

drowsiness and NREM sleep had chaotic dynamics with periodic trend and variable CD (2.9–4.5). Among the significant results of this study was the demonstration of intrinsic unpredictability of drifting to sleep that can be explained by extreme sensitivity to initial conditions of chaotic dynamics. **Conclusions:** Our results support the concept of inverted consciousness in sleep and make clear nonlinear dynamics of directional changes of consciousness with emergence of diverse subjective experience.

#### Chronobiology/Circadian Disorders

### WAKE-UP TIME IN ADOLESCENCE RELATES TO OVERWEIGHT RISK IN EARLY ADULTHOOD

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**Introduction:** The shift toward later sleep onset and wake-up times in adolescence mismatch with unmodified school start times, resulting in insufficient sleep amount. This context might be related to higher body mass index (BMI). Given the current challenge for identifying variables that might contribute to weight gain, this issue is of relevance. Our main goal was to assess the effect of sleep-wake cycle (SWC) patterns in adolescence on BMI changes in young adulthood.

**Materials and methods:** Participants were part of a cohort followed since infancy and assessed in adolescence and early adulthood. Motor activity was recorded for a week with actigraphs (Actiwatch-16/64) worn in the non-dominant wrist, allowing identification of sleep and wake episodes through an automated procedure (1). We assessed SWC patterns for the nighttime period of weekdays. Variables of interest were: bedtime (BT), wake-up time (WT), total wake time (TWT), and total sleep time (TST). These were categorized according to the 50th percentile of their distribution. Sex- and age-specific BMI z-scores were calculated and categorized as normal weight (NW, BMI z-score  $\geq -2$  to  $< 1$ ) and overweight/obesity (OW, BMI z-score  $\geq 1$ ). BMI changes from adolescence to adulthood were classified as: (a) Good BMI: those who were NW or OW in adolescence and NW in adulthood, and (b) Poor BMI: those who were NW or OW in adolescence and OW in adulthood.

We used logistic regression to explore the effect of SWC patterns in adolescence on BMI category in adulthood.

**Results:** 265 participants (50.2% female) were included. In adolescence, mean age was  $16.7 \pm 0.2$  y and 34.0% were OW. Median  $\pm$  interquartile range was 00:00 am  $\pm 1.8$  h for BT, 7:38 am  $\pm 2.5$  h for WT,  $0.2 \pm 0.4$  h for TWT, and  $7.6 \pm 1.5$  h for TST. In adulthood, mean age was  $22.1 \pm 0.4$  y; 42.6% were OW. Regarding BMI change, 43% were categorized as Poor BMI. Later WT (odds ratio [OR] = 0.52; 95% confidence interval [CI] = 0.28–0.98;  $p < .05$ ) and being male (OR = 0.47; 95% CI = 0.28–0.77;  $p < .01$ ) were associated with a decreased likelihood of being Poor BMI.

**Conclusions:** Our results show that waking-up later during weekdays in adolescence had a decreased likelihood of becoming or remaining OW in early adulthood. These findings provide further support to policy initiatives to delay school start times for teenagers (2).

#### References:

- Reyes S, Algarín C, Bunout D, Peirano P. Sleep/wake patterns and physical performance in older adults. *Aging Clin Exp Res* 2013;25(2):175–181.
- Adolescent Sleep Working Group, Committee on Adolescence, Council on School Health Pediatrics. School start times for adolescents. *Pediatrics* 2014;134(3):642–9.

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#### Sleep Breathing Disorders

### EFFECT OF ONE-YEAR CPAP TREATMENT ON MOOD IN PATIENTS WITH CORONARY ARTERY DISEASE AND OBSTRUCTIVE SLEEP APNEA

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**Introduction:** Many patients with coronary artery disease (CAD) have concomitant obstructive sleep apnea (OSA) and excessive daytime sleepiness (EDS). Depression is also common both in CAD and OSA. Less is known whether OSA contributes to depression in CAD patients, and whether continuous positive airway pressure (CPAP) treatment would improve mood in this group. The purpose of the current study was to identify correlates of moderate-to-severe depression in CAD patients following revascularization, and address the effect of CPAP treatment on mood in patients with comorbid OSA.

