



Report by Emma Queen - Integrated Psychotherapist

Sleep deprivation effects and psychological treatments for better sleep

American comedian Dov Davidson said that “a lack of sleep is only bad if you have to drive, think, talk, or move”. This entertaining quip resonates with us all, given that we know how important sleep is to our physical and mental health. With today's busy lifestyles, people are getting less and less sleep. Nearly half of Australians (48%) report having at least two sleep-related issues (Australian Institute of Health and Welfare, 2021), leading to ongoing pressure on the public health system at an estimated \$943.8 million in 2019-20 (Rise and Try to Shine: The Social and Economic Cost of Sleep Disorders in Australia Sleep Health Foundation, 2021). Sleep deficits affect all facets of human biology and behaviour - this report will summarise the effects of sleep deprivation and the psychological treatments available for people afflicted.

Liew and Aung (2020) intended their research article as a platform for future sleep deprivation and disease enquiry. Over time, increasing public health costs and the links to illness led to their reviewing 145 reports. They summarised papers on the following conditions and illnesses connected to what happens to the human body with sleep issues:

- neurological
- cardiovascular
- gastrointestinal
- respiratory
- immunological
- dermatology
- musculoskeletal
- endocrine
- nephrology
- urology
- reproduction
- stress

Liew and Aung (2020) concluded that sleep deprivation is an ongoing long-term health issue for the world's population, and more research is a much-needed requirement if a basic human need (or lack thereof) can cause such varied importance on the body. Both authors are at Perdana University



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and the main contributor (Liew) is a seasoned author of over ten articles over the past decade who specialises in clinical competence.

Tobaldini et al. (2017) 's well-cited (291) report on sleep deprivation (SD), autonomic nervous system (ANS) and cardiovascular diseases covered four key findings impacting health. Firstly, discussing sleep physiology and the ANS, they explained the importance of the human body's biological functions and their impact on cardiovascular function. As the body sleeps - blood pressure, heart rate, temperature, hormone regulation and immune function are regulated. The ANS plays a crucial role in this regulation, and they found that when non-REM (NREM) sleep occurred - this resulted in lower blood pressure and regulated heart rates. Conversely, in REM sleep, the opposite occurred (Tobaldini et al., 2017, p. 322). They concluded that early diagnosis of SD and further research is needed to reduce the various health impacts on populations. All contributors to this article have remarkable biographies and have attracted considerable citation attention in their represented fields.

Further research to add weight to sleep affecting the ANS, Morales et al. (2019) studied groups of medical students who were sleep deprived. Medical students are known to work long hours, and controversially, the effects of lack of sleep are theorised to affect several functions. This study aimed to provide evidence of this to advocate a review of hospital on-call systems and review how the stress affected the students' cortisol levels, heart rate variability (HRV), mood and cognitive execution. They concluded their hypothesis that ANS disorders affect HRV and, in turn, are connected to stress in the workplace and cardiovascular diseases (Morales et al., 2019). They had convincing degradation in their physical and cognitive health over their 24-hour shift, and whilst doctors could adjust to their working conditions in the longer term, this still confirms the need for reviews of working hours. The principal author (Morales) has made noteworthy contributions in their field over the last decade, and this study is significant, having garnered 25 citations to date.

Lack of sleep is universally known to affect mental health. In the Jamieson et al. (2019) literature review, the authors focused on adolescents - partly due to their habits of staying up late and needing to attend school in the early mornings. Mental health issues also start to appear in this stage of life, and sleep disturbances are a criterion for several conditions in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) in the areas of anxiety and depression. Their focus on brain development at the juvenile level was a focus as the myelin process of uncinata fasciculus (UF) is the last white matter tract to undergo this process (Jamieson et al., 2019, p. 65).



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The UF is critical for understanding new information, self-regulation, and evaluating emotions. They concluded that sleep deprivation potentially leads to mental health issues for teenagers, and treatment solutions may prove ineffective. All authors who contributed to this research article are widely cited and have extensive backgrounds in the respective fields, leading to a quality article.

Insomnia is the principal diagnosis found when researching sleep disorders and psychological treatments. Rémi et al. (2019) reviewed research articles and established three grievances - insomnia, excessive daytime sleepiness and sleep-associated motor phenomena (physical movements whilst asleep or drowsy). They established that proper diagnosis of these conditions would limit the ramifications of sleep deprivation on the physical and mental body. In Table 1, the researchers displayed the core modules of cognitive behavioural therapy for insomnia (CBT-I), which reveal five techniques used in treating individuals (Rémi et al., 2019, p. 683). They argue the need for better diagnosis and tailor-made solutions for patients. Additionally, they suggest a better approach for new treatment access in Germany. The authors are all medical doctors and collectively have 1000 articles published over the last decade.

