

# Neuropsychological assessment in newly diagnosed cryptogenic partial epilepsy in children – a pilot study

*Kaczmarek I\*, Winczewska-Wiktor A, Steinborn B*

Chair and Department of Developmental Neurology, University of Medical Science, Poznań, Poland

## Abstract

**Purpose:** Cryptogenic epilepsy (CE) is defined as a partial or generalized epilepsy syndromes in which we can not point out any underlying cause. The role of neuropsychological assessment of “non-lesional” epilepsies is crucial not only to better control of different medical treatment but also to understanding the role of epilepsy for cognitive functions. The aim of the study was to compare the intellectual and cognitive functions between children with newly diagnosed cryptogenic partial epilepsy (CPE) children and the control healthy group.

**Material and methods:** 184 participants, 89 patients with cryptogenic partial epilepsy and 95 healthy children and adolescents, with ages ranging from 6-16 years were assessed on neuropsychological tests of general intellectual functioning and selected cognitive skills.

**Results:** There were significant differences found between groups for four examined functions. Children with CPE scored significantly lower in verbal and categorial fluency, visuoconstructional tasks, learning and memory than group of healthy children. There was no differences in general IQ level.

**Conclusions:** Study of neuropsychological profile in newly diagnosed CPE can get us an information of influence of stable, related to illness factors and the paroxysmal activity on cognitive function. Neurological follow-up of children with CPE at the very beginning of diagnosis should include screening evaluation of cognitive functions to provide appropriate intervention.

**Key words:** cognitive functions, cryptogenic epilepsy.

## Introduction

Cryptogenic epilepsy (CE) is defined as a partial or generalized epilepsy syndromes in which we can not point out any underlying cause. Cryptogenic epilepsies generally are well-controlled in pharmacological treatment [1]. There were popular also opinions that epilepsy of that etiology is not accompanied by impairment of cognitive functions. The association between childhood and adolescent epilepsy and neuropsychological impairments has been long and well documented [2-4]. Theoretically, the results of our study can bring us closer to the denouement of the problem of influence of the underlying seizure condition on cognition at the formal beginning of the illness and treatment. In practice, the results may contribute to the formation of neuropsychological intervention and treatment that will improve the recovery of this children. The aim of the study was to evaluate systematically the cognitive function in a group of the children with newly diagnosed cryptogenic partial epilepsy (CPE) before the pharmacological treatment. Our study had screening character.

## Material and methods

Children with newly diagnosed (CE, n=89) and group of healthy children (control, n=95) were selected from group of patients at The Chair and Department of Developmental Neurology in University of Medical Sciences in Poznań. Criteria for the patients with epilepsy included: chronological age between 6-16 years, no other developmental disabilities (e.g. learning disorder, mental retardation). Epilepsy participants met criteria for classification of cryptogenic partial epilepsy in that they no identifiable lesions on MRI. Patients were interviewed by psychologist before pharmacological treatment. Each partici-

\* CORRESPONDING AUTHOR:

Chair and Department of Developmental Neurology,  
University of Medical Science, Poznań  
60-355 Poznań, ul. Przybyszewskiego 49, Poland  
Tel: +48 61 8691255; Fax: +48 61 8671232  
e-mail: isab@poczta.onet.pl (Izabela Kaczmarek)

**Table 1.** Neuropsychological test results and p value for: t-test, Mann-Whitney test and  $\chi^2$ 

Neuropsychological tests	CPE patients (SD)	Control (SD)	t (df)	$\chi^2$ (df=1)	z	p value
Raven Matrix <sup>a</sup>	49.14 (28.09)	58.69 (30.09)	-	-	2.24	n.s.
Verbal fluency <sup>b</sup>	9.47 (4.32)	12.36 (4.27)	4.18 (155)	-	-	**
VF errors	0.01 (0.11)	0.04 (0.26)	-	-	0.22	n.s.
VF perseverations	0.15 (0.49)	0.06 (0.25)	-	-	- 0.35	n.s.
Categorical Fluency <sup>b</sup>	15.15 (5.30)	17.63 (4.93)	3.02 (154)	-	-	**
CF errors	0.02 (0.23)	0.04 (0.33)	-	-	0.96	n.s.
CF perseverations	0.10 (0.42)	0.20 (0.61)	-	-	0.62	n.s.
10 word experiment <sup>b</sup>	33.93 (6.11)	37.55 (5.74)	3.84 (162)	-	-	**
I Trial	4.62 (1.73)	5.36 (1.48)	-	-	2.88	**
II Trial	6.39 (1.51)	7.09 (1.58)	-	-	2.97	**
III Trial	7.29 (1.7)	7.89 (1.42)	-	-	2.44	*
IV Trial	7.78 (1.50)	8.44 (1.41)	-	-	2.90	**
V Trial	7.89 (1.60)	8.85 (1.18)	-	-	3.92	**
Primary effect (%)	49 (28.16)	53 (30.46)	-	.01	-	n.s.
Recency effect (%)	43 (24.71)	50 (28.73)	-	.33	-	n.s.
Bender <sup>b</sup>	7.5 (5.00)	5.52 (3.99)	-	-	- 2.71	**
elaborations	2.58 (2.21)	1.75 (1.68)	-	-	-2.28	*
perseverations	0.25 (0.52)	0.04 (0.21)	-	-	-1.91	n.s.
reduction	0.67 (1.42)	0.60 (1.40)	-	-	-0.38	n.s.
enlargement	0.34 (0.93)	0.17 (0.54)	-	-	-0.77	n.s.
rotations	0.48 (0.90)	0.34 (0.64)	-	-	- 0.54	n.s.
incorrect integration	1.23 (1.29)	0.86 (1.10)	-	-	- 2.01	*
redrawing	0.88 (1.35)	1.02 (1.51)	-	-	0.34	n.s.

