eSLEEP EUROPE
October 4-6, 2023 | Virtual Congress

Sleep Regularity in Healthy Adolescents and its Association with Sleep Quality and Mental Health

Chiara Castiglione-Fontanellaz[1,2], Samira Schaufler[1], Salome Wild[1,2,3], Christoph Hamann[4], Michael Kaess[1,5], Leila Tarokh[1,2]

[1]University Hospital of Child and Adolescent Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland

[2]Translational Research Center, University Hospital of Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland

[3]Graduate School for Health Sciences, University of Bern, Bern, Switzerland

[4]Department of Child and Adolescent Psychiatry and Psychosomatic Medicine, University Children's Hospital, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

[5]Department of Child and Adolescent Psychiatry, Center for Psychosocial Medicine, University Hospital Heidelberg, Heidelberg, Germany

Introduction

Current evidence points out the importance of sleep for adolescent physical and mental health [e.g. Fuligni & Hardway, 2006]. In addition to sleep duration and quality, regularity in the timing of sleep may play an important role [e.g. Fuligni & Hardway, 2006]. **To address this aspect of sleep, the aim of the present study was to investigate daily variability of sleep in adolescents during school days, weekends, and holidays and its association with depressive symptomatology as well as overall mental health.**

Methods

Participants

- Forty-six adolescents aged 10 to 14 years (23 girls and 23 boys; *M* = 12.78, *SD* = 1.07).
- All participants were recruited as part of a longitudinal twin study on sleep.

Measurements

Actigraphy

- Participants were asked to wear an actigraph for 6 consecutive months.
- Daily variability of sleep was quantified through the **sleep regularity index** (SRI; [Phillips et al., 2017]).

Questionnaires

- **Depressive Symptoms:** Sum score of Center for Epidemiological Studies – Depression scale.
- **Mental Health:** Sum score of the Strengths and Difficulties Questionnaire.
- **Subjective sleep:** Sum score of the Sleep Habit Survey.

Procedure

- Questionnaires were filled out at baseline and follow-up 6 months apart.
- SRI was calculated separately for school days, weekends and holidays.

Hypotheses and Statistics

- Partial correlations controlling for age and gender were performed with the corresponding sleep parameter for the different day types (school day, weekend, holiday).
- Based on findings from previous studies investigating sleep regularity in adults [e.g. Bei et al., 2016] and adolescents [e.g. Bei et al., 2017], we hypothesized that SRI predicts depressive symptoms and mental health after a 6-months-period. Partial correlations controlling for age and sex were conducted with CES-D and SDQ, all at follow up measurement.

Results

More sleep regularity is associated with better sleep

Partial Pearson Correlation Coefficients for SRI on Schooldays, Weekends and Holidays

		SRI		
	n	School days	Weekends	Holidays
mTST (hours)	46	.39*	-.07	.00
mSOL (min)	46	-.45*	-.09	.02
mWASO (min)	46	-.16	.15	.13
mSE (%)	46	.43*	-.10	.13
mSST (hours)	46	-.51**	-.30	-.54**
mSET (hours)	46	-.27	-.19	-.48**
Social jet lag	46	-.25	-.17	-.29
Chronotype	45	-.07	.06	-.15
Problematic Sleep	44	-.47*	-.26	-.34*
CES-D	46	-.31*	-.29	-.14
SDQ	46	-.15	-.33*	-.12

Note. SRI = sleep regularity index; TST = total sleep time; SOL = sleep onset latency; WASO = wake after sleep onset; SST = sleep start time; SSE = sleep end time; SE = sleep efficiency; m = mean; sd = standard deviation; CES-D = Center for Epidemiologic Studies Depression Scale; SDQ = Strength and Difficulties Questionnaire; * $p < 0.05$; ** $p < 0.01$

Table 1. Results of partial correlations indicate that more regular sleep is associated with longer total sleep time, shorter sleep onset latency, better sleep quality, earlier sleep start time as measured via actigraphy as well as less self-reported problematic sleep on school days. More regular sleep on weekends is associated with less mental health issues and on holidays it is associated with earlier sleep start times, earlier sleep end times and less self-reported problematic sleep.