**Materials and methods:** Secondary analysis of the Randomized Intervention with CPAP in Coronary Artery Disease and Sleep Apnea (RICCADSA) trial, which was conducted in Sweden between 2005 and 2013. For the current protocol, 431 participants (mean age  $63.9 \pm 8.5$  years; 83% men, body mass index [BMI]  $28.2 \pm 4.1$  kg/m<sup>2</sup>) with OSA (apnea-hypopnea index [AHI]  $\geq 15$ /h) or no-OSA (AHI  $< 5$ /h) on cardiorespiratory polygraphy, who had answered Epworth Sleepiness Scale (ESS) and Zung Self-Rating Depression Scale (SDS) questionnaires at baseline and after one-year, were included. Patients with nonsleepy OSA (ESS score  $< 10$ ) were randomized to CPAP or no-treatment, and patients with sleepy OSA (ESS score  $\geq 10$ ) received CPAP. Zung SDS score (range 20–100) of at least 50 was defined as depression (50–59 mild, 60–69 moderate, and  $\geq 70$  severe depression, respectively).

**Results:** Average Zung SDS scores at baseline were similar in OSA and no-OSA patients ( $54.0 \pm 6.7$  vs  $54.6 \pm 6.1$ ; n.s). Overall, 80.4% of the OSA patients and 88.3% of no-OSA patients had depression ( $p = 0.078$ ) at baseline. Moderate to severe depression was observed among 15.4% in the OSA group, and 18.1% in the no-OSA group, respectively (n.s). In a multivariate logistic regression model, moderate to severe depression at baseline was significantly associated with female sex (odds ratio [OR] 2.4, 95% confidence interval [CI] 1.3–4.5;  $p = 0.007$ ), and ESS score (OR 1.1, 95% CI 1.0–1.2;  $p = 0.041$ ), but not with age, BMI and AHI. At the 1-year follow-up, improvement in mood (changing to better category of Zung SDS scores vs worsening/no-change) was predicted by CPAP-usage for  $\geq 4$  h/night (OR 1.7; 95% CI 1.1–3.0;  $p = 0.052$ ) adjusted for age, sex, and ESS score change from baseline.

**Conclusions:** In this revascularized cohort of patients with CAD, moderate to severe depression at baseline was associated with female sex and ESS score, independent of age, BMI and AHI. In the OSA group, good CPAP adherence was a significant predictor of improvement in mood after one year, adjusted for age, sex, and improvement in EDS. Adding interventions to improve CPAP compliance, and reduce EDS to standard clinical care of OSA may contribute to better mood in patients with CAD following revascularization.

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#### Sleep Breathing Disorders

### DETERMINANTS OF NONSLEEPY VS SLEEPY PHENOTYPES OF OBSTRUCTIVE SLEEP APNEA IN A REVASCULARIZED CORONARY ARTERY DISEASE COHORT

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**Objectives:** To investigate clinical and polysomnographic characteristics of nonsleepy vs sleepy phenotype of obstructive sleep apnea (OSA) patients in a revascularized coronary artery disease (CAD) cohort.

**Materials and methods:** Secondary analysis of the Randomized Intervention with CPAP in Coronary Artery Disease and Sleep Apnea (RICCADSA) trial. Participants were recruited between 2005 and 2010 in Sweden. For the current protocol, 399 patients with OSA (apnea-hypopnea index [AHI]  $\geq 15$ /h) on cardiorespiratory polygraphy (PG) underwent polysomnography (PSG) in hospital, in median 93 days after the revascularization, and 30 days after the initial PG at home. Technically adequate sleep recordings were obtained in 389 patients, of whom 5 excluded due to no-OSA (AHI  $\geq 5$ /h) on the PSG night. Remaining 234 nonsleepy (Epworth Sleepiness Scale [ESS] score  $< 10$ ), and 150 sleepy (ESS score  $\geq 10$ ) OSA