

# Mental health of children and adolescents with epilepsy: analysis of clinical and neuropsychological aspects

Saúde mental de crianças e adolescentes com epilepsia: análise de fatores clínicos e neuropsicológicos

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## ABSTRACT

Epilepsy compromises the development of cognitive and social skills and represents a risk of psychiatric comorbidity. **Objective:** To compare psychopathological symptoms in children with epilepsy and in a healthy group, and to correlate the results with neuropsychological and clinical variables. **Method:** Forty five children with idiopathic epilepsy and sixty five healthy controls underwent neuropsychological evaluation and their caregivers replied to a psychopathology questionnaire (Child Behavior Checklist – CBCL). **Results:** There were significant differences in CBCL, with poorer results showed mainly by patients with epilepsy. There was no significant association between any psychopathological symptom and disease duration or amount of antiepileptic drugs used. There was positive correlation between intelligence quotient and CBCL on items such as sluggish cognitive tempo, aggressive behavior, attention problems and activities and a negative relation between academic achievement, conduct and rule-breaking behavior. **Conclusion:** Children with epilepsy had the worse results in the psychopathology evaluation. Certain psychopathological variables are related to the cognitive profile, with no relation to clinical variables.

**Keywords:** epilepsy, children, adolescent, neuropsychology, psychopathology, mental health.

## RESUMO

A epilepsia compromete o desenvolvimento de habilidades cognitivas e sociais e representa um risco para comorbidade psiquiátrica. **Objetivo:** Comparar sintomas psicopatológicos em crianças com epilepsia e um grupo saudável, e correlacionar os resultados com variáveis neuropsicológicas e clínicas. **Método:** Quarenta e cinco crianças com epilepsia idiopática e sessenta e cinco controles saudáveis foram submetidos à avaliação neuropsicológica e seus cuidadores responderam a um questionário de psicopatologia (Child Behavior Checklist – CBCL). **Resultados:** Houve diferenças significativas no CBCL, com piores resultados principalmente para pacientes com epilepsia. Não houve associação significativa entre os resultados e duração da doença ou número de drogas antiepilépticas. Houve relação positiva entre quociente de inteligência e CBCL em itens como tempo cognitivo lento, comportamento agressivo, problemas de atenção e atividades e uma relação negativa entre o desempenho acadêmico e conduta e comportamento de quebras de regra. **Conclusão:** Crianças com epilepsia apresentaram piores resultados em psicopatologia, com certas variáveis psicopatológicas relacionadas ao perfil cognitivo, mas sem relação com variáveis clínicas.

**Palavras-chave:** epilepsia, crianças, adolescentes, neuropsicologia, psicopatologia, saúde mental.

Although the most specific characteristic of epilepsy is the epileptic seizure, the condition involves mental problems, including learning disorders, compromised quality of life and psychopathology. Such problems arise from a

complex sum of factors related to etiology, therapy, seizure *per se*, as well as individual and social-familial aspects.

Rates of mental disorder in children and adolescents with epilepsy are higher than the ones found in normal children

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or even in those with other chronic diseases. McDermott et al.<sup>1</sup> estimated that the prevalence of behavioral disorders in children with epilepsy is 4.7 times higher than in healthy children. Davis et al.<sup>2</sup> performed an epidemiological study on the rates of psychiatric disorder in 5-to-15-year-old children, with a representative group of children and adolescents with epilepsy compared with children with diabetes and control group. The rate of children with epilepsy was 37%, compared with 11% among diabetic patients. Children and adolescents with epilepsy have a wide variety of neurological and psychiatric comorbidities, including depression, anxiety, psychosis, attentional deficit and hyperactive disorder (ADHD), autism, mental disability, migraines and sleep disorders<sup>3</sup>.

The overall prevalence of psychiatric comorbidity in childhood epilepsy is in the range of 51%, falling to 40% when mental retardation and pervasive developmental disorders are excluded<sup>4</sup>. The individual prevalence of the main comorbidities corresponds to: depression (11-60%), anxiety (19-45%), psychosis (2-8%), ADHD (25-30%)<sup>5,6</sup>.

