

Does DNA methylation link sleep disturbances to mental health problems?

By Dr. Jessica Edwards

Sleep disturbances have long been linked to mental health problems in children,¹ but the underlying mechanisms of this relationship are unclear. DNA methylation — an epigenetic mechanism that regulates the way in which genes are expressed in response to genetic and environmental influences — is one possible mechanism that might underlie the sleep–mental health axis.² Now, for the first time, researchers in the Netherlands have tested whether this is the case in the general paediatric population.

Maria Koopman-Verhoeff and colleagues recruited >450 children aged 10 and 11 years old to their study. They measured genome-wide DNA methylation levels in blood samples, collected information on sleep and mental health problems using questionnaires, and monitored sleep duration by actigraphy. Then, they conducted network analyses to test whether there were any associations between sleep and mental health outcomes with DNA methylation patterns across genes.

The researchers found that typical variation in sleep among children, as measured using actigraphy, is indeed associated with DNA methylation. Many of the DNA methylation patterns identified were located in genes that have been previously linked to sleep by genetic studies, including *MAPT*, an important gene for brain function.³ Interestingly, this association was not evident when using self-reported sleep data. Furthermore, the identified DNA methylation module associated with sleep was not associated with mental health outcomes.

“It is intriguing that DNA methylation patterns associated with sleep were not also associated with mental health in this cohort, despite evidence that sleep and mental health are strongly related”, explains corresponding author Charlotte Cecil. “It is therefore possible that factors other than DNA methylation explain the relationship between sleep and mental health – something that will need to be researched in future”.

Going forward, the researchers hope to understand whether their identified DNA methylation patterns are influenced by specific environmental factors, and whether these could be targeted in future to promote healthy sleep in children.



Referring to:

Koopman-Verhoeff, M. E., Mulder, R.H., Saletin, J.M., Reiss, I., van derHorst, G.T.J., Felix, J.F., Carskadon, M.A., Tiemeier, H. & Cecil, C.A.M. (2020), *Genome-wide DNA methylation patterns associated with sleep and mental health in children: a population-based study*. *J. Child Psychol. Psychiatr.* doi: 10.1111/jcpp.13252.

References:

¹ Gregory, A.M. et al. (2016), *Annual Research Review: Sleep problems in childhood psychiatric disorders—a review of the latest science*. *J. Child Psychol. Psychiatr.* 57: 296–317. doi: 10.1111/jcpp.12469.

² Morales-Lara, D. et al. (2018), *Dad’s snoring may have left molecular scars in your DNA: The emerging role of epigenetics in sleep disorders*. *Mol. Neurobiol.* 55: 2713–2724. doi: 10.1007/s12035-0409-6.

³ Dashti, H.S. et al. (2019), *Genome-wide association study identifies genetic loci for self-reported habitual sleep duration supported by accelerometer-derived estimates*. *Nat. Commun.* 10: 1100–1112. doi: 10.1038/s41467-019-08917-4.

Glossary:

Actigraphy: the continuous measurement of movement during sleep using a non-invasive, wearable device known as an actigraph.