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WORLD SLEEP
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Sleep versus school timings of preschool and school-age children

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Disclosure

Clara MI, Allen Gomes A. (2020). An epidemiological study of sleep-wake timings in school children from 4 to 11 years old: insights on the sleep phase shift and implications for the school starting times' debate. Sleep Medicine 66; 51-60.

SCAN ME

This study made use of research data from a national project funded by the Portuguese Foundation for Science and Technology coordinated by Professor Ana Allen Gomes, who is currently coordinating the related research project True Times: Morningness-eveningness and time-of-day effects on cognitive performances and emotional states. This presentation was prepared in the framework of the current project.

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Background: developmental changes in circadian preferences

Circadian preferences determine sleep-wake behaviors and are determined by biological (genes), individual (e.g., age, sex), environmental (e.g., latitudinal influence), and social factors (e.g., school schedules).

Some studies have suggested the sleep-wake rhythm delay assumed to start during adolescence or with the transition to puberty might start earlier. Although the delay in sleep-wake patterns and its conflict with school start-times is well studied on adolescents, there are fewer studies focusing on younger children.

Aims of the study

Characterize the sleep-wake patterns of preschool and school-age children

Examining age-related (and school grade level) changes and addressing school vs. free-days differences

Investigate the sleep-wake pattern delay in non-pubertal children and its relation to school start times

Hypothesis: changes assumed to occur essentially with the transition to puberty start earlier. Ergo, there is a mismatch between school schedules and children's circadian patterns

Procedures

Cross-sectional study: school-based survey

Continental Portugal is divided in 5 educational regions.

"school cluster": group of schools in the same city and under the same direction that offer all levels of education (kindergarten-high school)

Ethical approval by the Portuguese Ministry of Education

Cluster sample covering all educational regions

Based on the list of public-school clusters at the Ministry of Education, school clusters were randomly sampled based on the calculation of the approximate proportion of school clusters (and thus the country's population distribution)

Invitations sent to principals: 11 school clusters agreed

Distribution of questionnaires through teachers

The target population included all preschool to 6th grade students, 4-11 years of age, from each of these school clusters, whose tutors were invited to participate in the survey

Participants

The final analysis included 3155 children attending 1 of 11 public school clusters across 5 educational regions of continental Portugal: 51% (1601) boys and 49% girls (1555), with ages ranging from 4 to 11 years old (7.92 ± 2.05).

Distribution of school clusters by educational region

Measures

Portuguese version of the Children's Chronotype Questionnaire

all children; sleep-wake parameters for both scheduled and free-days (days when the children's patterns are directly influenced by individual or family activities, such as school; and when these patterns are free from any influence, respectively)

