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Constructing sleep health: understanding risks and interventions in the New Zealand roofing industry

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Abstract

The study investigated sleep health in terms of obstructive sleep apnoea and chronic insomnia amongst the Roofing trade in the New Zealand construction industry. Despite efforts to support workers, intervention uptake remained low, indicating a necessity for more tailored approaches. Addressing work-related stressors and offering sleep health education could enhance treatment acceptance. Future research should investigate cultural and experiential influences on sleep quality. However, limitations like the small sample size and convenience sampling must be acknowledged. In conclusion, while the study provides valuable insights, further exploration and nuanced interventions are imperative to address sleep-related challenges in the construction industry effectively.

Introduction

Internationally, impaired (or insufficient) or suboptimal sleep is a common public health issue. In the United States, 50 to 70 million adults suffer from a chronic disorder of sleep and wakefulness (Altevogt & Colten, 2006). In Australia, 34.7% of respondents aged 14 or older 'often' wake feeling unrefreshed and 23.7% of respondents 'often' do not get adequate sleep (Hillman & Lack, 2013). New Zealand research suggest that 27% of adults aged between 20 to 59 years have a sleeping problems. Of those adults, approximately 25% have sleeping problems lasting more than six months (Paine et al., 2005).

Impaired sleep is associated with a broad range of adverse effects on physiological, psychological, and occupational health. Physiologically, insufficient or disrupted sleep compromises immune function and is linked to the development of cardiovascular and respiratory diseases, obesity, diabetes, and alterations in metabolic processes (Kim et al., 2021; Short & Banks, 2013). Psychologically, sleep impairment detrimentally affects cognitive functions, including memory, attention, alertness, judgment, and decision-making (Khan & Al-Jahdali, 2023). It also increases the risk of mental health disorders such as depression, anxiety, and mood disturbances (Wolkow et al., 2015).

In some workplaces, impaired sleep can impact productivity by increasing workplace stress, diminishing task performance, and contributing to underachievement (Chung et al., 2019; Drucker et al., 1969; Sathvik et al., 2023). It also compromises an individual's capacity to perform work effectively, leading to reduced output, elevated absenteeism, and a higher incidence of workplace accidents (de Miranda et al., 2023). Outside the workplace, impaired sleep significantly raises the risk of commuting accidents (Vargas-Garrido et al., 2021) and job-related near misses (Yamauchi et al., 2019).

Common types of sleep conditions include insomnia, upper airway resistance syndrome (UARS), obstructive sleep apnoea (OSA), and delayed sleep-wake phase disorder (DSWPD). Insomnia is when someone has difficulty falling asleep or staying asleep which results in fatigue, low energy, difficulty concentrating, mood disturbances, and decreased performance in work (Reynolds et al., 2023). UARS is a sleep disorder characterized by abnormal respiratory effort and airflow limitations (Pépin et al., 2012). Symptoms include fatigue, excessive daytime sleepiness, and sleep disruption, and lead to significant impairment in daytime functioning (Masri & Guilleminault, 2013). Workers with DSWPD struggle with maintaining a 9 to 5 work schedule, resulting in sleep deprivation, fatigue, impaired concentration, and absenteeism, which can further exacerbate depressive symptoms and lead to a decline in work performance (Futenma et al., 2023; Wu, 2023). Addressing these challenges

requires a multifaceted approach that includes both medical intervention and workplace accommodations (Smieszek, 2022; Ulfberg et al., 2019; Watson et al., 2020).

Studies examining sleep quality in the construction industry reveal a significant prevalence of impaired sleep among workers. For example, Kim et al (2021) surveyed 206 construction workers and found that 63% had poor quality of sleep (Kim et al., 2021). Out of 475 construction workers, 30% of the construction workers experienced poor sleep quality based on the Pittsburgh Sleep Quality Index (PSQI) (Sathvik et al., 2023).

Workers with impaired sleep in physically demanding jobs (including construction) are more likely to be injured than those without sleep impairment. For example, workers from construction, manufacturing, farming, nursing, rail transport, and coalmining with sleep problems were at 1.62 times higher risk of being injured compared to those without sleep problems (Uehli et al., 2014).

