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**The proposed study will test whether the misalignment of eating occasions to the sleep period leads to positive energy balance and body composition changes.**

Individuals who sleep and eat late into the day are at increased risk of obesity and metabolic disorders. This may be due to the activity of neuropeptides that activate brain reward areas and stimulate food intake, which are also involved in the sleep-wake cycle. We have shown that sleep restriction activates brain reward areas, such as the insula and orbitofrontal cortex, and enhances food intake but there is also increasing evidence that eating at the wrong time of day (i.e. during resting periods in animals or later in the day in humans), may promote weight gain/hinder weight loss. However, studies of late meal timing are limited to observational studies and confounded by differences in sleep duration and timing. Since eating is a strong external time keeper, we hypothesize that altering the alignment of sleep and meal times will cause changes in hormones that regulate energy balance. The goal of the proposed study is to determine whether eating out of synchrony with sleep has negative consequences for weight management. The proposed study has both mechanistic and translational objectives. First, we will test the hypothesis that eating late in the day will promote positive energy balance (mechanistic aims 1 & 2) by enhancing the rewarding properties of food, altering appetite-regulating hormones, and energy expenditure compared to eating at earlier times. This will be assessed by measuring neuronal responses to food (functional magnetic resonance imaging), appetite-regulating hormones, and 24-h energy expenditure under controlled conditions. Next, we will test the hypothesis that free-living conditions of misaligned meals, relative to aligned meals, will affect energy balance. Overweight men and women will be recruited to participate in a 2-phase, crossover study, with constant sleep periods. Phases will only differ in the alignment of meals to the sleep period, either 1 h after awakening or 5 h after awakening. This proposed study, which will manipulate meal timing, without affecting total sleep time, is important because it will provide information on the mechanism by which circadian misalignment influences obesity risk, independent of sleep duration. It will also provide information to help explain the greater prevalence of obesity in shift workers, those affected by jetlag/social jetlag, and breakfast skippers. As such, the proposed study will be a stepping-stone in the establishment of lifestyle recommendations or therapies to personalize chronotype to improve weight management and cardio-metabolic risk reduction.