

accelerometer and GPS data from cell phones (N=15; 3052 total driving events recorded). Risky driving behaviors included: 1) frequency of hard-braking events, 2) frequency of aggressive-acceleration events, 3) duration of excessive-speeding, and 4) duration of phone-usage. At week 2, participants spent 24 hours in-lab where hourly saliva samples were collected and assayed for melatonin, and DLMOFF was calculated. Phase angle of driving events relative to DLMOFF was used as the predictor in nested mixed-effects regressions, with risky driving behaviors as the outcome variables.

**Results:** The most common occurrences of risky driving were phone-usage and hard-braking. On average, NSWs had 46.7% and 42.0% of driving events with at least one occurrence of phone-usage and hard-braking, respectively. Rates of aggressive-acceleration and speeding were 24.4% and 20.4%. Positive phase angles (i.e. driving after DLMOFF) were associated with reduced rates of hard-braking and aggressive-acceleration, but not of phone-usage and excessive-speeding. Specifically, rates of hard-braking and aggressive-acceleration decreased by 4.5% ( $p < .01$ ) and 3.4% ( $p = .05$ ) every two hours following DLMOFF, respectively.

**Conclusion:** The study suggests DLMOFF appears to be an important variable for predicting accident risk in NSWs. If replicated, circadian phase should be considered in recommendations to increase occupational health and safety of NSWs.

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## 0204

### THE IMPACT OF SLEEP ON WELL-BEING AND DIURNAL PERFORMANCE IN ELITE AUSTRALIAN FOOTBALL LEAGUE ATHLETES

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**Introduction:** The ultimate goal in the sports world is achieving optimal health and continuous high-level performance through an adequate balance of training load and recovery e.g. rehab, nutrition, well being and sleep. Athletes often encounter situations that negatively impact their ability to sleep well, disrupt their biological rhythms and increase mental stress e.g. late competition times, travel and high training load. Therefore, there is a need to increase our understanding of how individual variability could be impacting recovery and performance in elite sports.

**Methods:** This study examined the relationships between individual sleep and circadian patterns, well-being and performance variables in Australian Football League (AFL) athletes. Actigraphy combined with daily sleep diaries were used to gather objective sleep data over a period of 14 days. Performance tests were conducted in the morning (between 07:00 - 08:00am) and afternoon (between 14:00 - 15:00) on days 3, 5, 7, 10, 12 and 14. Performance measures included a strength test (force plate jump), a skilled based accuracy test (goal kicking) and a reaction time test (psychomotor vigilance task).

**Results:** Preliminary results show that sleep and circadian parameters differed significantly between individuals and were correlated with measures of well-being and diurnal performance.

**Conclusion:** The Australian Football League (AFL) is one of the largest growing sports industries in Australia and New Zealand with annual revenues reaching a billion dollars. These findings add to the growing literature showing how sleep impacts performance in elite athletes and highlights the need to take sleep and time of day into account. This is of critical importance to the global sports industry, who are constantly seeking marginal gains.

**Support:** n/a

## 0205

### REMOTE COLLECTION OF DAILY LIFE INFORMATION FOR JAPANESE RESIDENTS

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**Introduction:** Japanese medical students spend their school days under a dense curriculum. It is often difficult to maintain their healthy lifestyle. After graduation, most of them participate in clinical training programs as residents. It is also difficult to maintain a normal life because they are engaged in different specialized departments every few months. Such an environment is considered prone to mental health problems. In fact, one in four residents are reported to be newly depressed two months after the start of clinical training (Maeno T, et al. 2008). These mental health issues are thought to be affected by changes in daily life, but it is difficult to know such changes. In order to investigate changes in their daily lives, we developed a data collection system related to mental health via the Internet.

