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Evidence Briefing

What does the evidence say about employee sleep and workplace interventions to improve sleep?

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What does the evidence say about employee sleep and workplace interventions to improve sleep?

Question
This briefing summarises the evidence on employee sleep and workplace interventions to improve sleep.

Key messages
- There is a lack of evidence on interventions to improve employee sleep
- Much of the evidence on employee sleep focusses on shift workers
- Shift work and long working hours are the main causes of sleep deprivation and poor quality sleep amongst workers
- Insomnia and interrupted sleep increases the risk of anxiety, depression, reproductive difficulties, immunological disorders, obesity, cardiovascular disease, diabetes, and some cancers
- Sleep deprivation has a negative impact on cognitive function and memory which can result in accidents and errors
- Non pharmacological interventions to improve sleep include, altering shift patterns, sleep hygiene, napping, CBT, exercise, sleep apnoea screening, dietary adjustments, education
- Workers in shift work professions such as, healthcare workers, emergency service personnel, drivers and airline workers are more susceptible to sleep deprivation

Evidence briefings are a summary of best available evidence that has been selected from research using a systematic and transparent method.

What doesn’t this briefing do?
The findings from research papers summarised here have not been quality assessed or critically appraised.

Who is this briefing for?
This briefing is for the Adults Team in the PHE Health Improvement Directorate, and will be used to inform policy and strategy.

Information about this evidence briefing
This briefing draws upon a literature search of the sources Cochrane, Embase, Medline and Scopus, from 2007-2017

31 highly relevant citations were used to produce this evidence briefing. 58 additional papers were considered to be ‘of interest’ and details can be obtained on request.

You may request any publications referred to in this briefing from libraries@phe.gov.uk

Disclaimer
The information in this report summarises evidence from a literature search - it may not be representative of the whole body of evidence available. Although every effort is made to ensure that the information presented is accurate, articles and internet resources may contain errors or out of date information. No critical appraisal or quality assessment of individual articles has been performed. No responsibility can be accepted for any action taken on the basis of this information.
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**Background**

The 24-hour society, working long hours, shift work and sleep apnoea are the main causes of sleep deprivation and poor quality sleep amongst employees. Circadian rhythms are physical, mental and behavioural changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism’s environment (1). Circadian disruption caused by sleep deprivation is linked to a range of poor health outcomes including, anxiety, depression, reproductive difficulties, immunological disorders, obesity, cardiovascular disease, diabetes, and some cancers.

Much of the available evidence on employee sleep focusses on shift workers and those working long hours, particularly those working in certain professions such as healthcare workers, emergency service personnel, airline pilots and drivers. Whilst there is plenty of evidence on the health impacts of sleep deprivation amongst the general population as a whole, less research has been undertaken specifically on the impact of sleep deprivation amongst the working population. There is a paucity of systematic review level evidence and evidence on interventions to improve employee sleep.

**Health impact**

Circadian disruption has a significant impact on employee health. There is evidence to show that it causes changes in hormone levels, raising levels of cortisol and ghrelin and decreasing levels of melatonin and leptin which affects appetite, increasing hunger and the desire to eat sweet and fatty foods (2). The evidence implies that those working at night also have more opportunities to eat, thus both physiological and behavioural factors contribute to increased food consumption. Those who sleep less tend to eat more or have poorer diets, and have a higher body mass index. There is evidence to show that sleep loss is an important contributor to obesity (3-6).

Disruption of the circadian rhythm affects immune responses. Sleep is known to regulate immune functions and the evidence suggests that sleep deprived shift workers are at increased risk of viral infections because their immune systems are compromised by sleep loss (7). The immune and inflammatory responses to chronic sleep deprivation (<6 h/day) show that sleep deficits and insufficient time for recovery sleep increases the risk of cardiovascular disease (4, 8, 9). There is also some evidence to suggest that there are inequalities in sleep associated cardiovascular risk, with low income and minority populations being at greater risk (8).

The WHO International Agency for Research on Cancer has classified circadian disruption of sleep, as a probable human carcinogen, group 2A. Developed countries have 24 hours societies and approximately 20% of the population in these countries work shifts. Epidemiological observations show that female night shift workers are at
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increased risk of breast cancer(2). Exposure to electric light at night suppresses the production of melatonin a protective, oncostatic hormone. The hypothesis is that increased exposure to bright light at night and the suppression of melatonin is contributing to increasing rates of breast, prostate and colorectal cancers in the developed world(2, 10).

It is likely that increased prevalence of metabolic syndrome and/or CHD in shift workers is due to an inappropriate hormonal response to eating meals at irregular times of the day. Those who eat during the circadian resting and fasting phase when the body expects to be asleep and not eating, have elevated levels of insulin, glucose and tryglycerol. Persistent changes in glucose and insulin levels can lead to diabetes(9).

The literature on employee sleep refers to anxiety and depression resulting from insomnia but no papers describing a causal link between sleep deprivation and poor mental health amongst workers were found(11). Reference to sleep related anxiety and depression in the literature suggests that the evidence on the relationship between sleep loss and mental health can be found in the evidence base on sleep and health more generally rather than in the literature on employee sleep specifically.

