

Table 1. Characteristics of the sample

	All (N=303)	In school (n=194)	On break (n=109)	P-value
Demographics				
Female sex, %	47.5%	45.4%	51.4%	0.314
Racial/ethnic minority, %	21.5%	20.1%	23.9%	0.445
Age, years	16.2 (2.2)	16.0 (2.1)	16.7 (2.4)	0.009
Tanner stage, score	4.1 (0.8)	4.1 (0.8)	4.2 (0.8)	0.155
Anthropometrics				
BMI, percentile	66.0 (28.0)	64.3 (28.7)	69.2 (26.4)	0.143
VAT, cm ²	59.9 (39.4)	57.9 (39.5)	63.5 (39.2)	0.236
SAT, cm ²	223.5 (159.0)	215.1 (155.0)	238.3 (165.5)	0.224
Blood pressure				
SBP, mmHg	113.2 (11.7)	112.5 (11.6)	114.5 (11.6)	0.141
DBP, mmHg	66.8 (8.6)	66.1 (8.4)	68.1 (8.4)	0.053
Actigraphy				
Overall				
Sleep midpoint, hh:mm	3:55 (1:31)	3:30 (1:34)	4:40 (1:06)	<0.001
Sleep irregularity, hh:mm	0:56 (0:32)	0:57 (0:34)	0:54 (0:28)	0.492
Sleep duration, min	420.1 (50.0)	417.3 (47.9)	425.2 (53.5)	0.187
Sleep variability, min	71.5 (36.7)	68.6 (34.5)	76.5 (40.0)	0.073
Weekdays				
Bedtime, hh:mm	23:23 (1:29)	22:59 (1:24)	24:08 (1:20)	<0.001
Rising time, hh:mm	7:52 (1:50)	7:14 (1:46)	8:59 (1:21)	<0.001
Sleep midpoint, hh:mm	3:04 (1:24)	2:36 (1:16)	3:55 (1:13)	<0.001
Sleep irregularity, hh:mm	0:50 (0:48)	0:47 (0:54)	0:56 (0:33)	0.116
Sleep duration, min	418.6 (53.2)	409.9 (48.7)	434.1 (57.4)	<0.001
Sleep variability, min	64.0 (40.6)	58.3 (37.6)	74.1 (43.8)	0.001
Weekends				
Bedtime, hh:mm	23:51 (1:30)	23:34 (1:27)	24:20 (1:28)	<0.001
Rising time, hh:mm	8:43 (1:26)	8:34 (1:32)	8:58 (1:14)	0.024
Sleep midpoint, hh:mm	3:41 (1:20)	3:30 (1:21)	4:02 (1:13)	0.001
Sleep irregularity, hh:mm	n/a	n/a	n/a	n/a
Sleep duration, min	446.0 (82.2)	459.0 (80.5)	422.5 (80.3)	<0.001
Sleep variability, min	n/a	n/a	n/a	n/a
Weekends – Weekdays				
Bedtime, hh:mm	0:27 (1:10)	0:35 (1:13)	0:12 (1:04)	0.007
Rising time, hh:mm	0:50 (1:44)	1:20 (1:42)	-0:02 (1:26)	<0.001
Sleep midpoint, hh:mm	0:37 (1:23)	0:53 (1:27)	0:07 (1:06)	<0.001
Sleep irregularity, hh:mm	n/a	n/a	n/a	n/a
Sleep duration, min	27.2 (84.6)	49.1 (76.4)	-12.3 (84.7)	<0.001
Sleep variability, min	n/a	n/a	n/a	n/a
Morningness-Eveningness				
Morning-type, %	33.3%	32.5%	34.9%	0.357
Intermediate-type, %	34.3%	38.1%	27.5%	

Evening-type, %	32.3%	29.4%	37.6%	
Polysomnography				
Sleep duration, min	446.6 (58.3)	454.6 (52.1)	432.3 (65.7)	0.001
AHI, events / hour	2.6 (6.0)	2.2 (2.8)	3.2 (9.3)	0.192

Data are mean (SD) or % for continuous and categorical variables, respectively. AHI = apnea/hypopnea index; BMI = body mass index; DBP = diastolic blood pressure; n/a = not applicable; SAT = Subcutaneous adipose tissue; SBP = systolic blood pressure; VAT = Visceral adipose tissue. Blood pressure levels between groups adjusted for age. Bold p-values are statistically significant at < 0.05

Table 2. Association of visceral adiposity and circadian timing of sleep with blood pressure

