



## Behavioral problems of preschool children with new-onset epilepsy and one-year follow-up – A prospective study

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### ABSTRACT

**Objectives:** Childhood emotional/behavioral problems in children with epilepsy have been reported to be higher compared with those with typical development or with other nonneurologic health conditions. Increasing interest towards understanding these behavioral comorbidities is reflected in literature. However, longitudinal investigations regarding the course of behavioral problems in children with newly diagnosed epilepsy and normal development are rare, and majority of them involve school-aged children. We aimed to study the behavioral comorbidities of preschool children with newly diagnosed epilepsy and to explore the changes of behavioral problems after one year from the diagnosis in comparison with the healthy group and subsequently, to elucidate the potential developmental, neurologic, and social risk factors associated with these difficulties.

**Methods:** Participants were 83 patients, aged between 18 and 59 months, 43 of them were children with new-onset epilepsy, and 40 of them were healthy children as the comparison group. The Child Behavior Check List-1 1/2-5 (CBCL) was used to evaluate emotional/behavioral problems of the children. Maternal anxiety was analyzed by The State-Trait Anxiety Inventory (STAI). The general development of children was evaluated by the Denver-II-Developmental Screening Test (D-II-DST). Sociodemographic characteristics were also collected for all participants. Each evaluation was repeated after one year from the diagnosis.

**Results:** Internalizing, externalizing, and total problem scores were higher in children with epilepsy than the control group at baseline, and despite some reduction in several scales, the differences continued across groups after one year. The analysis for the course revealed that behavior problem scores reduced in children with new-onset epilepsy over a year, but it did not change in healthy children. Among the possible factors related to behavior problem scores, in correlation analysis, the duration of screen viewing, socioeconomic status, and maternal education were associated with behavior problem scores. There was no significant association between epilepsy-related variables and the behavior problem scores and the course. Among all possible risk factors in the regression analyses, maternal trait anxiety level was found to be significantly related to the total problems, internalizing, and externalizing scores in the group with epilepsy.

**Conclusion:** Behavioral comorbidities of epilepsy are present very early and can be seen at the time of the diagnosis, however, they do not worsen over time in preschool children. Maternal anxiety should be considered as a risk factor for behavioral problems in preschool children with epilepsy. Assisting children and parents and ensuring necessary guidance and support should be a crucial part of epilepsy treatment initiated as soon as the time of diagnosis.

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### 1. Introduction

Epilepsy is one of the most common neurologic disorders of childhood with a greater burden in low- and middle-income countries

(LMICs) than in high-income countries (HICs) [1]. Epilepsy has significant adverse effects on development as well as emotional and behavioral adjustment. These effects may be bidirectional based on the shared risk factors such as genetic susceptibility and social disadvantage for both conditions [2]. Therefore, the child's capacity for adaptation to the characteristics of the illness is of particular importance. Neuropsychological deficits are frequent in children with epilepsy, and more behavior problems have been reported in children with neuropsychological deficits [3,4]. A subgroup of children with epilepsy named 'epilepsy only' has promising results regarding the natural history of

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behavior comorbidities [5]. Previous literature have reported a higher prevalence of childhood emotional/behavioral problems in children with epilepsy compared with those with typical development or with other nonneurologic health conditions [6,7]. A wide range of risk factors including parental anxiety, perception, socioeconomic deprivation, and epilepsy-related variables were debated for behavior problems in children with epilepsy, however, the outcomes were variable because of possible differences in inclusion and exclusion criteria of different investigations [5,8–10]. Furthermore, it is not clear when and why these problems appear in children with epilepsy, so longitudinal studies at or near the time of epilepsy onset are required [11]. Particularly, the course over time, which is not fully understood, may provide information about the etiology of behavioral problems [12].

Interest has grown to understand the origin, development, and trajectories of the behavioral comorbidities in patients with epilepsy. Along with the investigations, searching the potential effects of epileptogenesis, environmental, and genetic vulnerabilities, a careful history may indicate the presence of neurobehavioral comorbidities at or near the time of the onset of epilepsy. Identifying behavioral comorbidities is crucial for children because of its effects on life course, in later youth and adulthood. For the last 30 years, population-based prospective investigations from different countries have reported that children with epilepsy showed lower rates of employment, income, marriage, independent living status, and other aspects of quality of life in their later life, and as expected, children with severe epilepsy exhibit poor lifespan outcomes. As a predictor variable, the association has been found between these adverse lifespan outcomes and the history of neurobehavioral comorbidities [13].

