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Predicting Behavioral Problems from Sleep-disordered Breathing Trajectories

Not an Easy Game

Ever since the initial observations of the association between sleep-disordered breathing (SDB) and its negative effect on academic and behavioral functioning in children, the identification of those children at higher risk of being adversely affected, without subjecting them to tedious, time-consuming, laborious, and realistically unimplementable batteries of neuropsychological testing, has been an aspiration among pediatric sleep clinicians.

The seminal observation that the negative effects of SDB on academic performance, with proper early detection and treatment, could pause or reverse (1) otherwise further reinforces the necessity of screening children routinely to obtain clinical elements, which can predict the risk (2–6). The increased awareness in recent years by both the public and health practitioners of the relatively elevated prevalence of SDB during childhood has accentuated the pressing need for early diagnosis and detecting children at higher risk.

Despite such increased awareness, overnight polysomnography remains the gold standard for the diagnosis and severity delineation of SDB. However, current analytical methods used for evaluation of the polysomnogram do not provide any insights as to the downstream adverse consequences of the underlying perturbations associated with it. Furthermore, pediatric sleep laboratories are relatively scarce, leading to long waiting times, which in turn promote the likelihood of many children either going undiagnosed or waiting too long to be diagnosed. Under such circumstances, a significant proportion of children who were considered for treatment and even prescribed psychostimulants based on "behavioral difficulties" could have benefited from polysomnogram assessment and consequent intervention. In parallel with the incremental experience accumulated through several decades, the quest for a well-designed, universally validated, and widely applicable screening tool that can accurately, and as early as possible, identify the most behaviorally vulnerable snoring children, those who are at risk of developing cognitive and behavioral problems associated with SDB, has been a primary line of investigative efforts (7–9). Among the multitude of studies focused on this issue, some initial reports proposed that the temporal trajectory of SDB-related symptoms may reveal susceptibility to behavioral morbidity, though the topic was not assertively tested.

Using a trajectory analysis method, van Eeden and colleagues (pp. 718–725) examined the behavioral outcomes of children in relation to their SDB symptoms over the first 5 years of life in this issue of the *Journal* (10). The longitudinal dataset consisted of the periodic assessments performed using the 22-item Sleep Related

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Breathing Disorder subscale of the Pediatric Sleep Questionnaire (11, 12). Based on the age of onset and duration of SDB symptoms, an SDBeasy score was developed using an *a priori* assumption that the longer the SDB symptoms, the more likely the probability of manifesting behavioral problems. Analysis of the dataset revealed a significant association between duration of SDB and greater risk of behavioral sequelae, whereby an increase of 0.35 points in the Continuous Behavioral Check List total behavior score would occur at age 5 years for each 1-point increase in the SDBeasy score.

This study is undoubtedly an important initial effort that could have a significant impact on the way temporal trajectory assessments of SDB symptoms are obtained and linked through the cumulative SDBeasy score to the risk of behavioral changes in younger children.

Using the SDBeasy score across multiple time points in a primary care setting can provide very valuable insights that should allow for more informed and precise decision making about patient evaluation and intervention.

However, some methodological pitfalls in the fastidious steps required for the development and evaluating a screening tool, together with the low sensitivity of the SDBeasy score even among the highest risk groups, detract somewhat from the immediate implementation of this approach. Several issues must first be addressed, and the overall concept extensively validated before the tool can be confidently applied broadly in clinical care. The cohort used in the study was a relatively skewed population with a limited age range and did not include a separate independent cohort to test the validity of the proposed tool. More importantly, the delineation of SDB was not predicated on objective criteria, rather relegated to a parental questionnaire, a subset of the Pediatric Sleep Questionnaire, with all of the attendant uncertainties that are inherent to such an approach (13). Furthermore, quantification of the number of nights that children snored has been shown to have implications for behavioral risk (14) and it is possible that adding other elements to the periodic SDBeasy assessment may improve the receiver–operator curves in the prediction of "if and when" to evaluate for SDB because of the underlying risk of behavioral problems. Finally, temporal trajectories may have intrinsic significance, thus it might be worthwhile to apply pattern recognition approaches to identify whether specific SDBeasy changes over time add value and predictability to the use of this proposed score.

In summary, the study by van Eeden and colleagues insightfully reminds us that we should add the time domain to the traditional SDB questionnaire. It opens an intriguing possibility that duration and possibly patterns of SDB symptoms may be used for timely identification of the subset of children at increased behavioral risk from the much larger group of children with snoring and/or SDB. Such findings open exciting opportunities for multicenter studies aiming to assess the potential relationships between individual behavioral phenotypic clusters in pediatric SDB. Whether SDBeasy score use can optimize the reversibility of behavioral morbidity with the treatment of SDB in children remains to be seen. ■

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