## O55 One year later: longitudinal effects of flexible school start times on teenage sleep, subjective benefits, and official grades

A.M. Biller[1]; C. Molenda[1]; G. Zerbini[2]; F. Obster[3]; C. Förtsch[4]; T. Roenneberg[1]; E.C. Winnebeck[1]

*[1]Institute of Medical Psychology, Ludwig Maximilian University, Munich; [2]Department of Medical Psychology and Sociology, University of Augsburg, Augsburg; [3]Department of Statistics, Ludwig Maximilian University, Munich, Germany; [4]Biology Education, Ludwig Maximilian University, Munich, Germany*

**Objectives/Introduction**: Early school starts are a key reason for the widespread sleep deprivation observed in teenagers worldwide. Apart from posing health risks, insufficient sleep impairs learning and reduces students' career prospects. Whether delayed school starts can ease this problem has been investigated mostly cross-sectionally and via low-resolution or subjective measures. Hence, good evidence concerning this potentially transformative policy measure is still scare.

**Methods**: We monitored sleep and official grades in a longitudinal pre-post design when a high school in Germany introduced a flexible start system, allowing senior students to choose daily between 8 AM or ≥08:50 AM start. Sleep was assessed via daily sleep diaries for 3 weeks at baseline, followed by 6 weeks in the flexible system ($n$ = 65), and for 6 weeks after 1 year ($n$ = 105; overlap $n$ = 33). Official, quarterly grades were obtained by 157 students over 4 years in 11 disciplines ($n$ = 16,724).

**Results**: Longitudinal analyses showed that students maintained their ~1-hour sleep gain on ≥08:50 AM-days over 1 year in the flexible system ($p < 0.001$). Students reported to feel more concentrated and motivated, and slept and learned better on ≥08:50 AM days (all $p < 0.001$). Overall grades only improved in the flexible system when not adjusted for covariates. In contrast, detailed mixed model analyses that adjusted for covariates showed no grade improvement in the flexible system ($p > 0.05$). Similarly, neither absolute values in chronotype, sleep duration, or social jetlag, nor their changes from the conventional to the flexible system had any significant influence on grades (all $p > 0.05$), except for social jetlag ($p = 0.027$). Robust effects were however found for academic quarter, grade level, and academic discipline (all $p < 0.001$).

**Conclusions**: Improving sleep carries important implications for learning and memory. Given the many contributing factors to school grades, however, it may be an unwarranted expectation that better sleep leads to immediate and substantial grade improvements. Importantly, we found that grades did not worsen while students benefitted psychologically from later starts and maintained their sleep extension longitudinally. Future studies should track longer changes in sleep and performance to disentangle the complex relationships between the multitude of players, and to add more high-quality evidence to this unresolved scientific and public debate.

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