Sleep and Body weight

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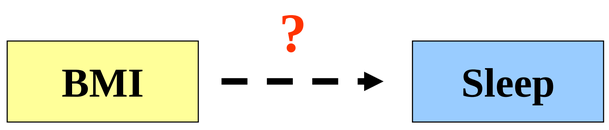
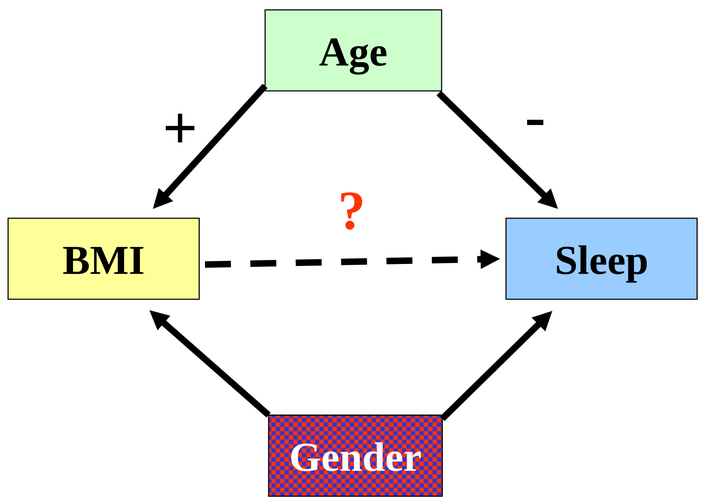
Introduction

Obesity is one of the emerging health problems in large parts of the world. It is associated with numerous diseases and thereby a substantial underlying cause of morbidity and mortality.
Increased relative body weight is associated with specific sleep disorders such as sleep apnea and narcolepsy but, to date, very little is known about the relationship between body weight and sleep in the general population.



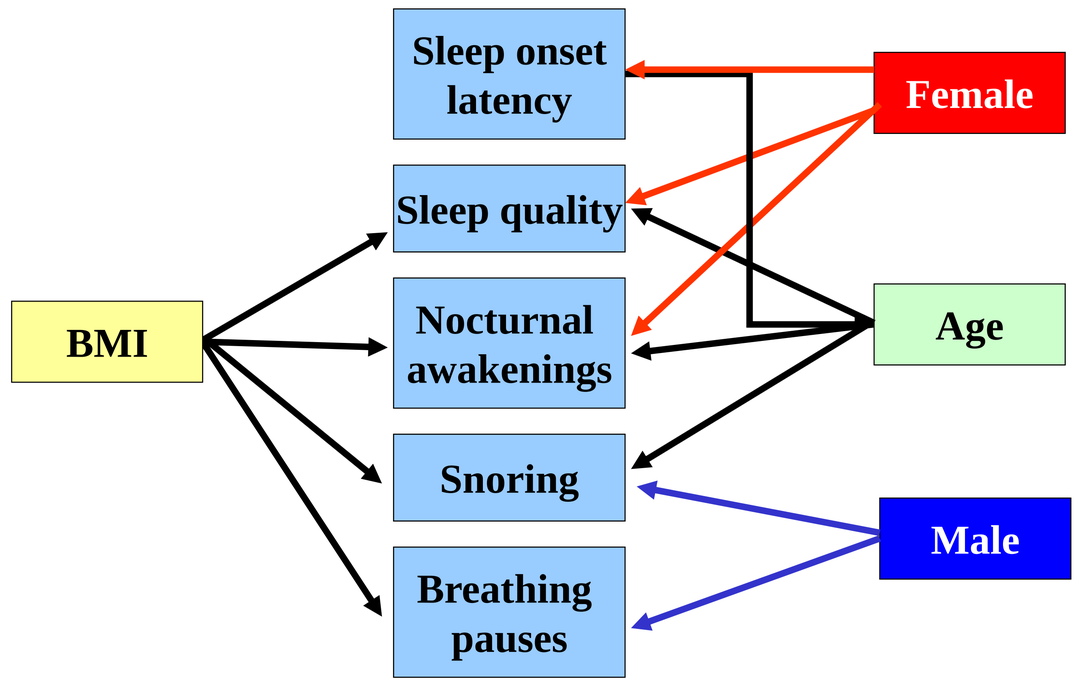
Investigations into the possible relationship between body weight and sleep must take age into account. It is well documented that sleep changes with increasing age. On the other hand body weight increases with aging. We investigated in a large scaled population study whether body weight is independently related to sleep even when taking known age and gender effects into account.