Longitudinal investigations of the course of behavioral problems in children with newly diagnosed epilepsy and no developmental delay are rare, and most of them are school-aged children [4,5,14]. Their outcomes were variable and have reported that these difficulties declined up to 36 months after diagnosis [4], or children with new-onset epilepsy continued to show behavioral problems compared with children with typical development, however, they were not persistent over time, and individual differences were found [5]. To our knowledge, data about this subject in preschool ages are scarce [15], and this is the first study with controlled prospective behavioral follow-up data in preschool children with newly diagnosed epilepsy.

We hypothesized that behavioral problems start as early as preschool years, but they can abate with regular follow-up. In the current study, we aimed firstly to search the behavioral comorbidities of preschool children with newly diagnosed epilepsy and to explore the changes of behavioral problems after one year from the diagnose in comparison with the healthy group and secondly, to elucidate the potential developmental, neurologic, and social risk factors associated with these difficulties. The findings in preschool children are supposed to contribute to the information on understanding the natural course of behavior problems in patients with new-onset epilepsy beginning from the early ages. Also, timely intervention may be planned, if certain developmental risk factors for vulnerability are detected.

## 2. Material and methods

### 2.1. Procedure and participants

This cross-sectional prospective study was conducted by the Developmental Pediatrics Division and the Pediatric Neurology Division of the Department of Pediatrics at Hacettepe University Faculty of Medicine between May 2015 and March 2017. After receiving the ethical approval, 43 patients aged 18–59 months old were included in the study; with 3 declining, 40 patients were studied. The inclusion criteria were 1) diagnosis of epilepsy within the past 6 months, 2) absence of any developmental delay and neurodevelopmental disorders, and 3) absence of sensorial deficit (hearing and viewing). The exclusion criteria were as follows: 1) initial precipitating injuries (such as simple

and complex febrile seizures), 2) any seizure-like episode, and 3) systemic, metabolic, genetic, and neurologic conditions (except epilepsy). The comparison group included 40 healthy participants who admitted to general pediatric outpatient clinics for well-child visits. The inclusion criteria for the comparison group were absence of any neurodevelopmental or systemic disorder and sensorial deficit and to be similar in age and gender. The International League Against Epilepsy (ILAE) definitions were used for the classification of epilepsies and seizure types [16]. Seizures are classified as focal or generalized according to the onset that was based on the history obtained from parents and/or homemade video displays. If onset was not clarified, the seizure was classified as an unknown onset. According the ILAE definition, if the patient did not achieve seizure freedom after adequate trials of two tolerated, properly chosen, and used antiepileptic drug (monotherapies and/or combination), he/she was classified as a drug-resistant case [17].

Each patient was examined by a child neurologist and screened for the eligibility for the study. After receiving the consent from families, they were referred to the Developmental Pediatrics Division. The general development and emotional/behavioral problems of children and maternal anxiety of each participant were evaluated by the developmental pediatrician at baseline and after one year from the first evaluation. The treatment and follow-up of all children with epilepsy were continued in the Pediatric Neurology Division.

### 2.2. Evaluation tools

The questionnaire of sociodemographic data including possible risk factors like perinatal complications, primiparity, parents' ages, education, employment, marital status, family structure, reading to child, and duration of screen viewing was prepared by the study team. Practices regarding reading a book and screen time were searched by a blind rater. Total amount of screen time including both television (TV) and small screen (tablet, telephone, computer-based machines) time were surveyed as average daily watching time for children as obtained from the family. Reading practices were asked as whether they read to their children regularly or not. Social economic status (SES) was determined using Hollingshead Redlich Scale that was based on the profession and training of both parents [18].

