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Scrolling toward sleep: Cellphone routines of high school students

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ABSTRACT

Debates about adolescents and cellphones often rest on total screen time, a measure that says little about what students do on their phones or when. This study surveyed 128 students in grades 9 through 12 at two high schools in Rochester, New York, recording purpose-specific use on school days and weekend days, use in the hour before sleep, homework interruption, household rules, and estimated sleep. Students reported an average of 257.2 minutes of active use per school day and 354.1 minutes per weekend day, a within-student increase of 96.9 minutes driven mainly by social media, video, and gaming. Schoolwork was reported by 85.2% of students yet accounted for only 11.2% of school-day phone time, and many students who found their phones useful for school also reported frequent interruption during homework. After adjustment for other phone use, grade, household rules, and school, each additional 30 minutes of bedtime use was associated with 12.35 fewer minutes of estimated sleep, whereas other nonacademic use was not clearly associated with sleep. Other nonacademic use was strongly associated with homework interruption, and a household homework rule with less of it. The findings suggest that the timing and purpose of use deserve more attention than total time alone.

INTRODUCTION

Few objects are as constantly present in the lives of high school students as the cellphone. The same device carries conversations with friends, social media feeds, videos, games, class announcements, maps, and the photograph of a worksheet that has to be submitted before midnight. Public concern about adolescents and phones has nonetheless tended to collapse this variety into a single number: how many hours a day students spend on their screens. That figure is easy to report and easy to worry about, but it hides most of what matters. Four hours of messaging and coursework are not the same as four hours of scrolling, and an hour of use in the afternoon is not the same as an hour in bed before sleep.

Research on adolescent technology use has increasingly questioned the value of aggregate screen time. Associations between overall digital technology use and adolescent well-being tend to be small, and they vary with how use is defined and measured (Orben & Przybylski, 2019). Self-reported totals also correspond only moderately to logged device activity (Parry et al., 2021). Several researchers have argued

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that the field would learn more by asking what people do with their devices and in which contexts, rather than how long they look at them (Ellis, 2019). Social media feeds, in particular, are not neutral containers of time. They are environments where emotionally charged and rhetorically framed content circulates. which may make them harder to put down than a message thread or a map.

Two settings bring these questions into sharp relief for high school students: homework and bedtime. Homework is a period of sustained attention that a phone can easily interrupt, even when the phone is also being used to look up course information or coordinate with classmates. Bedtime is a period in which phone use may compete directly with sleep, at an age when many adolescents already sleep less than recommended. Use in these settings may matter more than total time, and it may also be shaped by household rules that families set for them.

This article reports a survey of 128 students at two high schools in Rochester, New York. The study recorded cellphone use by purpose on school days and weekend days, located that use within daily routines, and examined its associations with homework interruption and estimated sleep. It asked how students divide phone time among communication, entertainment, schoolwork, and practical tasks; how that division changes between school days and weekends; whether use in the hour before sleep is associated with estimated sleep beyond other phone use; and how nonacademic use and household rules relate to interruption during homework.

BACKGROUND

Beyond Total Screen Time

The case for looking past total screen time is partly conceptual and partly practical. Conceptually, a phone is a general-purpose device, and its effects, if any, are likely to depend on the activity it supports. Practically, large-sample analyses have found that total technology use explains only a very small share of variation in adolescent well-being, an amount comparable to that of everyday behaviors not usually seen as risks (Orben & Przybylski, 2019). Measurement adds a further complication. A meta-analysis of studies comparing logged and self-reported digital media use found only moderate agreement between the two, with self-reports often over- or underestimating actual use (Parry et al., 2021). These findings do not mean that phone use is unimportant. They suggest that research should separate purposes and contexts and should be cautious about what self-reported durations can show.

Attention to purpose also has a methodological precedent in research on social networks. Sabbar and Matheson (2019) examined how the characteristics of social network users related to the messages they chose to engage with, treating the user and the activity as distinct objects of analysis. The present study adopts a similar distinction at a much simpler level. It does not analyze content, but it records the purposes of use alongside the characteristics of the student, so that a student who spends hours on coursework coordination is not grouped with one who spends the same time watching videos.

Phones and Adolescent Sleep

The relationship between screen media and adolescent sleep has been studied extensively. Reviews have identified several plausible mechanisms: media use can displace time that would otherwise be spent sleeping, stimulating content can increase arousal, and light from screens may delay the onset of sleep (Cain & Gradisar, 2010). A systematic review of screen time and sleep among school-aged children and adolescents found adverse associations in the large majority of included studies, most often with delayed bedtimes and shorter sleep (Hale & Guan, 2015). A later meta-analysis focused on portable devices reported that bedtime access to and use of such devices was associated with inadequate sleep quantity, poor sleep quality, and daytime sleepiness (Carter et al., 2016). Professional guidance recommends 8 to 10 hours of sleep per 24 hours for adolescents aged 13 to 18 (Paruthi et al., 2016).

