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TITLE: Testing for moderation of mid-life cognitive performance by sleep duration

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ABSTRACT:

Sleep duration is associated with cognition at midlife, a key period predictive of late-life cognitive aging, however whether sleep duration moderates the etiology of cognitive performance is unclear. We performed initial analyses using an informative twin design, drawing from Minnesota Twin Study of Adult Development and Aging (MTSADA;  $X_{age} = 58.7$ ,  $N=918$ ,  $F=59.5\%$ , 540 MZ individuals, 378 DZ individuals) one of the participating studies within the Interplay of Genes and Environments across Multiple Studies (IGEMS) consortium. Measures for this study included sleep duration and three cognitive functioning measures (Digit Symbol, Vocabulary, and Block Design subtests). All analyses included adjustments for age and sex. Phenotypically, the correlations between sleep duration and cognitive performance were modest ( $r = .03-.08$ ). Twin correlations for sleep duration, controlling for age and sex, were  $r_{MZ} = .36$ ,  $r_{DZ} = .27$  indicating substantial environmental influence. Univariate ACE moderation models were fitted accounting for both self and co-twin sleep duration to evaluate moderation of variability in cognitive performance by sleep duration. Age moderation was

simultaneously fitted. Full models suggested that genetic variance in cognition decreased as sleep duration increased on the cognitive task of block design ( $a^2_{5hrs}=.50$ ,  $a^2_{9hrs}=.04$ ), while remaining fairly stable for digit symbol ( $a^2_{5hrs}=.21$ ,  $a^2_{9hrs}=.23$ ) and vocabulary ( $a^2_{5hrs}=.58$ ,  $a^2_{9hrs}=.33$ ). Shared common environment contributions ( $c^2$ ) in cognition increased as sleep duration increased on all cognitive tasks ( $c^2_{5hrs}=.14-.25$ ,  $c^2_{9hrs}=.43-.58$ ). Patterns of unique environmental contributions ( $e^2$ ) differed by cognitive task. These preliminary findings may add to the growing behavioral genetic literature, possibly indicating that sleep may moderate health related outcomes including cognitive functioning at midlife.

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