<sup>a</sup> scaled scores; <sup>b</sup> raw scores; \* p<0.05; \*\* p<0.01

pant underwent neuropsychological evaluation, that included: Raven Standard Matrices as a non-verbal reasoning ability test, Verbal and Categorical Fluency Test. Verbal learning and memory was assessed with 10-words experiment. In our study we assessed both quantitative and qualitative aspects of learning and memory e.g. we were interested in the serial position effect. Visuoconstructional task was measured by the quantity and quality of reproduction in Bender-Gestalt. Performance on the Bender-Gestalt was reducible to 6 characteristic distortions: elaboration, rotation, redrawing, integration, perseveration, size changes (reduction, enlargement).

## Results

Neuropsychological results of scaled, raw scores and statistical analysis are showed in *Tab. 1*. There were significant differences found between groups for four examinee functions. Children with CPE scored significantly lower in verbal and categorical fluency, visuoconstructional tasks, learning and memory than group of healthy children. The analysis of the dynamic of learning showed a significant improvement in all trials in control group that was not found in group of CPE children. There were no differences in serial position effect between the groups. The quality of mistakes in verbal fluency and categorical fluency was not statistically important. Qualities analysis of errors in Bender-Gestalt showed significant difference between group in the number of elaborations and incorrect integrations.

Difference of the level of non-verbal reasoning ability was not significant.

## Discussion

Studies of the intellectual and cognitive abilities in patients in CPE have yield contradictory results. Even though, researches show that there is a lot of subtle impairments in specific cognitive function [5-8]. The most often are learning disability, selective deficits in memory and attention with poor concentration. Children with CPE are more likely to have lower school achievement and suffer behavioral and affective disorders, particularly depression. Less educational achievement is due to the dominant impact of underlying brain damage, as well as seizure etiology, age of onset and AEDs [6-8]. Children with newly diagnosed cryptogenic partial epilepsy, even if otherwise neurologically normal, appear to be at high risk of adverse outcomes. Possible explanations for this include seizure effects with cognitive co-morbidity. In our study the general intellectual functioning in both group was in the normal range. The statistical important differences of the results in cognitive functions between groups has given cause for concern. We can come to the conclusions, that there are some cognitive problems in CPE at the very beginning of the illness. Our results may suggest a weakness in CPE group in studied function caused purely by process underlying epilepsy. Continuation of our study can bring us closer to the answer of the risk factors for appearance

of cognitive functions, and positive or negative result on them during pharmacological treatments. We can also understand better the character of the developmental changes in cognition in group of children with CPE.

### References

1. Engel J. ILAE Task Force on Classification and Terminology. *Epilepsia*, 2001; 42: 316.
2. Weglage J, Demsky A, Kurlleman G. Neuropsychological, intellectual and behavioral findings in patients with centrotemporal spikes with and without seizures. *Dev Med Child Neurol*, 1997; 39: 646-51.
3. Neyens L, Aldenkamp AP, Meinardi HM. Prospective follow-up of intellectual development in children with a recent onset of epilepsy. *Epilepsy Res*, 1999; 34: 85-90.
4. Nolan MA, Redoblado MA, Lah S, Sabaz M, Lawson JA, Cunningham AM. Intelligence in childhood epilepsy syndromes. *Epilepsy Res*, 2003; 53: 139-50.
5. Bailet LL, Turk WR. The impact of childhood epilepsy on neuro-cognitive and behavioral performance: a prospective longitudinal study. *Epilepsia*, 2000; 41: 426-31.
6. Yung AW, Park YD, Coben MJ, Garrison TN. Cognitive and behavioral problems in children with centrotemporal spikes. *Pediatr Neurol*, 2000; 23: 391-5.
7. Dodrill CB. Neuropsychological effects of seizures. *Epilepsy Behav*, 2004; 5: 21-6.
8. Bulteau C, Jambaque I, Viguier D, Kieffer V, Dellatolas G, Dulac O. Epileptic syndromes, cognitive assessment and school placement: a study of 251 children. *Dev Med Child Neurol*, 2000; 42: 319-27.