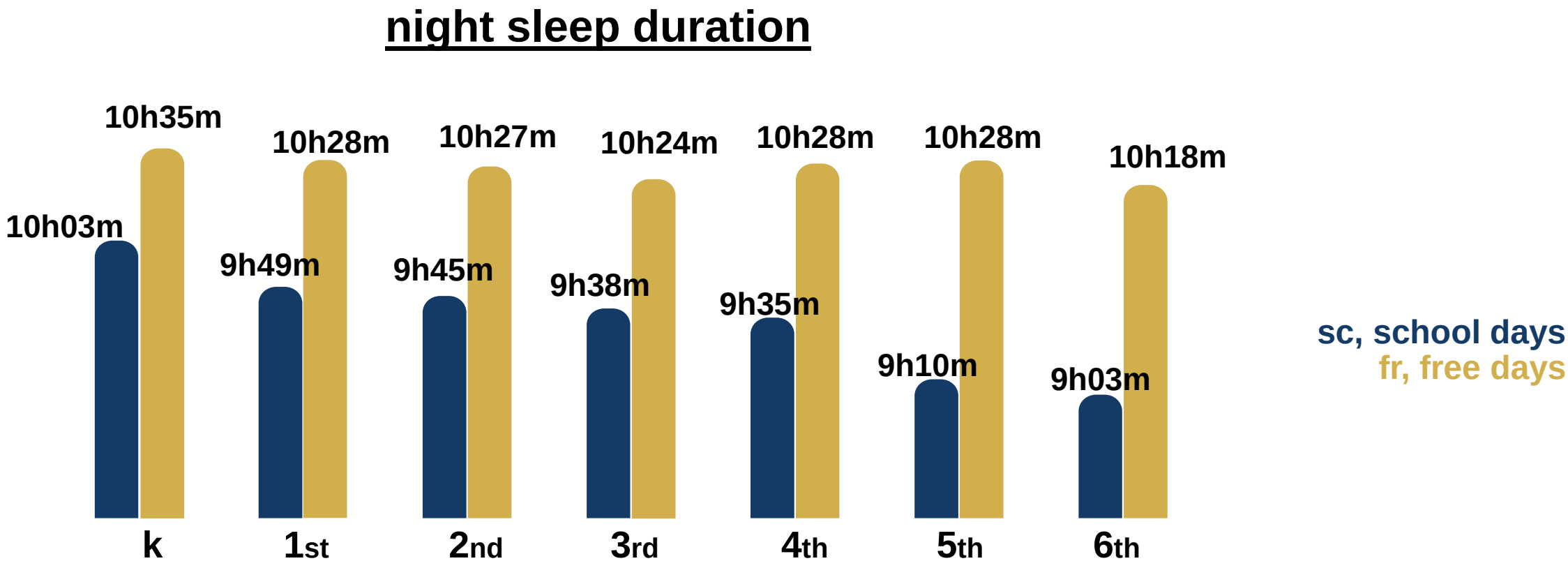
Portuguese version of Self-Rating Scale for Pubertal Development

only children > 9 years old from attending 4th grade or above

Differences by age vs. school grade level