Insufficient sleep can affect safety on lead to worksite accidents. Construction workers with less than 7 hours of sleep per night had a 9% increased risk of having an accident at work (Powell & Copping, 2010) while workers with insomnia engaged in fewer voluntary safety behaviours increasing their risk for workplace injuries (Brossoit et al., 2019). Workers with insufficient high-quality sleep, were at greater risk for workplace accidents and injuries, and were more likely to have a fatal occupational accident (Watson et al., 2020).

Research has shown a relationship between sleep and pain. For example, a case control study of 2021 construction workers (Chung, 2019) reported that those in the pain group averaged 6.78hrs of sleep per day, while those in the non-pain group averaged 7.02hrs of sleep. Those who slept less suffered more pain.

Sleep is an important factor in tissue healing and remodelling processes, and there is substantial and growing evidence that getting a prolonged amount of high-quality sleep is beneficial to the healing of wounds and remodelling of musculoskeletal tissues (Klyne et al, 2021).

Although there is extensive international evidence documenting impaired sleep among workers, research specifically addressing sleep impairment among construction workers in New Zealand remains limited.

The current research

This study was initiated by Construction Health and Safety New Zealand (CHASNZ) in conjunction with Dr Kelly Dale (Health Lifestyle NZ) and Mr Matt Vaughn (My Corporate Health). The study is part of the Work Should Not Hurt programme. The findings will be used to inform future interventions for reducing musculoskeletal injuries in the workplace, focussing on holistic wellbeing and health.

The study was conducted to provide data about sleep and risk of sleep conditions in the New Zealand roofing industry. The study also provided the participants with an opportunity to address their sleep problems. A secondary aim of this research was to raise awareness of sleep and screening of sleep conditions in the wider New Zealand construction industry.

Method

Participants

The participants in the study were professional roofers and their companies that were receiving wellness training and education run by My Corporate Health. The study consisted of four roofing companies located across the North Island and in Christchurch, New Zealand.

Sampling

The study used convenience sampling as participants were part of a wellness education training course conducted by My Corporate Health. The same participants were invited to take part in a sleep survey for which they provided consent. Four additional roofers who did not attend training also completed the survey at their companies' request.

Questionnaire

The study used an innovative self-paced questionnaire created by Dr Kelly Dale to collect data from the participants. In addition to participant demographic information, the questionnaire comprised a range of inquiries aimed at identifying individuals at risk of various sleep disorders, including obstructive sleep apnoea, insomnia, and delayed sleep phase disorder, as well as gathering

information on sleep habits and daytime functioning. The questionnaire stated that individual results would not be shared with their employer.

Procedure

At the end of the wellbeing education training participants were briefed about the sleep study to gauge interest. Those interested were given the sleep questionnaire. Participants were asked to give their consent to being followed up by a sleep specialist/ physiologist. The sleep specialist/ physiologist reviewed each survey response and identified participants who were at high risk of having a sleep condition. Those perceived as high risk were advised they were high risk by SMS and were offered a follow-up phone call consult at a time convenient to them. Those who agreed to a sleep test were referred to a sleep clinic. The research team also approached the roofing companies to request whether funding was available to support their employees receiving a sleep assessment so this could be offered during the sleep specialists' consultation. Participants who were deemed low risk were contacted by SMS and notified that they were at a low risk of a sleep condition. They were provided advice about their sleep; for example, if they needed to extend their sleep and were offered a phone call if they would like to discuss their sleep further.

Results

A total of 110 participants from the roofing industry took part in the study. Ten of the participants conducted the study anonymously. The participants had an average age of 35 years and ranged from 17 to 66 years of age (see Table 1).

Across all participants, their average time for going to sleep was 9:42 PM (ranging from 8:45 PM to 1:00 AM) and average awake time was 5:04 AM (ranging from 3:45 to 6:30 AM). The average total sleep time was 6 hours and 54 minutes.

