

Diet: Is lack of sleep making you fat?

In today's world of hectic schedules and busy lives, "burning the candle" at both ends of the day is commonplace. For those of us who are 'time poor', getting up that bit earlier and staying up that bit later is often the only way we can find the time to achieve all that want to achieve in a day. Getting a good 8 hours sleep a night simply doesn't happen for many of us. Indeed, over the past 40 years, self reported sleep duration in the United States has decreased by almost 2 hours (Spiegel *et al.* (2004)).

Apart from feeling a bit tired and perhaps a bit grumpy, many people are unaware of the potential adverse health effects of habitual sleep restriction. One such effect is that continued curtailed sleep duration can lead to weight gain as sleep duration is thought to be an important regulator of body weight and metabolism. In 1982, the Cancer Prevention Study II of the American Cancer Society asked more than 1.1 million men and women aged 30 to 102 years of age about their sleep duration and frequency of insomnia. Increasing body mass index (BMI) occurred where habitual sleep duration was less than 7-8 hours at a time (Kripke *et al.* (2002)).

In a recent study, 1,024 volunteers from the Wisconsin Sleep Cohort Study (a population-based longitudinal study of sleep disorders) underwent nocturnal polysomnography (multi parametric testing) and reported on their sleep habits through questionnaires and sleep diaries. Following polysomnography, morning, fasted blood samples were evaluated for, inter alia, serum leptin and ghrelin levels. A U-shaped curvilinear association between sleep duration and BMI was observed. In persons sleeping less than 8 hours (74.4% of the sample), increased BMI was proportional to decreased sleep. The serum samples revealed that participants with short sleep had reduced leptin and elevated ghrelin levels (predicted 15.5% lower leptin and predicted 14.9% higher ghrelin for nocturnal sleep of 5 hours versus 8 hours, independent of BMI) (Taheri *et al.*(2004)).

Leptin, a peptide hormone, is implicated in the regulation of food intake and energy balance. The hormone acts on the central nervous system, in particular the hypothalamus, suppressing food intake and stimulating energy expenditure. Whilst leptin decreases appetite, ghrelin (a hormone produced largely in the stomach) accelerates appetite. The differences found in leptin and ghrelin levels by Taheri and his team are likely to lead to increased appetite, and may possibly, therefore, provide

an explanation as to why BMI increases as sleep duration decreases.

However, one caveat to Taheri's results should be added. The study population had a large proportion of snorers, making the results less applicable to the general population as a whole (Prinz (2004)). Furthermore, whilst the Taheri study lends support to the hypothesis that reduced sleep levels cause the hormonal changes, there is also evidence of the opposite effect - that is to say that the administration of leptin and ghrelin can alter sleep (Prinz (2004)).

Despite the note of caution sounded by Prinz, she observes that the Taheri study provides "an exciting addition to the growing literature showing relationships between sleep curtailment, metabolic hormones, and metabolic disorders (including obesity)." Whilst the available studies suggest the presence of reciprocal interactions between metabolic hormones and sleep, these relationships are as yet poorly understood. It is clear that further research is needed so as to fully understand exactly what is happening. The work by Taheri and his team is definitely a step in the right direction. As Taheri *et al.*conclude, "in Western societies, where chronic sleep restriction is common and food is widely available, changes in appetite regulatory hormones with sleep curtailment may contribute to obesity." So lack of sleep may indeed be making you fat.

References:-

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