dark period for 7 days. Body weight was monitored throughout the treatment. After treatments, CSF Hcrt1 concentration was determined by competitive enzyme immunoassay (EK-003-30, Phoenix Pharmaceuticals Inc). HcrtR1 and HcrtR2 levels within the hypothalamus were analyzed by western blotting (HcrtR1 antibody - ab68718; HcrtR2 antibody - ab183072). Paired t-tests, ANOVAs for repeated measures and independent samples, and post-hoc Fisher PLSD test were used for statistical comparisons.

Results: Systemic blockade of the hypocretinergic transmission with the high dose of Suvorexant produced a statistical significant increase in body weight by the end of the treatment. In control conditions hypothalamic HcrtR1 expression was significantly higher than that of HcrtR2. The high dose of Suvorexant also produced statistical significant changes in both, Hrct1 levels in CSF and HrctR1 expression in the hypothalamus, while, not significant changes occurred with the low dose. That is, daily i.p. administration of 30mg/kg of Suvorexant produced a significant decrease in Hcrt1 concentration in CSF together with a significant overexpression of HcrtR1 in the hypothalamus with respect to the control group. HcrtR2 hypothalamic levels did not change significantly.

Conclusions: The pharmacological model with narcolepsy-like features induced by chronic administration of high doses of suvorexant showed a significant increase in body weight and a significant decrease in CSF Hcrt1 levels as observed in narcoleptic type1 patients. These effects were accompanied by a compensatory overexpression of HcrtR1 in the hypothalamus while HcrtR2 expression remained almost unchanged. Altogether, they indicate an autoregulatory role of HcrtR1 within the hypothalamus for the synthesis and/or release of hypocretins.

Acknowledgements: This study was supported by FI19058 FEDER grant

INVESTIGATING THE RELATIONSHIP BETWEEN SLEEP AND FASTING-INDUCED TORPOR IN THE LABORATORY MOUSE

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Introduction: Torpor is a controlled state of hypometabolism that many species utilise to conserve energy. It is thought that there is a relationship between torpor and sleep. For example, torpor is entered via non-rapid eye movement sleep (NREMS), and a rebound in slow wave activity (SWA, EEG power density between 0.5-4 Hz) is observed in sleep immediately following arousal from torpor in Djungarian hamsters. Laboratory mice are known to readily enter bouts of torpor when undergoing food restriction protocols, which are commonly used in sleep and circadian studies, and behavioural neuroscience. However, the relationship between euthermic sleep and torpor in laboratory mice has not been well characterised, as such torpor induction may be confounding data generated in these fields when food restriction (FR) is used. The aim of this study was to further investigate how torpor and euthermic sleep processes interact.

Materials and Methods: Chronic EEG/EMG implants were performed in adult male C57Bl/6J mice (n=4). Mice subsequently underwent a 6-hour sleep deprivation (ZT 21-3) under ad libitum feeing conditions. Following a recovery period, mice were fed once daily and maintained at ~85% of their free feeding weight to induce torpor. Peripheral body temperature (Tskin) was continuously monitored using non-invasive thermal imaging cameras, to detect hypothermia bouts associated with torpor. Torpor bouts were operationally defined as a Tskin of >2 standard deviations below baseline for at least 1 hour. Once the animals were reliably entering torpor, another 6-hour sleep deprivation was conducted, followed by feeding. As a control, mice were also fed following a ~6-hour torpor bout occurring between ZT 21-3. Vigilance states were scored offline by visual inspection of EEG/EMG signals in 4s epochs.

Results: On days where no manipulations where performed, mice spent a greater percentage of time in NREMS during FR compared to during ad libitum (56% vs 38%, P<0.05). In the 6 hours following sleep deprivation, mice spent significantly less time in NREMS when food restricted compared to when fed ad lib (52.1 ± 2.5% vs 62.9 ± 4.9%; p=0.04). Mice fed after a torpor bout also spent less time in NREMS compared to post-sleep deprivation in ad libitum conditions (48.6 ± 3.8% vs 62.9 ± 4.9%; p<0.05). In the 24 hours following sleep deprivation/torpor, mice spent more time in NREMS (Ad lib: 42.6 ± 5.1%; FR: 50.8 ± 2.1%; Torpor: 53.1 ±2.9%), but less time in REMS (Ad lib: 7.0 ± 1.4%; FR: 6.0± 1.3%; Torpor: 6.2 ± 1.3%), when undergoing food restriction although these differences were not significant (P>0.05). In all conditions, initial sleep after sleep deprivation or torpor was characterised by increased levels of SWA. However, peak SWA in the FR and post-torpor condition was delayed and lower than during ad libitum conditions (Ad lib peak: 153 ± 1.3%; FR peak: 118 ± 2.1%; Torpor peak: 98 ± 4.6%).

