



The effect of sleep restriction on snacking behaviour during a week of simulated shiftwork

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ABSTRACT

Due to irregular working hours shiftworkers experience circadian disruption and sleep restriction. There is some evidence to indicate that these factors adversely affect health through changes in snacking behaviour. The aim of this study was to investigate the impact of sleep restriction, prior wake and circadian phase on snacking behaviour during a week of simulated shiftwork. Twenty-four healthy males (age: 22.0 ± 3.6 years, mean \pm SD) lived in a sleep laboratory for 12 consecutive days. Participants were assigned to one of two schedules: a moderate sleep restriction condition ($n = 10$) equivalent to a 6-h sleep opportunity per 24 h or a severe sleep restriction condition ($n = 14$) equivalent to a 4-h sleep opportunity per 24 h. In both conditions, sleep/wake episodes occurred 4 h later each day to simulate a rotating shiftwork pattern. While living in the laboratory, participants were served three meals and were provided with either five (moderate sleep restriction condition) or six (severe sleep restriction condition) snack opportunities daily. Snack choice was recorded at each opportunity and assigned to a category (sweet, savoury or healthy) based on the content of the snack. Data were analysed using a Generalised Estimating Equations approach. Analyses show a significant effect of sleep restriction condition on overall and sweet snack consumption. The odds of consuming a snack were significantly greater in the severe sleep restriction condition ($P < 0.05$) compared to the moderate sleep restriction condition. In particular, the odds of choosing a sweet snack were significantly increased in the severe sleep restriction condition ($P < 0.05$). Shiftworkers who are severely sleep restricted may be at risk of obesity and related health disorders due to elevated snack consumption and unhealthy snack choice. To further understand the impact of sleep restriction on snacking behaviour, future studies should examine physiological, psychological and environmental motivators.

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1. Introduction

Traditionally there has been considerable focus on obesity as a major public health concern. Recently there has been increasing interest as to how obesity affects performance in the workplace. Obesity has been associated with reduced productivity and higher rates of absenteeism (Narbro et al., 1996) and in America the annual cost of obesity on full time employment is estimated to be \$73.1 billion (Finkelstein et al., 2010). This is of significant concern to industry and organisations, as obesity rates have risen dramatically throughout the world over the past 15 years (World Health Organisation, 2009).

According to the World Health Organisation, the rising rates of obesity can be attributed to behavioural and lifestyle changes in society (World Health Organisation, 2009). Over the past two decades there has been a shift to a “24-h society”. In turn, the demand for industry, organisations and services to operate round-the-clock has led to an increase in shiftwork in recent years (Australian Bureau of Statistics, 2010; U.S. Department of Labour, 2005). Shiftwork is associated with lifestyle and behavioural factors that may predispose shiftworkers to obesity. Therefore it is not surprising that when compared to day workers shiftworkers are more overweight and obese (Atkinson et al., 2008) and suffer from numerous chronic health conditions related to obesity such as cardiovascular disease (Boggild and Knutsson, 1999) and type 2 diabetes (Kawachi et al., 1995).

Shiftworkers experience circadian disruption and sleep restriction and there is emerging evidence to suggest these two factors may contribute to the increased incidence of obesity seen in shiftwork populations. Due to irregular working hours, shiftworkers sleep and eat at sub optimal circadian phases consequently affecting the quality, quantity and distribution of food intake.

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