Stop-Vowel Coarticulation in Italian Children with Articulation Disorders: A Developmental Study

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Abstract

Speech sound disorders (SSD) are a category of communication disorders in which the individual has difficulty producing certain sounds or sound patterns. This study examined the acoustic characteristics of vocalic productions by Italian speaking children with speech sound disorders and normal speech development in two age groups: early childhood (four to six years) and school-age (seven to twelve years). Acoustic analysis was conducted using Praat Software and included measurements of F1 and F2 in words and non-words, measurements of vowel duration and transition rate, and the use of locus equations to compare consonant-vowel and consonant-vowel-vowel coarticulatory patterns. Results of the study found that children with SSD in relation to children with normal speech would differ from children with normal speech production in how they coordinate articulatory gestures within syllables. In addition this study investigates whether it is possible to identify coarticulation errors typical of different stages of development for children with SSD. It was expected that differences in coarticulation would exist across age groups of children with SSD. A Developmental Study

Research Questions & Hypotheses

Research Question 1:
What is the nature of coarticulation errors by SSD children with respect to normal coarticulation patterns?

Hypothesis 1:
There will be between-group differences in the locus equations.

Research Question 2:
Is it possible to identify coarticulation errors typical of different stages of development of SSD?

Hypothesis 2:
There will be identifiable coarticulation errors typical to different stages of SSD development.

Methods

Participants
Sixteen subjects were recruited to the Centro Ricerca e Cura della Balbuzie e dei Disturbi della Voce e del Linguaggio (Center for Research and Therapy for Fluency, Voice and Speech Disorders, or CRC) in Rome, Italy: eight subjects diagnosed with speech sound disorders (SSD) and eight normal speaking age matched peers. These subjects were divided into two age groups: preschool (four to six years) and school-age (seven to twelve years). The subjects were evaluated for SSD based on a battery of tests. Expressive language tests included the Morpho-syntactic TVL for children below age six years and the Boston Naming Test for children ages six to eleven years. Receptive language tests included the RUSTIONI for children age three-and-a-half to eight years and the Peabody syntactic lexical for children age three to seven years. Receptive language tests included the RUSTIONI for children age three and a half to eight years. The Esame Prassile and FUSII were administered as tests of oral-motor function, articulation, and diadochokinetic.

Results

Age Differences:
A significant difference was found between the school-age SSD and normal group locus equations for the labial plosive [p].

Syllable Differences:
A significant difference was found between the SSD and normal groups for the labial plosive [p].

Children with SSD v Normal Children
A significant difference was found between the SSD and normal groups for the labial plosive [p].

Conclusions & Discussion

Research Question 1:
This study sought to investigate the nature of coarticulation errors by SSD children with respect to normal coarticulation patterns. Locus equation calculations for [k] and [p] indicate that there are differences in coarticulation patterns between SSD and normal children. However it was outside of the realm of this study to determine the type of errors. Also, while there are diagnostic group differences between the locus equations for [k], the factors of syllable and age are not correlated with this difference. This indicates that factors other than those examined in this study are tied to the differences in articulation between these groups.

Research Question 2:
This research also sought to determine if there are coarticulation errors typical of different stages of development in children with SSD. The locus equation data for this factor is conflicting. There is no significant difference between age groups for any consonant and thus, there is no evidence for a developmental trend characteristic of SSD.

Discussion:
Across all three consonants the regression lines exhibit a two-cluster pattern in which the data values corresponding to the vowels [a, o, u] are clustered together and the data values corresponding to the vowel [i] are clustered together. This pattern may reflect learned articulatory processes associated with these vowels but is more likely to reflect the fact the portion of the corpus used for this study’s analysis does not represent vowels distributed evenly across word quintile. Sussman has asserted a pattern of locus equations that is present in adults and children in which “labels had the steepest slopes and lowest y-intercepts, alveolars the lowest slopes and highest y-intercepts, and velars had intermediate slopes and y-intercepts” (Sussman, Hoemes, & McCaffrey, 774). This pattern was found for the locus equation calculations for Italian children; however it is important to note that the locus equations for /t/ and /k/ are very similar.

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