Although the prevalence of psychiatric disorders is high, factors such as the use of diagnostic tools that can be influenced by seizure phenomenology and clinical samples with an overemphasis on refractory or symptomatic epilepsy can compromise the efforts of causal analysis and the understanding of the real extent of the disease<sup>3</sup>.

Due to the impact of psychiatric disorders on the daily lives of children and adolescents with epilepsy, it is necessary to perform further studies in this area, not only for a better understanding of these patients mental health but also for the proper treatment of these comorbidities.

The aim of the current study is to compare psychopathological symptoms in children with epilepsy and in a healthy group, and to correlate them with neuropsychological and clinical variables.

## METHOD

### Subjects

Forty-five patients consecutively served in the Neuropediatric Service of *Hospital Universitário Antonio Pedro* located in a city in southeastern Brazil were evaluated. Patients were selected based on the following criteria: diagnosis of epilepsy and idiopathic epileptic syndrome established according to the clinical-electroencephalographic criteria of ILAE (1989), with age between 6 and 16 years old, with regular attendance at school (being enrolled at least in the 1<sup>st</sup> grade of elementary school), normal neuroimaging (MRI or CT) and normal neurological examination. The caregivers had to have intellectual conditions to respond (alone or with assistance) the instruments of research.

Healthy controls were matched by age and gender and, except for the epilepsy, they had to meet the same inclusion and exclusion criteria. The study was approved by the local Ethics Committee. All caregivers signed an informed consent form.

### Evaluation

Caregivers answered the Child Behavior Checklist (CBCL)<sup>7</sup> and children underwent neuropsychological assessment. CBCL is a questionnaire that assesses social competence and behavioral problems in children and adolescents with age between 6 and 18 years old, and it is based on information provided by parents. The analyzed syndromes and profiles were the following ones: affective problems, anxiety problems, somatic problems, attention deficit/hyperactivity problems, oppositional defiant disorder, conduct problems, anxious depressed symptoms, withdrawn depressed behavior, somatic complaints, sluggish cognitive tempo, obsessive compulsive disorder, posttraumatic stress disorder, rule-breaking behavior, aggressive behavior, social problems, thought problems, attention problem, activities competence, social competence and school competence. Raw scores were elected, as suggested by the authors in clinical research<sup>7</sup>. Neuropsychological tests were WISC-III (Wechsler Intelligence Scale for Children – 3<sup>rd</sup> Edition) and Academic Performance Test (APT). The WISC-III consists of 13 subtests organized into two groups: verbal and performance intelligence quotient (IQ). The results of children in subtest results in three IQ scales (verbal IQ, performance IQ and total IQ) and four optional scores named index factors (processing speed, perceptual organization, freedom from distractibility and verbal comprehension)<sup>8</sup>. APT provides an objective assessment of the essential abilities to school performance, more specifically, writing, arithmetics and reading, according to school age and Brazilian school policies<sup>9</sup>. The test provides, for each item, a raw score which corresponds to the sum of correct items. This score generates a category (inferior, medium and superior) out of the relation of the raw score and school level. The raw scores were used in order to establish correlations with the neuropsychological variables.

### Statistical analysis

The Statistical Package for Social Sciences Release (SPSS 17.0) for Windows (SPSS, 2008) was used for all analyses. Data were presented in their basic aspects (demographic, clinical, neuropsychological assessment and school performance) using descriptive statistics. Qualitative variables (dichotomous categorical and polytomous ones) were described in simple frequencies and the quantitative ones as mean, standard deviation and limits.

The hypothesis tests were performed within the specific objectives and selected according to the type of variable

used: categorical, continuous, quantitative and discrete ones. Whenever possible, the accuracy of estimates was expressed through the Confidence Interval (CI). The following non-parametric tests were used: Mann-Whitney (dichotomous categorical variables X numerical variables) and Spearman correlation coefficient (correlation between numerical continuous variables). The following study hypotheses were tested: children with epilepsy have worse performance in CBCL than the control group; there will be inversally proportional relations between IQ and CBCL; there will be inversally proportional relations between APT and CBCL; children with epilepsy in polytherapy will have worse performance in CBCL than the control group; there will be negative relation between psychopathology and clinical variables: seizure type and duration of epilepsy .