Another German research paper (Peter et al., 2019) investigated the effectiveness of CBT-I on shift workers. Shiftwork is known to have a detrimental effect on sleep, and yet, treatment plans specifically aimed at this cohort are not readily available or researched. Peter et al. developed and delivered a 4-week first-of-its-kind online CBT-I program using a sleep diary and the Epworth Sleepiness Scale (ESS) for 50 participants (21 finished the entire program) (Peter et al., 2019, p. 3). The article is well cited (30) and is recognised, with its contributors as an impressive contribution to sleep research. Its primary findings are positive in increasing sleep quality and are helpful for future research, given that the program is online and anonymous. An obvious limitation of the study is the low number of participants finishing it; the online therapist recognised they had to manually respond to messages, leaving delays in responses and a significant dropout rate.

Kang et al. (2017) 's research chapter focused on depression and sleep deprivation. Sleep is a biomarker for depression and the relapse of depression in individuals. Sleep issues (as already mentioned in this report) are a significant criterion for depression in the DSM-5. Three solutions to the lack of sleep were incorporated - pharmacotherapy, CBT-I and light therapy. CBT-I also covered relaxation techniques (muscle relaxation therapy) and diaphragmatic breathing. The findings highlighted the need for CBT for depression at the same time as CBT-I, simultaneously combating depression and sleep disturbances (Kang et al., 2017, p. 118). Furthermore, they argued that restless leg syndrome (RLS) is a comorbid effect of sleep disturbances, and this neurological disease appears in 26% of depression sufferers (Kang et al., 2017, p. 116). Lastly, obstructive sleep apnoea



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(OSA) can have similar effects on mood and can be an unmanageable symptom of major depressive disorder (MDD). All authors have significant backgrounds in psychiatry. The chapter originated from a peer-reviewed book called 'Understanding Depression' and is used by practitioners for its varied and comprehensive treatments of depression.

A recent research article by Claßen et al. (2022) focused on utilising CBT-I and HT-I (hypnotherapy for insomnia) for its 54 participants. These were all university students suffering from a range of sleep disorders. Their research explained that over six weeks, they participated in a sleep intervention program called "Studieren wie im Schlaf" (SWIS) (Claßen et al., 2022, p.6). The SWIS included a session of CBT-I and HT-I by different psychologists supervised by a psychotherapist over this period, and the subjects were tested again after six weeks. The intervention improved all sleep issues, and the students reported increased cognitive abilities; additionally, daytime sleepiness factors decreased for the intervention group of participants. Despite this article being recent and not yet cited, it is included in this report to demonstrate the potential and promising new data and solutions for sleep issues.

Discussion

The report findings using scholarly resources were initially complex from the multiple studies on insomnia - a diagnosed condition, but not necessarily an effect of sleep deprivation (SD). What was surprising was the level of detriment to the human body and the volumes of studies done on the topic. We know that SD can affect us all, and the research showed the varied costs to the body. Tobaldini et al. (2017)'s well-cited paper on the ANS and cardiovascular system demonstrated the massive stress on the human body's most essential organs and systems. They stressed the importance of early diagnosis of sleep disorders and the adverse effects of short sleep. The alarming part of these trends is that there seems to be no end in sight, given the influence of modern technology and the reduction/quality of sleep. Over half of the US population gets less than 7 hours of sleep, and 52.7% of US adults watch TV to get to sleep (Suni, 2021). In a 2011 report, blue light from screens "may impair the photoentrainment of circadian rhythm leading to sleep disorders" (Kessel et al., 2011, p.1215), leading us to realise the extent of these issues for the future population.

The trend of research tended to focus on specific groups of people prone to sleep disturbances - medical residents, university students and, more recently, shift workers. This enabled this report to use specific examples of treatment plans for these groups. Particular programs such as Claßen et al.'s (2021) intervention utilising CBT-I and HT-I for its participants demonstrated its positive effects but also spoke about the need for future research with larger sample sizes. The Morales et al. (2019)



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study on hospital medical residents showed a decline in all markers from the sleep-deprived subjects when they studied the effects of stress on the body. Therefore, there is a clear need to review on-call rotations in the medical world. The pilot online CBT-I intervention for shift workers (Peter et al., 2019) interpreted their results as a feasible solution to sleep disturbances and improving sleep efficiency in their subjects. These results are promising, given that this online program was easy to use and access - and could be cost-effective for its patients.