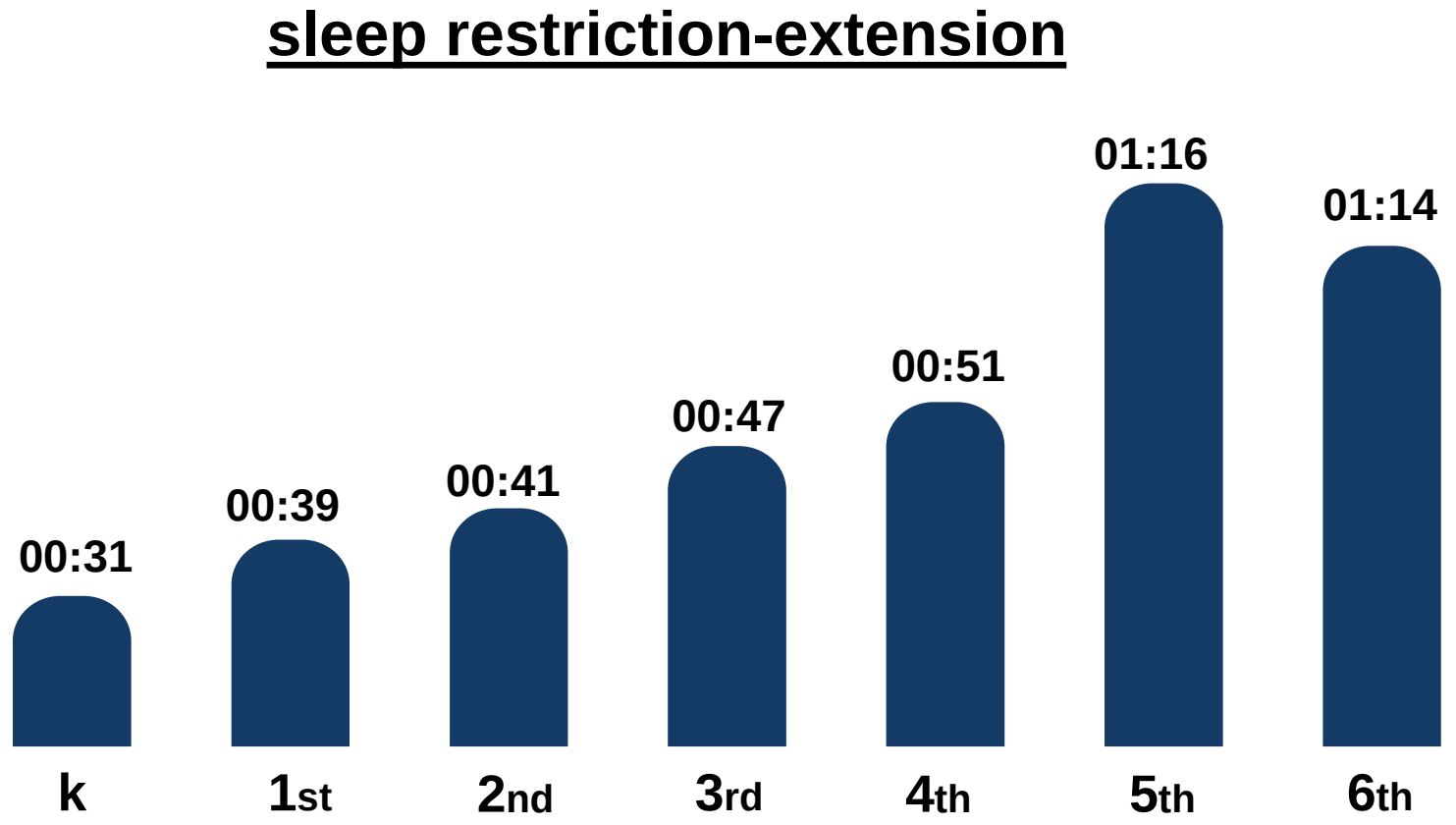
While there is an obvious overlap of children's sleep-wake patterns across age and school grade level, school start times vary significantly across school grade level in Portugal.