Conclusions: Our preliminary results support the notion that daily sleep architecture is altered in association with fasting-induced torpor in mice, but provide limited evidence for that fasting-induced torpor is a sleep-depriving state.

Acknowledgements: NC3Rs (NC/S001689/1)

MACHINE LEARNING APPROACH FOR DETECTION OF INTRACRANIAL INTERICTAL DISCHARGES IN THE MEDIAL TEMPORAL LOBE DURING SLEEP

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Introduction: Interictal epileptiform discharges (IEDs) are brief paroxysmal electrographic events observed between spontaneous recurrent seizures in epilepsy patients. IEDs (i) have a duration of 70–200 ms (for a sharp wave) or 20–70 ms (for a spike), (ii) entail an abrupt change in polarity, (iii) have a restricted physiological spatial field, and (iv) are most prevalent in non-rapid eye movement (NREM) sleep. IEDs occurring in the medial temporal lobe (MTL) during sleep may impair memory by affecting hippocampal-cortical coupling, and their reliable detection has clinical value in epilepsy and other neurological conditions. Here we set out to develop and validate automatic detection of IEDs with a machine learning approach in intracranial EEG (iEEG) and in scalp EEG.

Methods: Six drug-resistant mesial temporal lobe epilepsy (MTLE) patients underwent clinical pre-surgical evaluation and were implanted with intracranial depth electrodes in the MTL. Overnight iEEG recorded with Blackrock system, referenced to a central scalp electrode sampled at 2KHz and bandpass- filtered between 0.1-500Hz. Sleep was scored using established guidelines of the American Academy of Sleep Medicine. We focused on three channels per hemisphere: the anterior hippocampus referenced to Cz, the anterior hippocampus referenced to adjacent electrode (5mm more laterally), and the amygdala referenced to Cz. Preprocessing included segmentation of the signal to 250ms intervals and extraction of signal features for the current and the previous interval, such as spectral power in specific frequency bands and statistical features such as variance and skewness. Then, we split intervals randomly into train (75%) and test (25%) subsets and trained two algorithms- Random forest and LightGBM. The first task aimed at detecting IEDs in iEEG. To this end, we used a dataset that contained 337 IEDs in NREM sleep (overall: 30 minutes, n=6) tagged by an expert neurologist. The second task aimed at detecting IEDs in a limited number of scalp EEG (Fz, Cz, Pz) and EOG electrodes. To this end, we used the results from the first model on the entire overnight dataset. This dataset contained 3466 IEDs (overall: 40 hours, n=6) as tagged by the random forest classifier. For each task and algorithm, we assessed the test results using standard metrics of precision (number of positive class predictions that indeed belong to the positive class) and recall (also known as sensitivity; number of positive class predictions out of all positive examples in the dataset).

Results: Results of the first task (automatic detection in intracranial data) were assessed by comparing model outputs to manual annotation by expert neurologists. We obtained with random forest classifier: precision=92% and recall=66%, and with LightGBM classifier: precision=88% and recall=74%. Results of the second task (automatic detection in scalp

EEG/EOG electrodes) were assessed by comparing model outputs to the automatic intracranial results. We obtained with random forest classifier: precision=77% and recall=2%, and with lightGBM: precision=67% and recall=3%.
Conclusion: The presence of a small (<5%) subset of IEDs in the MTL can be automatically detected with acceptable (>75%) precision non-invasively. We are now exploring the extent to which our models can generalize across individuals.
Acknowledgment: Supported by the European Research Council (ERC-2019-CoG 864353).

MORNING PERCEPTION OF SLEEP, STRESS AND MOOD, AND ITS RELATIONSHIP WITH OVERNIGHT PHYSIOLOGICAL SLEEP PROCESSES IN ADOLESCENTS