Much of this evidence concerns screen use in general or device presence in the bedroom. Fewer studies separate use in the period immediately before sleep from use earlier in the day while also

accounting for the purposes of use. That separation matters. If shorter sleep is associated chiefly with total entertainment time, the relevant question for families is how much students use their phones. If it is associated chiefly with use close to bedtime, the more relevant question is when.

Homework and Interruption

Phones occupy an ambiguous position in schoolwork. Students use them to check assignments, message classmates about group projects, and photograph and submit work. The same device also delivers notifications and offers entertainment one tap away. Observational research on students studying at home found that they stayed on task for only a few minutes at a time before switching to something else, frequently to technology such as texting or social media, and that frequent switching was associated with poorer academic outcomes (Rosen et al., 2013). Students' belief that their phones help them with school may therefore coexist with a pattern of interruption that makes homework take longer.

Household Rules

Families often respond to these concerns by setting rules, such as no phones at the dinner table, during homework, or after a certain hour. Research on family routines has found that adolescents whose parents set and enforce bedtime rules tend to sleep longer, and that keeping electronic devices on in the bedroom at night is associated with shorter sleep (Buxton et al., 2015). Rules are not random, however. They may reflect broader household routines, parental concerns about earlier difficulties, or a student's age. An association between a rule and an outcome may therefore reflect the families that adopt rules as much as the rules themselves.

METHOD

Design

The study used a cross-sectional survey to examine how high school students in Rochester, New York, used cellphones on school days and weekends. The unit of analysis was the individual student. The study focused on active use, the purposes for which the phone was used, and the placement of that use within daily routines, with particular attention to schoolwork, interruption during homework, and use in the hour before sleep. Recording several activities separately avoided treating total time as a sufficient description of cellphone behavior. The study was exploratory and did not adopt a clinical definition of excessive use.

Participants

The analytical sample comprised 128 students in grades 9 through 12. Two school strata, School A and School B, contributed 64 records each, and within each school the quota was 16 students per grade, giving 32 students per grade across the sample. Eligible students were currently enrolled in high school, were aged 14 to 18 years, and had access to a cellphone at least once during the reference week, either through personal ownership or regular use of a shared device. Because students without cellphone access fell outside the intended population, the study could not estimate cellphone ownership among Rochester students as a whole.

The balanced structure preserved coverage of earlier and later high school years within a modest sample. Selection relied on school and grade quotas rather than probability sampling, and no response rate could be calculated because a complete invitation denominator was not recorded. The sample size was fixed at 128 rather than derived from a formal power calculation, and subgroup analyses were limited accordingly. All 128 records were complete for the variables analyzed. The design supports comparisons within the sample but not weighted estimates for the Rochester student population.

Questionnaire

The questionnaire took about 15 minutes to complete and used the preceding seven days as its reference period. It recorded age, grade, gender, school, and whether the student had personal or shared access to a cellphone. Students indicated whether they had used their phone for each of six purposes during the week and estimated their average minutes of active use for each purpose on a school day and on a weekend day. The six purposes were messaging and voice calls, social media feeds, video viewing, gaming, schoolwork and learning, and practical tasks

or information searches. The last category covered activities such as checking travel arrangements, using a map, and looking up information unrelated to an assignment.

Purpose took precedence over the application used. A message arranging a group assignment counted as schoolwork, while an unrelated conversation counted as communication. A video watched to complete an assignment counted as learning, and an entertainment video as video viewing. Students were asked to assign each period of use to its main purpose and not to count the same minutes twice. Background audio, use of computers or tablets, and periods when the phone was idle were excluded, while voice calls were included even when the screen was off. The resulting totals represent reported activity time rather than operating-system screen-time figures or verified device logs.

A separate set of questions located phone use within daily routines: keeping the phone within reach of the bed, checking it within 15 minutes of waking, recreational use during lessons, silencing notifications while doing homework, and placing the phone out of reach while studying. Bedtime use was defined as nonacademic phone activity in the 60 minutes before the student intended to sleep. Its duration was recorded as average minutes per school night, including nights with no use, and its frequency as the number of nights with any such use during the week. Household rules about homework and about bedtime were recorded separately. These questions identified whether a rule existed, not how it was enforced or whether the student followed it.

Homework interruption was measured with four items asking how often students checked personal messages while studying, switched to entertainment before finishing a task, had to resume work after a notification interrupted them, and spent longer on homework because of phone checks. Responses ranged from 1 (never) to 5 (very often), and the mean of the four items formed the interruption score. A score of 3 or above was used as a descriptive threshold for frequent interruption, not as a diagnostic cutoff. Further items asked whether students used their phones to find course information, coordinate assignments, or photograph and submit work, and whether the phone made school tasks easier. The last item measured perceived usefulness rather than demonstrated learning.

