

## Sleep disruption in toddlers with Down syndrome may affect behavior

August 2 2012, By Ursula Tooley and La Monica Everett-Haynes

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Undergraduate researcher Ursula Tooley is working with the UA's Down Syndrome Research Group to study the effects of sleep disruption on cognition and behavior in children with Down syndrome. (Photo credit: Beatriz Verdugo/UANews)

(Medical Xpress) -- In typically developing children, links between behavioral issues and disrupted sleep have been well-researched, though fewer studies have focused on understanding how early sleep disruption affects children with Down syndrome.

At the University of Arizona, undergraduate researcher Ursula Tooley is working with a team to fill the gap in the literature to one day help improve treatment.

Children with [Down syndrome](#) have long been identified as a population at risk for [sleep](#)-related disorders. But it now seems that sleep disturbance can have an effect on early development, said Tooley, a

member of the UA's Down Syndrome Research Group.

Tooley has been investigating a preschool population of children who have Down syndrome, and her study has indicated that the effect of disrupted sleep may begin to influence behavior and [working memory](#) in children with Down syndrome who are as young as age 2.

“Sleep is much more important than most people realize,” said Tooley, a neuroscience major and Honors College student. “Many of these children are clearly having difficulty sleeping, and it’s rewarding to be able to provide parents with another avenue of possible treatment for their child.”

Down syndrome is caused by an extra copy of the 21st human chromosome and affects approximately one out of every 600 children born in the U.S. The condition is characterized by delayed development, specific cognitive difficulties and a particular set of physical characteristics. These characteristics, such as decreased muscle tone, contribute to an increase in the probability of sleep apnea.

“Parents of children with Down syndrome should be on the lookout for sleep problems at an early age,” said Tooley, also is a student with the UA Undergraduate Biology Research Program, UBRP, and became involved in the lab through the program.

Tooley works under the direction of Drs. Jamie Edgin and Regents' Professor Lynn Nadel, both UA psychologists who lead the research group. In earlier studies, the UA Down Syndrome Research Group found in studying children with Down syndrome that there exists an increase in sleep problems with age. The group also has found connections between memory deficits and sleep apnea.

"She found preliminary correlations between sleep and behavior scores

across a number of measures that were quite striking," Edgin, a UA assistant professor of psychology, said of Tooley's work, noting that while the research group gathered the data, Tooley stepped in to complete the analysis.

"In general, sleep is underrecognized as an issue in pediatric populations. We're only starting to understand how sleep may contribute to brain development and delays in brain development over and beyond Down syndrome," Edgin said.

Edgin said current guidelines suggest screening children at age 4, though some doctors and researchers would prefer that to occur much earlier to help prevent future problems.

"Across a person's lifespan, they could be taking an additional hit because of sleep disruption," she added. "It may be easier to treat these children if we get them on the treatment that they need at 18 months to 2-years old rather than a teenager."

Thus, Tooley's findings provide an important addition to the existing gap in the [literature](#), she said, adding that the team will be pursuing publication in the future. Edgin presented the preliminary findings to an audience of more than 100 doctors and other medical professionals during the recent National Down Syndrome Medical Interest Group meeting in Washington, D.C.

"When completed, Ursula's study will provide us with evidence to say that we need to begin screenings and treatments much earlier than we currently do," Edgin said.

In the lab, Tooley performs polysomnograms, which record various physiological variables such as the brain's activity and eye movements during sleep and allow for the determination of sleep patterns.

Actigraphy, a method of measuring movement that uses a wristband worn during sleep, also is used to evaluate sleep in younger children – toddlers ages 2-5, which is rare in research – to determine the degree of their sleep disturbance over a period of several days, as measured by what is called a fragmentation index.

The fragmentation index is an indicator of how much the child moves during sleep, and thus how often their sleep is disturbed by physical movement or awakenings. In Tooley' study, a higher fragmentation index was associated with both a lower working memory function and an increase in general maladaptive behavior, such as aggression toward others, noncompliance or hyperactivity.

“This increase in restlessness could be caused by Down syndrome-induced sleep apnea or more general [sleep disruption](#), but regardless of the origin, addressing it could lead to improved outcomes for the child,” Tooley said.

Tooley said her initial findings provide hope for parents and caregivers, as early diagnosis and treatment of sleep disorders may help to alleviate some of the behavioral and memory deficits associated with Down syndrome.

"One of the main concerns of parents with [children](#) with Down syndrome is how they can mitigate the effects and better incorporate their child into society," Tooley said. "Any insight we can gain into the workings of what contributes to behavioral and cognitive issues provides another avenue for positive treatments. It's something parents can take into account when considering their child's health."

Provided by University of Arizona

Citation: Sleep disruption in toddlers with Down syndrome may affect behavior (2012, August 2)  
retrieved 6 May 2024 from

<https://medicalxpress.com/news/2012-08-disruption-toddlers-syndrome-affect-behavior.html>

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