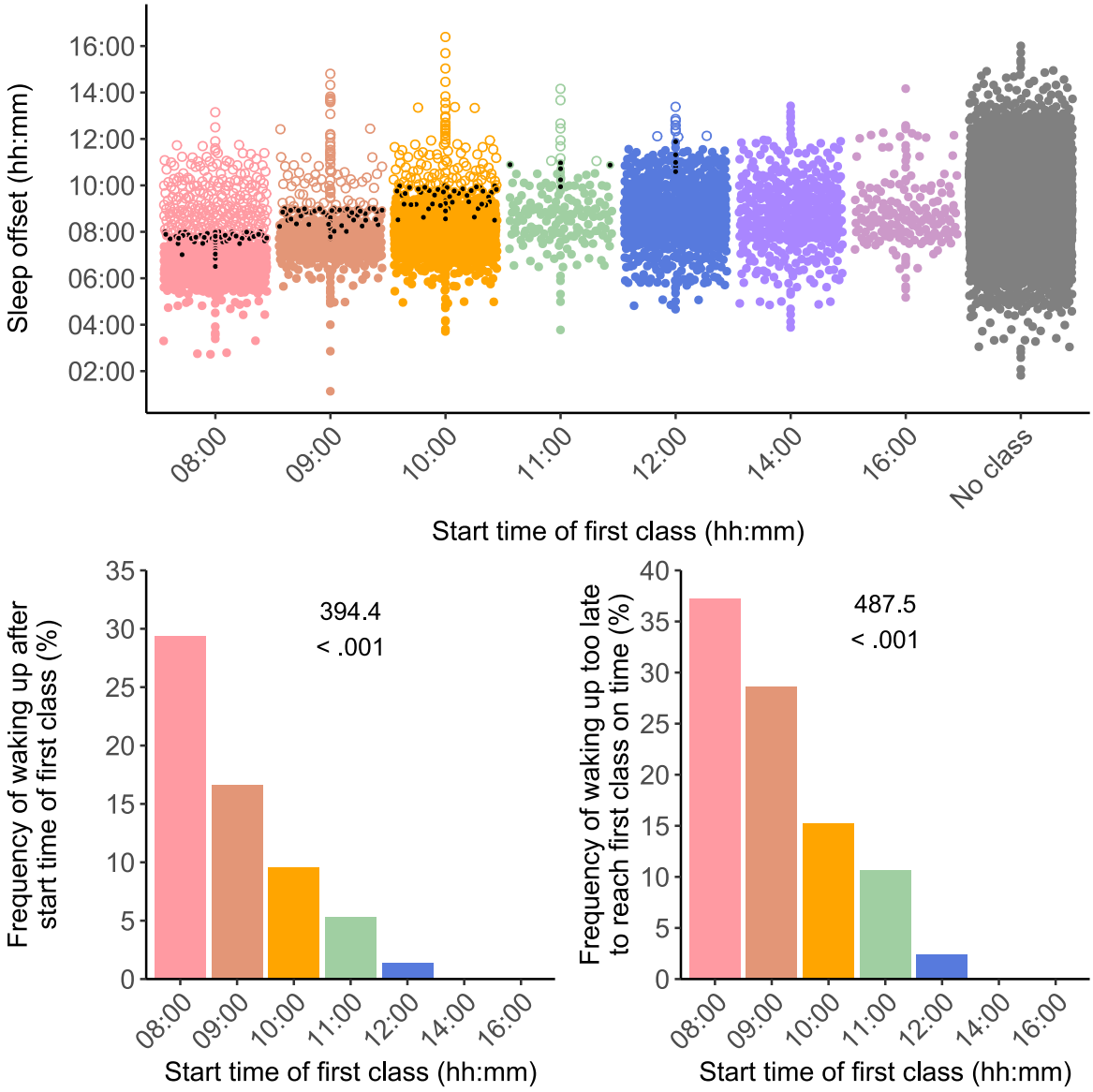

Fig. 1. Students frequently slept past the start of morning classes (original Fig. 2).

