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A pioneer in studying specific learning and memory profiles in atypical development, University of Arizona professor Jamie Edgin is uncovering the link between poor sleep and learning for children with Down syndrome.

What originally led you to your general interest in sleep and memory in children, in particular children with Down syndrome and autism?

In the early 2000s, I received my PhD training from Bruce Pennington at the University of Denver, who studied cognition in developmental disorders. Pennington's lab allowed me to conduct research and publish on the neuropsychological profiles across a number of intellectual and developmental disabilities, including Down syndrome, Williams syndrome, ADHD, and autism. When I began my work at the University of Arizona, the merging of that background and our sleep-science programs at the U of A really motivated me to further pursue the ways that sleep disturbance may affect learning and cognition in developmental disorders broadly. Surprisingly, even though sleep disturbances are highly prevalent in developmental disorders, the research in this area is scant. That is what we are hoping to change.

What do you consider your most important or surprising finding in this research?

In 2018, my lab published a paper suggesting that the timing of sleep in relation to new learning is really important. Recent studies from my lab and others have shown that young typical children benefit from naps—and need them—to retain memories, and napping right after learning is the most beneficial. However, in Down syndrome, sleeping right after learning had the opposite effect—children lost new knowledge from poor sleep quality during those naps. This suggests that memory impairment is not universal in Down syndrome, and it depends on how and when children learn.

What important assessment tools have you developed and employed in your work?

Working with developmental disabilities requires the careful use of measures of cognition and memory that have been validated for specific populations. We have validated and designed new assessments to take up this task, including a battery of iPad assessments of memory function, funded by the National Institutes of Health, and eye-tracking measures. We use a variety of methodologies to understand brain function during sleep, including electroencephalographic measures and movement monitoring.

What new lines of research are you pursuing?

Given the substantial sleep disturbances in autism, we are starting new studies to understand how sleep may affect memory and learning in this group. Because previous studies of autism have had limited numbers of participants, we are designing a multi-site international trial of those effects. Further, my collaborators and I are conducting studies testing memory intervention techniques through behavioral, pharmacological, and electromagnetic stimulation protocols (i.e., transcranial magnetic stimulation).

What long-term clinical outcomes would you like to see as a result of your findings?

Some of our work has motivated early screening for sleep disorders in Down syndrome, but many children with developmental disorders still go unscreened. Sleep disturbance often remains untreated in children and adults in the general population. I would like to see routine early and lifelong screening by doctors for these conditions. Further, many active clinical trials aim to change cognitive or behavioral function in developmental disorders, but there is little recognition that poor sleep may confound the results of those trials. How and when we administer drugs in treatment trials is critical, and sleep quality must be considered.

Photo by Bevin Dunn