The Child Behavior Check List-1 1/2-5 (CBCL) was used to evaluate emotional/behavioral problems of children. The CBCL was completed by parents while they were waiting in the outpatient clinics. It is the most commonly used assessment method for identification of behavioral and psychiatric disorders in children with a specificity of 83% and a sensitivity of 66% [19,20]. It has 100 items for children ages 1.5–5 years. It results in a Total Behavior Problems score and two broadband scores, Internalizing Problems and Externalizing Problems. Internalizing problems comprise emotionally reactive, anxious/depressed, somatic complaints, and withdrawn subscale measures. Externalizing problems comprise attention problems and aggressive problem subscale measures. The total problems comprise both internalizing and externalizing problems. The respondent rates how well each item describes the child, from 0 (it is not true at all) to 2 (it is completely true). It has been validated for Turkish children. The items of CBCL/2–3 were translated into Turkish with an internal consistency coefficient of 0.82 [21,22]. Cross-informant correlations of CBCL 1 1/2-5 on 62 mothers' ratings were found satisfactory ranging from 0.54 to 0.84,  $p < 0.001$ , across all scales, and test–retest coefficients of internalizing, externalizing, and total problem scales were found to be 0.72, 0.84, and 0.78;  $p < 0.001$ , respectively [22,23]. In this study, we used total/raw scores, and high scores reflected more problematic behavior.

The State–Trait Anxiety Inventory (STAI) was used to evaluate maternal anxiety. The STAI is a self-report measure that has two separate forms for state and trait anxiety with a total of 40 items. It is based on a 4-point Likert scale and measures two types of anxiety. State anxiety is an anxiety level about an event, and trait anxiety is a

characteristic predisposition to respond with anxiety to a stimulus [24]. The STAI is frequently used in research as an indicator of caregiver distress. Higher scores indicate greater anxiety. Test–retest reliabilities of the Turkish forms of the STAI were found to be 0.71 and 0.86, and the construct and criterion related validities of the scales were also supported [25,26].

The Denver-II-Developmental Screening Test (D-II-DST) was used to evaluate the general development of all children in the study. The screening test was initially developed in 1967 for developmental screening of 0- to 6-year-old children by Frankenburg and Dodds [27]. Multiple translations were made and all demonstrated cross-cultural reliability and validity. The original test was revised in 1990, forming the D-II-DST, and reliability and validity of the Turkish version were established by Anlar and Yalaz [28].

### 2.3. Data analysis

Parametric tests were used for data with normal distributions whereas nonparametric tests were used otherwise. Descriptive analysis and bivariate comparisons (t test and chi square) were used to assess group differences, and  $p < 0.05$  was significant. Factors associated with behavioral problems were analyzed with Correlations, Kruskal–Wallis, and Mann–Whitney U Test. Behavioral problems across groups were analyzed with Mann–Whitney U, and the changes over time were analyzed with Wilcoxon Signed-Rank Test. Statistical analysis was performed using SPSS 21 software.

### 3. Results

Initially, 83 children were included in the study, 43 of them were children with new-onset epilepsy and 40 of them were healthy children as a control group. Three children with new-onset epilepsy were excluded after one year because of the inaccessibility of their data and diagnosis of a new systemic illness, so for the final analysis, 40 children were left with new-onset epilepsy. The median ages of patient and comparison groups were 40.5 months and 42 months, respectively with a range of 18–59 months. There were no differences in gender, age, parents' ages, primiparity, perinatal complication, parental employment, marital status, and family structure ( $p > 0.05$ ), but there was a significant difference in parental education, reading to the child, duration of screen viewing, and SES between epilepsy and control groups ( $p < 0.05$ ). Parents in the group with epilepsy were reading less to their children ( $p = 0.000$ ) and let their children view screen for longer duration than parents in the control group ( $p = 0.018$ ).

Sociodemographic data of both epilepsy and control groups are shown in Table 1. The mean age of onset for seizures was 35.4 months (SD (standard deviation): 14.7). Six patients had poor seizure control, and 17 patients were seizure-free in the one-year interval. Seventeen patients had rare seizures (one seizure per 6 months). The other neurologic data are shown in Table 2. Maternal state anxiety level was higher in the group with epilepsy than in the control group ( $p = 0.024$ ), however, trait anxiety level was similar ( $p = 0.871$ ) for both groups. Mean scores of state and trait anxiety were  $44.2 \pm 8.7$  and  $48.5 \pm 8$  in the group with epilepsy and  $41.1 \pm 5.5$  and  $47 \pm 7.1$  in the control group, respectively.

