

survey about the mental health status of university students once a year from November 2011 to December 2014.

Materials and methods: Data were collected from undergraduate students enrolled in general psychology and health psychology courses at two universities in Sendai city (the capital of Miyagi prefecture) each year. To compare the influence among areas of residence with different damage severity, participants were divided into two groups according to their residence:

- 1) the coastal areas of Miyagi, which suffered from both the tsunami floods and the earthquake oscillation;
- 2) the inland areas of Miyagi, which suffered only from the earthquake.

The final sample consisted of 30, 38, 28, and 34 students who lived in the coastal area of Miyagi prefecture and 143, 111, 96, and 115 students who lived in the inland area of Miyagi prefecture at the time of survey in the years 2011, 2012, 2013, and 2014 respectively. These data were compared with the data from the study conducted in 2005, before the earthquake.

Results: In general, some differences among the areas and problems were observed; some problems were mitigated, while others remained high or got worse. In addition, these tendencies were partly different between the two residential areas. For example, the percentage of students who experienced difficulties in falling asleep increased largely in the coastal but not so much in inland area in the first year, and the percentage decreased in the second year in those in the coastal area. Whereas, the percentage of students who experienced nightmare problems increased in the first year and remained high at least for three years in the coastal area, while the percentage of students experiencing nightmares in the inland area increased after the earthquake, but the amount of the change was smaller than that of students in the coastal area.

Conclusions: After the earthquake, in the students in the coastal area, some sleep problems, including difficulties in falling asleep, were mitigated within the first two years, while other problems, including nightmares, remained high at least for three years. Conversely, in general, the percentages of various kinds of sleep problems were smaller in the inland area than those in the coastal area.

Insomnia

DEVELOPMENT AND EVALUATION OF A 4-WEEK SLEEP-COACHING PROGRAM

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Introduction: The prevalence of disturbed sleep in the German armed forces has been shown to be higher than in the general population. Furthermore, since impaired sleep quality prior to deployment is a risk factor for the development of mental health problems, a good sleep quality is essential for the health of military service members. The results of the evaluation of a short-term sleep-coaching program for the German armed forces are presented.

Materials and methods: The sleep-coaching program comprises four 1.5-hrs sessions, which were applied on a weekly basis. The program was evaluated with a treatment group (TG) and a control group (CG) in a cross-over study design. The CG participated in the sleep coaching program after the TG completed the program. Objective sleep quality was measured by ambulatory polysomnography in both groups in parallel prior to participation of the treatment group in the sleep coaching program (t0 baseline), directly after the end of participation of the treatment group in the program (t1), and after the end of participation of the control group (t2), at two consecutive nights each. Subjective sleep quality was analyzed at the same three points in time and in a 3-month follow-up evaluation (t3) by applying evening- and morning protocols, the Pittsburgh Sleep Quality Index (PSQI), the Insomnia Severity Index (ISI), and the Epworth Sleepiness Scale (ESS). Statistical analyses comprised general linear models for repeated measurements, Friedman tests, Mann-Whitney U-Tests for independent samples and Chi-square tests.

Results: In total 57 members (42 male; mean age: 40.6 ± 10.6 years; range: 18–58 years) of the German armed forces participated in the sleep-coaching program. Complete PSG data for all six nights (t0–t2) was

available of 29 participants, complete questionnaire data were available for three points in time (t0–t2) in 51 participants and for all four points (t0–t3) in 39 participants, respectively. The TG and the CG neither differed in age, gender nor in baseline scores of questionnaires. Objective sleep efficiency improved significantly in both groups ($p < 0.05$). The objective and subjective sleep latencies as well as objective wake after sleep onset time decreased significantly across time ($p < 0.05$). Both groups showed significant improvements from t0 to t3 in subjective sleep quality (PSQI: $p < 0.01$; ISI: $p < 0.01$) and in daytime sleepiness in the TG (ESS: TG: $p = 0.003$; CG: $p = 0.241$). A significant intervention effect was seen in the ISI at t1 ($p < 0.026$).

Conclusions: The sleep-coaching program is a very efficient method to improve objective and subjective sleep quality in members of the German armed forces. To increase the accessibility of the sleep-coaching program as a preventive tool in occupational health management, the program will be disseminated by trained psychologists of the German armed forces, and an e-learning version of the program will be implemented.