Results: differences by school grade level

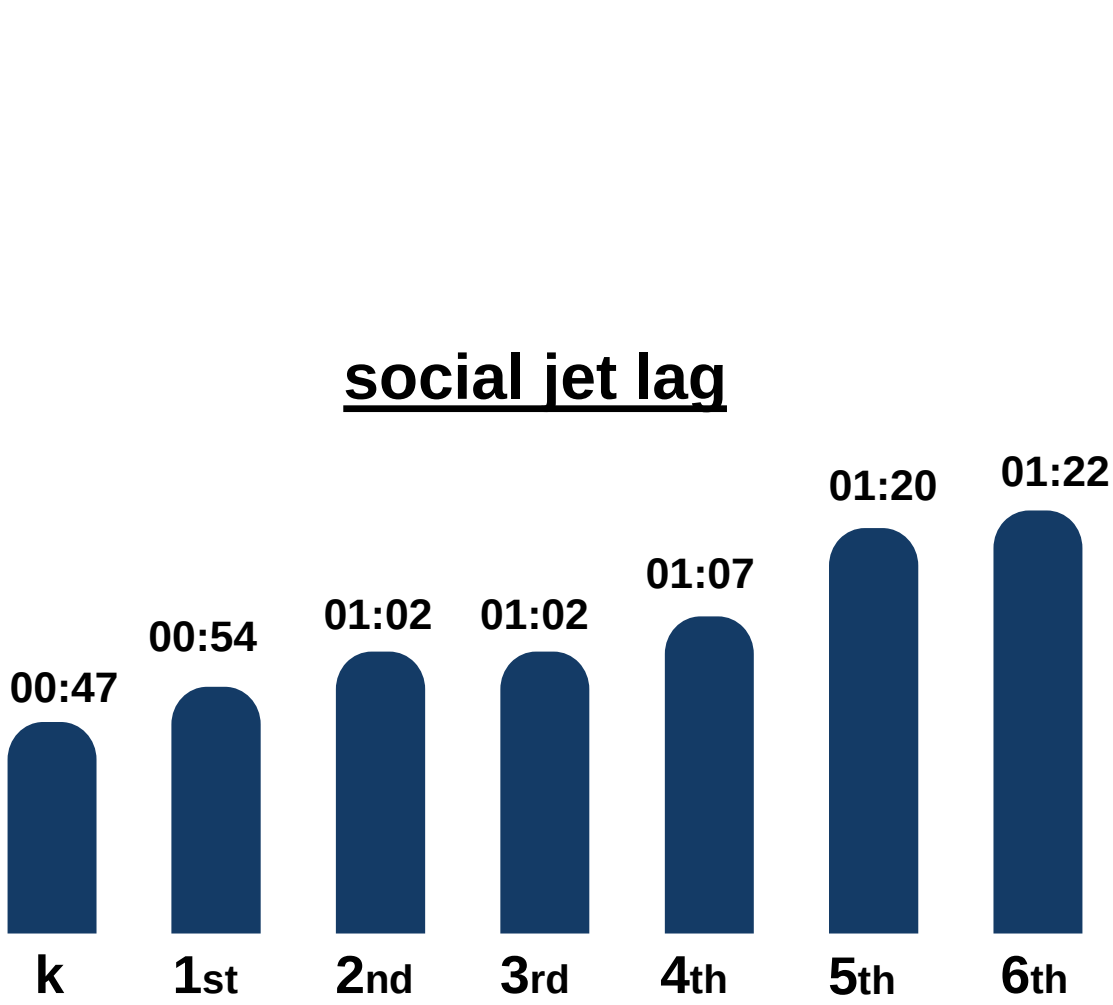


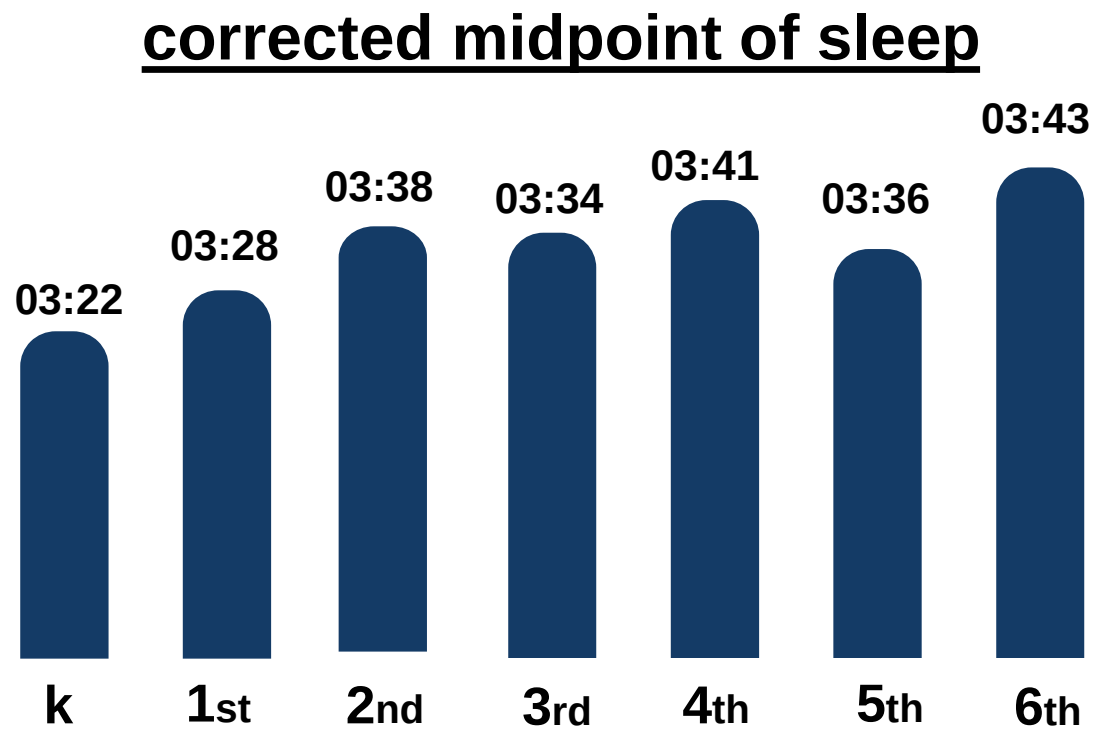
Progressive and significant reduction in the amount of sleep time on school days.

