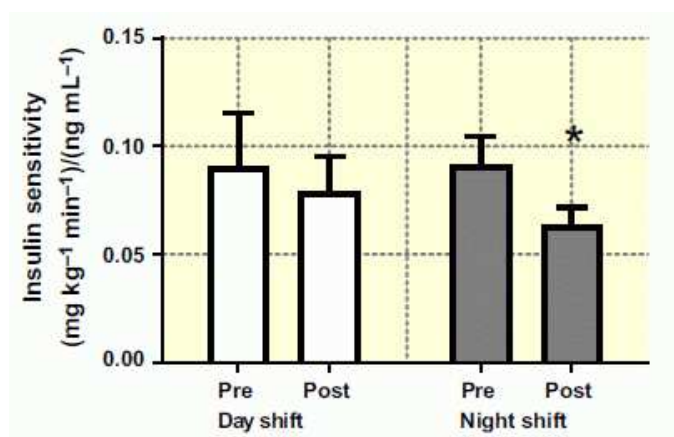


Can exercise overcome the negative metabolic effects of shift work?

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Shift work is common and increasing, with more than 18% of the Australian workforce (1.5 million people) working outside the “normal” working hours of 8am to 6pm. This includes doctors, nurses, police, fire and ambulance workers, mine workers, truck drivers and pilots. Therefore a significant proportion of the population is required to function at a time when humans have evolved to sleep, and instead need to sleep when our circadian clocks promote wakefulness.

These disrupted schedules have clear and immediate implications for population health, as shift work increases all-cause mortality. Indeed, rates of type 2 diabetes (T2D) are up to 2-fold higher in shift workers compared with the general population and shift work is an independent risk factor for T2D. We recently found that only 4 nights of simulated night shift work, in young healthy individuals led to a ~25% reduction in insulin sensitivity measured by the gold standard hyperinsulinaemic euglycaemic clamp technique (See Figure) (Bescos *et al.*, 2017). Importantly, this reduction in insulin sensitivity occurred as a direct consequence of shift work as sleep amount, physical activity and dietary caloric and fat intake were not different to a control day shift group.



Exercise increases insulin sensitivity in non-shift workers, but it is not known whether exercise can prevent the reduction in insulin sensitivity caused by shift work. This cannot be assumed because it is possible that the “stress” of exercise may not overcome the stress of shift work. Indeed, it has been shown in mice undertaking the stress of sleep restriction, that the addition of the “stress” of exercise actually exacerbated the negative effects observed (intestinal polyps). We are currently examining whether 4 nights of exercise can prevent the reduction in insulin sensitivity caused by 4 nights of simulated night shift work.

Bescos R, Boden MJ, Jackson ML, Trewin AJ, Marin EC, Levinger I, Garnham A, Hiam DS, Falcao-Tebas F, Conte F, Owens JA, Kennaway DJ, McConell GK. (2018). Four days of simulated shift work reduces insulin sensitivity in humans. *Acta Physiologica* **223**:e13039. doi: 10.1111/apha.13039