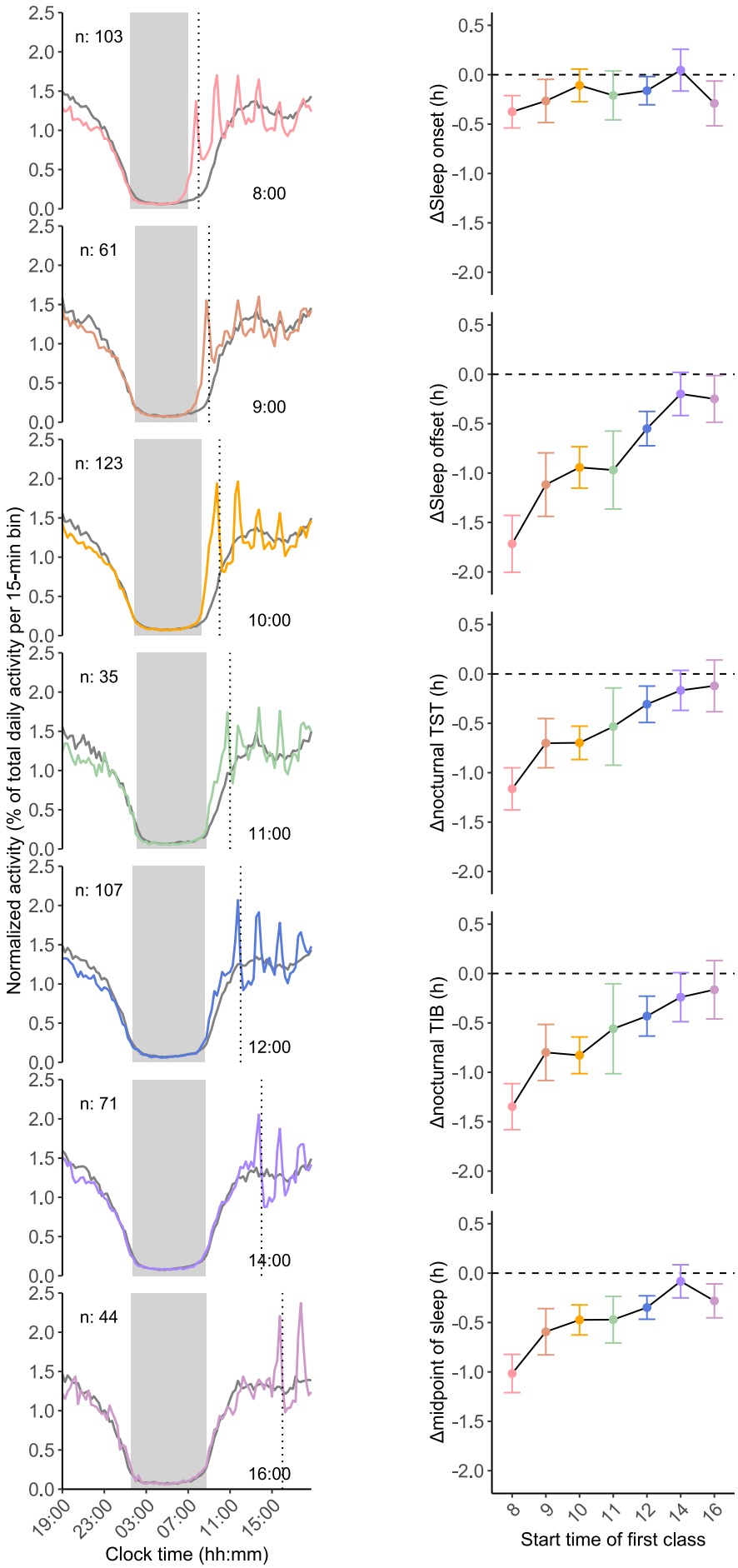

Fig. 2. Earlier class start times were associated with shorter sleep (original Fig. 4). TIB, time in bed for sleep; TST, total sleep time.

