Language Function in Epilepsy: Effects of Hemispheric Focus and Chronicity

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Purpose

To investigate the relationship between localization-related (LR) epilepsy and language function in children through a comparison of performance on various standardized language tests

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Introduction

- Each year in the United States, approximately 150,000 children and adolescents seek medical attention for newly occurring seizure disorders (Hauser, 1994).
- 45,000 children under the age of 15 develop epilepsy each year.
- 326,000 school children through age 14 have epilepsy (Epilepsy Foundation, 2006).
- These children are at risk for the development of speech-language problems and yet, many such cases are frequently overlooked (Svoboda, 2004).

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Previous Findings: Cognition & Psychopathology

- Childhood-onset epilepsy adversely impacts cognition (Ellenberg, Hirtz, & Nelson, 1986; Hermann, 2002).
- Caplan, et al. (2004) reported that significantly more children with complex partial epilepsy experienced psychopathology, cognitive deficits, and language problems than their typically-developing peers.
- Caplan et al. (2006) found that children with complex partial seizures who also experienced thought disorder (i.e. difficulties with formulation and organization of thoughts) were at a higher risk for psychopathology, school problems, low academic achievement, and poor peer relations.

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Previous Findings: Memory, Attention, and Auditory Processing

- Kolk et al. (2001) reported that children who had recently been diagnosed with epilepsy, showed impairments in attention, short-term memory, auditory perception, lexical function, and speech comprehension.
- Epilepsy patients commonly complain of memory problems (Bortz, 2003).
- Oostrom, et al. (2005) found that, when compared to a group typically-developing peers, children with epilepsy displayed learning, memory, attention, and behavior deficits.

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Previous Research: Language

- Dube, LeNormand, & Cohen (2001) found that children with simple partial epilepsy showed deficits in their use of auxiliary verbs.
- Caplan et al. (2001) found that children with complex partial seizure disorder were impaired in their use of conversational repair strategies.
- Parkinson (2002) discovered a subtle association between focal epilepsy and language disorder.
- Henkin, et al. (2003) found linguistic-processing deficits in children with idiopathic generalized epilepsy.

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Our questions:

- Do children with localization-related epilepsy demonstrate different standardized language test profiles than children without epilepsy?
- Do these profiles differ by site of focus (left vs. right hemisphere), or length of time since onset of symptoms (recent onset vs. chronic)?

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Participants

- Children ranged in age between 4 and 12 years. All were right-handed.
  1. Typically-developing peers (N=71)
  2. Children with **recent-onset** Localization-Related (LR) epilepsy (duration <1 year) with a **left** hemisphere focus (N =17)
  3. Children with **chronic** LR epilepsy (duration > 3 years) with a **left** hemisphere focus (N =21)
  4. Children with **recent-onset** LR epilepsy (duration <1 year) with a **right** hemisphere focus (N =4)
  5. Children with **chronic** LR epilepsy (duration > 3 years) with a **right** hemisphere focus (N =6)

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Methods

- Participants are part of a larger NIH-funded study (POLER, Plasticity of Language in Epilepsy Research) at Children's National Medical Center (PI: William D. Gaillard NINDS R01 NS44280)
- All participants received speech, language, developmental, and psycho-educational testing, as well as fMRI scans.
- Standardized Language Tests included: the *Expressive One-Word Vocabulary Test* (*EOWVT*) and *Clinical Evaluation of Language Fundamentals, 4th edition (CELF-4)*, or the *CELF-P* (younger children).
- Children also completed spontaneous narratives (results reported elsewhere at this convention).

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Results

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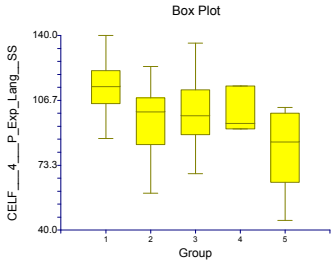
CELF Expressive Language Results – Standard Score comparisons



Legend:

1 = Typical

2 = Recent-onset left H

3 = Chronic left H

4 = Recent-onset right H

5 = Chronic right H

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Differences among groups' performance

- *CELF* expressive language scores differed significantly as a factor of group ($F = 11.75$, $p < .0000$).
- Post-hoc analysis (Fisher's LSD Multiple Comparison) showed the typically developing children to differ significantly from all groups but the recent onset RH children
  - In addition, both groups of LH children scored significantly lower than the typically developing children
  - Performance was also statistically depressed in chronic children with right hemisphere focus. However, this group is quite small (n=6).

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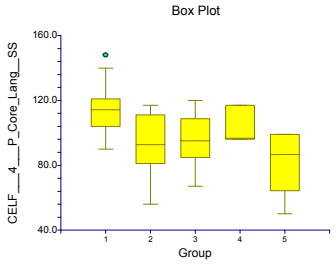
CELF Core Language Results – Standard Score comparisons



Legend:

1 = Typical

2 = Recent-onset left H

3 = Chronic left H

4 = Recent-onset right H

5 = Chronic right H

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Differences among groups' performance

- *CELF* Core language scores differed significantly across groups (F= 15.84, p <.0001)
- Post-hoc analysis (Fisher's LSD Multiple Comparisons) showed significantly best performance, as expected, by the typically-developing children, with significantly poorer performance by BOTH groups of left-hemisphere focus children as well as children with chronic right hemisphere focus.

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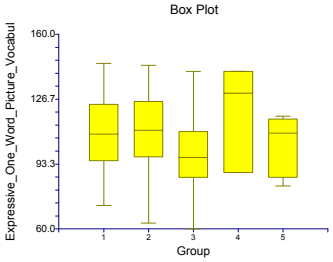
Expressive One-Word Vocabulary Test Results – Standard Score comparisons



Legend:

1 = Typical

2 = Recent-onset left H

3 = Chronic left H

4 = Recent-onset right H

5 = Chronic right H

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Differences among groups' performance

- *Expressive One-Word Vocabulary Test* scores DID NOT DIFFER significantly across groups (F = 1.96, ns.)
- Descriptively, the best performance was by the children with recent-onset right hemisphere focus epilepsy (who were few in number), with comparable and above-average performance by both the typical children and children with recent onset left hemisphere focus epilepsy.
- Poorest performance was by the children with chronic left-hemisphere focus epilepsy.

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Discussion

- Although the data are complicated by uneven cell frequency, this preliminary analysis shows that:
  - On general tests of language ability (*CELF*), children with left-hemisphere focus epilepsy, both chronic and of recent onset, tend to score lower than unaffected children, or children with right-hemisphere focus epilepsy.
  - Children with chronic right hemisphere focus also performed poorly on the *CELF*.
  - However, epilepsy did not appear to statistically affect performance on expressive vocabulary (*EOWVT*).

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- As additional children are added to our sample, these trends may change.
  - In all, 128 children, typically-developing and those with epilepsy, will eventually be studied.
  - Additional variables must be considered, such as IQ, SES, possible side-effects of medications, and history of pre-existing speech-language problems.
- However, it is not surprising that seizure activity in the language-dominant hemisphere should affect children's standardized test performance.

- It should be noted that virtually all groups' mean test performance was within normal limits, although individual children did score above or well below, the group means.
  - This indicates that language impairments specifically due to or concomitant with seizure activity may be somewhat subtle.
  - SLPs may wish to monitor language skills in this population.
- For this reason, we are performing ongoing analyses of the children's spontaneous narrative abilities, to ascertain whether or not differences emerge at this level of analysis.
- Results of these analyses will be presented tomorrow morning (Friday) at 8 AM, Sessions 1378/1379, CC/A108.

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