Highest sleep regularity on school days

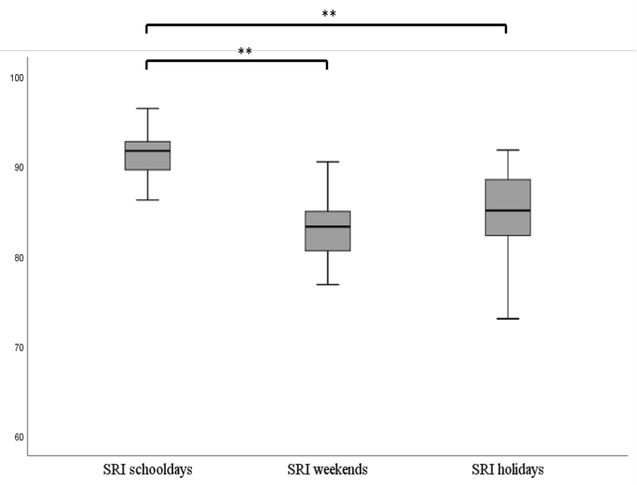

Figure 1. Box plots of sleep regularity for schooldays, weekends, and holidays; ** p < .001. Sleep regularity was highest on school days as compared to weekends and holidays.

More sleep regularity is associated with lower depressive symptoms

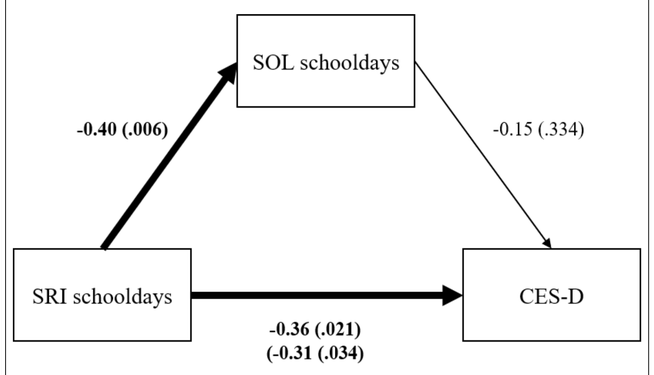

Figure 2. For depressive symptoms as outcome (measured via CES-D), the standardized regression coefficient between SRI and SOL was statistically significant (F(1, 44) = 8.49, p = .006). SOL in return does not predict CES-D (t = -0.98, p = .334). These results indicate that a higher SRI during school days predicts longer SOL during school days and higher CES-D scores. However, SOL does not predict CES-D scores, and the indirect effect of SRI and SOL does not explain depressive symptoms.

Conclusion

- The association of regular sleep with better sleep parameters (e.g. longer sleep duration, shorter sleep onset latency, better sleep quality and earlier sleep start time) demonstrates the importance of regular sleep timing during the school week.
- The relationship between sleep irregularity and depressiveness is in line with existing evidence and suggests that regular sleep timing may be protective of mental health.
- The association of sleep irregularity on weekends with worse mental health might be explained by overlapping genes for sleep timing and psychopathology.
- **To promote better physical as well as mental health, adolescents should not only be encouraged to get enough sleep but also to retain regular sleeping patterns, especially during school days.**

References

1 Fuligni, AJ, & Hardway, C (2006). Daily Variation in Adolescents' Sleep Activities, and Psychological Well-Being. *J of Res on Adolescence*, 16, 353-378.

2 Phillips, AJK, Clerx, WM, O'Brien, CS, et al. (2017). Irregular sleep/wake patterns are associated with poorer academic performance and delayed circadian and sleep/wake timing. *Scientific Reports*, 7, 3216.

3 Lunsford-Avery, JR, Engelhard, MM, Navar, AM, Kollins, SH (2018). Validation of the Sleep Regularity Index in Older Adults and Associations with Cardiometabolic Risk. Sci Rep, 8.

4 Bei, B., Wiley, JF, Trinder, J, Manber, R (2016). Beyond the mean: A systematic review on the correlates of daily intraindividual variability of sleep/wake patterns. *Sleep Med Rev,* 28, 108–124.

5 Bei, B, Manber, R, Allen, NB, Trinder, J, Wiley, JF (2017). Too Long, Too Short, or Too Variable? Sleep Intraindividual Variability and Its Associations With Perceived Sleep Quality and Mood in Adolescents During Naturalistically Unconstrained Sleep. *Sleep*, 40.

Contact

M Sc Chiara Castiglione-Fontanellaz
University Hospital for Child and Adolescent Psychiatry and Psychotherapy Bern
Research Department

E-Mail: chiara.fontanellaz@unibe.ch

published in Journal of Sleep Research, 2023, 32*(4)*. DOI: 10.1111/jsr.13865

https://esleepeurope.eu/