Methods

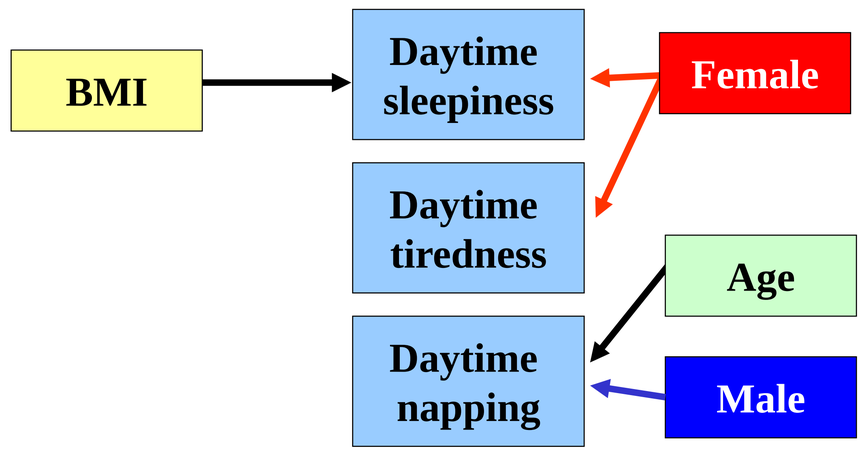
The Bavarian Food Consumption Survey II (BVS II) is a representative study of the Bavarian population aged 14-80 years (**N = 1050**) with data on weight, height, diet and sleep. The mean age was 46.2 ± 17.1 years, the male/female ratio was 430/584, and the mean body mass index (BMI) was 25.1±4.7 kg/m2. Individual BMIs were classified as underweight (BMI < 18.5; 4.1% of the sample), normal weight (BMI: 18.5-25; 49.6%), pre-adipositas (BMI 25-30; 34.0%) and adipositas (BMI: > 30; 12.4%).
Sleep parameters were assessed with questions from the Pittsburgh Sleep Quality Index (PSQI, **Table**).

Sleep parameters
Sleep duration (h)
Sleep onset latency (min)
Rating scales
Sleep quality
Number of awakenings
Snoring
Breathing pauses
Leg movements
Daytime tiredness
Daytime sleepiness
Daytime naps



Data analysis

For sleep duration and (log-transformed) sleep onset latency univariate analyses of variance were computed with age, gender and BMI as independent variables. For the ordinal dependent outcomes proportional odds models were employed. The proportional odds assumption was tested by comparing the fit of the model with the fit of a multinomial logit model, that does not assume any ordering of categories of the dependent variable.



Results

- Body weight was related to sleep quality, number of nocturnal awakenings, daytime sleepiness, snoring and breathing pauses during sleep in a systematic „sleep-disturbing" fashion.
- Females were more likely to report a worse sleep quality, more nocturnal awakenings, more daytime tiredness and daytime sleepiness. Males were more likely to nap during the day and have breathing pauses during sleep.
- With increasing age sleep quality became worse and there was a higher probability for daytime napping, snoring and breathing pauses.
- Self-reported sleep duration and nocturnal leg movements were unrelated to gender, age or BMI, while sleep onset latency showed a gender x age interaction, with increasing latencies for older women.
- Snoring increased with age but in addition we found a BMI x gender interaction. As the **Figure** shows, overall, females were less likely to snore than males. However, the relationship between increases in relative body weight and the probability to snore more frequently was more pronounced in females.

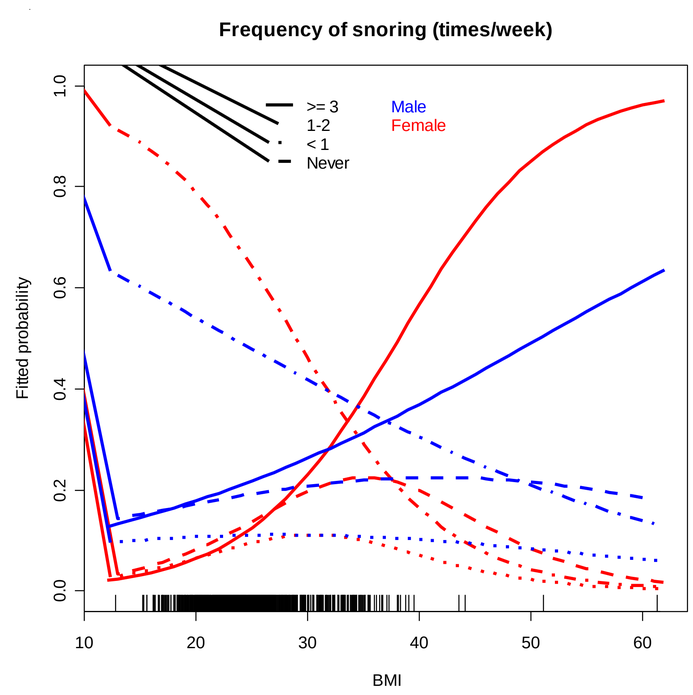


Figure. Fitted probabilities to snore for men and women with increasing BMI (age set to median age of 45 years).

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Conclusions

This large-scaled representative population study provides evidence that increased body weight is independently associated with disturbed sleep and daytime sleepiness in the general population.