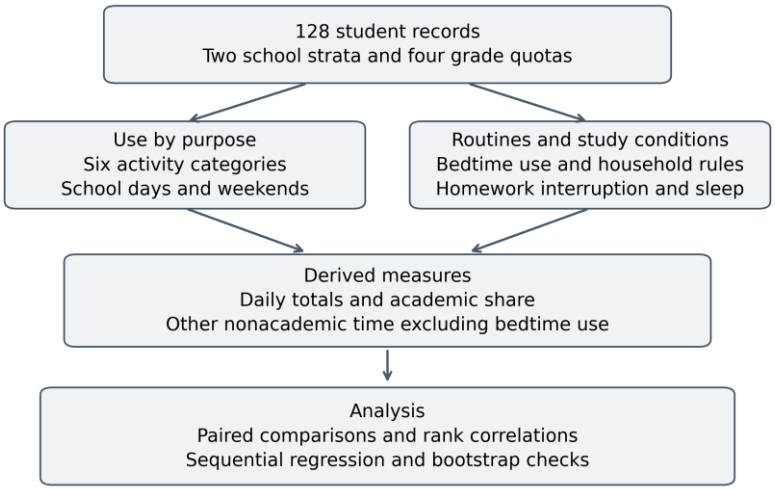
School-night sleep was recorded as the estimated number of minutes actually slept, excluding time spent awake after going to bed, and was analyzed as a continuous variable. The proportion of students reporting less than eight hours is given as a description of the distribution, not as a clinical assessment. The questionnaire was developed for this study and had not been externally validated, so reliability was examined within the sample.

Data Preparation

Daily totals were obtained by summing the six mutually exclusive purpose categories. The weekly average was calculated as five times the school-day total plus two times the weekend-day total, divided by seven. Zero minutes were retained when a student did not engage in a category. Each record was checked for the stipulated age range, grade coding, nonnegative durations, and consistency between reported participation and duration. All 128 records were retained, and no imputation was needed.

Bedtime use was restricted to the 60-minute window before intended sleep and could not exceed total nonacademic school-day use. Other nonacademic time was calculated by subtracting bedtime minutes from the nonacademic total, so that the two predictors did not count the same minutes twice. Homework and bedtime rules were coded separately because a rule aimed at one setting need not apply to the other. Internal consistency of the four interruption items was assessed with Cronbach's (1951) alpha.

Figure 1. Analytical Workflow



Note. All stages concern the same 128 records. Arrows indicate the order of data preparation and analysis rather than causal effects.

Statistical Analysis

Counts and percentages described participant characteristics and weekly participation in each activity. Means and standard deviations summarized durations, and medians and interquartile ranges showed the spread of total phone time. Purpose-specific means included all students, with zeros for those who did not engage in a category. The academic share of school-day use was calculated by dividing total schoolwork minutes by total phone minutes across the sample, making it a share of aggregate time rather than an average of individual proportions.

School-day and weekend-day totals were compared within students using a paired t test, a 95% confidence interval for the mean difference, and the paired standardized difference dz (Lakens, 2013). A Wilcoxon signed-rank test checked whether the result depended on the parametric test. Spearman correlations described the relationships between bedtime use and sleep, between other nonacademic use and homework interruption, and between grade and total school-day use. All tests were two-sided.

An ordinary least squares model estimated school-night sleep in minutes from bedtime use (per 30 minutes), other nonacademic use (per hour), schoolwork use (per hour), grade, the presence of a bedtime rule, and school. Grade was centered at 10.5 and entered as a linear term, with School A and the absence of a bedtime rule as reference categories. Standard errors used the HC3 estimator (Long & Ervin, 2000), with t-based intervals on 121 residual degrees of freedom. A sensitivity model replaced grade with centered age, since the two overlap closely. Variance inflation factors were checked for predictor redundancy. With only two schools, school was entered as an indicator rather than modeled as a random effect or used for cluster-robust inference.

To separate the contribution of timing from that of student characteristics and overall use, the sleep analysis was also estimated as three nested models. Model 1 included grade, bedtime rule, and school. Model 2 added other nonacademic hours and schoolwork hours. Model 3 added bedtime use. Changes in R^2 described the additional sample variation accounted for at each step, and partial R^2 for the bedtime term was calculated relative to the variation left unexplained by Model 2. These are descriptions of in-sample fit rather than assessments of predictive accuracy. Changes in the bedtime-rule coefficient across models were examined without treating attenuation as evidence of mediation.

A second regression modeled the mean interruption score from other nonacademic use, schoolwork use, a household homework rule, grade, and school, again with HC3 standard errors and t-

based 95% intervals on 122 residual degrees of freedom. Treating the averaged score as approximately continuous made coefficients interpretable in score points, although the bounded scale calls for caution beyond the observed range.

