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Genetic and Environmental Influences on Sleep–Wake Behaviors in Adolescence

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ABSTRACT:

The study objective was to investigate the role of genetic and environmental factors on sleep-wake behaviors across adolescence and differences between school and non-school nights. Four hundred and ninety-five participants (aged 9 to 18; 55% females), including 93 monozygotic (MZ) and 117 dizygotic (DZ) twin pairs, and 75 unmatched twins, wore a wrist activity monitor and completed a sleep diary for two weeks. Individual differences in sleep onset, wake time, and sleep midpoint were similarly influenced by additive genetic (50%; 48%; 44% of total variance) and shared environmental (36%; 31%; 42%) factors, with a predominant genetic influence for sleep duration (62%) and restorative sleep (43%). When we stratified by age, in older adolescents (aged 16-17), genes accounted for more of the variance than in younger adolescents (aged 9-14), and shared environmental factors were no longer significant. Bivariate analyses showed sleep duration and sleep midpoint were correlated ($r_p = -.43$, $r_G = .54$), due to a common genetic source. Additionally, while heritability was similar for school and non-school nights, there were genetic sources common and specific to each night type for all objectively measured sleep-wake behaviors. Across adolescence, there is a strong genetic influence on sleep phenotypes, but genes have a greater impact on older adolescents' sleep timing than younger adolescents, likely to be influenced by family environment. The relationship between sleep maintenance and chronotype is entirely due to a common genetic source. Both common and specific genetic sources influence sleep-wake behaviors on school and non-school nights in adolescence.