The research demonstrated that one type of psychological treatment was suitable for sleep deprivation - CBT-I. In Tables 1 and 2, the components of this treatment are listed in two different ways. Essentially sleep education and hygiene lead the treatment, followed by stimulus control (only using the bed for sleep and leaving the bedroom if unable to sleep). Bedtime and sleep restriction are significant restrictions of time in bed not to reduce the time slept but to increase sleep efficiency. Relaxation techniques such as visualisation and progressive muscle relaxation are utilised with CBT-I, and lastly, working on cognitive thought patterns detrimental to sleeping habits - such as restructuring undesired thinking patterns. The research results are positive for CBT-I, yet it seems to be the only solution to psychological treatments available for the general population.

While technology may hinder sleep, sleep trackers and smartphones can now track sleep quality, which is already a multi-billion dollar business. However, we already see evidence of Orthosomnia, an anxiety development for people obsessed with sleep trackers (News, 2022). Other sleep aids are proving beneficial to help sleep-deprived individuals - such as melatonin, which has had a 425% increase in usage from 1999-2018 in US adults (Sun, 2021). An individual approach to sleep deprivation is needed due to the unique needs and situations they require, rather than a reliance on CBT-I alone.

Conclusion

The findings of this report topic shed light on the complexity of sleep deprivation in humans and the extent of the damage it can have on individuals. The human body is seemingly in a precarious position every night. The significant stress that a lack of sleep can have on the body is attached to nearly every part of the body's system. It seems as if no one is safe from its pervasive repercussions. The research concluded the need for early diagnosis of sleep disturbances and underscored the requirement for more exploration in this field.



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Modern technology continues to affect sleep quality with no end in sight, yet a paradox is that this can also help users of sleep applications shed light on their sleeping patterns. CBT-I led the way in being the most studied and available psychological treatment – its components signifying various ways to alleviate the effect of sleep deprivation on individuals. However, it is worth noting that this treatment may only be available to some due to cost and potential waiting lists. Alternate treatment methods, such as natural therapies, including supplements (melatonin), are worth mentioning too. In conclusion, the findings in this report highlight the need for further research and an urgent need to address this issue. The high impact of health concerns and ongoing ramifications of a lack of sleep on the population is extensive. Promoting better sleep and treatments for individuals across all cross sections of people and their occupations will positively affect behaviours, attitudes and health in the future.





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Appendices

Appendix A – Core modules of cognitive behavioural therapy for Insomnia (CBT-I)








Table 1

Core modules of cognitive behavioral therapy for insomnia (CBT-I)

Module	Description
Psychoeducation	Information about “sleep hygiene rules” and basic information about sleep and sleep disorders
Relaxation techniques	Methods of physical and mental relaxation (e.g. progressive muscle relaxation; guided visualization)
Bedtime restriction	Temporary significant restriction of the amount of time spent in bed during the night to the average amount of sleep with subsequent adjustment of the amount of time spent in bed in the weekly rhythm. To this end, the average sleep efficiency (sleeping time/bed time) is calculated for one week; in case of high values (e.g. >90%), the bedtime for the following week is extended by e.g. 30 min, while in case of low values (e.g. <80%) the bedtime for the following week is shortened by e.g. 30 min
Stimulus-control therapy	Reassociation of the sleeping environment with the behavior “sleep” by asking the patient not to engage in any activities other than sleep in bed and to get out of bed if unable to fall asleep in 15–30 minutes.
Cognitive techniques	Psychological methods to reduce worrying or to challenge and change dysfunctional sleep- and insomnia-related cognitions (e.g. the dysfunctional cognitions “The sleep before midnight is the healthiest sleep”, “everyone needs 8 hours of sleep” or “If I don’t get enough sleep, I will not be able to function tomorrow”)

Rémi, J., Pollmächer, T., Spiegelhalter, K., Trenkwalder, C., & Young, P. (2019). Sleep-Related Disorders in Neurology and Psychiatry. *Deutsches Ärzteblatt International*. <https://doi.org/10.3238/arztebl.2019.0681>

Table 2 The structure of CBT-I components in in-person treatment

Sleep Hygiene	Stimulus Control	Sleep Restriction	Relaxation	Cognitive	Wrap-Up
 appropriate bedroom environment  avoiding screen-based devices before bedtime  avoiding coffee or alcohol consumption	 using bedroom only to sleep  leaving bedroom when cannot fall asleep	 restricting sleep times  increasing in-bed sleep times	 taking short and long relaxations during the day	 restructuring undesired thinking patterns	going over each component to prevent the relapse of insomnia

Erten Uyumaz, B., Feijs, L., & Hu, J. (2021). A Review of Digital Cognitive Behavioral Therapy for Insomnia (CBT-I Apps): Are They Designed for Engagement? *International Journal of Environmental Research and Public Health*, 18(6), 2929. <https://doi.org/10.3390/ijerph18062929>