Results: differences by school grade level



Results: differences by school grade level



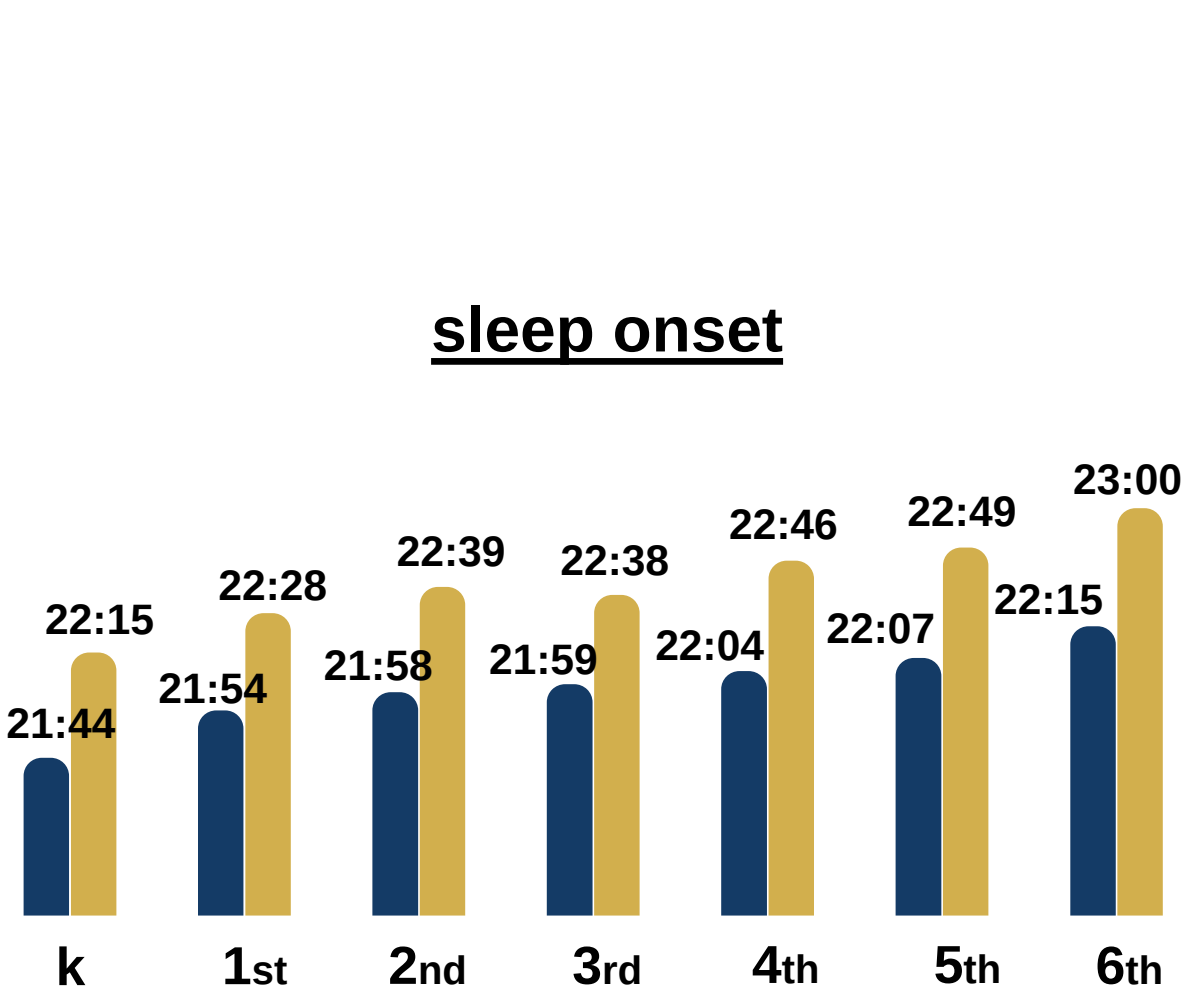


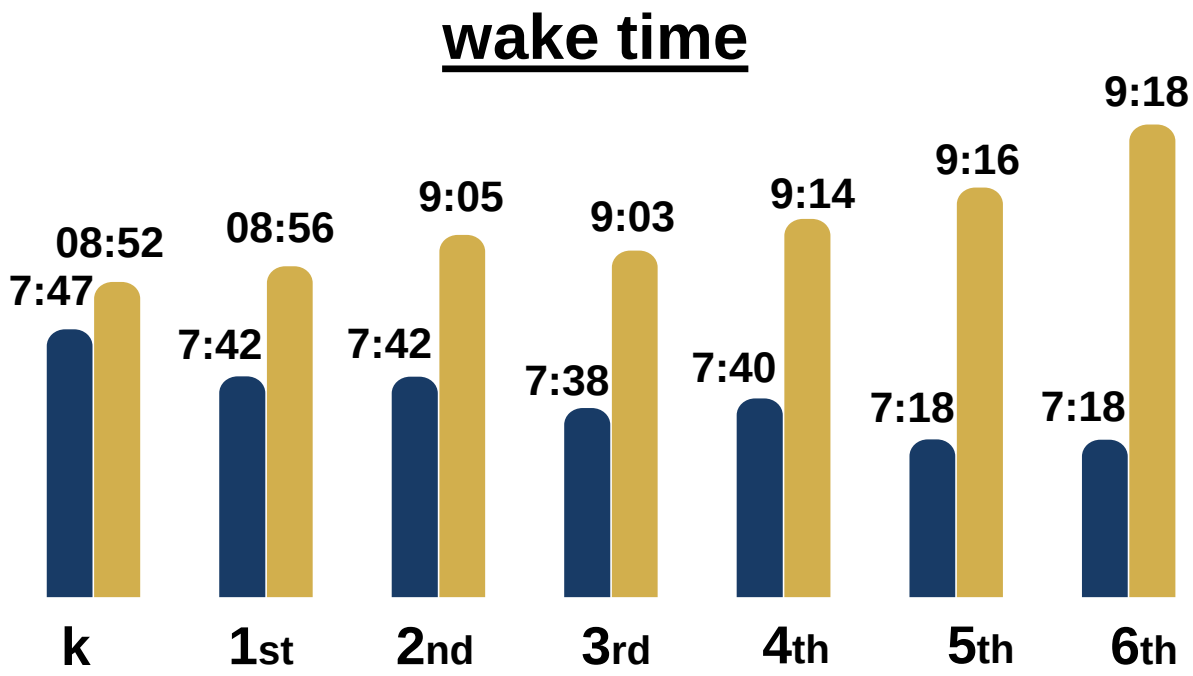
Conclusion

Younger children exhibit significant sleep restriction-extension patterns, as well as social jetlag, suggesting that their sleep-wake patterns lead to the accumulation of sleep debt during the week, for which they try to compensate on free days by extending their sleep duration.

These phenomena, consistently found in adolescents, suggest a gradual delay in sleep-wake patterns of children in the preschool and school-age years.