**Methods:** The subjects were 22 medical students who graduated from our university in March 2017. They were asked to wear activity tracker wrist bands from December 2016. They were also asked to answer the questionnaire on a web site every week as much as possible, and the responses were collected via the Internet together with the activity data. The first eight months of the observation period, including four months before the start of clinical training and four month after the start of clinical training, are divided into four quarters every two months, and the averaged sleep time and responses to the questionnaire in each period were investigated.

**Results:** The average number of days that the sleep was effectively recorded during each two months was 28–48. The average number of responses to the questionnaire during each two months was 6.0–7.2.

**Conclusion:** Residents in the initial clinical training period should be very busy, but the system we have developed seems to have worked well with them for the first four months after the start of clinical training. Whether this system would work as well a longer period is a further problem.

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## 0206

### SLEEP OPPORTUNITY AND DURATION ARE RELATED TO RISK INJURY IN ELITE ATHLETES

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**Introduction:** Sleep is essential to musculoskeletal recovery, acquisition of new skills and emotional regulation in athletes. Insufficient sleep is detrimental to performance. Recent publications indicate that sleep duration is related to risk for injury in young athletes. We aimed at analyzing the relation between sleep opportunity and duration and the likelihood of an injury among adult elite athletes.

**Methods:** We studied 7,237 nights recorded with the SleepRate application by 71 adult elite athletes from diverse sports, during the period September 2018–October 2019. Night recordings included perceived and measured sleep parameters. In addition, athletes reported their previous day nap duration, injuries and illness status. Out of the total number of nights, 4,205 included reported injury status with no injury and no illness for the previous night. Nightly total time in bed (TIB), TIB including reported naps (TIB24hr) and measured total sleep time (TST) were examined.

**Results:** Average TIB was significantly shorter ( $508 \pm 77$  minutes, mean  $\pm$  STD) in healthy days preceding injuries than in healthy days preceding days with no injury ( $525 \pm 70$  minutes,  $p < .001$ ). Similar results were found when comparing the TIB24hr (injury:  $517 \pm 83$  minutes, no injury:  $543 \pm 76$  minutes,  $p < .001$ ) and TST (injury:  $443 \pm 72$  minutes, no injury:  $457 \pm 69$  minutes,  $p < .001$ ).

**Conclusion:** Average sleep opportunities of the elite athletes in this study were in accordance with their age and workouts load. The time athletes allow themselves as an opportunity for sleep is inversely correlated to the chances of developing an injury. These findings corroborate published research regarding sleep duration and risk of injury in athletes, yet our findings are based on real life data of elite athletes, and demonstrate the importance of sleep as part of the elite or professional athlete's routine, suggesting that even as little as around 20 minutes of added sleep may be efficient in preventing injury.

**Support:** N/A

## 0207

### THE EFFECT OF NAPS ON INHIBITORY CONTROL AND SUSTAINED ATTENTION IN EARLY CHILDHOOD

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**Introduction:** Sleep in adults and school-age children has been shown to improve regulatory behaviors. Specifically, slow wave sleep (SWS) disruptions have been positively associated with decreased levels of sustained attention and inhibitory control in adults, while REM sleep has been associated with inhibitory control in typically developing children. However, it is unknown whether midday naps confer a similar benefit in preschool-aged children, particularly since REM sleep is often lacking in their naps. In this study, we used a Go/No-Go task to determine whether SWS during early childhood naps benefits sustained attention and inhibitory control. We also explored nap habituality as a factor given that habitual and non-habitual nappers have different sleep architecture in adults and children.

**Methods:** Preschool children ( $N=22$ , 38–69 months) completed a Go/No-Go task, after which they either napped with polysomnography (nap condition) or stayed awake (wake condition) for an equivalent amount of time (within subject; order counterbalanced;  $\sim 1$  week apart). After their nap and wake sessions, they completed the Go/No-Go task again.

**Results:** When controlling for nap frequency, participant performance (accuracy) post-session did not differ across conditions. However, by examining only the habitual nappers (5–7 days/week,  $N=9$ ), we found a moderate positive correlation between percent of sleep spent in SWS and post-nap accuracy ( $r=0.335$ ,  $p=0.037$ ). Interestingly, we did not see the same relationship with non-habitual nappers (0–4 days/week,  $N=13$ ) and found a weak negative correlation with SWS ( $r=0.007$ ,  $p=0.031$ ).

