Keeping Relative Age Effects and ADHD Care in Context

Eric M. Butter, PhD

The diagnosis and treatment of attention-deficit/hyperactivity disorder (ADHD) requires discerning clinical judgment and deliberate shared decision-making between parents, teachers, and other engaged caregivers. ADHD is widely accepted as a neurodevelopmental disorder that emerges early in life and has life span implications for many. The functional impairment associated with ADHD is significant, and the available treatments, including medication, can be effective at improving educational, behavioral, and social-emotional functioning. Missing or delaying the diagnosis of ADHD can lead to unnecessary suffering and poor adaptation for children.[1] Similarly, overdiagnosing and overprescribing to children who are misidentified as having ADHD brings many serious adverse consequences, including medication side effects such as sleep disturbance, appetite suppression, and cardiovascular system impacts as well as negative psychosocial sequelae of being misdiagnosed with a behavioral health disorder.

In this issue of *Pediatrics*, Vuori et al,[2] using a national registry from Finland, report on the relative age effect (RAE) associated with ADHD diagnoses in which the youngest children in a classroom are at the higher risk of being diagnosed with ADHD and being prescribed medications compared with older classmates. This study builds on the findings of Sayal et al[3] and others, which document that a younger relative age increases the risk of being diagnosed with ADHD. Support for the RAE has grown in the literature, and a significant body of evidence documents similar observations of the RAE worldwide.[4]

Many may interpret the findings of relative age impacts on rates of diagnosis of ADHD and medication use as reflecting teacher biases rather than a true presence of the disorder in some younger children. From this perspective, the finding suggests that teachers are more likely to initiate a diagnostic process for less mature children who may exhibit more problematic behavior in the classroom than slightly older peers. This line of thinking suggests that there is a bias in referring younger children for an evaluation of ADHD symptoms supported by both the teacher's intention to help the identified children and difficulty to manage classroom behavior of relatively immature students. Vuori et al[2] and most others who have reported on RAEs and ADHD recommend a reconsideration of school entry regulations and increased classroom contingency management programs.

This understanding of the association between the RAE and inappropriate ADHD diagnoses and treatment assumes the diagnostic assessment process lacks sufficient internal validity to combat the underlying bias. It further assumes that when an ADHD diagnosis is sought, one will be obtained, sometimes regardless of critical clinical discernment. In addition, the implied impact of the RAE by these authors is that the risk to beginning medication for ADHD is directly related to being diagnosed with ADHD and, thus, is routinely or

Nationwide Children's Hospital and The Ohio State University, Columbus, Ohio

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Address correspondence to Eric M. Butter, PhD, Department of Pediatric Psychology and Neuropsychology, Nationwide Children's Hospital, 700 Children's Drive, JWest Building 3rd Floor, Columbus, OH 43205. E-mail: eric.butter@nationwidechildrens.org

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automatically connected to teacher bias against younger children in their classrooms. This presumed process toward inappropriate prescribing also implies that there are flaws in how decisions are made by physicians to begin ADHD medications with young children. The necessary practice changes recommended by those who understand the RAE this way would be to implore parents or teachers to provide information about ADHD symptoms, keeping the child's relative age in mind as they report to the provider. Presumably, analysis of the child's age in relation to the age for school entry could be used to influence starting medication treatment in a child newly diagnosed with ADHD or even whether medication treatment should be continued for a child or adolescent with a long-standing history of ADHD. Although there is much unproven in this reasoning, the reminder that age matters when considering developmental psychopathology seems like an appropriate and worthy caution.

There are other considerations, however. Vuori et al[2] do offer that their study does not settle whether increased medication use in younger children was due to "misidentification of ADHD or, perhaps, to the fact that relative immaturity aggravates ADHD traits." Indeed, an alternative explanation of the observation that younger children are more likely to be diagnosed with ADHD than older classroom peers is related to school entry being a trigger for ADHD symptoms. Similarly, the possibility also exists that older children among a school-year cohort, because of relative maturity, may be able to mask ADHD symptoms. Within limited and circumscribed contexts like the low academic demands and highly structured social environment of the first grades of schooling, these children's ADHD symptoms could be overlooked until more serious academic impacts, behavioral problems, and social deficits emerge later in childhood. Indeed, Vuori et al[2] and the body of research on the RAE in ADHD has not yet answered the question of the direction, cause, or implication of the effect. It remains to be seen if the RAE is a factor in overdiagnosing and overprescribing or is a signal that school entry could trigger ADHD symptoms in younger children and/or mask symptoms of ADHD in older children.