Two thousand bootstrap samples were drawn by resampling students with replacement within each of the eight school-by-grade strata, so that every resample kept 16 records per stratum. Percentile intervals were obtained for the weekend minus school-day difference, the bedtime coefficient in the full sleep model, the nonacademic-use coefficient in the interruption model, and the mean duration of each purpose. These intervals reflect resampling variability given the observed sample structure and cannot correct for selection bias. The full sleep model was also refitted 128 times, each time omitting one record, to check whether the bedtime coefficient depended on any single observation. A Holm (1979) adjustment was applied to three focal tests: the paired difference in total use, the bedtime term in the sleep model, and the nonacademic-use term in the interruption model. This family was chosen for the analysis and was not preregistered; other correlations and secondary coefficients were reported without adjustment.

Ethical Considerations

Because most participants were minors, the research required institutional ethical review, school authorization, parental permission where applicable, and the affirmative assent of students, with students aged 18 consenting for themselves. Participation was voluntary, students could skip any question, and teachers did not receive individual responses. The questionnaire excluded names, telephone numbers, account identifiers, message contents, and private photographs, and permission records were stored separately from responses. Data governance problems and cybersecurity vulnerabilities are persistent concerns in data-intensive sectors (Habib Zadeh Khiyaban & Sabbar, 2026), and leaving identifying details out of the dataset reduced what could be exposed if records were compromised. Sabbar's (2026) discussion of children's visibility, privacy, and consent on social media informed the decision to minimize the collection of identifiable digital material, although that study concerns Persian-language platforms and is not treated here as evidence about American high school students.

RESULTS

Participants

The 128 students were evenly divided across the four grades and the two schools. Ages ranged from 14 to 18 years (M = 15.84, SD = 1.25). The sample included 62 girls and 62 boys, and four students did not disclose their gender. Most students (121, 94.5%) had a personal cellphone, and the remaining seven (5.5%) used a shared device; they were retained in all analyses because the study concerned students with access rather than owners alone. Table 1 summarizes the sample. The equal grade and school proportions reflect the quota design and should not be read as estimates of enrollment in Rochester.

Table 1. *Characteristics of the Sample*

Characteristic	n	%
School A or School B (each)	64	50.0
Grade 9, 10, 11, or 12 (each)	32	25.0
Boys	62	48.4
Girls	62	48.4
Gender not disclosed	4	3.1
Personal cellphone	121	94.5
Shared cellphone	7	5.5

Note. N = 128. School and grade rows give the count and percentage for each school or grade. Gender and access are separate classifications; percentages within each total 100, subject to rounding.

School Days and Weekends

Students reported an average of 257.2 minutes of active phone use per school day (SD = 111.3), or about 4.3 hours. The median was 244.5 minutes, with an interquartile range of 173.0 to 313.2 minutes; the gap between mean and median reflects a minority of students reporting comparatively long use. Sixty-six students (51.6%) reported at least four hours on a school day. This threshold describes duration only. The same total could combine very different mixtures of schoolwork, conversation, and entertainment, and it does not identify problematic use.

Weekend use was higher, averaging 354.1 minutes per day (SD = 166.1), with a median of 336.5 minutes and an interquartile range of 223.8 to 445.0 minutes. Averaged across the week, students reported 284.9 minutes per day (SD = 126.4), or about 4.75 hours. Weekend use exceeded school-day use for 126 of the 128 students. The mean within-student increase was 96.9 minutes, 95% CI [86.3, 107.5], $t(127) = 18.17$, $p < .001$, $dz = 1.61$, and the Wilcoxon test gave the same result, $W = 3$, $p < .001$.

What Students Used Their Phones For

Every student reported messaging or voice calls during the week, making direct communication the most widespread activity. Video viewing was also nearly universal, followed by social media feeds and schoolwork. Gaming was reported by fewer students, although those who played could account for substantial time. Table 2 distinguishes participation in each activity from the time allocated to it. Participation percentages overlap because students could engage in several activities, while the duration categories were defined so that minutes did not overlap.

Table 2. *Purposes and Duration of Cellphone Use*

Purpose	Weekly use, n (%)	School day, M (SD)	Weekend day, M (SD)
Messaging and voice calls	128 (100.0)	48.8 (23.1)	60.3 (29.8)
Social media feeds	113 (88.3)	70.3 (54.5)	106.2 (82.6)
Video viewing	121 (94.5)	59.8 (35.6)	92.5 (56.8)
Gaming	78 (60.9)	32.4 (34.1)	55.1 (58.4)
Schoolwork and learning	109 (85.2)	28.7 (17.3)	20.9 (12.8)
Practical tasks and information	97 (75.8)	17.2 (13.3)	19.1 (15.6)
Total active use	128 (100.0)	257.2 (111.3)	354.1 (166.1)

Note. Durations are in minutes per day. All means include the 128 students, with zero minutes for those who did not engage in a category. Weekly participation is a multiple-response measure. Purpose-specific means may not sum exactly to the total because of rounding; standard deviations cannot be added.

