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Brief clinical screening for academic underachievement in new-onset childhood epilepsy: Utility and longitudinal results

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ABSTRACT

Objective: This study was conducted to determine the lifetime rate and distribution of supportive academic and educational services provided to children with new- or recent-onset epilepsy and typically developing controls, the relationship of this history to objective academic test performance, and the course of performance over serial evaluations (baseline and 2 and 5 years later).
Methods: Research participants were 91 children aged 8–18 at study entry, including 50 youth with recent-onset epilepsy (28 focal [FE] and 22 generalized [GE] epilepsy) and healthy first-degree cousin controls (n = 41). The sample with epilepsy included children with uncomplicated epilepsy and normal imaging and development. Lifetime history of a diversity of supportive educational services was determined via a structured interview with parents at the baseline study visit. Associations were examined between these support services and participants' academic performance in reading, spelling, and arithmetic (Wide Range Achievement Test—Revision 3 [WRAT3] [12]) during three serial study visits including baseline and 2 and 5 years later.
Results: Children with epilepsy had a higher lifetime rate of provision of diverse academic supportive services compared to controls at the baseline visit (52% vs. 18%). These services antedated epilepsy diagnosis in the majority (80.8%) of the children with epilepsy. Among children with epilepsy, children who presented with academic services had significantly lower WRAT3 reading, spelling, and arithmetic performance at baseline and at 2- and 5-year follow-ups.
Conclusion: A brief structured clinical interview conducted with parents identifies children with epilepsy who are at academic risk at the time of diagnosis, with that risk persisting up to 5 years later.

1. Introduction

Academic struggles and clinically significant academic underachievement are known complications of childhood epilepsies [1–3]. These are critical issues as they may contribute to subsequent adverse impacts on career trajectories, income, and socioeconomic status—long-term complications of childhood-onset epilepsy that have been reported by many investigators [4]. These issues associated with severe and intractable epilepsies are not unanticipated, but in children with "epilepsy only" without comorbid neurological disease, who have average intelligence and are attending regular classes, ongoing academic difficulties are often unrecognized [5].

There are differing views of the natural history of academic problems in childhood epilepsy. Some authors suggest that significant academic problems are not evident at or near the time of diagnosis but tend to worsen over time [1,6], while others contend that the academic careers of children with new-onset epilepsy are already at risk at the time of diagnosis [7]. These differing views may be attributable to the varying nature of the populations studied and the methods used to assess and define academic performance.

From a practical standpoint, it is difficult to determine how to best screen efficiently for potential cognitive and academic problems in the clinic setting. In the current United States health-care environment, there are limitations regarding referral for cognitive and academic assessments and when and how often testing may be repeated. A quick, efficient, informed, and validated system that could be used in the clinic to identify those children most in need of and likely to benefit from assessment would be useful. In this study, we performed a brief structured interview with parents that inquired about their concerns regarding their child's academic performance, focusing on the concrete steps that they, or the school, had taken to address the academic concerns. In order to characterize the prospective academic trajectories of the children, this history was examined in the context of traditional

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objective measures of word reading, spelling, and arithmetic computation not only at the time of the baseline parent interview but also longitudinally at 2- and 5-year follow-up visits. By examining children with new- and recent-onset epilepsy, we were able to address the natural history of these relationships and the specific contribution of epilepsy-related factors. We hypothesized that children with epilepsy and a history of parent-reported academic problems and services for academic struggles at baseline would have significantly lower objective academic performance over time when compared to children with epilepsy without academic problems or services. Further, children with epilepsy and no history of academic problems and services would be comparable to controls in academic performance at baseline and 2- and 5-year follow-up assessments.

2. Methods

2.1. Participants

Research participants consisted of 91 youth aged 8–18 at baseline, including 50 with new- and recent-onset epilepsy and 41 healthy first-degree cousin controls (Table 1). All participants attended regular schools at baseline.

All participants completed three waves of assessment including baseline and 2- and 5-year follow-ups. Children with epilepsy were recruited from pediatric neurology clinics at three Midwestern medical centers (University of Wisconsin-Madison, Marshfield Clinic, and Dean Clinic) and met the following inclusion criteria: (i) diagnosis of epilepsy within the past 12 months; (ii) no other developmental disabilities (e.g., intellectual impairment and autism); (iii) no other neurological disorder; and (iv) normal clinical MRI. Children entered the study with active epilepsy as diagnosed by their treating pediatric neurologists and confirmed by medical record review of the research study pediatric neurologist. We did not exclude children on the basis of psychiatric comorbidities (including ADHD) or learning disabilities. We did, however, exclude children with intellectual disability (IQ < 70), autism, and/or other neurological disorders. Specifics regarding the participant selection process have been described in detail in a previous publication [8]. In general, we tried to stay true to the concept of "epilepsy only" as defined broadly in the literature: normal neurological exams, average intelligence, and attendance at regular schools.