Internalizing, externalizing, and total problem scores were higher in children with epilepsy than the control group at baseline ( $p = 0.001$ ,  $p = 0.000$ ,  $p = 0.000$  respectively), and after one year, the differences continued across groups ( $p = 0.03$ ,  $p = 0.002$ ,  $p = 0.012$  respectively). But, the differences in some scales including emotional reactivity ( $p = 0.056$ ), anxious/depressed ( $p = 0.452$ ), somatic complaints ( $p = 0.094$ ), sleep problems ( $p = 0.885$ ), attention problems ( $p = 0.479$ ), affective problems ( $p = 0.348$ ), and anxiety problems ( $p = 0.553$ ) disappeared between the groups after one year. The analysis for the course demonstrated that internalizing, externalizing, and total problem scores reduced in children with new-onset epilepsy

**Table 1**  
Sociodemographic characteristics of epilepsy and control groups.

Sociodemographic characteristic N(%)	Epilepsy n = 40	Control n = 40	p
Median age (month) (range)	40.5(18–59)	42(18–59)	0.976
Female	22(55)	24(66)	0.651
Term	37(92.5)	38(95)	1000
Perinatal complication	4(10)	2(5)	0.675
Primipara	12(30)	20(50)	0.068
Maternal age mean (SD)	32.1(5.1)	33.3(4.3)	0.250
Maternal education (under high school)	17(42.5)	10(25)	0.000
Maternal employment (housewife)	29(72.5)	31(77.5)	0.606
Paternal age mean (SD)	34.9(5.4)	35.4(4.4)	0.654
Paternal education (under high school)	6(15)	7(17.5)	0.006
Paternal employment (regular)	35(87.5)	37(92.5)	0.662
Married	38(95)	39(97.5)	1000
Nuclear family	36(90)	36(90)	1000
Reading book to the child regularly	22(55)	31(77.5)	0.000
Screen viewing (median hour in a day) (range)	3(0.5–13)	1.75(0.5–10)	0.018
SES (mean) (SD)	3.02(0.86)	2.57(0.98)	0.033

SES: socioeconomic status.

over a year ( $p = 0.000$ ,  $p = 0.001$ ,  $p = 0.000$  respectively), but it did not change in healthy children ( $p = 0.359$ ,  $p = 0.180$ ,  $p = 0.463$  respectively). The course of behavior problems according to groups are shown in Table 3.

Among the possible factors related to behavior problem scores, in correlation analysis, the duration of screen viewing was associated positively with anxiety/depressed scale scores ( $r = 0.458$ ,  $p = 0.003$ ) and anxiety problem scores ( $r = 0.336$ ,  $p = 0.034$ ) in the group with epilepsy. Social economic status was correlated inversely with emotional reactivity ( $r = -0.403$ ,  $p = 0.01$ ), sleep problems ( $r = -0.508$ ,  $p = 0.001$ ), aggressive behavior ( $r = -0.339$ ,  $p = 0.033$ ), and oppositional defiant problem scores ( $r = -0.510$ ,  $p = 0.001$ ) in the control group, but it was not associated with any behavior problem scores in the group with epilepsy ( $p > 0.05$ ). Maternal education was correlated inversely with anxiety problem scores in the group with epilepsy ( $r = -0.352$ ,  $p = 0.026$ ). There was no significant association between seizure type, seizure frequency, number of antiseizure medications, drug resistance, neuroimaging findings, and the behavioral problem scores ( $p > 0.05$ ), and also, epilepsy-related variables were not

**Table 2**  
Neurologic data of the group with epilepsy.

	Patients n(%)
Seizure types	
Focal	14(35)
Generalized	13(32.5)
Unknown	13(32.5)
Treatment	
Monotherapy	35(87.5)
Polytherapy	5(12.5)
Drug resistance	
Yes	6(15)
No	34(85)
MRI	
Yes	36(90)
Normal	21(58.3)
Abnormal*	3(8.3)
Nonspecific**	12(33.3)
No	4(10)
Age of epilepsy onset (mean) (SD) (months)	35.4(14.7)

Abnormal\*: 3 patients had abnormal MRI: One with FCD in the right parietal lobe/one with FCD in the left frontal lobe/one with left periventricular nodular heterotopia. Nonspecific\*\*: 12 patients had nonspecific MRI findings: Six with nonspecific hyperintensities on T2-weighted images/one with enlargement of the left posterior horn/two with cavum septi pellucidum/two with prominent extra-axial cerebrospinal fluid space/one with prominent cerebral sulci. FCD: focal cortical dysplasia, MRI: magnetic resonance imaging.