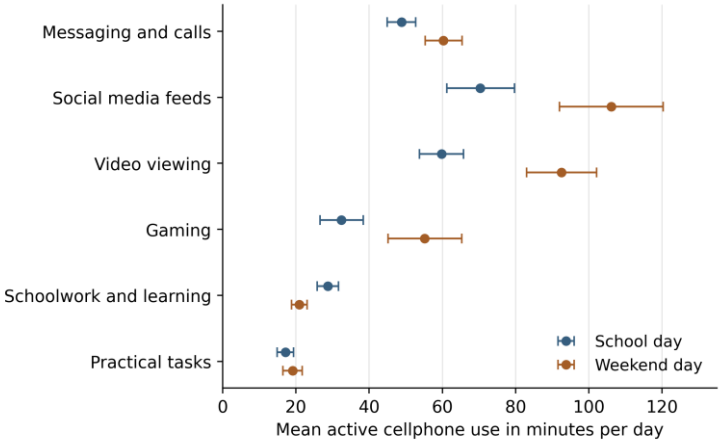
Social media feeds took the largest share of school-day time, at an average of 70.3 minutes, followed by video viewing at 59.8 minutes. Together these two activities made up 50.6% of aggregate school-day phone time, and their combined average rose from 130.1 minutes on a school day to 198.7 minutes on a weekend day. Gaming also increased at weekends, whereas schoolwork fell from 28.7 to 20.9 minutes. The weekend increase therefore came mainly from entertainment rather than from a uniform rise across all purposes.

Schoolwork and learning were reported by 109 students (85.2%), yet academic use accounted for only 11.2% of aggregate school-day phone time. Specific academic uses included looking up course information (84 students, 65.6%), coordinating schoolwork with classmates (75, 58.6%), and photographing or submitting work (63, 49.2%); these categories were not mutually exclusive. Ninety-two students (71.9%) agreed that their phone made school tasks easier. That view did not exclude interruption. Thirty-eight students, 29.7% of the full

sample, both regarded the phone as useful for school and had an interruption score of 3 or more. Practical value and disruption, in other words, appeared in the same students rather than in separate groups.

Figure 2 shows the school-day and weekend profiles with bootstrap intervals. Larger weekend allocations to social media, video, and gaming contrast with the lower allocation to schoolwork. Overlap between intervals is not a formal test of difference, and because the same students reported each activity, any inferential claim about a specific change would require a paired comparison. The figure is intended to show how time was distributed across purposes, not to rank students by the quality of their activities.

Figure 2. *Cellphone Use by Purpose and Type of Day*



Note. Points are mean minutes for all 128 students, including zero values. Bars are 95% percentile intervals from 2,000 bootstrap resamples within school and grade strata. Intervals are conditional on the sample and do not account for quota selection.

Phones in Daily Routines

Phones were closely tied to sleeping and waking. Ninety-two students (71.9%) kept the phone within reach of their bed, and 84 (65.6%) checked it within 15 minutes of waking. Forty-six (35.9%) reported phone use before sleep on at least four nights of the reference week. Average use in the hour before sleep was 23.75 minutes per school night (SD = 18.16), with nights of no use included. Keeping a phone near the bed does not by itself mean using it through the night, but it describes the setting in which nighttime checking can occur. Location, duration, and frequency were therefore measured separately (Table 3).

Table 3. Cellphone Routines, Interruption, and Household Rules

Behavior or condition	n	%
Used phone before sleep on at least four nights	46	35.9
Kept phone within reach of the bed	92	71.9
Checked phone within 15 minutes of waking	84	65.6
Used phone recreationally during class on at least three days	29	22.7
Frequent homework interruption	48	37.5
Silenced notifications during homework on at least three days	72	56.2
Placed phone out of reach during homework on at least three days	48	37.5
Household bedtime rule	43	33.6
Household homework rule	50	39.1

Note. N = 128 for every row. Categories overlap. Frequent homework interruption is a mean item score of 3 or more on the 1 to 5 scale and is not a clinical classification.

The mean interruption score was 2.69 (SD = 0.67), and 48 students (37.5%) met the descriptive threshold for frequent interruption. The four items showed acceptable internal consistency in the sample (α = .70), although this coefficient reflects covariation among the items and does not establish validity. Other nonacademic school-day use, excluding bedtime minutes, was strongly and positively related to interruption, ρ = .69, p < .001. Grade showed almost no monotonic relationship with total school-day use, ρ = −.03, p = .768, though this does not show that use patterns were the same across grades.

