

Timing Sleep to Support Mental Health

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Received: May 30, 2018; **Published:** June 13, 2018

Human sleep behaviour is regulated by a combination of biopsychosocial factors. On average, sleep duration has slowly declined over the past few decades. Sleep loss, which is experienced across most age groups, has been largely attributed to family, social and employment demands. Sleep curtailment is ubiquitous in contemporary society with individuals misplacing sleep to accommodate other activities. Of course, this results in later bedtimes, yet rise times remain relatively stable to accommodate work, family and life commitments. The effects of sleep loss have been extensively studied with much of the empirical evidence demonstrating that insufficient sleep duration and poor sleep quality can have a range of adverse psychological and physiological chronic health consequences [1-3]. Interestingly, the prevalence of mental health problems has risen concurrent with the decline in sleep duration. Indeed, the importance of a healthy sleep-wake balance is now undisputable and its relationship with mental health may be pivotal in how the onset and progression of conditions are understood and treated, and possibly prevented.

One emerging area of sleep research is the effect of sleep timing on physiological and psychological health outcomes. Humans are naturally programmed to be diurnal, yet the rapid rise in urbanisation has resulted in a higher demand for night-shift workers. The natural human circadian rhythms are majorly challenged in these individuals where sleep occurs during the day and wakefulness at night. Interestingly, night-shift and rotating shift workers are at higher risk of chronic health conditions including depression [4], anxiety [4], obesity [5], metabolic dysfunction [5], type 2 diabetes mellitus [6], cardiovascular events [7] and cancer [8]. Night-shift work and rotating shift-work places the body's physiology into disarray by challenging the evolution of human sleep-wake patterns through the misalignment of the circadian clock. The effects of depression upon sleep are well known. For example, it is common for patients with depression (and other mental health conditions) to experience symptoms of insomnia, have more sleep drive during the day which results in nap during the day, which then exacerbates insomnia symptoms at night. Not surprisingly, this results in poor sleep quality, nocturnal sleep loss and daytime consequences, all of which may aggravate the mental health symptoms, acting as an impasse. Whilst not quite as extreme as shift-workers sleep-wake patterns, it is not uncommon for the depressed patient to experience and report circadian misalignment (sleep during day and increased nocturnal wakefulness. In line with this, recent efforts have focused less on extreme circadian shifts and diverted research attention to examining circadian preference, also referred to as chronotype.

Shifts in circadian preference (morningness-eveningness) are routinely experienced by adolescents who have a strong preference for optimal functionality in the evening (night owls), thus have delayed bed and sleep times. Conversely, older adults are referred to as early birds (larks), given that their preference is to retire to bed and wake early. Recent efforts to examine the health effects of circadian shifts have been explored. Data from a large sample of adolescents residing in the United Kingdom showed that those with an evening circadian preference, validated through wrist actigraphy (objective sleep estimate), had higher body mass index z-scores and poorer dietary habits compared to intermediate chronotypes (those with less extreme circadian preferences) [9]. There are several recent studies that have

shown a relationship between chronotype and mood. One Korean study, which recruited 641 young, healthy adults, of which 19.2% classified themselves as having an evening circadian preference, found that this group had significantly greater depressive symptoms compared to intermediate chronotypes [10]. Similar findings have also been reported in adolescents [11], as well as in the general population of Korea [12]. These results seem relatively stable across clinical populations. For example, a recent study explored the relationship between mood and chronotype. Patients with depression and/or anxiety were recruited (n = 676), as well as patients in remission (n = 831) and healthy controls (n = 437). They found that those with mental health conditions had later chronotypes compared to controls and remitted patients, concluding that late chronotype was associated with an existing diagnosis of major depressive disorder [13]. Given that association between late chronotype and lower mood is consistent across healthy populations and age groups, as well as clinical populations, this is suggestive that sleep timings may precede the onset of mental health conditions and persist after diagnosis. It should be noted that the study of the Korean general population only included 302 healthy adults, thus representativeness of the sample is questionable [12]. One possible avenue of study which could capture a larger number of individuals in a naturalistic environment is the use of big data. Future studies could examine the relationship between chronotype and mood based on semantic expression. For example, affect as expressed in language on social media, and the clock timings when individuals post their thoughts and opinions, could be one method to further assess the relationship at a mass population level. Small experimental studies are useful to inform and verify relationships [14], but big data can, and should, be used to capture patterns at a population level to further inform and better understand the association that sleep timing has with mental health.

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Volume 7 Issue 7 July 2018

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