## RESULTS

### Clinical and socio-demographic data

There was no statistical difference regarding gender, age and schooling between epilepsy cases and controls. Mothers were the main caregivers in 40 patients (88.8 %), fathers in 3 patients (6.6%) and others in 2 (4.4%). Regarding the controls the following division occurred (n-%): mother (60–92.3%), father (3–4.6%) and others (2–3.1%). The duration of epilepsy ranged from 10 to 120 months, with a mean of 49.1 months (SD 27.1). Twenty-three (51.3%) patients had no seizures in the previous year and 14 (31.1%) had less than three. Thirty-four (75.5%) patients were on monotherapy and 3 (6.7) were discontinued from antiepileptic drugs. Thirty-two (71.1%) patients had generalized epilepsy. The family history of epilepsy was negative in 35 patients (31.8%).

### Averages of CBCL syndromes and profiles

Table 1 presents the means of the various syndromes and behavioral profiles proposed by the CBCL compared with the control group. There were higher rates of psychopathology in epilepsy cases compared with controls on the following items: internalizing, externalizing and total problems, affective, anxiety and somatic problems, attention deficit problems, oppositional defiant disorder, conduct problems, withdrawn depressed behavior, social problems, thought problems, attention problems, aggressive behavior, obsessive compulsive disorder, post traumatic stress, and rule-breaking behavior. In school item, scores were equal. Epilepsy cases got better performance than controls in the following items: anxious depressed symptoms, somatic complaints, sluggish cognitive tempo, social and activities competences.

### Neuropsychological results

Table 2 describes the IQ and APT averages of children and adolescents with epilepsy compared with the control

**Table 1.** Averages of several syndromes and profiles of CBCL.

	Patients with epilepsy Mean±SD	Healthy controls Mean±SD	p
<b>General profile of problems</b>			
Internalizing problems	17.0±9.3	9.0±6.6	<0.001
Externalizing problems	16.5±10.0	10.5±9.0	0.001
Total of problems	60.2±28.9	36.1±25.1	<0.001
<b>Profile of DSM-IV scales</b>			
Affective problems	6.5±3.9	2.8±2.5	<0.001
Anxiety problems	4.3±2.4	2.3±1.8	<0.001
Somatic problems	2.9±2.4	1.7±1.8	0.013
Attention deficit/hyperactivity	7.8±3.4	5.5±3.8	0.003
Oppositional defiant disorder	4.3±2.4	3.2±2.6	0.031
Conduct problems	4.9±4.5	2.6±2.6	0.010
<b>Profile of syndromes</b>			
<b>Internalizing problems</b>			
Anxious depressed symptoms	7.7±4.6	9.7±1.4	<0.001
Withdraw depressed behavior	4.6±3.1	2.0±1.8	<0.001
Somatic complaints	4.6±3.5	6.1±4.1	<0.001
Sluggish cognitive tempo	2.2±1.6	5.5±4.1	<0.001
Obsessive compulsive disorder	4.2±2.8	2.6±2.3	0.007
Posttraumatic stress disorder	10.5±5.1	8.0±7.3	0.013
<b>Externalizing problems</b>			
Rule-breaking behavior	4.1±3.5	4.1±3.4	0.816
Aggressive behavior	12.4±7.4	2.2±2.8	<0.001
<b>Other problems</b>			
Social problems	6.4±4.3	3.9±3.5	0.003
Thought problems	4.7±4.0	2.3±2.1	0.001
Attention problem	8.2±4.5	2.6±2.7	<0.001
<b>Profile of competences</b>			
Activities competence	8.8±3.3	5.4±3.5	<0.001
Social competence	5.8±2.33	5.3±3.33	0.627
School competence	4±1.4	4±1.8	0.972

CBCL: child behavior checklist; SD: standard deviation.

group. There was a statistically significant difference between epilepsy cases and controls in the performance IQ item, with the worst results related to children and adolescents with epilepsy.

**Table 2.** Comparison of IQ and APT between cases and controls.

	Patients with epilepsy Mean±SD	Controls healthy Mean±SD	p
Total IQ	99±13.3	105.6±14.9	0.056
Verbal IQ	103±13.7	106.2±14.6	0.274
Executive IQ	93.4±20.1	104.1±15.5	0.022
Total APT	97.4±33.6	104.6±25	0.6

IQ: intelligence quotient; APT: Academic Performance Test; SD: standard deviation.