Many students also took steps to manage their phones while studying. Seventy-two (56.2%) silenced notifications on at least three school days, and 48 (37.5%) placed the phone out of reach during homework on at least three days. Homework rules were reported in 50 households (39.1%) and bedtime rules in 43 (33.6%). Students with a bedtime rule averaged 14.5 minutes of bedtime use, compared with 28.4 minutes among those without one, and their average sleep was 480.3 and 468.6 minutes, respectively. These unadjusted contrasts describe the two groups. They do not show that introducing a rule would change either outcome, since rules may accompany other family routines that the questionnaire did not measure.

Bedtime Use and Sleep

Estimated school-night sleep averaged 472.5 minutes (SD = 29.5), or 7.88 hours, and 75 students (58.6%) reported less than eight hours. Bedtime phone use was inversely related to sleep in the unadjusted rank correlation, ρ = −.33, p < .001. The adjusted model examined whether this association held after accounting for other phone use, grade, household bedtime rules, and school (Table 4).

Table 4. Adjusted Associations With School-Night Sleep Duration

Predictor	B	SE	95% CI	p
Intercept	488.61	10.81	[467.21, 510.02]	< .001
Bedtime use (per 30 minutes)	−12.35	4.94	[−22.14, −2.57]	.014
Other nonacademic use (per hour)	−3.27	1.70	[−6.63, 0.10]	.057
Schoolwork use (per hour)	1.56	10.01	[−18.25, 21.37]	.876
Grade (per year)	−3.18	1.98	[−7.10, 0.74]	.111
Bedtime rule present	4.59	5.56	[−6.42, 15.60]	.411
School B vs. School A	5.09	5.19	[−5.19, 15.36]	.329

Note. N = 128. The outcome is estimated sleep in minutes. Standard errors use HC3 estimation. Grade is centered at 10.5. No bedtime rule and School A are the reference categories. Other nonacademic use excludes bedtime minutes. R^2 = .181; adjusted R^2 = .140; residual df = 121.

Each additional 30 minutes of bedtime use was associated with 12.35 fewer minutes of estimated sleep, 95% CI [−22.14, −2.57], p = .014, holding the other variables constant. The coefficient for other nonacademic use was much smaller per unit of time, and its interval included zero, B = −3.27, 95% CI [−6.63, 0.10]. Schoolwork use had a very wide interval, so the data say little about its association with sleep. Grade, the bedtime rule, and school also had intervals spanning zero. Notably, once phone use and the other covariates were taken into account, the bedtime rule showed no clear separate association with sleep, despite the difference between rule and no-rule groups before adjustment.

The model accounted for 18.1% of the variation in estimated sleep (adjusted R^2 = .140). The largest variance inflation factor was 1.33, indicating little redundancy among predictors. Replacing grade with age left the bedtime coefficient almost unchanged, B = −12.36, 95% CI [−22.25, −2.47], p = .015. That

check addresses one modeling choice. It does not rule out confounding by homework demands, commuting, extracurricular activities, family schedules, or existing sleep difficulties, and the cross-sectional design cannot show whether phone use came before shorter sleep or whether students who were already awake used their phones more. Figure 3 displays the adjusted coefficients.

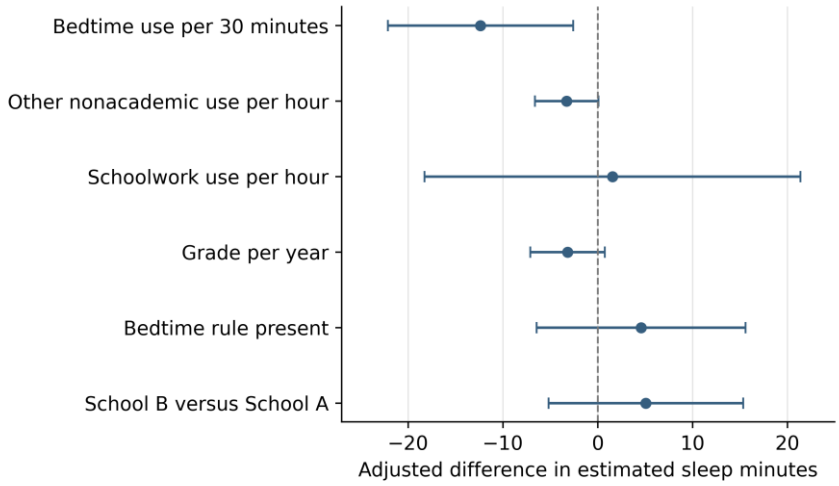


Figure 3. *Adjusted Coefficients for School-Night Sleep*

Note. Points are unstandardized coefficients from Table 4, and horizontal bars are 95% HC3 t-based confidence intervals. The dashed line marks no adjusted difference. Predictors are measured in different units, so coefficient size does not indicate relative importance. The intercept is omitted.