ADVANTAGES AND LIMITATIONS OF POPULATION-BASED REGISTRY RESEARCH

The research by Vuori et al[2] is another example of the effective use of large population-based registry databases to observe how a disease is manifesting within specific societal parameters or geographies. More, not less, of this kind of population-based research is needed in pediatric behavioral health. In this case, the observation is about ADHD in young children in Finland born ~15 years ago and diagnosed with ADHD before cautions about diagnosing ADHD in the context of relative immaturity were offered. The primary observation in this study is based on prescribing patterns that date back 9 years. The current data do not account for practice changes that may have occurred with cautions made by many organizations about RAE to consider children's symptoms relative to age and other contexts.

Aside from the conclusions being dated and historical, another concern is that the nature of large national registries allow for great variability and large unknowns in what diagnostic processes were used to identify ADHD. Also, the course of treatment is often not well characterized in registry research. That is the case here as well. In this cohort, the main finding is related to children who "received ADHD medication at least once" without regard for how the treatment course may have been adjusted over time. And, actually, the cohort is best defined as those children whose parents made "the first purchase of medication for ADHD." It is inappropriate for anyone to conclude sweeping statements implying biases toward overdiagnosing or overprescribing solely on the basis of the observations made in limited data sets, such as the one used here. At best, Vuori et al[2] and authors of other reports like it offer guidance for the questions yet to be asked and answered. In fact, the authors call for prospective studies to advance this knowledge. The conversation about RAE and ADHD is supported but not greatly advanced by this report, given the limited generalizability of the data set.

WHAT DO WE HAVE AND WHAT IS NEEDED TO RESPOND TO RAE IN ADHD?

There are many known limitations to our diagnostic classification systems for ADHD. Using only the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) as a diagnostic tool, clinicians may not adequately account for environmental contexts, may overly focus on individual functioning, and could struggle with defining the boundaries between subthreshold symptoms and disorder.[5] The questions raised by the RAE in ADHD lay at the center of these limitations of the DSM-5. The understanding of the developmental pathways of ADHD and the interconnections of ADHD diagnoses and treatment decisions with school and age require additional research and then application to practice.

Beyond the DSM-5, we do have best practice guidelines in diagnosing and treating ADHD.[6] The American Academy of Pediatrics "Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents" represents an opportunity to mitigate any negative consequences of the observed RAEs, such as those reported in Vuori et al.[2] This guideline, as well as others available to clinicians,

used in combination with responsible application of the DSM-5 criteria for ADHD, offers protection against inappropriate diagnosing and prescribing. It is widely accepted that to receive a diagnosis of ADHD a child must show a persistent pattern of inattention and/or hyperactivity-impulsivity across multiple settings. Critically, children's ADHD symptoms must be inconsistent with their developmental level, and it is recommended to use norm-referenced rating scales across multiple raters to aide in diagnostic assessment. Finally, a diagnostic impression for ADHD can only be positive if children's symptoms interfere with their everyday functioning. There must be clear impairment in academic, social, and occupational activities. In addition, ADHD diagnoses can be specified by the severity of symptoms. Clinicians can allow treatment to be guided by the level of mild, moderate, or severe presentations and age of the child. Best practice implementation could mitigate the implied bias in the reports of a RAE for ADHD among early school-aged cohorts.

CONCLUSIONS

There is risk that continued reporting on the RAEs on the diagnosis of ADHD and medication prescribing could inadvertently lead to delays in diagnosis of this impairing neurodevelopmental disability. More research is needed on understanding what causes this effect and the implications of it. However, any reminder for clinicians to use best practice guidelines in diagnosing and treating children with ADHD symptoms is welcomed. These guidelines include the recommendation that diagnosing and treating ADHD should be a developmentally sensitive process. The use of norm-referenced standardized rating scales, multiinformant and multidimensional assessment, and careful observation and monitoring of a child's symptoms and functional impairment remain critical foundations of treating ADHD in children. Another report observing that there is a RAE for ADHD diagnoses in young children is a reminder of the carefulness by which pediatricians and other clinical providers must approach this complicated developmental disability.

ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
DSM-5: *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*
RAE: relative age effect

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