Spoken Word Recognition of Children who Stutter and Children with Specific Language Impairment: A Pilot Study

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Introduction

•Young children's phonological representations are considered to be holistic (e.g, Brooks & MacWhinney, 2000; Fowler, 1991; Metsala, 1997; Rosner & Simon, 1971; Treiman & Breaux, 1982; Treiman & Zukowski, 1991).

•However, at around two to three years of age, children experience significant growth in their vocabulary; growth thought to enhance the specification of their phonological representations because of need to distinguish among an increasing number of similar words (Charles-Luce & Luce, 1990; 1995; Elliot, Hammer, & Evan, 1987).

•Children begin to link lexical items on the basis of finer units of phonological similarity resulting in a more robust representation (Metsala, 1997; Nittrouer, 1996).

•Interestingly, **both children who stutter (CWS) and children with specific language impairment (CSLI)** have been hypothesized to have less specified or rather more holistic phonological representations.

•This common theoretical assumption is not surprising given the similar manner in which these two groups have performed on multiple tasks including: non-word repetition, digit for memory and even manual motor movement.

•Recent research using a picture naming priming paradigm (Byrd, Conture & Ohde, 2007) has shown that CWS appear to persist in their use of a holistic means of encoding a later age than is developmentally expected supporting the notion that that their phonological representations may be less specified (Anderson & Byrd, 2008; Anderson, 2009).

•However, these findings may be task or rather paradigm related; exploration of phonological representations via a different methodology may yield different findings.

•Mainela-Arnold, Evans, & Coady (2008) recently explored the robustness of the phonological representations of CSLI via a spoken word recognition task.

•During spoken word recognition a matching process occurs between speech input and the related phonological representations (Gaskell & Marslen-Wilson, 1997). Phonological representations that are more "robustly specified" are better recognized from partial input (Brown & Watson, 1987; Metsala & Walley, 1998).

•Although the results from the Mainela-Arnold et al. (2008) study did not support the hypothesis that the representations of children with SLI differ from their typically developing peers, they used participants who were ≥ 8 years old. If they had included younger children, they may have found different results.

•Thus, the **purpose** of the present study was to explore the amount of acoustic phonetic information required to recognize spoken words by CWS and CSLI in comparison to children who do not stutter (CWNS).

•If the underlying phonological representations these children are less specified (i.e., more holistic), CWS and CSLI should require more acoustic phonetic information to recognize spoken words than CWNS.

Method

• *Participants*

•Data has been collected on 8 CWS, 5 CSLI, and 11 TD, thus far, but the poster is limited to the matched comparisons across 4 CWS, 4 CSLI, and 4 TD selected from this group.

n=4	Age (mos)	Gender	Maternal Education	NVIQ[a]	SPELT[b]	TNL[c]	PPVT[d]	EVT[e]	NWRT[f]	MD[g]
SLI	82.50	3M; 1F	16	99.50	70.33	79.00	91.00	88.50	7.00	6.50
CWS	80.25	4M	16.5	105.00	N/A	98.50	118.25	111.00	8.50	12.50
TD	80.25	3M; 1F	16.25	118.00	109.00	113.50	128.75	124.00	11.33	11.00

Note. a. Matrices section of the Kaufman Brief Intelligence Test – 2nd Edition; b. the Structured Photographic Expressive Language Test-3; c. Test of Narrative Language; d. Peabody Picture Vocabulary Test – 4th Edition; e. Expressive Vocabulary Test – 2nd Edition; f. Non-word Repetition subtest of the Comprehensive Test of Phonological Processing (CTOPP); g. Memory for Digits subtest of the CTOPP.

• *Procedures*

•Each participant completed a spoken word recognition task where they were presented auditorily with 32 words that were systematically controlled for relative to onset and lexical variables spliced into 10 gates of duration (from 120 ms to 660 ms).

•A duration blocked format was used such that the 1st gate of each word (i.e., the first 120 ms) was presented, then the 2nd gate and so on until the 10th and final gate of each word was presented (see Example below).