Timing Beyond Total Use

The nested models show how much the fit changed when timing was added to the duration measures (Table 5). Grade, bedtime rule, and school together accounted for 5.6% of the variation in sleep. Adding other nonacademic and schoolwork time raised R^2 to .132, and adding bedtime use raised it to .181. The final step accounted for 4.8 percentage points of total variation, or 5.6% of the variation left unexplained by Model 2. This is a modest contribution, and sleep was clearly shaped by much that the models did not capture.

Table 5. *Sequential Sleep Models and the Bedtime-Rule Coefficient*

Model	R^2	Adjusted R^2	ΔR^2	Rule B	Rule 95% CI
Model 1	.056	.033	—	12.75	[2.58, 22.92]
Model 2	.132	.097	.076	9.13	[−1.34, 19.61]
Model 3	.181	.140	.048	4.59	[−6.42, 15.60]

Note. N = 128 in every model. Model 1 includes grade, bedtime rule, and school. Model 2 adds other nonacademic hours and schoolwork hours. Model 3 adds bedtime use. Rule coefficients are in minutes of sleep with HC3 intervals.

The bedtime-rule coefficient fell from 12.75 minutes in Model 1 to 9.13 in Model 2 and 4.59 in Model 3, and its interval excluded zero only in the first model. This pattern is consistent with overlap between having a rule and patterns of phone use in the sample. It cannot show whether rules changed

behavior, reflected existing family routines, or were introduced in response to earlier problems, and the decline in the coefficient is not taken as evidence of an indirect effect through bedtime use.

Homework Interruption

In the interruption model, each additional hour of other nonacademic school-day use was associated with a 0.258-point higher interruption score, 95% CI [0.212, 0.305], p < .001. A household homework rule was associated with a score 0.442 points lower, 95% CI [−0.590, −0.294], after accounting for phone use, grade, and school. The coefficient for schoolwork use was negative but imprecise, and grade and school also had intervals spanning zero (Table 6). The model explained 62.0% of the variation in interruption (adjusted R^2 = .604).

Table 6. Regression Estimates for Homework Interruption

Predictor	B	SE	95% CI	p
Intercept	2.052	0.124	[1.807, 2.297]	< .001
Other nonacademic use (per hour)	0.258	0.024	[0.212, 0.305]	< .001
Schoolwork use (per hour)	−0.111	0.127	[−0.361, 0.140]	.383
Homework rule present	−0.442	0.075	[−0.590, −0.294]	< .001
Grade (per year)	0.052	0.034	[−0.015, 0.118]	.129
School B vs. School A	−0.030	0.076	[−0.181, 0.121]	.698

Note. N = 128. The outcome is the mean interruption score on a 1 to 5 scale, and coefficients are in score points. Standard errors and intervals use HC3 estimation. Other nonacademic use excludes bedtime minutes. No homework rule and School A are the reference categories. Grade is centered at 10.5. Residual df = 122.

Interruption and phone use were reported for the same week, and a high R^2 within the sample does not establish predictive accuracy elsewhere. Predictive accuracy and robustness are better judged by comparing model performance across multiple contexts (Habib Zadeh Khiyaban & Sabbar, 2022), which a single-week sample from two schools cannot provide. The bounded response scale also limits extrapolation beyond the observed values. Grades, task completion, and learning were not measured, so neither academic phone use nor perceived usefulness can be taken as evidence of educational benefit. As with bedtime rules, the presence of a homework rule may reflect wider family routines or responses to earlier difficulties.

Robustness Checks

The stratified bootstrap interval for the weekend minus school-day difference was [86.4, 107.0] minutes, close to the paired t interval. The bootstrap interval for the bedtime coefficient in the sleep model was [−21.05, −3.75] minutes per additional 30 minutes of use, and for the nonacademic-use coefficient in the interruption model it was [0.216, 0.305] score points per hour. Each kept the direction of the fitted estimate. Omitting one record at a time from the sleep model produced bedtime coefficients between −13.72 and −10.65 minutes, so the direction of the association did not depend on any single student. After Holm adjustment, the three focal tests retained p < .001 for the difference in total use, p = .014 for bedtime use in the sleep model, and p < .001 for nonacademic use in the interruption model. These checks address multiplicity and numerical stability within the sample; they do not correct for selection bias or replace independent replication.

DISCUSSION

The students in this study spent a great deal of time on their phones, averaging more than four hours on school days and nearly six on weekend days. Yet the most informative findings concern not how much they used their phones but what they used them for

and when. Entertainment dominated, and it accounted for most of the weekend increase. Schoolwork was almost universal but occupied a small slice of time. Use in the hour before sleep was associated with shorter estimated sleep even after other phone use was taken into account, while nonacademic use during the rest of the day showed no clear association with sleep but a strong one with interruption during homework. Each of these patterns would be invisible in a single measure of screen time.

