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Original article

# Psychosocial and behavioral functioning and their relationship to seizure timing in children with benign epilepsy with centrotemporal spikes

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**Abstract**

*Background:* Psychosocial and behavioral problems have been reported in children with benign epilepsy with centrotemporal spikes (BECTS). Distinctive features of typical BECTS associated with cognitive and behavioral problems have not clearly been defined.

*Purpose:* We aimed to identify psychosocial and behavioral functioning and their relationship to seizure timing in BECTS.

*Methods:* Consecutive patients with BECTS were recruited from the pediatric neurology outpatient clinic between May 2015 and May 2016. The patients were divided into two subgroups in according to seizure timing; group 1 consisted of patients with seizures only in the morning short before awakening, and group 2 consisted of patients with seizure shortly after falling asleep or in both time periods. Neuropsychological and behavioral evaluation in patients and healthy controls were examined using the Wechsler Intelligence Scale for Children-Revised test and the Turkish version of Strengths and Difficulties Questionnaire (SDQ).

*Results:* The participants comprised 46 children with BECTS and 49 healthy controls aged 7–16 years. There was no significant difference between group 1, group 2, and control group regarding intelligence quantity in full-scale or verbal and performance subscales. Behavioral scores for overall stress significantly differed between group 2 and controls on the SDQ test, while group 1 and control group had no difference on the SDQ scores.

*Conclusion:* Patients with BECTS who have seizure shortly after falling asleep may have a tendency towards behavior difficulties.


*Keywords:* Behavior; Benign epilepsy with centrotemporal spikes; Neuropsychology; Seizure

## 1. Introduction

Benign epilepsy with centrotemporal spikes (BECTS) is characterized by infrequent simple partial seizures with or without secondary generalization and a seizure onset between the ages of 3 and 13 years. Seizures typically occur either on awakening or during sleep of short duration (30–120 s) [1]. It was considered as a benign epileptic disorder in terms of infrequent seizures resolving spontaneously by the age 16 years, but this statement has been altered because of recent studies

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identifying cognitive and behavioral problems in children with BECTS [2–6].

Neuropsychological and behavioral impairment was defined in patients with atypical BECTS [7]. Seizures only in the daytime, early age at onset, postictal Todd paresis, prolonged seizures, or atypical spike morphology, unusual location of spikes, absence-like spike-wave discharges, abnormal background activity on the electroencephalography (EEG) are atypical features which have been associated with cognitive and behavioral problems [8]. Neuropsychological and behavioral impairment also demonstrated either in new-onset or long lasting BECTS presenting with typical features. However distinctive features of typical BECTS associated with cognitive and behavioral problems have not clearly been defined [9–12].

The contribution of genetic factors on sleep/wake variation of seizure timing was defined in BECTS [13]. The occurrence of variable phenotypes caused by different genetic mutations is supposed [14]. Although the underlying genetic mutations have not yet been identified, the correlation of seizure timing with different phenotypes of BECTS can help to predict prognosis and direct therapeutic management. In this study, we aimed to investigate the psychosocial and behavioral functioning and their relationship to seizure timing in children with typical BECTS.

## 2. Materials and methods

### 2.1. Participants

Children with BECTS aged 7–16 years were recruited from the pediatric neurology outpatient clinic at Istanbul Faculty of Medicine between May 2015 and May 2016. The children with BECTS had a typical seizure semiology, and benign epileptic discharges as defined by the International League Against Epilepsy on the EEG [15]. The inclusion criteria for the children with BECTS were as follows: (1) chronological age between 6 and 16 years; (2) a classical seizure history for BECTS as a nocturnal simple partial seizure with or without secondary generalization; (3) normal brain magnetic resonance imaging (MRI) findings. Patients presenting with other neurological disorders, intellectual disability (intelligence quantity [IQ] < 70), and atypical features of BECTS defined in previous publication [8], and taking more than one antiepileptic drug were excluded. Healthy controls matched for age, sex, and parents' educational level were recruited from normal schools. Typically developing children without history of any seizure or seizure-like episode, neurological and chronic disorders, family history of a first-degree relative with seizure or seizure-like episode were included in the control group.

The study was reviewed and approved by the Institutional Ethics Committee at Istanbul Faculty of Medicine. All participants and/or their legal representatives provided written informed consent and assent.

### 2.2. Clinical data

Information on demographic data, features of seizures (age of onset, timing, and frequency of seizures), the presence of prolonged seizure (>15 min), EEG findings, and antiepileptic medication used over the disease course were abstracted from medical records and interviews with children and parents. Seizure timing was classified as (1) shortly after falling asleep or (2) in the morning just before awakening based on the previously described [9]. The patients were divided into two subgroups in according to seizure timing; group 1 consisted of patients with seizures only in the morning short before awakening, and group 2 consisted of patients with seizure shortly after falling asleep or in both time periods. All participants' scalp EEG recordings (Micromed, Mogliano Veneto, Italy) during sleep and awakening were obtained in accordance with the 10–20 international system of electrode placement, and were interpreted by two pediatric neurologists.

### 2.3. Neuropsychological and behavioral evaluation

All participants were screened for psychological and behavioral functioning using a set of standardized tests. Cognitive functioning was analyzed using the Wechsler Intelligence Scale for Children-Revised (WISC-R) test, which was conducted through verbal and performance tests [16]. Verbal, performance, and total IQ scores were recorded. Behavioral functions were examined using the Turkish version of Strengths and Difficulties Questionnaire (SDQ-Tur), which was completed by parents. The SDQ is a behavioral screening questionnaire that promises reliable and valid results in pediatric patients [17,18]. It comprises 25 items on psychological attributes including emotional symptoms, conduct problems, hyperactivity and concentration difficulties, peer relationship problems, and prosocial properties [17]. The behavioral problems were scored using a computer-scoring algorithm.

### 2.4. Data analysis

All statistical analyses were performed using SPSS Statistics for Windows version 16.0 (IBM Corp., Armonk, NY, USA). Distributions of neuropsychological and behavioral functioning were examined to assess normality using the Shapiro-Wilk test. Group differences were assessed using the independent two samples *t*-test in case of normality and homogeneity of variances, or otherwise the Mann-Whitney *U* tests. We examined

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