Expressive language skills of children with recent-onset epilepsy

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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).

Epilepsy

Epilepsy has been shown to affect:

- Cognition: IQ, memory, attention
- Representation of speech in the brain
- Word recognition, word recall, verbal memory
- Verb production
- Pragmatics
- Narrative skills
**Epilepsy and Cognition**

- Epilepsy is associated with a higher risk of memory dysfunction (Bortz, 2002)
- If left untreated, epilepsy may affect attention (Kolk et al., 2001)
- Chronic epilepsy may lead to a decline in IQ (Hermann et al., 2002; Ellenberg et al., 1986)

**Epilepsy and Speech Representation in the Brain**

- Atypical speech representation is more likely to occur in children with the following characteristics:
  - Younger age of onset (before 5 years)
  - Seizure focus in left hemisphere
  - Extratemporal seizure foci
  - Left-handedness


**Epilepsy and Language Deficits**

- Parkinson, (2002) found that children with focal, localization-related epilepsy are at higher risk for subtle language deficits.
  - In a study of 109 children with epilepsy (5-18 years of age), nearly half (42.2%) were found to have language deficits as diagnosed by a pediatric neurologist
Epilepsy and Verb Production

- Dube et al., (2001) examined verb production in 3 French-speaking children (ages 3-5) who have simple partial epilepsy, compared to 51 typically-developing peers
  - CWE produced fewer auxiliary verbs
  - CWE demonstrated comparable production of main verbs and copula verbs
  - CWE produced more nonfinite verbs, suggesting a telegraphic style of speech

Epilepsy and Pragmatics

- Caplan, et al., (2001) examined discourse-level abilities in 143 children with epilepsy (ages 5-16) and 65 typically-developing children
  - CWE self-corrected syntax and referents more often than TD children
  - CWE used fewer fillers than TD children, suggesting an atypical language-encoding process

Focal Lesions and Narratives

- Reilly, et. al., (2004) examined narrative abilities in 52 children (4-12 years of age) with early focal lesions (<6 months of age) using the wordless picture book *Frog, Where are You?*
  - Children with focal lesions are initially delayed compared to typically-developing peers, but perform similarly by the end of the elementary years:
    - CWFL told shorter stories overall
    - CWFL aged 4-9 made more morphological errors
    - CWFL aged 4-9 used fewer different complex syntactical structures
    - CWFL used complex syntactical structures less often
Research Questions
- What is the effect of epilepsy on language function?
- Does epilepsy cause language impairment?
- Are seizures and language impairment symptoms of the same underlying process?
- Are epilepsy and language impairment separate, unrelated phenomena?

Current Study
- We examined the effects of epilepsy on children's language skills
- Specifically, we examined the narrative abilities and other language characteristics of children with recent onset epilepsy (<1 year)
- Strekas et al (Session 1379) examined these characteristics in children with chronic epilepsy (>3 years)

Participants
- 10 right-handed children with recent-onset (<1 year), localization-related epilepsy focused in the left hemisphere
  - 6 boys, 4 girls
  - 4 to 11 years (mean = 7 years)
- 10 typically-developing children with no history of neurological disorder, matched for gender and age within 3 months (always same age or younger)
Participants

These children are part of a larger, NIH-funded study (P.I. William Davis Gaillard, M.D.; NINDS R01 NS44280, National Children’s Medical Center)
- 200+ children
- fMRI
- Speech and language assessments
- Developmental and psycho-educational evaluations

Method

- Narratives were collected at the National Children’s Medical Center
- *Frog, where are you?* by Mercer Mayer
- Narratives were digitally recorded and sent to University of Maryland, College Park

Method

- Samples were transcribed using the Child Language Data Exchange System conventions (MacWhinney, 2000)
- The basic unit of the transcriptions is the C-unit (“communication unit”; Loban, 1976), which consists of an independent clause and its modifiers
- Analyses focused on:
  - Narrative structure
  - Syntactic complexity
  - Discourse Cohesion
Narrative Structure

- Trabasso & Rodkin (1994)
  - Setting
  - Initiating events
  - Higher order goals
  - Attempts at finding the frog
  - Outcomes

Syntactic Complexity

- Complex C-unit: A C-unit with at least one subordinate clause
  - "While the boy was sleeping, Frog climbed out of his jar."
- Relative clause: A phrase introduced by a relative pronoun that modifies a noun phrase
  - "There was an owl that lived in that hole."
- Verb phrase complement: Embedded clause that modifies a verb phrase
  - "The dog wondered where the frog was, too."