**Table 3.** Comparison between CBCL and neuropsychological variables (IQ and APT) in patients with epilepsy

CBCL	IQ		APT	
	p	r <sub>s</sub>	p	r <sub>s</sub>
<b>General profile of problems</b>				
Internalizing problems	0.232	-0.144	0.518	-0.078
Externalizing problems	0.569	0.529	0.189	0.189
Total of problems	0.259	-0.137	0.154	-0.172
<b>Profile of DSM-IV scales</b>				
Affective problems	0.237	-0.149	0.244	-0.147
Anxiety problems	0.806	-0.031	0.796	-0.033
Somatic problems	0.307	0.370	0.989	0.989
Attention deficit/hyperactivity	0.862	-0.019	0.554	-0.075
Oppositional defiant disorder	0.862	0.022	0.652	-0.057
Conduct problems	0.325	-0.124	0.018	-0.293
<b>Profile of syndromes</b>				
<b>Internalizing problems</b>				
Anxious depressed symptoms	0.856	-0.028	0.390	-0.134
Withdraw depressed behavior	0.873	-0.025	0.297	-0.163
Somatic complaints	0.712	0.058	0.932	0.013
Sluggish cognitive tempo	0.043	0.267	0.87	0.227
Obsessive compulsive disorder	0.854	-0.025	0.828	-0.029
Posttraumatic stress disorder	0.404	0.113	0.847	0.026
<b>Externalizing problems</b>				
Rule-breaking behavior	0.272	-0.133	0.018	-0.293
Aggressive behavior	0.040	-0.247	0.184	-0.161
<b>Other problems</b>				
Social problems	0.643	-0.056	0.288	-0.129
Thought problems	0.214	-0.150	0.243	-0.141
Attention problem	0.004	-0.343	0.078	-0.212
<b>Profile of competences</b>				
Activities competence	0.045	-0.327	0.729	0.058
Social competence	0.549	-0.094	0.463	0.115
School competence	0.632	0.076	0.015	0.374

CBCL: child behavior checklist; IQ: intelligence quotient; APT: Academic Performance Test.

### Comparison between CBCL and neuropsychological variables

Table 3 shows the comparison between CBCL and neuropsychological variables (IQ and APT) in patients with epilepsy. Positive correlation was observed between IQ and CBCL in the following items: sluggish cognitive tempo, aggressive behaviour, attention problems and competence activities. There was a negative relation between APT, conduct and rule-breaking behavior and a positive relation with school competence.

### Comparison between CBCL and clinical variables

Table 4 shows that there was no statistical difference between CBCL and clinical variables such as disease duration, seizure type and amount of antiepileptic drugs.

## DISCUSSION

Our findings indicate that children with epilepsy had the worse results in psychopathology in most of the CBCL

domains, with certain psychopathological variables (sluggish cognitive tempo, aggressive behavior, attention problem and activities performance) relating to IQ; and other psychopathological variables (conduct, rule-breaking behavior and school) relating to APT; with no relation to clinical variables.

The psychopathology questionnaire applied to the caregivers, CBCL, is a widely used screening tool<sup>10,11,12,13,14,15,16,17,18</sup>. It allows building different profiles on the same child, presenting itself as a tool for probing psychopathology<sup>7</sup>. Children with epilepsy had higher psychopathology indexes when compared with the control group on most scores, corroborating the literature<sup>13,14,15,16</sup>. The findings by Stefanello et al.<sup>19</sup> indicate an increased risk of depression and anxiety among people with epilepsy suffering from more than one psychiatric disease. According to Dunn et al.<sup>14</sup>, epileptic children under the age of twelve tend to have higher scores in the following items of the CBCL: total, internalizing and externalizing problems. This age group coincides with the mean age of this study, confirming the impact of epilepsy as a chronic disease in the psychopathological profile of this age group. Statistical significance was observed in almost all psychopathology items except for rule-breaking behavior and social and academic skills.

In this sample, unexpectedly, the controls showed poorer performance on the following items: anxious depressed symptoms, somatic complaints, sluggish cognitive tempo, activities and social competences. In school competence the scores were equal. We did not find any cause for this fact. Nevertheless, unexplored psychosocial variables may be related to the poorer performance on these items.

