could be predicted by subjective measures of mood and further indicate that this relationship may be independent of any effects due to endogenous circadian rhythms.

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EXTENDED SLEEP AND THE EFFECTS ON MOOD AND ATHLETIC PERFORMANCE IN COLLEGIATE SWIMMERS

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Introduction: Relatively few studies have clearly elucidated the immediate and long term effects of extended sleep. In particular, little research has thoroughly investigated the impact of multiple nights of extra sleep over a prolonged period of time and specifically, how extended sleep affects athletic performance.

Methods: In this ongoing study, five healthy students (age 18 - 22) on the Stanford men's and women's swimming teams established a two week baseline in which they maintained their usual sleep/wake patterns. Athletes then extended their sleep to 10 hours per day for 6-7 weeks. Following each regularly scheduled swim practice, swimmers were assessed for athletic performance including 15m sprint, reaction time off the block, and turn time. To monitor daily sleep/wake activity, actigraphy and self-reported sleep logs were recorded throughout the study. The Epworth Sleepiness Scale assessed daytime sleepiness and the Profile of Mood States (POMS) monitored weekly changes in mood.

Results: Indicators of athletic performance significantly improved following the extended sleep period. Improvements included faster 15m sprint (6.98 ± 0.99 seconds at baseline, 6.47 ± 0.64 seconds at end sleep extension, $p<0.05$), faster reaction time (0.88 ± 0.20 at baseline, 0.73 ± 0.13 at end sleep extension, $p<0.05$), improved turn time (1.10 ± 0.20 at baseline, 1.00 ± 0.22 at end sleep extension, $p<0.05$), and increased kick strokes (26.2 ± 1.53 at baseline, 31.2 ± 1.84 at end sleep extension, $p<0.05$). Swimmers also demonstrated mood improvements including POMS vigor ratings (42.9 ± 3.80 at baseline, 65.3 ± 5.08 at end sleep extension, $p<0.05$) and decreased POMS fatigue scores (57.9 ± 4.86 at baseline, 34.1 ± 0.22 at end sleep extension, $p<0.05$). Epworth scores decreased from 11.0 ± 3.32 at baseline to 2.40 ± 2.07, $p<0.05$ at end sleep extension.

Conclusion: Significant improvements in measures of athletic performance and mood were observed in collegiate swimmers after extended sleep.

0385

RELATIONSHIP BETWEEN SLEEP PHYSIOLOGY AND EXECUTIVE FUNCTION DURING CHRONIC PARTIAL SLEEP RESTRICTION

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Introduction: Research suggests total sleep loss affects the prefrontal cortex, which is important for executive function (EF). However, little data exist on the relationship between sleep physiology during chronic partial sleep restriction and EF. This study was designed to assess this issue.

Methods: N=120 participants (22-45y, 68m, 52f,) completed one of two identical sleep restriction protocols of 4h time in bed (TIB) for sleep on 5 consecutive nights after 2 baseline nights of 10h TIB. On the day after the 5th sleep restriction night, the Hayling Sentence Completion Test and Brixton Spatial Anticipation Test were administered and scored according to standard criteria. The Hayling test measured response inhibition (total errors), response initiation (response latency), and divergent thinking (type B errors). The Brixton test measured cognitive flexibility (total errors). A measure of overall EF was also derived (Hayling + Brixton scaled scores). PSG was recorded using a standard montage (EEG-C3/A1, EOG, EMG), and scored to derive slow wave sleep (SWS), REM sleep, and stage 2 sleep times (minutes). A stepwise linear regression was conducted to identify which sleep parameters best related to EF measures.

Results: SWS on the final night of sleep restriction was the best PSG predictor of each EF measure, but SWS explained ≤8% of the variance in EF dependent measures. Significant negative associations were demonstrated between SWS and response inhibition (beta = -0.21, $p = 0.02$); response initiation (beta = -0.26, $p < 0.01$); divergent thinking (beta = -0.20, $p = 0.03$); and cognitive flexibility (beta = -0.23, $p = 0.01$). SWS was positively associated with overall EF (beta = 0.29, $p < 0.01$).

Conclusion: Having more SWS during sleep restriction predicted fewer errors, shorter response latencies, and better overall performance on tests of EF. It remains to be determined whether these associations reflect physiological causality

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FIVE NIGHTS OF PARTIAL SLEEP RESTRICTION INCREASED PLASMA LEPTIN LEVELS IN HEALTHY ADULTS

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Introduction: Sleep deprivation has previously been shown to affect a number of inflammatory and neuroendocrine markers related to health. Leptin, a pro-inflammatory hormone produced by adipocyte tissues in humans, plays an important role in obesity and metabolic function. Limited previous research has observed that leptin levels decrease in response to total and partial sleep deprivation; however, sample sizes have been small and generally included only male participants.

Methods: N=112 healthy adults (mean age 30.2+7.1 years, 46% men, 44% Caucasian) underwent an 11-day inpatient sleep protocol. Following 2 nights of full (10h) baseline sleep, 106 participants received 4h time in bed (TIB) for the next five nights. N=8 participants served as controls and received 10h TIB each night. 10mL samples of venous blood were collected between 0900-1100 following the second night of baseline sleep (B2) and the fifth night of partial sleep restriction (P5).

Results: While there were no significant differences between groups at either the B2 or P5 time points, sleep restriction resulted in a significant (within-group) increase in leptin levels from B2 to P5 ($Z=-7.55$, $p=<.001$); the control group showed no significant changes. Significant gender and ethnicity differences were also observed at both B2 and P5 within the deprivation group: women and African-Americans had higher leptin levels than men and Caucasians, respectively (all p's <.02). Within the deprivation group, women demonstrated a significantly greater increase in leptin levels compared to men ($Z=-4.44$, $p=<.001$). There was no significant difference in response to sleep deprivation between ethnic groups.

Conclusion: In a large sample, plasma leptin levels increased significantly, particularly in women, in response to five nights of partial (4h TIB) sleep restriction. These results have implications with respect to the role of sleep duration and obesity and other metabolic disorders.

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