Each child's epilepsy syndrome was defined in a research consensus meeting by the research pediatric neurologist who reviewed all available clinical data (e.g., seizure description and phenomenology, EEG, clinical imaging, and neurodevelopmental history) while blinded to all research cognitive, behavioral, and neuroimaging data. Two levels of epilepsy syndrome classification were undertaken and confirmed by a board-certified pediatric neurologist who was blinded to all research data. Children with epilepsy were first classified into broad syndrome groups including generalized epilepsy (GE) and focal epilepsy (FE), followed by classification into specific GE (juvenile myoclonic epilepsy [JME], childhood and juvenile absence [Absence], and GE not otherwise specified [GE NOS]) and FE (childhood epilepsy with centrotemporal spikes [CECTS], temporal lobe epilepsy [TLE], childhood occipital epilepsy [COE], frontal lobe epilepsy [FLE], and FE not otherwise specified [FE NOS]). Syndrome data and a summary of antiepileptic treatment for all participants with epilepsy are provided in Table 1.

First-degree cousins were used as controls, and exclusion criteria were as follows: (i) history of any initial precipitating insult (e.g., simple or complex febrile seizures, cerebral infections, and perinatal stroke); (ii) any seizure or seizure-like episode; (iii) diagnosed neurological disease; (iv) loss of consciousness greater than 5 min; and (v) other family history of a first-degree relative with epilepsy or febrile convulsions. For the current analysis, we also excluded control participants who received special services in school (n = 9). We used cousin controls rather than siblings or other potential control groups for the following reasons: (i) first-degree cousins are more genetically distant from the participants with epilepsy and, thus, less predisposed than siblings to shared genetic factors that may contribute to anomalies in brain structure and cognition; (ii) a greater number of first-degree cousins are available than siblings in the target age range; and (iii) the family link was anticipated to facilitate participant recruitment and especially retention over time (which was our intent) compared to more general control populations (e.g., unrelated schoolmates).

This study was reviewed and approved by the institutional review boards of all participating institutions. On the day of study participation, families and children gave informed consent and assent. All procedures were consistent with the Declaration of Helsinki [9].

2.2. Procedures

Participating children completed three study visits: baseline and 2 and 5 years following the baseline visit. Each participant completed a comprehensive battery of neuropsychological tests, questionnaires, clinical interview, structured psychiatric interview (Kiddie Schedule for Affective Disorders and Schizophrenia for School-age Children [K-SADS] [10]), and MRI. At the baseline visit, each participating child was accompanied by a parent who underwent a clinical interview, completed a brief intelligence test (Wechsler Abbreviated Scale of Intelligence [WASI] [11]), and completed questionnaires characterizing the

Table 1
Sample demographics.

	Group		
	Controls	Epi_AP−	Epi_AP+
Group, N	41	24	26
Age in years	12.51 (3.0)	12.6 (3.0)	11.87 (3.36)
Gender (male/female)	17 (41.5%)/24 (58.5%)	10 (41.7%)/14 (58.3%)	16 (61.5%)/10 (38.5%)
Grade	6.42 (2.92)	6.5 (3.2)	5.73 (3.38)
Full-scale IQ*	112.32 (8.79)	110.92 (11.64)	97.42 (10.24)
Epilepsy syndrome (FE/GE)[a]	–	13/11	15/11
Age at onset in years	–	11.8 (3.04)	10.89 (3.58)
AEDs (0/≥1)			
Baseline	–	6/18	3/23
2-year follow-up	–	12/12	7/19
5-year follow-up	–	14/10	14/12
Epilepsy remission (no, yes)			
2-year follow-up		12, 12	24, 2
5-year follow-up		10, 14	13, 11[b]

[a] Epilepsy syndromes: Epi_AP−: FE (7—CECTS, 4—TLE, 1—FE NOS, 1—FLE) and GE (4—Absence, 7—JME); Epi_AP+: FE (6—CECTS, 1—COE, 3—TLE, 2—FE NOS, 3—FLE) and GE (4—Absence, 7—JME).
[b] Epilepsy remission status could not be determined for 2 participants.
* $p < 0.001$.