There was no statistically significant correlation between seizure type and CBCL variables. Due to the small sample size, we could only compare focal and generalized epilepsies, but not subtypes. We found no significant correlation between psychopathology and type of seizures. Caplan et al.<sup>16</sup> evaluated children and adolescents with epilepsy with complex focal seizures and absence seizure and the results show that the first ones are five times more likely to have an affective disorder or anxiety. In our study, we did not have patients with complex focal seizures since they were more related to symptomatic and refractory epilepsy.

There was no relation between disease duration and psychopathology. We could not find any correlation between psychopathology and the amount of drugs. Berg et al.<sup>20</sup> and Caplan R<sup>21</sup> associated the use of antiepileptic drugs with low scores in school competence and total competence.

We found the worst academic performance in cases with psychopathology symptoms, in a directly proportional relation between academic performance and conduct, rule-breaking behavior and school competence. Such results are expected due to the impact of psychological distress on cognitive performance and to the greater chance of absenteeism and poor compliance to studies<sup>18</sup>. We also found a direct

Table 4. Comparison between CBCL and seizure type and use the AEDs.

CBCL	Focal seizure (MeanSD)	Generalized seizure (MeanSD)	p*	No AED (MeanSD)	One drug (MeanSD)	More than one drug (MeanSD)	p*
<b>General profile of problems</b>							
Internalizing problems	18.5±7.3	16.5±10.2	0.110	22.6±7.02	17.5±9.3	13.3±10.1	0.182
Externalizing problems	19.9±10.7	14.9±9.5	0.110	11.6±10.2	17.4±9.5	13.6±12.1	0.130
Total of problems	69.2±26.7	55.7±29.5	0.110	65.0±25.1	61.4±28.8	51.1±33.4	0.335
<b>Profile of DSM-IV scales</b>							
Affective	7.4±3.7	6.0±4.2	0.185	7.6±4.0	6.5±4.1	5.9±4.1	0.679
Anxiety	5.0±3.0	4.1±2.1	0.393	0.066	4.7±2.9	3.1±2.0	0.085
Somatic	3.0±2.5	2.9±2.6	0.865	1.3±1.1	3.4±2.1	1.7±2.2	0.085
Attention deficit/hyperactivity	8.8±3.2	7.1±3.4	0.185	6.0±2.6	7.9±3.3	7.6±3.3	0.859
Oppositional defiant disorder	5.0±2.1	3.9±2.5	0.195	2.7±3.0	4.6±2.3	3.5±2.4	0.212
Conduct problems	6.2±5.1	4.3±4.2	0.243	2.7±2.9	5.6±4.4	3.2±5.0	0.066
<b>Profile of syndromes</b>							
<b>Internalizing problems</b>							
Anxious depressed	8.0±4.7	7.8±4.6	0.907	11.3±6.1	7.8±4.4	6.9±4.6	0.564
Withdraw depressed	5.5±3.0	4.2±3.2	0.144	8.7±1.5	4.6±3.1	3.2±3.0	0.201
Somatic complaints	5.0±2.8	4.4±3.9	0.288	3.7±1.1	5.0±3.7	3.2±3.9	0.148
Sluggish cognitive tempo	2.4±1.3	2.2±1.8	0.685	3.3±1.1	2.3±1.6	1.7±1.9	0.498
Obsessive compulsive disorder	4.1±2.1	4.4±2.9	0.814	4.7±2.3	4.3±2.7	4.4±3.2	0.915
Posttraumatic stress disorder	12.3±5.2	9.8±5.0	0.236	12.3±6.1	11.0±5.0	8.4±5.2	0.325
<b>Externalizing problems</b>							
Rule-breaking behavior	5.5±4.1	3.6±3.2	0.193	3.3±3.2	4.5±3.4	3.1±4.1	0.178
Aggressive behavior	14.5±7.7	11.3±7.2	0.175	8.3±7.0	13.0±7.2	10.5±8.2	0.165
<b>Other problems</b>							
Social problems	6.5±4.9	6.2±4.2	0.824	9.3±3.0	6.5±4.5	4.0±3.2	0.089
Thought problems	6.5±4.7	4.0±3.9	0.130	3.3±2.5	4.8±3.9	5.1±5.5	0.825
Attention problem	9.5±4.7	7.5±4.2	0.243	10.0±4.5	7.9±4.3	8.3±5.0	0.812
<b>Profile of competences</b>							
Activities competence	7.8±3.5	9.3±3.3	0.267	12.2±0.3	7.7±3.5	9.9±2.9	0.176
Social competence	5.7±2.5	6.1±2.1	0.900	7.5±2.1	5.9±2.0	5.7±2.9	0.784
School competence	3.1±1.2	3.8±1.4	0.281	2.5±0.2	3.7±1.5	3.9±1.3	0.311