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Basic Research

EFFECT OF PULSED GSM 900 MHZ, WCDMA/UMTS AND TETRA EXPOSURE ON THE MACROSTRUCTURE OF SLEEP: AN INTRA-INDIVIDUAL PERSPECTIVE

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Introduction: To analyse possible RF-EMF effects on the physiologically measured macrostructure of sleep. Based on the observation that in some individuals GSM 900 MHz (Global System for Mobile Communications) and to a lesser extent also WCDMA/UMTS (Wideband Code Division Multiple Access/ Universal Mobile Telecommunications System) exposure leads to a consistent increase in REM sleep in a sample of young male healthy volunteers (Danker-Hopfe et al. 2016) the present study investigates whether similar effects can also be observed with TETRA exposure in young healthy males and with GSM 900 MHz and TETRA (Terrestrial Trunked Radio) exposure in elderly women.

Materials and methods: In three double-blind, randomized, sham-controlled cross-over studies effects of different RF-EMF exposures on sleep were investigated in two samples of young healthy male volunteers (20–30 years) and in one sample of elderly healthy female volunteers (60–80 years; each sample $n = 30$). Exposure was delivered by a head worn antennas, which had been specifically designed for the projects. An adaptation night, which served as screening night for sleep disorders and as an adjustment night to the laboratory environment, was followed by nine study nights in the laboratory (three nights per condition), in which subjects were exposed to three different exposure conditions (SHAM, and two verum exposures) in an individually randomized order. Polysomnography was performed (assessment and evaluation) according to the AASM standard. All nights were scored according to the standard rules and all three nights/condition and subject were used in the analysis of nine individual verum exposure/SHAM comparisons per subject.

Results: The percentage of subjects showing significant variations with exposure as compared to sham in at least one sleep variable varied from 68.8% in healthy young men under TETRA 6.0 W/kg exposure to 96.7% in elderly women also under TETRA 6.0 W/kg exposure. The average number of sleep variables, which showed a significant individual difference between sham and exposure varied from 1.5 in young men (TETRA 6.0 W/kg) to 2.8 in elderly women (again TETRA 6.0 W/kg). While in young males stage R sleep tended to be consistently higher in individuals, in which REM sleep was affected at all (see also Danker-Hopfe et al 2016), this trend could not be observed in elderly females. At the individual level elderly females tended to have slightly more deep sleep (stage N3) under RF-EMF exposure.

Conclusions: The data underline that at the individual level there are differences in sleep parameters and that there are differences between young men and elderly women. Whether these effects are gender and/or age related will be answered when the data of a study in elderly men,

which is still ongoing, are available. Anyhow, all observed effects are not indicative of a disturbed sleep under RF-EMF exposure.

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Behavior, Cognition and Dreaming

AGING AND DREAMING: EEG OSCILLATIONS PREDICT DREAM RECALL

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Introduction: Neural correlates of dreaming in elderly people are still largely unknown. Several studies showed that electrophysiological (EEG) background during sleep may predict the subsequent presence/absence of dream recall (DR). For instance, it has been demonstrated a relationship between high-frequency (20/25–50 Hz) and DR in young subjects (Siclari et al., 2017), consistently with the “Activation Models” (e.g., Antrobus, 1991). Other studies found that DR is related to frontal theta activity (5–7 Hz) during REM sleep, underlying the presence of shared mechanisms in the retrieval of episodic memory across different states of consciousness (Marzano et al., 2011; Scarpelli et al., 2015). Bearing in mind this scientific background on young healthy subjects, our study aimed to understand whether the presence/absence of DR could be related to specific topographical features of the sleep EEG in elderly.

Materials and methods: Forty healthy older volunteers (mean age=68.4±1.02) were recorded with polysomnography (19 derivations). Twenty subjects were awakened from REM sleep and twenty subjects from stage 2 NREM sleep. Dreams were collected upon morning awakening from both stages. EEG power spectra of the total sleep and of the last 5 min were calculated by Fast Fourier Transform (FFT). The Better OSCillation (BOSC) detection method was used to detect oscillatory activity within EEG signals of the last sleep segment.

Results: In both sub-groups (REM awakenings, NREM awakenings) the 45% of subjects reported DR. Statistical comparisons (unpaired t-test) between recallers (REC) and non-recallers (NREC) revealed that DR from NREM sleep is related to higher beta activity (16–24.75 Hz) over temporal areas during the total sleep. Moreover, DR from REM sleep is related to a general increased of alpha activity (8–11.75 Hz) during the whole-night sleep. BOSC analysis showed that in the last 5 min of REM sleep higher alpha oscillations predict DR. No differences were found in the oscillatory activity during the last segment of stage 2.