- Adverbial complement: Embedded clause that contains a subordinating conjunction (before, after, if, because)
  - "The dog had the jar stuck on his head because he was looking for Frog in there."
- Wh-clause: Embedded clause introduced by who, what, where, when, while, if
  - "While the boy was sleeping, Frog climbed out of his jar."
- Expanded Noun Phrase: A noun phrase with more than one modifier.
  - "They found the frog with another frog and little baby frogs."
Discourse Cohesion

- Devices used to tie the utterances of a discourse together into a coherent and cohesive narrative
  - Referential pronouns
  - Conjunctions
  - Usage of related words
  - Ellipsis

Discourse Cohesion

- Referential pronouns: refer back to previously-introduced entities
  - "Once upon a time there was a little boy and a frog. He slept and then the frog was gone."
- Conjunctions: link events or set up a systematic relationship
  - "And I found him with a wife and baby. Then I took that baby home with me."

Discourse Cohesion

- Substitution: replacement of a word with another grammatically- or structurally-similar word
  - "And there were some frogs there. And then he chose one."
- Lexical cohesion: using vocabulary to tie the narrative together
  - "There was a boy who caught a frog. One night when he was sleeping, the frog got out of the jar."
Discourse Cohesion

- Ellipsis: links elements of the discourse together by omitting a word or phrase
  - “Then the deer threw the boy into the river. The dog fell [into the river] too.”

Analysis

- NCSS – PASS Statistical and Power Analysis Software
  - Assumptions about normality of variances were not met
  - Non-parametric statistics
- Characteristics analyzed:
  - CELF-P/CELF-4, Expressive Language
  - Mean Length of Utterance (MLU)
  - Vocabulary diversity (VOCD)
  - Narrative structure
  - Syntactic complexity
  - Discourse cohesion
  - Errors, Repetitions, Revisions

Results – CELF-P, CELF-4

- CWE-R scored significantly lower than TD children; \( p = .0137 \)
  - CWE-R mean = 85.9
  - TD mean = 110.7
Results – Narrative Structure

- CWE-R mentioned significantly fewer setting details than TD children ($p = 0.039$)
- CWE-R mean = 0.7
- TD mean = 1.4

Results – Syntactic Complexity, Discourse Coherence

Results: Accuracy, Fluency
Discussion

- Few statistically significant differences between CWE-R and TD children
- The major difference was on the CELF, where CWE-R showed lower standard scores than their peers
  - Two children in the CWE-R group were or had been receiving speech-language therapy
  - Their scores were above the group mean (89 and 110)

Discussion (continued)

- What is the relationship between epilepsy and language impairment?
  - Language performance (CELF) and seizures may reflect a common underlying impairment
  - Epilepsy may cause disruptions in language performance
  - They could be unrelated phenomena

Discussion (continued)

- Other differences were subtle, and group trends went in both directions across analyses, suggesting no major differences between groups in
  - Narrative structure
  - MLU, vocabulary diversity, syntactic complexity and discourse cohesion
  - Fluency and error rate
Conclusions

- Children whose epilepsy is of recent onset do not appear to greatly differ from typical peers in most language measures.

Limitations of the current study

- Sample size is small
- SES is not controlled
- Age of onset of epilepsy not considered
- Possible side-effects from medication not considered
- Some aspects of pre-existing conditions are unknown
- Trabasso & Rodkin’s narrative taxonomy is quantitative, not qualitative in nature

Conclusions (continued)

- As duration of epilepsy increases, deficits in language abilities are seen
  - Differences in narrative abilities are seen in children with chronic epilepsy (Strekas, et al, Session 1379)
  - Differences emerge on standardized language tests (Strekas, et al, Poster Session 1140)
- Thus, it appears that chronic epilepsy in children can disturb language function

Acknowledgments

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  - Ashley Akrie, Jessica Bienstock, Darlene Foster, Laura Gutowski, Keena James, Erin Moore, Lisa Rosenberger
References


References (continued)


Appendix: Narrative taxonomy

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