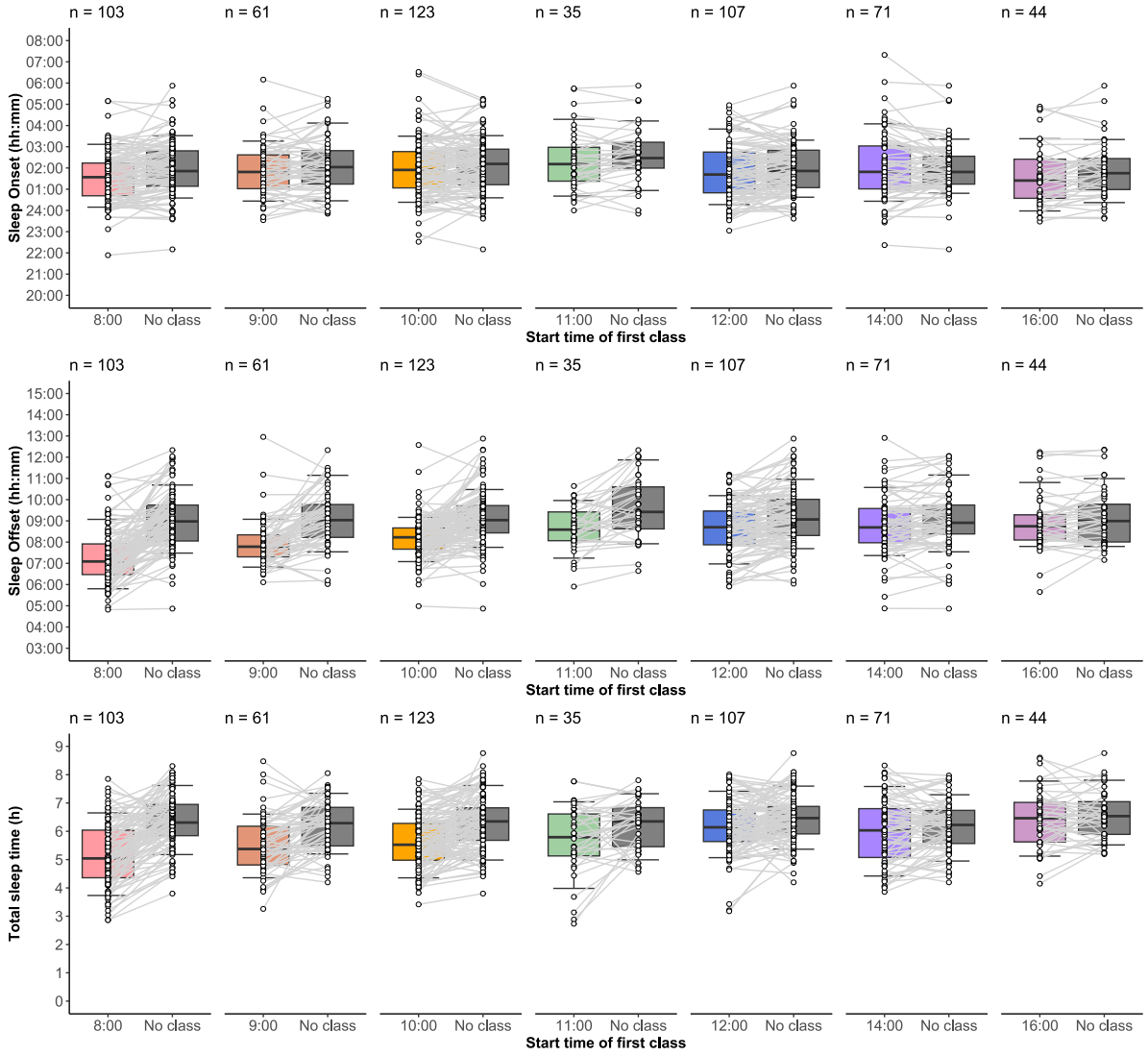

Fig. 3. Sleep parameters sorted by students' first class of the day (original Extended Data Fig. 4)

Tables

Table 4. Actigraphy-derived sleep onset (h). Original Supp. Table 2f

	Estimate	**SE**	**t(df)**	**P**
Intercept	24.72	2.04	12.12(169)	<0.001
Class start time				
No class	ref	-	-	-
8:00	-0.38	0.054	-6.97(6626)	<0.001
9:00	-0.22	0.068	-3.20(6646)	0.001
10:00	-0.11	0.049	-2.24(6615)	0.025
11:00	-0.17	0.103	-1.67(6612)	0.095
12:00	-0.13	0.057	-2.37(6615)	0.018
14:00	-0.07	0.071	-0.98(6609)	0.328
16:00	-0.23	0.103	-2.21(6602)	0.027
Sex				
Female	ref	-	-	-
Male	0.41	0.24	1.70(169)	0.090
Age	0.06	0.10	0.56(169)	0.575
Ethnicity				
Chinese	ref	-	-	-
Malay	-0.52	1.18	-0.44(167)	0.660
Indian	-0.29	0.44	-0.67(168)	0.504
Others	0.10	0.39	0.25(169)	0.801
Class year				
Year 1	ref	-	-	-
Year 2	-0.04	0.25	-0.18(169)	0.860
Year 3	-0.54	0.33	-1.63(168)	0.105
Year 4	-0.25	0.38	-0.66(169)	0.513
Semester				
2018/19 sem 2	ref	-	-	-
2019/20 sem 1	0.20	0.19	1.04(169)	0.299