Conclusions: According to the idea that an EEG milieu characterized by a less synchronized cortical activity is a prerequisite for DR (Activation Models), these results showed that DR is facilitated by higher cortical activation in both REM and NREM sleep. In fact, EEG alpha and beta activity, respectively found during REM and NREM sleep, could be considered as an expression of relative cortical arousal.

Considering that the differences between REC and NREC, obtained by a FFT analysis, were significant only for entire sleep using a between-subject design, we can hypothesize that these EEG correlates of DR may be partially explained by trait-like factors.

Finally, it should be noted that the differences between REC and NREC during REM sleep are larger when alpha oscillations are specifically detected, suggesting that the predictive relationship between EEG pattern and DR upon awakenings from REM sleep mostly depends on the oscillatory activity, more than on tonic–non rhythmic activity.

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Sleep Breathing Disorders

SYSTOLIC BLOOD PRESSURE IS DETERMINED BY RISK OF SLEEP APNOEA AND BODY MASS INDEX IN SOUTH AFRICAN HIV+ PATIENTS AND CONTROLS

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Introduction: Sleep apnoea is a known contributor to hypertension. HIV+ patients have been shown to be more prone to sleep apnoea at identical ages and body mass index (BMI) than HIV- controls. Under antiretroviral treatment, HIV+ patients gain weight, which may increase their risk of becoming hypertensive and developing sleep apnoea. In this study, we investigated the relationship between blood pressure, BMI and risk of sleep apnoea in 147 treated HIV+ patients and 200 controls from the general population in the Phuthaditjhaba municipality in South Africa.

Materials and methods: We enrolled 200 treated HIV+ patients from local clinics in Phuthaditjhaba and 200 controls from the neighborhoods surrounding the clinics. In 147 HIV+ patients and in all controls, we measured blood pressure, BMI and assessed the risk of sleep apnoea using the Berlin Questionnaire (translated in Sesotho). We then assessed in multivariate analysis the main effects of HIV status, BMI and scoring high risk of sleep apnoea as well as the interaction between these main effects on systolic blood pressure.

Results: The demographic composition of the two groups was comparable, mainly female (72%) and middle aged (average age (SD)= 43 (15)). The HIV+ patients had an average (SD) current CD4 count of 515 (248). They had a lower average BMI than the controls (average(SD)=24(6) vs. 27(6), respectively), and 10% of HIV+ patients scored high risk of sleep apnoea vs. 15% in the controls (p=0.13). Average (SD) systolic blood pressure was 133 (24) mmHg and did not differ between the two groups. In multivariate analyses adjusted for age, we found a main effect of scoring high risk of sleep apnoea on the Berlin Questionnaire ($\beta=38$, p=0.0047), no significant main effects of group or BMI, and a three-way interaction between scoring high risk of sleep apnoea, HIV status and BMI (p=0.017) whereby in HIV+ patients each increase in BMI was associated with an increased effect on systolic blood pressure compared to controls.

Conclusions: We found that in HIV+ patients and in controls, when adjusting for age, BMI and HIV status, systolic blood pressure increased with scoring high risk of sleep apnoea. In addition, we found that HIV+ patients' systolic blood pressure was more impacted by increases in BMI than in controls. Although HIV+ patients had overall lower BMI than controls, this suggests that weight gain in HIV+ patients may translate into a higher risk of developing hypertension than in controls. This may have implications for the future chronic care of HIV+ patients.

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Narcolepsy

TREATMENT WITH SODIUM OXYBATE DECREASES BODY MASS INDEX IN NARCOLEPSY TYPE 1

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Introduction: Individuals with narcolepsy type 1 often gain body weight after disease onset, frequently leading to obesity. Previous work suggested this weight gain may be counteracted by treatment with sodium oxybate (SXB). This has not yet been confirmed, and long-term follow-up data are not available. We assessed body mass index (BMI) change after initiating treatment with SXB and compared this with BMI change after initiating treatment with modafinil in narcolepsy type 1.

Materials and methods: In the study period between 2009 and 2017 there were 81 individuals that fulfilled the entry criteria for this retrospective study: 59 had newly started treatment with sodium oxybate, and 22 had newly started modafinil. Gender and baseline BMI specific differences between both treatment groups were compared using Student's t-tests and mixed effect modeling.

Results: Mean follow-up was 2.0 years in SXB patients and 1.2 years in modafinil patients. Those using sodium oxybate lost weight with a mean BMI decrease of 2.55 kg/m² between first and last measurement (women; p=0.001) and 0.84 kg/m² (men; p= 0.006). Patients using modafinil, however, gained weight with a mean BMI increase of