EDITORIAL

Sleep Doesn't Waste Time, It's Good for the Waist Line

Commentary on Sperry et al. Sleep duration and waist circumference in adults: a meta-analysis. SLEEP 2015;38:1269–1276.

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Adopting and maintaining a healthy lifestyle, which incorporates multiple behaviors, is vital for optimum health and longevity. Maintenance of health-related behaviors, however, remains a difficult challenge. In particular, chronic diseases such as obesity and type 2 diabetes mellitus, which are primarily driven by lifestyle factors and closely linked to cardiovascular disease, are major challenges to global healthcare systems. Weight gain and subsequent obesity usually occur from unhealthy lifestyle practices including poor diet without sufficient counteractive physical activity. Sleep duration has been shown to influence energy homeostasis and has recently emerged as the third important lifestyle factor that can impact health and wellbeing.

Evidence linking insufficient sleep to obesity, usually defined according to body mass index (BMI; kg/m^2) thresholds, is copious and relatively consistent.[1–4] While BMI is a convenient, and internationally recognized measure of overall human obesity, there has been recent deliberation about this measure as a surrogate adipose marker for determining adverse health risks.[5] Localized adiposity, such as around the midline (waist), may better predict the risk of type 2 diabetes,[6] cardiovascular disease,[7] and mortality,[8] compared to BMI. Central adiposity, commonly identified using waist circumference (or sometimes waist-hip ratio), could be an alternative to BMI and/ or an additional research measure in human research focusing on clinical outcomes. Interestingly, inadequate sleep duration has also been linked to the aforementioned diseases[2,9,10] as well as excess central adiposity.[11] The evidence surrounding the sleep and waist circumference association is, however, less consistent compared to BMI.

In this edition of *SLEEP*, Sperry and colleagues report on findings from a systematic review and meta-analysis conducted on sleep duration and waist circumference.[11] They observed a significant, inverse relationship ($r = -0.10$, $P < 0.0001$) in 56,259 adults, drawn from a combination of 21 studies. Although not highlighted, inter-rater reliability is an obvious issue with central adiposity measurements. The authors do, however, acknowledge several obvious methodological and analytical concerns including: (1) limited objective sleep data; (2) treatment of categorical versus continuous data for sleep duration as well as waist circumference for drawing comparisons; and (3) multiple approaches to the waist circumference measurement site, all of which are likely to result in discrepancies. The authors attempt to overcome the latter issues along with significant study heterogeneity by performing moderator analyses using a random-effects model.

The results of the moderator analysis showed differences between sleep duration and waist circumference across the three methods used to categorize the association. Despite a potential reduction in statistical power when dichotomizing raw scale data, studies that dichotomized sleep (insufficient versus normal) and central adiposity (obese versus non-obese) yielded the strongest effect size, where $r = -0.18$, $P < 0.0001$. In contrast, when sleep duration was treated as binary and waist circumference as continuous, the observed weighted mean effect size was minimal ($r = -0.07$, $P < 0.01$). Whichever way sleep duration and waist circumference was operationalized, the negative and significant association remained, suggesting that short/ insufficient sleep duration is linked to increased central adiposity. This is consistent with the sleep-obesity (determined using BMI) literature in pediatric[13] and adolescent[14] populations, although the adult data suggest a U-shaped association.[2] Given that the focus of Sperry and colleagues[11] was on the relationship between inadequate sleep duration compared to normal/ adequate sleep and central adiposity, potential associations between long sleep duration and waist circumference were unable to be detected but are likely to be equally important for our understanding.

There are three main considerations that arise from the meta-analysis presented by Sperry et al. Firstly, their findings highlight the need to standardize analytical approaches to sleep duration and health-related outcomes, which are usually collected as continuous data. Dichotomizing data is useful in some cases. For example, clinical significance is important in clinical research. For this reason, universal cut points for obesity that are specific to gender, age group, and ethnicity have been established and are commonly utilized. Obesity measures, however, cannot be applied to every individual. For example, BMI does not distinguish between adiposity and muscle; therefore athletes with a high proportion of muscle will weigh heavy, indicating obesity. Decisions about dichotomizing data, if necessary, should be made upon initial study design and based on an appropriate power calculation. Secondly, the majority of studies (n = 19) included in the meta-analysis relied on subjective sleep estimates, with just two studies[15,16] utilizing actigraphy/ polysomnography. There are many documented drawbacks to self-reported sleep, which tends to be subject to considerable bias. For this reason, sleep researchers should be encouraged to obtain objective sleep measures to ensure accurate and reliable data. Furthermore,

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many of the identified studies were cross-sectional and do not therefore determine cause-effect relationships. In addition to objective sleep measures, prospective study is also needed to confirm the association.

Finally, uncertainty remains about waist circumference as a replacement measure for BMI to determine obesity in the absence of objective measurement. Given the well-documented negative relationship that exists between sleep duration and obesity, whether determined using waist circumference or BMI, there is no harm in incorporating both measures into future studies. What value the two measures add in relation to other health outcomes remains to be determined. However, both measures are noninvasive, require little time to gather, and can be used as a surrogate indicator of obesity.

Sleep need is another important consideration. Sleep need requirements, although largely subjective, differ at an individual level but are not usually considered by sleep researchers. Sleep need may, however, be an important addition for our understanding. Naturally short sleepers not suffering adverse physiological or psychological consequences, may achieve adequate sleep, but be classified as not achieving sufficient sleep quantity according to expert recommendations. Studies on these unique populations are required to provide a comprehensive understanding of sleep in relation to health.

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