Title: Sleep and the Law

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Dear Editor,

In this letter, we flag the importance of sleep for human behaviour. Sleep is essential for human functioning yet historically has been relatively neglected in various areas of psychological research such as that focusing on psychopathology (e.g. Gregory & Sadeh, 2016). Here we note empirical data and legal cases and considerations which emphasise the potential importance of further considering sleep in the context of the legal system. We argue for the need to conduct additional high-quality systematic research in this area as well as the importance of interdisciplinary collaborations to contribute to a more comprehensive understanding of human behaviour within the legal system and to maximise the impact of this work.

Sleep has many functions including supporting emotional regulation (Palmer & Alfano, 2017) as well as memory and cognition (Girardeau & Lopes-Dos-Santos, 2021). Consequentially, missing out on sleep can result in poorer emotional regulation as well as have a negative impact on cognitive functions including attention and decision making. It follows that sleep deprivation could play a role in certain crimes including those committed in the context of emotional outbursts ('provocation') or due to significant failures (e.g. falling asleep at the wheel or making serious errors at work).

Sleep quality and disorders also need to be considered in this context, with untreated or undisclosed narcolepsy or sleep apnoea examples of disorders which could lead to falling asleep with serious consequences and legal ramifications, potentially adding a new dimension to legal proceedings. Indeed, undiagnosed severe sleep apnoea was flagged as a possible contributor to the high-profile Long Island Rail Road Collision in 2017 in which 108 people

were injured (NTSB, 2017). More generally, untreated sleep apnoea is a risk factor for other outcomes, such as car accidents (Tregear et al., 2009).

Such findings highlight the legal obligations of those with certain sleep disorders. While patients may legally be able to refuse treatment for a sleep disorder, they do not have a right to ignore risks to others caused by this decision (see Brown, 2022). The employer also holds legal obligations linked to their employees' sleep – and may hold vicarious liability for sleep-related accidents occurring during work hours. In industries where safety is paramount (e.g. for doctors, pilots etc) there may also be regulation restricting work hours and reducing tiredness (Brown, 2022). Where a sleep disorder qualifies as a disability this will have implications for reasonable adjustments required by law. Working conditions (e.g. shift work) which are deemed to cause harm (e.g. cancer) may result in compensation claims (Erren et al., 2009).

Beyond employment law, early school start times, often considered to be out of sync with the internal timing of young people with consequential implications for accidents and missed potential, could hold implications for education law. What is more, if sleep is considered a fundamental human right, legal implications for housing, homelessness and detention could follow. Governments and local authorities might also want to consider promoting sleep quality via policies and public campaigns.

As well as potential legal implications of the sleep disorders narcolepsy and sleep apnoea, other sleep disorders have also been flagged in the legal context. These include sexomnia, which involves sexual behaviours related to sleep and may occur during a confusional arousal or in the context of sleep-walking (American Academy of Sleep Medicine, 2023). This sleep

disorder has led to sexual assaults (Dubessy et al., 2017) and been presented as defence against allegations of rape with a recent case being dismissed because it was deemed possible that the alleged victim could have experienced an episode of sexomnia, something she strongly contested (Ailes, 2022). Sleep-walking and confusional arousals have also been considered in defence against accusations of violent crimes (Ebrahim & Fenwick, 2008; Ingravallo et al., 2014).

In addition to the relevance of sleep-related variables to crimes committed and the potential defence (which could potentially be used to argue diminished capacity, lack of intent or involuntary behaviour), the sleep of others involved in the legal system may be worthy of further consideration. Given associations between sleep and memory, the quality and accuracy of an eye-witness testimony may vary as a function of the way a witness has slept prior to the event on which they are reporting; or whether statements are taken before or after periods of sleep. Some data support a role for sleep, and one report found that self-reported sleep quality prior to witnessing a mock crime, predicted the accuracy for which certain details were reported (Carlson et al., 2023). This chimes well with previous work showing that poorer self-reported sleep quality and greater sleepiness was associated with poorer accuracy reporting the peripheral details of a crime (Thorley, 2013). Other reports have examined the role of sleep deprivation for false memories finding that the former could increase the latter under certain conditions but not others (Frenda et al., 2014). Null findings have also been reported and one study found no support for the idea that sleeping after witnessing a crime and before assessing a line-up improved eye-witness identification (Morgan et al., 2019). These mixed results for different sleep variables suggest that further empirical study, systematic reviews and meta-analyses may help to establish the full

significance, magnitude and the way in which sleep could be relevant to eye-witness testimony.

Decision making within the legal context may also be impacted significantly by sleep/circadian factors. One striking report found that judges in the US handed out sentences on the Monday following the shift to daylight savings (which is often accompanied by missing out on sleep) that were 5% longer when compared to other Mondays (Cho et al., 2017). It is however noteworthy that a further consideration of these data suggested that modelling decisions impacted these results and that therefore this effect (if it exists) may be smaller than first considered (Spamann, 2018).

While the full extent of the importance of sleep for different aspects of the legal system is currently unclear, research and reports to date suggests that it might be fruitful to further consider this line of enquiry. It is beyond the aims of the authors (who have written this piece in our roles as sleep researchers and psychologists) to make suggestions about the way in which this information (if found to be robust) should be incorporated into legal recommendations and considerations – and it is and only with interdisciplinary collaborative research and discussion that this will become clearer. At the very least, further research should be conducted to examine robust effect sizes and legal experts should be aware of the role of sleep on human behaviour per se to decide if and how this needs to be further considered in a legal context.

Conflicts of interests

Alice Gregory is an advisor for a project initially sponsored by Johnson's Baby. She is a consultant for Perrigo (2021+). She receives royalties for two books *Nodding Off* (Bloomsbury Sigma, 2018) and *The Sleepy Pebble* (Flying Eye, 2019) and a sleep gift (*The Gift of Sleep*, Lawrence King Publishers, 2023). She was previously a CEO of *Sleep Universal LTD* (2022). She is a regular contributor to *BBC Focus Magazine* and has

contributed to other outlets (such as *The Conversation*, *The Guardian* and *Balance Magazine*). She occasionally receives sample products related to sleep (e.g. blue light blocking glasses) and has given a paid talk to a business (*Investec*). She is a specialist subject editor at *JCPP* (sleep) for which she receives a small honorarium. She has contributed a paid article to *Neurodiem*.

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