**Table 3**  
The course of behavior problem scores according to groups.

CBCL score	Baseline	One year	p
<i>Epilepsy group<sup>a</sup></i>			
median (range)			
Internalizing problems	13(3–34)	10(1–34)	0.000
Externalizing problems	13(2–30)	11(0–32)	0.001
Total problems	43(10–87)	34(3–94)	0.000
<i>Control group<sup>a</sup></i>			
median (range)			
Internalizing problems	7.5(0–19)	7(1–19)	0.359
Externalizing problems	7(1–23)	7(1–23)	0.180
Total problems	23.5(6–64)	21(6–63)	0.463

<sup>a</sup> Internalizing, externalizing, and total problems were more in children with epilepsy than healthy groups at baseline and after one year ( $p < 0.05$ ). CBCL: Child Behavior Check List-1 1/2-5.

related to the changes of the behavioral problem scores ( $p > 0.05$ ) in the group with epilepsy.

Maternal state anxiety level was not related to any kind of behavioral problem scores in either groups ( $p > 0.05$ ), however, trait anxiety level was associated positively with emotionally reactive ( $r = 0.439$ ,  $p = 0.008$ ), anxious/depressed scale ( $r = 0.503$ ,  $p = 0.002$ ), withdrawn ( $r = 0.367$ ,  $p = 0.03$ ), sleep problems ( $r = 0.363$ ,  $p = 0.032$ ), aggressive behavior ( $r = 0.528$ ,  $p = 0.001$ ), affective problems ( $r = 0.571$ ,  $p = 0.000$ ), anxiety problems ( $r = 0.433$ ,  $p = 0.009$ ), attention problems ( $r = 0.393$ ,  $p = 0.02$ ), oppositional defiant problems ( $r = 0.580$ ,  $p = 0.000$ ), and internalizing problems ( $r = 0.430$ ,  $p = 0.01$ ), externalizing problems ( $r = 0.512$ ,  $p = 0.002$ ), total problems ( $r = 0.488$ ,  $p = 0.003$ ) scores in the group with epilepsy. Trait anxiety level was associated positively with emotionally reactive ( $r = 0.412$ ,  $p = 0.014$ ), anxious/depressed scale ( $r = 0.407$ ,  $p = 0.015$ ), and anxiety problems ( $r = 0.403$ ,  $p = 0.018$ ) scores in the control group. After all these factors were evaluated separately above, multiple regression analysis was carried out finally, and the trait anxiety level was found to be significantly related to the total problems (multiple  $R = 0.390$ ,  $p = 0.001$ ), internalizing (multiple  $R = 0.255$ ,  $p = 0.005$ ), and externalizing scores (multiple  $R = 0.373$ ,  $p = 0.001$ ) in the group with epilepsy.

#### 4. Discussion

In this study, we identified behavioral problems in a group of preschool children with newly diagnosed epilepsy and no developmental delay. As we hypothesized, behavioral comorbidities in children with epilepsy start as early as preschool years, and it tends to decrease over time. Comparing with healthy children, internalizing, externalizing, and total problems were reduced in a one-year follow-up, however, these problems were still more in children with epilepsy than in healthy children. We also examined some developmental, neurologic, and social risk factors associated with these difficulties.

Firstly, we revealed apparent behavioral problems at or near the time of the diagnosis, and our findings were consistent with the previous literature. The existing studies in school-aged children have shown that behavioral problems were significantly more in children with recent-onset epilepsy than in healthy children [6,9,14,29–31]. Factors other than epilepsy-related variables have been mentioned to be associated with these comorbidities, and some intrinsic abnormalities have been suggested in children with new-onset idiopathic epilepsy even if they have normal intelligence [30,31]. In this context, Hermann and colleagues have shown an altered pattern in brain development of children with new-onset epilepsy. A significant delay of age-appropriate increase in white matter volume among children with new-onset epilepsy compared with controls may reflect a neurodevelopmental vulnerability associated with brain connectivity [32]. Furthermore, the course of these problems has a distinctive importance