The bedtime finding is consistent with a large body of research linking screen use near bedtime to shorter and later sleep (Cain & Gradisar, 2010; Carter et al., 2016; Hale & Guan, 2015). What the present analysis adds is a separation between timing and amount. Per unit of time, bedtime use carried a much larger coefficient than other nonacademic use, and its contribution to model fit remained after other phone use had been entered. One interpretation is that phone use close to sleep displaces sleep more directly than use earlier in the evening, perhaps by delaying the moment a student puts the phone down and tries to sleep. Another is that students who have trouble falling asleep reach for their phones. The cross-sectional design cannot choose between these readings. Still, the size of the association deserves attention. A student using a phone for an hour before bed on school nights would, on this estimate, sleep about 25 minutes less than an otherwise similar student who did not, in a sample where most students already reported less than the 8 to 10 hours recommended for their age group (Paruthi et al., 2016).

The schoolwork findings point to an ambivalent role. Most students used their phones for school, and most believed the phone made school tasks easier. These uses are real: looking up course information, coordinating with classmates, and submitting work are now routine parts of high school. Yet academic use accounted for barely a tenth of phone time, and nearly a third of all students combined a belief in the phone's usefulness with frequent interruption during homework. This combination fits observational evidence that students studying with technology at hand switch tasks often (Rosen et al., 2013). For these students, the phone is both a study tool and a source of distraction, and the two cannot easily be separated by removing the device. Research on virtual education offers a complementary educational perspective, emphasizing that meaningful technology-supported learning requires thoughtfully designed activities that promote active participation, social interaction, and critical engagement rather than access to digital tools alone (Dastyar et al., 2023).

Household rules showed a mixed picture. Homework rules were associated with lower interruption scores even after phone use was accounted for, which suggests that such rules may coincide with study conditions that the time measures did not capture. Bedtime rules, by contrast, were associated with longer sleep only before phone use entered the model. The attenuation of the rule coefficient is consistent with research linking family bedtime routines to adolescent sleep (Buxton et al., 2015), but it does not show that rules work through reduced bedtime use. Families that set rules may differ in many other ways, and some rules may be responses to problems that had already appeared.

Students' own management strategies are also worth noting. More than half silenced notifications during homework on most school days, and more than a third placed the phone out of reach. These practices suggest that many adolescents are aware of the phone's capacity to interrupt and take steps to limit it. Interventions that build on such practices, rather than treating students as passive users, may be more acceptable to them than blanket restrictions.

For schools and families, the findings suggest focusing on specific contexts rather than total time. Encouraging students to put phones away in the hour before sleep, and to keep them out of reach during homework, addresses the two settings where associations with sleep and interruption were clearest. Such advice also preserves the practical uses of the phone for communication and schoolwork, which most students valued. For researchers, the findings reinforce calls to measure purpose and timing rather than aggregate screen time (Ellis, 2019; Orben & Przybylski, 2019).

LIMITATIONS

Several limitations qualify these conclusions. The sample was small and drawn from two schools using quotas rather than probability selection, no response rate could be calculated, and the results cannot be generalized to all Rochester students or to adolescents elsewhere. Phone use and sleep were self-reported estimates, and self-reported media use often departs from logged activity (Parry et al., 2021); assigning minutes to a single main purpose may also have been difficult for students who switched quickly between activities. When a question is difficult, respondents may prefer to give an answer rather than admit that they do not know (Sabbar et al., 2019). The questionnaire had not been externally validated, and the interruption scale, although internally consistent, had no independent validation. The design was cross-sectional, so the direction of associations is unknown, and important influences on sleep and homework, such as workload, commuting, extracurricular activities, and existing sleep problems, were not measured. Household rules were recorded as present or absent, without information on enforcement or compliance. With only two schools, school-level differences could not be modeled beyond a simple indicator. Finally, the three focal tests were chosen for this analysis rather than preregistered, and the remaining tests were not adjusted for multiplicity.

FUTURE RESEARCH

Longitudinal studies with independently recorded device activity would clarify whether bedtime phone use precedes shorter sleep or follows difficulty sleeping. Combining device logs with brief diaries could preserve information about purpose while reducing reliance on recall. Studies that record how household rules are made and enforced, and that measure academic outcomes directly, would help determine whether the associations observed here translate into differences in learning and well-being. Larger samples across more schools would allow school-level variation to be examined properly.

CONCLUSION

For the high school students in this study, the cellphone was at once a means of communication, a source of entertainment, a study aid, and a constant presence beside the bed. Total time on the phone was high, but its meaning depended on purpose and timing. Entertainment drove the weekend increase, schoolwork was common but brief, use in the hour before sleep was associated with shorter estimated sleep, and nonacademic use during the day was closely tied to interruption during homework. These findings argue for attention to when and why adolescents use their phones, not only to how long, and for longitudinal research capable of testing the associations observed here.

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