Speech and Language Abilities in Children with Seizure Disorders: Pilot Data

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Overview

- Although childhood apraxia of speech (CAS) affects only 1-2 children out of every 1,000, it occurs at a much higher rate when associated with certain diagnoses (Shriberg, Potter, & Strand, 2011; Webb, Singh, Kennedy, & Elsas, 2003).
- Our retrospective analysis of the communication and motor profiles of 143 children with suspected CAS revealed a high percentage of children with seizure disorders (Iuzzini-Seigel, Delaney, & Kent, 2016).
- Previous work that reported CAS in children with epilepsy failed to use valid diagnostic criteria (Kugler et al., 2008) and consequently, a gap in our knowledge exists about the link between seizures and CAS.

Study Purpose & Hypotheses

This study aims to determine the speech and language profiles for children with seizure disorders.

(1) CAS features will be more common among children with epilepsy compared to the 3-4% prevalence rate in the general population of children with speech sound disorders (Delaney & Kent, 2004).

(2) Children with epilepsy with CAS will evidence higher rates of comorbid language impairments compared to children with epilepsy without CAS (i.e., non-CAS speech disorder).

Methods

- Participants were recruited through social media groups for individuals with epilepsy or speech sound disorders and at the Epilepsy Foundation Walk.
- All subjects were assessed on speech and language skills.
- 7 participants were assessed in-person and 8 participants were assessed virtually.
- Some assessments, such as the CELF-5 and CELF-P, were modified to accommodate time limitations for virtual assessments.
- Subjects were assigned to groups based on speech and language scores (Iuzzini-Seigel et. al., 2017) across standardized and custom assessments (i.e., GFTA-3, build upon words, multisyllabic words, nonwords, language sample, and "Buy Bobby a Puppy" repetition task). Groups included:
  - CAS only (CAS)
  - CAS + language impairment (CAS+LI)
  - Language impaired (LI)
  - Typically developing (TD)
  - Non-CAS speech sound disorder (SSD)
  - SSD + language impairment (SSD+LI)
- Pilot data from 15 children with seizures are presented in comparison to control groups.
  - Controls are age-matched and were assigned to groups based on scores from the same speech and language assessments.

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Results

Communication Findings in Children with Seizure Disorders

	CAS (n=1)	CAS+LI (n=5)	LI (n=3)	TD (n=1)	SSD (n=1)	SSD+LI (n=4)
Gender	1M	1M, 4F	2M, 1F	1F	1F	2M, 2F
Age in months	73	72.8 (25.9)	94.3 (24.3)	71	57	74 (23.1)
CAS Features	5.6	6.29 (0.4)	2.53 (0.5)	1.3	3	4.22 (1.0)
Articulation Assessment SS	61	43.4 (7.6)	90.67 (1.2)	110	72	49.25 (10.6)
ISP	20	27.02 (5.6)	0.81 (1.4)	0	1.63	9.21 (8.3)
Core Language Index SS	121	56.75* (14.3)	72.3 (12.2)	122	100	68.75 (16.7)
Seizure Type	febrile	absence, tonic clonic, partial simple	tonic clonic, Partial, complex, tonic	absence	partial, complex	absence, tonic clonic, myoclonic, partial simple

Communication Findings Across Groups

	CAS (n=1)	CAS+LI (n=9)	LI (n=1)	TD (n=21)	SSD (n=10)	SSD+LI (n=7)
Gender	1M	7M, 2F	1M	11M, 10F	2M, 4F	6M, 1F
Age in months	58	66.2 (10.8)	63	68.7 (13.0)	65.75 (16.6)	72.86 (20.7)
CAS Features	5.4	5.64 (0.5)	3.9	1.97 (0.7)	3.0 (0.9)	3.28 (0.7)
Articulation Assessment SS	40	41.2 (3.3)	95	100.52 (7.6)	64.63 (12.9)	60.71 (17.3)
ISP	31.7	28.42 (8.2)	0	0.49 (0.8)	6.71 (5.4)	8.01 (8.4)
Core Language Index SS	102	64.55 (15.3)	86	108.47 (12.3)	98.38 (12.9)	77.7 (14.8)

Notes: Group averages listed with standard deviations in parentheses *1 Participant was unable to condition to tasks; CAS Features (Iuzzini-Seigel et al., 2017) = 11 features rated & averaged across 5 speaking tasks: *GFTA-3*, Multisyllabic Words, Build-Upon Words, Non-Words, & Language Sample; SS = standard score; Articulation Assessment = Sounds-in-Words subtest of the *Goldman-Fristoe Test of Articulation 3* (Goldman & Fristoe, 2015); Core Language SS = *Clinical Evaluation of Language Fundamentals Preschool 2* (Wiig et al., 2004) for participants aged 3-6 years, and the *Clinical Evaluation of Language Fundamentals-Fifth Edition* (Wiig et al., 2013) for participants older than 6 years of age; test is considered reliable and valid for children with a range of cognitive-linguistic abilities.

Discussion and Future Directions

- Of the 15 pilot participants with seizure disorders, 6 children (40%) were diagnosed with CAS or CAS+LI; this is a substantially higher percentage of children with CAS compared to the general population of children with communication disorders.
  - This data further provides support for a link between seizures and increased rate of CAS. Future research will examine seizure type and seizure loci to determine if these factors are associated with specific speech/language diagnoses.
  - Only 2 of those children had previous apraxia diagnoses. CAS is still going undiagnosed in many cases and therefore it is important to understand connections between CAS and comorbid conditions.
- Although some participants reported incomplete information regarding seizure symptoms and loci, tonic clonic seizures were the most common with 26.7% reporting tonic clonic seizures amongst our 15 participants. Future research should continue to gather this data to determine if this prevalence is just as high or if patterns among different medications/treatments will emerge within a larger sample size. Any trends among seizure diagnosis, symptoms, or treatments and CAS features or specific expressive/receptive language abilities should be assessed.
- It is remarkable that 8 of the 14 (57%) seizure participants with speech or language impairments are female. Research in the field has found that typically males are more likely to have a speech disorder than females.
- The female protective model proposes that a larger deleterious genetic mutation is required for females to express a disordered phenotype than the size of the mutation that is required for male peers to be symptomatic. Consequently, there tend to be fewer females with certain diagnoses, but when the mutation is large enough for the phenotype to be expressed, it results in a more severe expression of symptoms.
  - Our seizure participants consist of 9 females, 4 of which (44.4%) are included in the CAS+LI group. A larger genetic mutation may account for the greater overall complexity and severity of these children. Further research is needed to determine the validity of this model in children with CAS and in children with seizures.

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