

Abstract

Introduction: Circadian rhythms are typically manifested by individual timing of the sleep-wake cycle, expressed as a specific chronotype. Social jet-lag (SJL) is a phenomenon related to circadian preference as it reflects the phase misalignment of internal biological and external social time. SJL occurs when a person does not have the opportunity to fall asleep and get up in accordance with chronotype. Chronotype and SJL are phenomena that have recently been increasingly associated with the pathogenesis of sleep disorders and many civilization diseases, especially diseases of metabolic system.

Aims and objectives: The aims of the thesis were: 1/ To determine chronotype and social jet-lag and observe further links between sex, age, BMI and other parameters in a selected sample of the Czech population across socio-demographic categories. 2/ To find out whether chronotype and the SJL play a role in the treatment of obesity. 3/ To revise the commonly used methods for chronotype assessment (questionnaires and actigraphy) for their future use in the Czech environment.

Material and methods: The thesis consists of three follow-up studies (questionnaire, actigraphic and combined). Both subjective and objective methods of chronotype and SJL assessment were used in the thesis. 1) The first study was a questionnaire and the data were collected via an online form. The complete collection of questionnaires consisted of: MEQ – The Morningness – Eveningness Questionnaire, MCTQ – Munich Chronotype Questionnaire, PSQI – Pittsburgh Sleep Quality Index, FSS – Fatigue Severity Scale and personal data (age, sex, education, body height and weight etc.). The analyzes were performed using descriptive, parametric and non-parametric statistics using IBM SPSS Statistics 23. Part of the study was an analysis of the properties of MEQ and MCTQ 2) In the second study we focused on actigraphic monitoring using actigraphic parameters: acrophase and interdaily stability (IS), total daily sleep time, the activity in the five least active hours of the day (L5), the activity in the 10 most active hours of the day (M10) and a total activity for a 24h (mesor). Data was also processed using IBM SPSS Statistics 23 and Matlab. 3) The third study presents a comparative analysis of selected circadian and sleep parameters from questionnaires, sleep diaries and actigraphs: acrophase, IS, M10, mesor, L5, the middle of sleep time, and focuses on the question of whether subjective chronotype determination and SJL can be replaced by actigraphic measurements. The interrelationships between parameters were tested by Matlab 2018b using univariate linear regression, as well as predicting error by five-fold cross-validation.

Results: The first study (n=2703) confirmed a negative correlation of the MEQ with the SJL extent, that is the earlier the chronotype, the lower the SJL level. The higher the SJL and the evening chronotype generally showed the bigger morning fatigue and worse/lower appetite upon awakening. Evening chronotype in men was associated with greater daily fatigue and in women with higher BMI. A strong significant relationship between the MEQ and the MCTQ was demonstrated with the MCTQ sensitivity in the range of 59-76 % and specificity in the range of 63-62 %. The results of the second study (n=92) indicate the success of the weight loss program is affected by the circadian phenotype and physical activity that is itself influenced by the SJL extent. In the last study (n=126) we were looking for actigraphy correlates to the subjectively measured sleep and circadian parameters. The expected difference in the actigraphy measurement compared to questionnaires is 7-8 points on the MEQ scale and 45-49 minutes on the MCTQ scale.

Conclusion: The thesis represents a collection of the three interlinked original studies related to the circadian rhythms, specifically chronotype and the social jet-lag in the connection with obesity and its treatment. The thesis clarifies the association between chronotype, SJL and physical activity with increased body weight and thus uncovers the potential for the future clinical practice not only in the field of obesitology, but also in chronobiology since it revises selected methods of chronotype and social jet-lag assessment.