Random effects (intercept): student, SD = 1.14; residual, SD = 1.25

Table 5. Actigraphy-derived sleep offset (h). Original Supp. Table 2g

	Estimate	**SE**	**t(df)**	**P**
Intercept	8.29	1.77	4.69(168)	<0.001
Class start time				
No class	ref	-	-	-
8:00	-1.65	0.059	-27.79(6657)	<0.001
9:00	-1.04	0.075	-13.87(6683)	<0.001
10:00	-0.82	0.054	-15.33(6641)	<0.001
11:00	-0.58	0.113	-5.13(6637)	<0.001
12:00	-0.40	0.062	-6.34(6641)	<0.001
14:00	-0.22	0.078	-2.85(6634)	0.004
16:00	-0.09	0.114	-0.81(6623)	0.420
Sex				
Female	ref	-	-	-
Male	0.23	0.21	1.11(168)	0.267

Age	0.04	0.09	0.44(168)	0.661
Ethnicity				
Chinese	ref	-	-	-
Malay	-0.27	1.02	-0.27(166)	0.790
Indian	-0.80	0.38	-2.12(168)	0.035
Others	-0.05	0.34	-0.15(168)	0.882
Class year				
Year 1	ref	-	-	-
Year 2	-0.45	0.21	-2.11(169)	0.036
Year 3	-0.38	0.29	-1.31(168)	0.192
Year 4	-0.48	0.33	-1.48(168)	0.141
Semester				
2018/19 sem 2	ref	-	-	-
2019/20 sem 1	0.38	0.16	2.31(168)	0.022

Random effects (intercept): student, SD = 0.98; residual, SD = 1.37

Table 6. Actigraphy-derived nocturnal total sleep time (h). Original Supp. Table 2h

	Estimate	**SE**	**t(df)**	**P**
Intercept	7.61	1.23	6.18(170)	<0.001
Class start time				
No class	ref	-	-	-
8:00	-1.16	0.058	-20.02(6735)	<0.001
9:00	-0.80	0.073	-10.96(6752)	<0.001
10:00	-0.65	0.052	-12.48(6715)	<0.001
11:00	-0.40	0.111	-3.60(6711)	<0.001
12:00	-0.24	0.061	-3.89(6716)	<0.001
14:00	-0.13	0.076	-1.74(6706)	0.083
16:00	0.10	0.112	0.87(6690)	0.383
Sex				
Female	ref	-	-	-
Male	-0.25	0.15	-1.74(170)	0.083
Age	-0.05	0.06	-0.86(170)	0.393
Ethnicity				
Chinese	ref	-	-	-
Malay	0.03	0.71	0.04(166)	0.972
Indian	-0.44	0.26	-1.66(169)	0.098
Others	-0.16	0.24	-0.67(170)	0.505
Class year				
Year 1	ref	-	-	-
Year 2	-0.32	0.15	-2.18(171)	0.031
Year 3	0.14	0.20	0.72(169)	0.474
Year 4	-0.10	0.23	-0.45(170)	0.651
Semester				
2018/19 sem 2	ref	-	-	-
2019/20 sem 1	0.13	0.11	1.12(170)	0.265

Random effects (intercept): student, SD = 0.66; residual, SD = 1.35

Table 7. Actigraphy-derived nocturnal time in bed for sleep (h). Original Supp. Table 2i

	Estimate	SE	t(df)	P
Intercept	7.90	1.48	5.33(170)	<0.001
Class start time				
No class	ref	-	-	-
8:00	-1.32	0.064	-20.52(6724)	<0.001
9:00	-0.86	0.081	-10.55(6747)	<0.001
10:00	-0.72	0.058	-12.44(6703)	<0.001
11:00	-0.33	0.123	-2.65(6698)	0.008
12:00	-0.25	0.068	-3.70(6703)	<0.001
14:00	-0.10	0.085	-1.20(6694)	0.232
16:00	0.15	0.124	1.19(6679)	0.234
Sex				
Female	ref	-	-	-
Male	-0.04	0.18	-0.23(170)	0.815
Age	-0.01	0.07	-0.13(170)	0.895
Ethnicity				
Chinese	ref	-	-	-
Malay	0.55	0.85	0.64(166)	0.522
Indian	-0.61	0.32	-1.93(169)	0.055
Others	0.02	0.28	0.06(169)	0.951
Class year				
Year 1	ref	-	-	-
Year 2	-0.50	0.18	-2.78(170)	0.006
Year 3	0.18	0.24	0.75(169)	0.453
Year 4	-0.34	0.27	-1.24(169)	0.215
Semester				
2018/19 sem 2	ref	-	-	-
2019/20 sem 1	0.25	0.14	1.85(170)	0.066