	Over all (N= 303)		In School (n= 194)		On Break (n= 109)	
	SBP	DBP	SBP	DBP	SBP	DBP
Sleep Midpoint						
Visceral Adiposity	3.52 (0.67) <0.001*	1.82 (0.51) <0.001*	4.44 (0.87) <0.001*	1.99 (0.68) 0.004*	2.58 (1.09) 0.020*	2.23 (0.82) 0.008*
Sleep Midpoint	1.11 (0.68) 0.101	-0.13 (0.52) 0.806	1.63 (0.90) 0.071 ^T	-0.19 (0.70) 0.788	-2.52 (1.41) 0.077 ^T	-2.04 (1.06) 0.056 ^T
Visceral Adiposity * Sleep Midpoint	-0.84 (0.64) 0.195	0.04 (0.49) 0.936	1.27 (0.94) 0.179	1.29 (0.73) 0.078 ^T	-1.95 (1.19) 0.104	-1.28 (0.89) 0.153
Sleep Regularity						
Visceral Adiposity	3.48 (0.67) <0.001*	1.80 (0.51) <0.001*	4.26 (0.88) <0.001*	1.95 (0.67) 0.004*	2.48 (1.11) 0.027*	2.15 (0.83) 0.011*
Sleep Irregularity	0.03 (0.65) 0.965	-0.45 (0.50) 0.371	0.03 (0.79) 0.966	-0.76 (0.60) 0.211	0.05 (1.19) 0.966	-0.11 (0.89) 0.899
Visceral Adiposity * Sleep Irregularity	1.45 (0.53) 0.007*	0.94 (0.41) 0.022*	1.67 (0.59) 0.005*	1.36 (0.45) 0.003*	1.17 (1.22) 0.340	-0.50 (0.92) 0.591

Data are unstandardized regression coefficients (standard error) p-value for each standard deviation increase (z-scores) associated with each independent variable (main effects without interaction in the model) and their interaction (with main effects in the model).

Adjusted for sex, age, race/ethnicity, polysomnography-measured apnea/hypopnea index, actigraphy-measured sleep duration, and actigraphy-measured sleep variability. * p-value<0.05, ^T 0.05<p-value<0.10

Table 3. Association of visceral adiposity and circadian timing of sleep during weekdays and weekends with blood pressure as a function of being in school vs. on break

	In School		On Break	
	SBP	DBP	SBP	DBP
Weekdays				
Visceral Adiposity	4.43 (0.87) <0.001*	1.99 (0.67) 0.003*	2.18 (1.08) 0.046*	1.88 (0.82) 0.023*
Sleep Midpoint	2.01 (1.13) 0.076 ^T	0.58 (0.87) 0.504	-2.54 (1.29) 0.052 ^T	-1.51 (0.98) 0.124
Visceral Adiposity * Sleep Midpoint	1.82 (0.81) 0.026*	1.27 (0.62) 0.043*	-0.54 (1.15) 0.642	-0.24 (0.87) 0.787
Visceral Adiposity	4.36 (0.87) <0.001*	1.94 (0.67) 0.004*	2.25 (1.10) 0.044*	1.91 (0.83) 0.023*
Sleep Irregularity	1.02 (0.72) 0.160	-0.23 (0.55) 0.684	-0.98 (1.75) 0.578	-0.86 (1.31) 0.512
Visceral Adiposity * Sleep Irregularity	0.44 (1.03) 0.667	0.55 (0.79) 0.490	2.92 (1.36) 0.034*	0.95 (1.04) 0.363
Weekends				
Visceral Adiposity	4.36 (0.87) <0.001*	2.03 (0.67) 0.003*	2.54 (1.12) 0.025*	2.21 (0.84) 0.010*
Sleep Midpoint	-0.20 (0.80) 0.800	-0.24 (0.62) 0.697	-1.40 (1.28) 0.278	-0.27 (0.96) 0.776
Visceral Adiposity * Sleep Midpoint	-0.27 (0.76) 0.724	0.57 (0.59) 0.328	-2.43 (1.36) 0.077 ^T	-0.60 (1.04) 0.566
Weekends – Weekdays				
Visceral Adiposity	4.20 (0.87) <0.001*	1.99 (0.67) 0.004*	2.41 (1.11) 0.033*	2.08 (0.83) 0.014*
ΔSleep Midpoint	-1.47 (0.75) 0.051 ^T	-0.51 (0.58) 0.374	1.31 (1.27) 0.305	1.35 (0.95) 0.159
Visceral Adiposity * ΔSleep Midpoint	-1.96 (0.68) 0.004*	-0.69 (0.54) 0.201	-1.00 (1.37) 0.467	0.14 (1.03) 0.889

Data are unstandardized regression coefficients (standard error) p-value for each standard deviation increase (z-scores) associated with each independent variable (main effects without interaction in the model) and their interaction (with main effects in the model). Adjusted for sex, age, race/ethnicity, polysomnography-measured apnea/hypopnea index, actigraphy-measured sleep duration, and actigraphy-measured sleep variability. * p-value<0.05, ^T 0.05<p-value<0.10