	1-120	2-180	3-240	4-300	5-360	6-420	7-480	8-540	9-600	10-660
bath										
watch										
leg										
fish										

• Participants were told: **"Your job is to listen as closely as possible to pieces of words. First, you'll hear a beep. Then you'll hear a piece of a word. Then I want you to guess what the whole word is. Then you'll hear another beep, another piece of a different word and you'll make another guess. At first the pieces will be short, and then they will get longer. Sometimes you might decide to change your guess when you hear a bigger piece of the word. That's fine. Just make your best guess as to what word it is after each piece you hear."** Each participant then completed four gated practice words prior to the initiation of the experiment.

•*Data analysis*

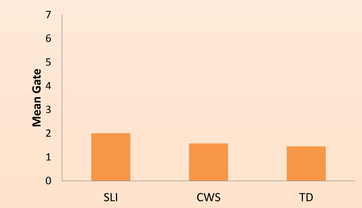
•The Independent Samples Kruskal Wallis Test was used as it is a nonparametric analysis that allowed for determination of differences in word recognition across the three talker groups to three key variables: 1) point of target initial sound: gate of first production of word with correct initial sound; 2) point of isolation: gate of first correct production of target word; 3) point of acceptance: gate at which child did not change from a correct response.

Acknowledgments

Libby Deardon, Elizabeth Hampton, Kristen Nelson, Angie Motal, Andre Lindsey, Tamara Fink, April Armstrong, Erin Castaneda, Erica Bodoin, Emily Newton, Jackie Shaw, Drs. Michael Mahometa, and Chang Liu, participating families and all the children who participated in the study

Results

Point of Target Initial Sound



Results from the Independent Samples Kruskal Wallis Test indicated no significant differences in the mean gate for the point of target initial sound across the 3 groups, *p* = .067.

Point of Isolation

Results from the Independent Samples Kruskal Wallis Test indicated no significant differences in the mean gate for the point of isolation across the 3 groups, *p* = .098.

Point of Acceptance

Results from the Independent Samples Kruskal Wallis Test indicated no significant differences in the mean gate for the point of acceptance across the 3 groups, *p* = .486.

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Discussion

•First, these results are preliminary in nature and should be interpreted with strict caution given to the limited sample size across groups.

•Based on these limited data, results do not reveal a statistically significant difference between CWS or CSLI as compared to TD in their performance in a duration blocked gating paradigm. Although it is of interest to note that the results for both point of target initial sound and point of isolation approached significance.

•If, after collecting a minimum of 20 children per group, we continue to find no difference, then this would suggest that neither CSLI nor CWS require additional acoustic phonetic information than TD to identify spoken words.

•In other words, such data would suggest both CWS and CSLI have phonological representations that are as "robustly specified" TD.

•However, even if this trend does in fact continue when we attain a sample size with sufficient power, a potential confound that will need to be considered is the type of gating paradigm we used.

•To review, in this study, we used a duration-blocked paradigm because evidence from typical adults showed that successive presentation of all gates of a target words (forward gating paradigm) resulted in delayed identification of the target words.

•Mainela-Arnold et al. (2008) also used a duration-blocked paradigm and found no differences in performance between children with SLI and typically developing children.

•Dollaghan (1998), however, used a forward gating paradigm, in which all gates of a target word were presented successively, and she found that children with SLI were less likely to produce the correct initial consonant for the target word and required more acoustic-phonetic information to identify newly learned words.

•Based on those findings, Dollaghan (1998) suggested that children with SLI were less successful at encoding and representing phonological characteristics of newly learned words.

•It is possible that if we had used a forward gating paradigm instead of a duration-blocked paradigm our results would have been similar to Dollaghan (1998), supporting the theory that children who stutter and children with SLI are more holistic processors.

•For this reason, we are currently continuing this line of investigation by running these participants in both a duration blocked and a forward gating paradigm as this will allow for enhanced understanding as to the potential differential influence of the task on the child's performance.