Random effects (intercept): student, SD = 0.80; residual, SD = 1.50

Table 8. Actigraphy-derived midpoint of sleep (h). Original Supp. Table 2j

	Estimate	SE	t(df)	P
Intercept	28.50	1.79	15.88(169)	<0.001
Class start time				
No class	ref	-	-	-
8:00	-1.01	0.047	-21.70(6624)	<0.001
9:00	-0.63	0.059	-10.69(6644)	<0.001
10:00	-0.47	0.042	-11.08(6613)	<0.001
11:00	-0.38	0.089	-4.28(6610)	<0.001
12:00	-0.27	0.049	-5.43(6613)	<0.001
14:00	-0.14	0.061	-2.36(6608)	0.018
16:00	-0.16	0.090	-1.80(6601)	0.071
Sex				
Female	ref	-	-	-
Male	0.32	0.21	1.52(169)	0.131

Age	0.05	0.09	0.54(169)	0.590
Ethnicity				
Chinese	ref	-	-	-
Malay	-0.40	1.04	-0.38(167)	0.703
Indian	-0.55	0.38	-1.42(168)	0.156
Others	0.03	0.34	0.08(168)	0.939
Class year				
Year 1	ref	-	-	-
Year 2	-0.25	0.22	-1.14(169)	0.255
Year 3	-0.46	0.29	-1.57(168)	0.117
Year 4	-0.37	0.33	-1.10(169)	0.272
Semester				
2018/19 sem 2	ref	-	-	-
2019/20 sem 1	0.29	0.17	1.73(169)	0.086

Random effects (intercept): student, SD = 1.00; residual, SD = 1.08

Table 9. Mean differences for actigraphy-derived sleep parameters relative to days with no classes for actigraphy-derived sleep parameters. Original Supp. Table 5.

Sleep variable	Start time of first class	Mean difference in hours relative to non-school days (95% CI)
Sleep onset	8	-0.38 (-0.54 to -0.21)
	9	-0.27 (-0.48 to -0.05)
	10	-0.11 (-0.27 to 0.06)
	11	-0.21 (-0.46 to 0.04)
	12	-0.16 (-0.3 to -0.02)
	14	0.05 (-0.17 to 0.26)
	16	-0.29 (-0.52 to -0.06)
Sleep offset	8	-1.72 (-2 to -1.43)
	9	-1.12 (-1.44 to -0.8)
	10	-0.94 (-1.15 to -0.73)
	11	-0.97 (-1.36 to -0.57)
	12	-0.55 (-0.72 to -0.38)
	14	-0.2 (-0.42 to 0.02)
	16	-0.25 (-0.49 to -0.01)
Nocturnal time in bed for sleep	8	-1.35 (-1.58 to -1.11)
	9	-0.8 (-1.08 to -0.52)
	10	-0.83 (-1.01 to -0.64)
	11	-0.56 (-1.01 to -0.1)
	12	-0.43 (-0.63 to -0.23)
	14	-0.24 (-0.49 to 0.01)
	16	-0.16 (-0.46 to 0.13)
Nocturnal total sleep time	8	-1.16 (-1.38 to -0.95)
	9	-0.7 (-0.95 to -0.45)
	10	-0.7 (-0.87 to -0.53)
	11	-0.53 (-0.92 to -0.14)
	12	-0.31 (-0.49 to -0.12)
	14	-0.17 (-0.37 to 0.04)
	16	-0.12 (-0.38 to 0.14)
Midpoint of sleep	8	-1.02 (-1.21 to -0.82)
	9	-0.59 (-0.83 to -0.36)
	10	-0.47 (-0.63 to -0.32)
	11	-0.47 (-0.71 to -0.23)
	12	-0.35 (-0.47 to -0.23)
	14	-0.08 (-0.25 to 0.09)
	16	-0.28 (-0.45 to -0.11)