Of those who were screened, 68 were at high risk of a sleep condition; 91 participants consented to contact by the sleep specialist to discuss their sleep results. These 91 participants were contacted by either a phone call or SMS. Those at high risk (68) were also given the opportunity to contact the researcher to discuss their results. Twenty-eight of the 68 high risk participants opted to receive consultation while 13 were recommended the sleep test/treatment from the researcher (Table 5).

The next three tables provide further information about the participant responses to questions pertaining to OSA and UARS (Table 2) insomnia (Table **3**), DSWPD (Table 4), and general information (Table 5)).

Table 1. Participant age information

Range	Participants (percentage of sample)
17 to 25	16 (18.6%)
26 to 35	35 (40.7%)
36 to 45	20 (23.3%)
46 to 55	9 (10.5%)
56 to 65	5 (5.8%)
66+	1 (1.2%)

Table 2. Sleep condition (OSA and UARS) related questions (where Yes = increased risk of sleep condition; No = low risk of sleep condition; and N/A = No answer).

Question	Yes	No	N/A
Are you older than 50?	12	88	10
Have you been told or do you think you snore at least some nights?	66	42	2
Have you been told or do you think you would regularly disturb a bed partner with your snoring?	38	70	2
Have you been told you sometimes have episodes in which you stop breathing during sleep?	20	86	4
Do you feel like you regularly have disturbed sleep yourself?	56	52	2
Do you have or are you being treated for high blood pressure?	10	98	2
Do you have or are you being treated for diabetes?	2	107	1
Do you usually go to the toilet more than once a night?	19	89	2
Is your Body Mass Index more than 35kg/m^2?	22	60	28

Table 3. Insomnia-related questions (where Yes = increased risk of sleep condition; No = low risk of sleep condition; and N/A = No answer).

Question	Yes	No	N/A
Do you often lie awake for at least half an hour before falling asleep?	57	51	2
Do you wake up frequently during the night?	45	63	2
If you wake up, do you frequently have trouble getting back to sleep?	41	68	1
Do you frequently wake up for the day earlier than desired (say at 3:00 AM or 4:00 AM) and cannot get back to sleep?	38	70	2
Has this been going on for more than 3 months?	42	39	29

Table 4. DSWPD-related questions (where Yes = increased risk of sleep condition; No = low risk of sleep condition; and N/A = No answer).

Question	Yes	No	N/A
Do you often struggle to get to sleep before 1:00 AM?	16	94	0
If yes, do you often experience difficulty waking up when your alarm goes off for work?	18	19	73
Has this been going on for more than 3 months?	14	9	87
If you could pick the time you go to sleep what time would that be?	8:41 PM		
If you could pick the time you wake up what time would that be?	5:47 AM		

Table 5. Day time effects and miscellaneous questions (where Yes = increased risk of sleep condition; No = low risk of sleep condition; and N/A = No answer).

Daytime effects	Yes	No	N/A
Do you generally feel more tired or less refreshed during the day than you would like?	56	48	-
Do you often struggle with concentration or remembering things?	91	19	-
OTHER			
Follow up (Consent for expert to contact participant)	91	18	1
SCREENING RESULTS			
High risk of a sleep condition or likely to be high risk but more information needed.	68	-	-
Contact made by researcher (text and/ or call) to outline if they are low or high risk of a sleep condition and for those high risk to organise a phone call with them to discuss their results.	91	-	-
Of the high-risk participants (n = 68) who took a phone call from the researcher	28	-	-
Sleep test/or sleep treatment recommended for sleep condition	13	-	-

Discussion

Main findings

A total of 110 participants took part in the study, with 91% consenting to being contacted by the sleep specialist about their sleep results. Ten participants chose to answer the questionnaire anonymously.

Out of the 68 participants identified as high risk for sleep conditions, only 44% took up the opportunity for a phone call to discuss their sleep results and possible next steps. Despite 13 participants receiving recommendations for a sleep test, only two underwent testing and received a diagnosis of OSA.

The cost of self-funding sleep tests ($490 including GST) is a likely potential barrier, although some roofing companies funded both the tests and treatment (eg, CPAP), suggesting that it is not entirely cost related. Some roofing companies offering to fund demonstrates a commitment to supporting employee health, wellbeing and safety.