in the area of research to elucidate the natural history and etiology, especially for children without intellectual disability; a limited number of longitudinal studies have been conducted in this area [4–6,9,14]. Only two controlled longitudinal studies, which have similar inclusion criteria with the current study, have shown a trend of declining behavioral problems over time, however, their findings were for schoolchildren [4,6]. In our study, although there was a reduction of behavioral problems in children with epilepsy, behavioral problems were still more common than in healthy children after one year from the first evaluation. In a recent study, Zhao et al. observed no significant difference between the group with epilepsy and healthy children 5–6 years after diagnosis [6]. Long-term follow-up is important to provide the compliance of treatment, to meet the needs of families regarding the guidance about the illness, and to support them to adapt themselves and their child into the course [33]. However, we do not know whether the increase of behavioral and emotional problems in children with epilepsy is related to epilepsy itself or a consequence of maladaptation of living with the illness [2]. Few longitudinal studies in a sample of children with new-onset epilepsy have found that parent/child adaptation was associated with behavioral adjustment [5,9,33]. Misperception of parents including epilepsy-related stigma and isolation can lead to anxiety and can disturb the mother–child relationship. As a matter of fact, high levels of anxiety were shown in mothers of children with epilepsy [10]. Since the higher levels of maternal anxiety might affect adversely the perception of the child's behavior, we evaluated the two types of anxiety in both groups. As expected, state anxiety was more in the patient group, however, it was not related to any kind of behavioral problems in either group. Interestingly, although trait anxiety was similar in both groups, it was associated with internalizing problems, externalizing problems, and total problems only in the group with epilepsy. Therefore, we could speculate that trait anxiety of mothers should be considered as a risk factor for behavioral problems in preschool children with epilepsy.

Secondly, among the possible factors related to behavior problems, duration of screen viewing, maternal education, and SES were associated with behavior problems. Long duration of screen viewing is an important developmental and behavioral risk factor and a global health concern [34]. Our findings revealed that long duration of screen viewing was associated with anxiety problems in the patient group. Screen viewing including TV, video games, computers, and smartphones is one of the most common sedentary activities in childhood and is associated with increased behavioral and emotional problems. Previous studies have found a significant association between TV exposure and prosocial behavior problems including anxiety [35]. Social economic status is another substantial social factor affecting behavioral development. In a recent study, Carson et al. have shown that socioeconomic deprivation in children with epilepsy is an independent risk factor for unhealthy behavioral development [19]. However, in our study, it was associated with emotional reactivity, sleep problems, aggressive behavior, and oppositional defiant problems in the healthy group. Furthermore, as a proxy of SES, maternal education was associated with anxiety problems in children with epilepsy. Maternal education is one of the most constant characteristics of SES and is related to accessibility to health services in developing countries [36]. Therefore, more behavior problems were expected in children whose mothers' education were below high school. A number of neurologic risk factors have been identified in previous studies for behavior problems, however, most of the findings were inconsistent because of the differences of inclusion and exclusion criteria of the investigations [4,8,9,14]. In this study, we could not show an association between epilepsy-related variables and the behavioral problems, as well as the change of these behavioral difficulties over time.

There were some limitations of the study, such as the small number of participants. Also, there was a single source to obtain the information regarding child behavior; the mothers' report was used as a source in the study. Because of the young age in the sample, teachers' report or

self-report could not be used to assess the generalizability and consistency of the findings. Formal psychiatric diagnosis with structured interviews were not derived. We assumed to see the behavioral course in only one year because of the young age of our sample, yet, longer duration of follow-up to observe the long-term changes over time is required. Further studies are needed to observe the behavioral course of children with newly diagnosed epilepsy at early ages.

There were also some strengths of the study. To our knowledge, this is the first prospective study in preschool ages regarding the behavioral changes of children with newly diagnosed epilepsy. We used the CBCL, which is the most commonly preferred tool to assess behavioral adjustment for children with epilepsy [37]. It is also important to use standardized assessment tools for each culture as we did in this study. We evaluated maternal anxiety in both groups according to the state and the trait. In our opinion, it was necessary since the higher levels of maternal anxiety might affect the outcomes. Developmental risk factors such as duration of screen viewing were asked as related to behavioral adjustment of children with epilepsy. Our findings may contribute to the current literature regarding the natural course of behavioral problems in preschool children with newly diagnosed epilepsy starting from the early ages and implementing intervention strategies.

## 5. Conclusion

This study demonstrated that behavioral comorbidities of epilepsy are present very early, but they do not worsen over time in preschool children who are in the critical periods of brain development. Although the exact etiology has not been identified, behavioral comorbidities can be seen at the time of the diagnosis and do not have to be related to the chronic course of epilepsy. We conclude that assisting both children and parents and ensuring necessary guidance and support should be a crucial part of the epilepsy treatment initiated at the time of diagnosis of epilepsy, to improve childhood developmental and behavioral outcomes.

## Conflict of interest

There is no conflict of interest.

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