**Conclusion:** The findings suggest that habitually napping children show a benefit of nap SWS on regulatory behaviors while non-habitual nappers do not. Such results have important translational significance for early education settings.

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## 0208

### THE EFFECT OF MASTICATION ON PSYCHOMOTOR VIGILANCE PERFORMANCE

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**Introduction:** Sustained attention is important for optimal neurobehavioral performance, but many biological and environment factors (e.g., circadian rhythm, distraction) may cause sustained attention deficits. Mastication (chewing) has been suggested to provide a countermeasure to sustained attention deficits. To investigate this, we conducted a randomized, within-subjects, cross-over study of sustained attention with a mastication condition and a control condition.

**Methods:**  $N=58$  adults (ages 18–45; 38 females) completed a 5h in-laboratory study. Subjects entered the laboratory at 09:00. Following training on performance tasks, they had a 1h break before beginning the first of two test bouts at 11:00. Each test bout was 40min long and included subjective rating scales, the Sustained Attention to Response Task, and the Psychomotor Vigilance Test (PVT). Here we focus on PVT lapses of attention ( $RT > 500$  ms), false starts, and mean reaction time (RT) as measures of sustained attention. In between test bouts, subjects had a 1h break inside the laboratory. During one of the two test bouts, subjects were instructed to chew a piece of gum at a steady, comfortable rate. Mastication activity was verified via electromyography (EMG). Half of the sample was assigned to the mastication condition during the first test bout, the other half during the second test bout.

**Results:** Controlling for order of conditions, there were no significant differences between conditions for PVT lapses ( $F_{1,56}=0.40$ ,  $P=0.54$ ) or false starts ( $F_{1,56}=0.10$ ,  $P=0.80$ ). Mean RT was higher in the mastication condition by  $8.9 \pm 2.5$ ms ( $F_{1,56}=12.68$ ,  $P < 0.001$ ).

**Conclusion:** Using this test paradigm, we were unable to detect any significant improvement in PVT performance, although mastication resulted in a very small increase in mean RT. However, subjects were not sleep-deprived, distracted, or otherwise perturbed. A follow-up study under conditions of sleep deprivation and/or with longer task duration may provide further insight into the countermeasure potential of mastication.

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## 0209

### THE EFFECT OF A NAP ON EMOTIONAL REACTIVITY IN INDIVIDUALS WITH A CHRONIC MILD TRAUMATIC BRAIN INJURY

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**Introduction:** Mild Traumatic brain injuries (mTBIs) affect  $\sim 1$ –3 million people per year in the US alone. Mild TBIs can have lasting ( $>1$  year) impacts on emotional reactivity and regulation. Sleep has also been shown to be significantly altered in individuals with a mTBI, even when tested over a year since the injury. Sleep quality is strongly linked with emotional stability and emotional memory. Therefore, one possible mediating factor between emotional reactivity and mTBIs is sleep. Reduced sleep quality following a mTBI may impair the emotional regulation that typically occurs across sleep. Thus, increasing total sleep time through a nap may help to alleviate some of the emotional symptoms. This study assessed whether individuals with a chronic mTBI showed differences in brain activity associated with emotional regulatory circuits, performance on an emotional reactivity task, and sleep physiology across a nap compared to controls.

**Methods:** Participants were 53 young adults (mTBI nap group:  $n=9$ ; control nap group:  $n=16$ ; mTBI wake group:  $n=11$ ; control wake group:  $n=17$ ). Following a nap, or an equivalent bout of wake (both recorded with polysomnography), participants completed an emotional Go/No-Go task in which they were asked to respond when a particular emotional valence was presented (neutral, fearful, or happy), and withhold a response when a different valence was presented.