CBCL: child behavior checklist; AEDs: antiepileptic drugs; SD: standard deviation; \*p<0.05.

relation between IQ and sluggish cognitive tempo, attention problems, aggressive behavior, and competence activities. Such a relation is expected because of the pervasive impact of intellectual underachievement on cognition, as well as on the adaptive capacity of the individual<sup>20,21,22,23</sup>. When categorizing the patients into normal and lowered IQ, unlike the linear correlation between IQ and psychopathology, we found that children with epilepsy with lowered IQ showed no significant difference with respect to psychopathology, when compared with epilepsy children with normal IQ. Thome-Souza et al.<sup>24</sup> performed a study in which children with low IQ had higher rates of psychopathology. However, the authors described a sample only with intellectual disabilities and a more severe epilepsy profile. In a recent study, Jones et al.<sup>18</sup> examined the hypothesis that the presence of comorbidities would be a predictor of a poorer outcome and that epilepsy variables would have a negative impact on comorbidities. The results showed that the group with an average IQ obtained significantly higher scores on the CBCL in social, activities and school competences. They found no significant difference in scores for total, internalizing and externalizing problems among the group of children and

adolescents with epilepsy with average IQs and the group with below average IQ. Likewise, in our study we found a statistically significant correlation between IQ and activities competence which did not occur with other competences. There was no significant difference between IQ and total, internalizing and externalizing problems.

Finally, the limitations of this investigation should be mentioned. The sample size was modest, meaning that a larger number of cases would be necessary in order to facilitate a more thorough statistical analysis of the psychopathological profiles. This is a limitation of most studies that used a similar methodology. By applying CBCL, it is possible to categorize the psychopathology's severity (border, clinical, non-clinical) which can be used to guide treatment; however, it does not define the specific type of psychopathology. Other studies using the K-SADS<sup>11,12,13,14,15,16,17,18</sup> prospectively found that children and adolescents with epilepsy present high rates of psychiatric disorders and behavior problems, and that those rates remain high over time.

A more comprehensive understanding on the causes of the impact of psychiatric disorders on cognition and life of these children will only be possible through a prospective

study. We need further research with other instruments, since the CBCL does not define the specific type of disorder. Our results are based on the caregivers' replies; we did not use another instrument to perform comparisons between their replies and the ones given by older children who could respond to another instrument. Internalizing problems are better noticed by the individuals themselves, and there may be the underestimation of these data when referred by others<sup>7</sup>.

Cognitive aspects such as memory, which could be of great value in the correlation with neuropsychological variables, were not collected, given that the already existing extensive evaluative battery prevented a longer time to collect these data. However, attention and executive function were investigated in two other studies of our research group (not published yet). Other variables that were not analyzed in this study may influence psychopathology, such as the presence of psychiatric disorders in caregivers (also a subject of our research group).

The presence of psychiatric comorbidity in children and adolescents with epilepsy makes of paramount importance

the systematic analysis of mental health problems in this population<sup>3</sup>. From this diagnosis, further treatments such as drug treatment, rehabilitation therapies and school adjustments must be added to improve the patient's quality of life.

In conclusion, the results reinforce the importance of studying mental health of children and adolescents with epilepsy and may contribute to appropriate diagnosis and treatment. Considering that the rate of psychopathology in these children is higher than expected in the general population, we emphasize the need for more comprehensive treatments, beyond seizure control, with the aim to improve the quality of life and to reduce the limiting effects that the epilepsy can cause.

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