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Introduction: Adolescence is characterized by profound biopsychosocial maturation, including changes in sleep physiology and behavior. Insomnia frequently emerges in adolescence, toward a greater prevalence in older girls. Although the objective-subjective sleep discrepancy is among the principal factors considered in insomnia diagnosis, the extent to which the profound developmental sleep changes occurring in adolescence are reflected in changes in subjective sleep perception is still unknown. In this study we aimed to investigate age- and sex-dependent differences in morning sleep perception, mood (e.g., sadness, stress, irritability), and readiness (e.g., concentration, fatigue, readiness), and explore the physiological correlates (polysomnographic (PSG) and electroencephalographic (EEG) sleep measures, and indices of sleep cardiac autonomic function) of morning perception of sleep, mood and readiness, in adolescents.
Materials and Methods: The sample consisted of 137 healthy adolescents (Age Range: 12-21 years; Mean Age: 15.5±2.3 y; 61 girls; Body Mass Index: 21.9 ±4.8 $kg \times m^{-2}$; 105 Caucasian), who were participating in the baseline sleep study of the National Consortium on Alcohol and Neurodevelopment in Adolescence (NCANDA) at SRI International (N = 109) and the University of Pittsburgh (N = 28). Participants underwent a laboratory-based PSG evaluation and rated their sleep quality, mood, and readiness the following morning. PSG, EEG, and autonomic indices were included in models to determine predictors of morning sleep perception, mood and state of readiness. Analyses were performed using Lasso predictor selection and linear regression with robust variance estimates.
Results: There was a significant effect of age for perceptions of sleep, with older adolescents reporting a deeper and less restless sleep than younger adolescents ($p<0.05$), however, they also reported more awakenings than younger adolescents ($p<0.05$). There were no sex differences in perceptions of sleep, however, older boys had greater discrepancy between the subjective and objective assessments of time spent awake at night (i.e., underestimation of PSG wakefulness), compared to younger boys and younger and older girls ($p<0.05$). Overall, PSG, EEG, and autonomic (heart rate and vagal-associated heart rate variability) measures explained between 3% and 29% of variance in morning sleep perception, mood, and readiness indices. Equally for both sexes, PSG measures (sleep timing, duration, and continuity) were the strongest predictors of morning self-reported measures, however, quantitative sleep EEG delta activity and autonomic measures also contributed to predicting sleep depth and restlessness, alertness, fatigue, sensation of being exhausted, and irritability ($p<0.05$).
Conclusions: For both boys and girls, the subjective experience of sleep is a complex and multi-component phenomenon, in which distinct physiological sleep processes only partially contributing to the morning perception of sleep and related measures of mood and readiness.
Acknowledgements:

NEURONS IN PREFRONTAL CORTEX RESPOND TO SLEEP DEPRIVATION BY INITIATING SLEEP PREPARATORY BEHAVIOUR AND NREM SLEEP

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Introduction: Animals undertake specific behaviours before sleep, yet little is known about whether these innate behaviours, such as nest building, are actually an intrinsic part of the sleep-inducing circuitry. The prefrontal cortex (PFC) contributes to executive functions and planning and is particularly sensitive to sleep deprivation. We examined the role of a subset of mouse PFC somatostatin/GABAergic (SOM/GABA) neurons which we found become activated during sleep deprivation.
Materials and Methods: We used cfos-based activity tagging to selectively capture SOM/GABA neurons in the mouse PFC cells that became active with sleep deprivation. To dissect the behavioural functions of these SOM/GABA cells, tagged mice were then challenged both chemogenetically and optogenetically. Projection specificities of the cells were tested by immunochemistry and electrophysiology.
Results: We found that mouse PFC SOM/GABA neurons, which become activated during sleep deprivation, induce sleep preparatory behaviour (nest building) when directly re-activated. Furthermore, if their activation is prolonged, these tagged neurons induce sustained global NREM sleep. We also found that these sleep-deprivation tagged PFC SOM/GABA neurons have long-range projections to the lateral preoptic (LPO) and lateral hypothalamus (LH) and these projections govern induction of nesting and NREM sleep respectively.
Conclusions: Our findings provide a circuit link for how the PFC responds to sleep deprivation by coordinating sleep preparatory behaviour and subsequent sleep. In the case of the PFC, with its role in executive function and planning, a direct connection to hypothalamic centres to initiate sleep preparation, and to help reinforce global sleep, could be a survival advantage to ensure the animal is in a safe place prior to sleeping.
Acknowledgements: This work was supported by the Wellcome Trust, the UK Dementia Research Institute at Imperial College, an MRC UK DRI studentship, an Imperial College Schrodinger Scholarship, an Imperial College/China Scholarship scheme, and EPSRC studentship, EPSRC Centre for Doctoral Training in Neurotechnology for Life and Health.

OBESITY-HYPOVENTILATION SYNDROME PREVALENCE IN PATIENTS WITH METABOLIC SYNDROME: INTERMEDIATE ANALYSIS ESTIMATES OBESITY-RELATED SLEEP HYPOVENTILATION PREVALENCE AT 6%

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Introduction: Obesity-hypoventilation syndrome (OHS) is defined by the combination of obesity (Body-Mass Index (BMI) $\geq 30 kg.m^{-2}$), sleep-disordered breathing , and awake daytime hypercapnia (awake resting PaCO2 > 45 mm Hg at sea level), after excluding other causes for hypoventilation. Worldwide OHS prevalence is estimated to be 10-20% in obese patients with obstructive sleep apnea (OSA) and 0.4% in the general adult population but is still unknown in France. Although frequently associated with OSA, it is a distinct clinical entity. The European Pneumology Society stages OHS severity from 0 (no OHS), 1-2 (obesity-related sleep hypoventilationmeasured by nocturnal capnography) to 3-4 (daytime hypercapnia). Under-diagnosed, OHS is most often discovered during an acute respiratory failure, which increases health-related costs and risk of hospitalization and death. It is thus critical to determine the prevalence of