Results: differences by school grade level

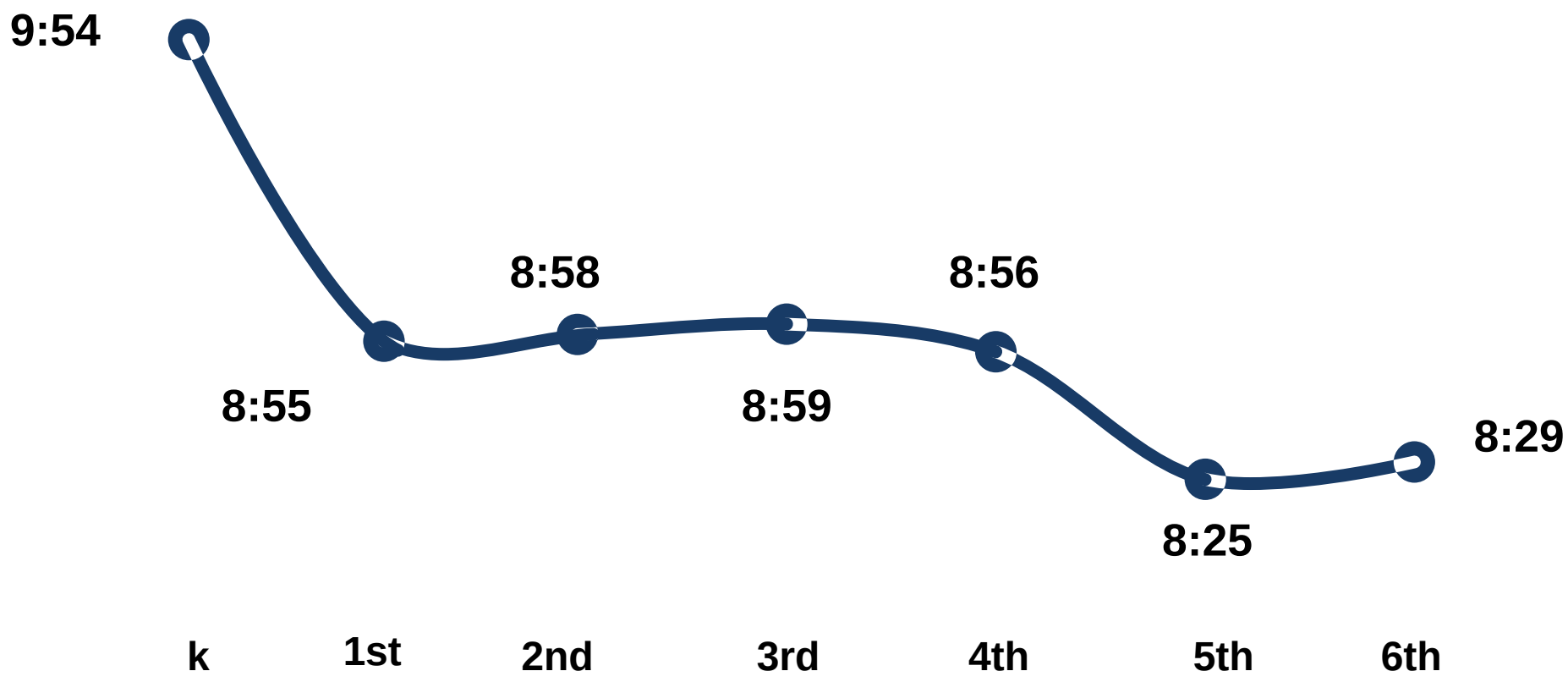




sc, school days
fr, free days

Results: differences by school grade level

school entry



Conclusion

The delay of the sleep-wake patterns is already apparent in preschool children, and it increases gradually year after year, from preschool to the 6th grade.

The reduction in the amount of sleep time occurs due to a progressive delay in sleep onset as age and school-grade level increase, whereas wake times demanded by school start times remain constant or even advance.

There is an increasing divergence between school schedules' progression and the sleep-wake patterns exhibited by children in our sample.

Practical implications / take home message

The advance of school start times across school grade level, from preschool to the second study cycle, in the Portuguese school system is clearly inappropriate, as it follows an inverse tendency from the sleep-wake schedules exhibited by our participants.

Delaying school start times could adjust social demands to the biological rhythm of children.

Thank you

Tutors/parents, teachers, schools, children

University of Coimbra

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Comments/questions

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Outcomes

	wake time, rise time, fully alert; bedtime, lights-off time, sleep latency
school vs.	**sleep onset: (time of lights-off+sleep latency)**
free-days	**night sleep duration: (sleep onset - wake time)**
	midpoint of sleep: (sleep onset + night sleep duration / 2)

sleep need: [(weekday sleep duration x 5) + (weekend sleep duration x 2)]/7

corrected midpoint of sleep: MSF - [0.5 x (sleep duration on free days - sleep need)]

social jet lag: (midpoint of sleep on free - midpoint of sleep on scheduled days)

sleep restriction-extension pattern: (sleep duration free - sleep duration in school days)