Worker performance

Sleep deprivation and poor quality sleep results in excess absenteeism, elevated accident risk, reduced productivity, career inhibition and reduced job satisfaction(12).

Long working hours can affect attention, cognition, motor skills and mood(13, 14). The need for 24 hour patient coverage means that extended working hours and shift work patterns are the norm for healthcare professionals. Fatigue has a negative impact not only on the health and wellbeing of healthcare professionals themselves but also on patient care and safety(14, 15). Healthcare workers operating in complex environments such as intensive or emergency care can least afford to make errors but are frequently being asked to make difficult decisions when they are fatigued and during times of the day when they are not operating optimally(16). The working hours and patterns of healthcare professionals is the subject of a number of papers and seems to be an important issue for the profession(17-19). Shift working patterns are common in a number of other professions such as drivers(20) and airline workers(15). For such workers fatigue caused by sleep deprivation elevates the risk of serious accidents.
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**Interventions**

Overall, there is a lack of evidence on the effectiveness of interventions to improve sleep but the available literature does propose a number of non-pharmacological interventions to improve employee sleep.

**Sleep apnoea screening**

Obstructive sleep apnoea (OSA) is a relatively common condition where the walls of the throat relax and narrow during sleep, interrupting normal breathing leading to disrupted sleep(21). OSA has adverse effects on workplace safety but is frequently undiagnosed(22). Sleep apnoea screening in the workplace is a potentially cost effective method of identifying those suffering from the health and performance impacts of sleep deprivation(23, 24). Screening for sleep apnoea alone does not improve employee sleep but is a method of identifying those who would benefit from other targeted interventions.

**Working patterns**

The circadian rhythm is an innate physiological clock which shift work and long working hours disrupts but that ultimately cannot be changed. Adjustments to working patterns is an adaptive intervention to promote sleep. There is some evidence to suggest that adjustments to shift work patterns can improve employee sleep. Timing sleep according to the circadian rhythm and work period to optimize sleep is a way of establishing a work-sleep balance similar to a work-life balance(25). Shorter shifts also improve sleep and well-being(19). Comparison of limited wake shift work schedules (LWSW) shows that 4hours on/8 hours off schedules were the best for promoting sleep and minimising sleepiness. Better sleep can be achieved with schedules that include shorter time-at-work, more frequent rest breaks, shifts that start and end at the same clock time every 24 hours, and shifts that commence in the daytime(26).

**Napping**

There is some evidence to suggest that planned naps during the day and during night shifts can improve alertness and performance(27, 28). Napping in the workplace is a controversial issue in some countries. It can be perceived as a sign of laziness rather than as a public health tool to improve health and wellbeing. If napping in the workplace is to be used by employers as a tool to address poor sleep then it is likely that employers will need to address this issue.

**Sleep hygiene**

Sleep hygiene is a series of habits or behaviours that can improve sleep. These include, waking at the same time every day; being exposed to morning sun; establishing routine eating; refraining from caffeine intake in the evening and alcohol consumption before bedtime; avoiding exercise, computers and bright lights before going to bed; and taking a warm bath and using relaxation techniques at
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The limited evidence available suggests that a workplace programme involving sleep hygiene education combined with behavioural approaches can improve the quality of sleep for employees suffering from insomnia.

**Dietary adjustments**

Whilst it appears that total energy intake is not affected by participation in shift work, the timing of eating is affected. Regular eating is disordered with fewer meals and more frequent snacking. Whether workers consume high or low density food during shifts can be influenced by the types of food available in the workplace. The limited evidence available seems to imply that regular meals can benefit employee wellbeing and in the context of shift work, employers can improve the diets of their employees by ensuring the availability of healthy food in the workplace.

**Computerised cognitive behavioural therapy**

Computerised cognitive behavioural therapy is one of a number of self-help treatments for insomnia. Delivered through a computer the specific components of CCBT-I include, sleep hygiene, stimulus control, relaxation training, sleep restriction and cognitive restructuring (a process of learning to identify and dispute irrational thoughts). A recent systematic review concludes that CCBT-I is a mildly to moderately effective self-help treatment that should be part of a stepped model of care for insomnia.

**Information**

Information on how to achieve better sleep is increasingly being made available online through websites and apps. Public health information is part of a range of self-help interventions available to workers. No evidence comparing the various online interventions was found but there is some limited evidence to show that tailored information can reduce the fatigue caused by sleep deprivation. The mHealth intervention consisted of tailored advice on exposure to daylight, sleep, physical activity and nutrition. The aim was to improve health-related behaviour, thereby reducing sleep problems and fatigue and improving health perception of airline pilots. The results of the randomised controlled trial showed improvements in self-reported fatigue and sleep quality.

The available evidence on interventions to improve employee sleep leads to the conclusion that there are currently no highly effective interventions and that of the ones available no one intervention is more effective than another. Taken together, the evidence suggests that a number of interventions need to be provided and utilised in order to achieve improved employee sleep and wellbeing for workers.
What does the evidence say about employee sleep and workplace interventions to improve sleep?

### Endnote database matrix showing the highly relevant papers with key information

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
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<td>Garibov, S., Gag...</td>
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References

17. Puddester D. Managing and mitigating fatigue in the era of changing resident duty hours. BMC Medical Education2015.
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