High risks were observed for delayed sleep phase disorder (13%), chronic insomnia (31%), and UARS or OSA (30%), with 33% being at high risk for both UARS or OSA and insomnia. Rates of insomnia were higher than estimated population averages. This pattern (a third of participants) is consistent with the percentages from earlier research (Paine et al., 2005; Sathvik et al., 2023).

While the average sleep duration was just under the recommended limit of seven hours, participants expressed a desire to lengthen their sleep, highlighting the individual range of sleep needs. The fact that workers averaged less than seven hours sleep suggests that they are more susceptible to accidents in the workplace or injuries, as indicated in the literature (Brossoit et al., 2019; Powell & Copping, 2010; Watson et al., 2020). More evidence (particularly in New Zealand construction workers) is needed to properly test this assumption. These interventions may be multifaceted, as suggested in the literature (Smieszek, 2022; Ulfberg et al., 2019; Watson et al., 2020).

Daytime effects included feelings of tiredness (54%) and difficulties with concentration or memory (83%) both of which are supported in the literature (Khan & Al-Jahdali, 2023).

Future work

There is a clear need for support to improve sleep quality, particularly through the treatment of identified sleep conditions. Despite efforts to provide recommendations and support (in this study at least), many participants did not take up the offer. This is a challenge of promoting positive health actions among tradespeople such as roofers, suggesting that interventions need to be more targeted or provide comprehensive training.

The uptake of help and treatment for sleep problems may be enhanced with more education on sleep health. Therefore, workplaces aiming to support workers with their sleep should provide comprehensive information on the importance of sleep before implementing interventions. More evidence is needed in this area.

Future iterations of this research can also investigate other factors affecting sleep quality such as cultural (eg Māori and Pacific workers) or experience (eg older construction workers). These demographics are known to be more susceptible to the effects of insomnia and sleep problems (Paine et al., 2005) compared to other ethnic groups in New Zealand. The same demographics are also high risk in workplace injuries statistics in New Zealand which warrants a more holistic approach to worker wellbeing (Lilley et al., 2018).

Study limitations

Limitations of our study are due to the cross-sectional design, small sample size, convenience sampling, and largely a male-based sample.

Recommendations

Based on this study, several recommendations are suggested as potential activities to be implemented by construction organisations in New Zealand:

- Given the well-established associations and research (see Introduction section) between stressors and insomnia symptoms, organisations can reduce employee strain by addressing work demands (psychological and physical) and providing adequate resources and social support.

- Addressing physical and psychological stress-related variables may improve sleep quality by reducing pain and ruminative thoughts before bedtime. This may increase the employees' ability to unwind, quickly fall asleep, and maintain sleep throughout the night.
- Organisations can fund sleep screening and clinical sleep assessments as part of their wellness investment for staff.
- Organisations can host workshops or training sessions specifically focused on sleep health and its importance. These sessions can cover topics such as the impact of sleep on physical and mental health, strategies for improving sleep quality, and recognizing signs of sleep disorders. The authors of this study are well versed in this area.
- Organisations can provide informational materials (eg videos, pamphlets, posters, or newsletters) to highlight the importance of good sleep and provide tips for better sleep hygiene. These materials can be displayed in common rooms, staff rooms, or distributed electronically to reach workers more effectively.
- Incorporate Sleep into Health and Safety Programmes: Integrate sleep education into existing health and safety programmes within the organisation. Emphasise how adequate sleep contributes to overall wellbeing and reduces the risk of workplace accidents and musculoskeletal injuries.
- Organisations could adopt flexible scheduling policies that allow workers to have sufficient time for adequate sleep. Avoid scheduling early morning shifts immediately following late-night shifts to allow for adequate rest.

Conclusion

In summary, the study shed light on sleep health issues among New Zealand Roofing trade, highlighting risks such as obstructive sleep apnoea and chronic insomnia. Despite efforts to offer support, uptake of interventions remains challenging, suggesting a need for more targeted approaches. Addressing work-related stressors and providing sleep health education could improve treatment acceptance. Future research should explore cultural and experiential factors affecting sleep quality. However, limitations such as the small sample size and convenience sampling need consideration.

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