CONSONANT CLUSTER ACQUISITION: A CASE STUDY

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Introduction

- Speech acquisition refers to how children make sense of and use the speech sounds they hear around them (Gildersleeve-Neumann & Wright, 2010).
- Learning to correctly pronounce language sounds, particularly consonant clusters, is one of the longest-lasting stages of speech acquisition (Kirk, 2008; McLeod et al., 2001a; McLeod et al., 2001b).

Introduction

- Children as young as 2;0 (years;months) can pronounce some clusters correctly, but many other children still struggle with consonant clusters at age 8;0 or 9;0 (Bland-Stewart, 2003; McLeod et al., 2001a; McLeod et al., 2001b).
- Pronunciation plays a major role in the intelligibility of speech sounds made during early language acquisition, and since English contains a large variety of consonant clusters (Anthony & Francis, 2005), not being able to pronounce these sounds correctly makes communication frustrating for many children (McCormack et al., 2010).

Pronunciation Strategies

Research has identified several strategies children use when learning to pronounce consonant clusters. Two of those are easy for even naïve listeners to identify: cluster reduction and cluster simplification (James, et al., 2008; Kirk, 2008; McLeod et al., 2001a; McLeod et al., 2001b).

Cluster reduction

- Cluster reduction occurs when one or more of the consonants is removed, leaving only a single consonant sound.
  - For example, many children will say [tɪk] *tick* instead of [stɪk] *stick* since they are unable to produce the /st/ cluster, even though most English-speaking 2-year-olds can successfully produce /s/ and /t/ separately (Li et al., 2009).

Cluster simplification

- Cluster simplification occurs when two elements of the cluster are produced, but one or both of them is pronounced incorrectly.
  - The most commonly observed instance of cluster simplification happens as the result of gliding approximants (McLeod et al., 2001b), for example, pronouncing [trejn] *train* as [twejn] *twain* where the /r/ is simplified into /w/.
  - Production of /w/ as part of a consonant cluster is also found in children's nonstandard pronunciations. McLeod and Bleile (2003) found that by age 2;0, children were able to correctly pronounce word-initial consonant clusters containing /w/, even if they appeared in clusters not found in the children's native languages, e.g. [bwejn'kət] instead of [blejn'kət] *blanket*.

Ten Trends in Cluster Acquisition

The study of language acquisition goes back decades, but little research has focused on the acquisition of consonant clusters. McLeod et al. (2001a; 2001b) expanded on the general trends in consonant cluster development they had identified in previous studies. The ten trends they describe were drawn from an examination of more than 70 years of research into children's language acquisition.

Trends at a Glance

1. Two-year-olds can produce clusters, but the clusters produced may not belong to the ambient language.
2. Production of word-final clusters precedes word-initial consonant clusters.
3. Two-element clusters are generally produced and mastered before three-element clusters.
4. Clusters containing stops are usually acquired before clusters containing fricatives.
5. Children tend to go through a period of consonant reduction.

Trends at a Glance

6. Production errors may result in homonyms.
7. Many strategies are used, but the most common are cluster reduction and cluster simplification.
8. There is a typical developmental sequence to acquiring consonant clusters.
9. Cluster reduction, cluster simplification, and correct production of consonant clusters are interrelated.
10. There are individual differences in acquiring consonant clusters.

Purpose of this Case Study

This paper will examine a two-year-old's consonant cluster acquisition at age 2;6 and compare the results with the trends identified by McLeod et al. (2001a, 2001b). Their work a decade ago noted that there are few studies that focus solely on the acquisition of consonant clusters, and since there still are relatively few studies of this type, I chose to examine the speech of my nephew in an attempt to provide additional data about how toddlers acquire consonant clusters.

Research Questions

- Does my nephew's speech follow the ten trends listed above?
- How does his production of consonant clusters compare with research on other toddlers' acquisition of consonant clusters?

Methods

- The participant in this case study is my nephew, a typically developing child with no identified learning disabilities or medical conditions.
- The speech used as data for this project was all spontaneously generated, although some of the instances are my nephew's attempt to repeat what an adult had said.
- Most of the speech samples were collected at his home during play time with his mother and me when he was age 2;6, but I have included a few short video recordings his parents made to have speech samples from when my nephew was closer to 2;0.

Methods

- The video recordings I made were done using the built-in video camera on my iPhone 4, and the audio-only recordings were made using the iTalk app on the same iPhone 4.
- The video recordings provided by my nephews' parents were made using an RCA Small Wonder EZ 200 digital camcorder.
- In addition to the recordings, I am including information from my own informal interactions with my nephew as well as speech data reported by his parents.

Methods

- I then reviewed the video and audio recordings and listed the words and phrases my nephew used.
- I examined the data for words that include consonant clusters and then created a list of these words, which I analyzed to determine the type of production errors he makes (either cluster reduction or cluster simplification).
- The focus of this case study is consonant clusters, so as long as the cluster was said correctly, I categorized the word as being pronounced correctly, even if the rest of the word was said using nonstandard pronunciation.
- Finally, I made comparisons between my nephew's results and the ten trends described by McLeod et al. (2001a, 2001b).

General Results

My nephew produced 90 words that included one or more consonant cluster. Of these, he was able to correctly pronounce the consonant clusters in 33 of the words. He used cluster reduction in 23 words and cluster simplification in 34 words.

Correct pronunciations

- My nephew was most successful pronouncing /tʃ/, both word-initially (*chair, cheese, chicken, chip, choo-choo*) and word-medially (*kitchen*).
- My nephew was also able to consistently use /θ/ (*that, the, there, these, this, another*), as well as /ʃ/ (*shirt, shoe, shopping, wash*).
- He was also able to pronounce the /ks/ in word-final position (*box, fix*), /f/ in word-initial position (*phone*) and word-medial position (*elephant*), and /pl/ in word-initial position (*plate, play*).

Cluster reduction

- Although he is able to use /ʃ/ in most words, his pronunciation of *sheep* more resembled /sip/ than /ʃip/.
- Similarly, he is able to use /θ/ in most instances but pronounces *something* like [sʊmkin] and *birthday* like [bərfdeɟ].
- His most common use of cluster reduction is in his pronunciation of /st/, which he consistently reduces to just /t/ in words like *stairs, stay, stick, stop, store,* and *stuck*.
- He also reduces the /str/ cluster at the start of *strawberry* to either [taw'bɛri] or [saw'bɛri]. My nephew also has difficulty with /sp/, reducing it to /p/ in *spell* [pɛl] and *spoon* [pun].

Cluster Simplification

- My nephew used cluster simplification in 11 words containing /θ/: *bath, bathtub, birthday, both, forth, something* (two types of cluster simplification), *think, three, through, toothbrush,* and *with*.
- He simplified /θ/ to /f/ word-initially in *through*, *think*, and *three*; word-medially in *bathtub*, *birthday*, *toothbrush*, and *something*; and word-finally in *bath*, *both*, *forth* and *with*.
- He also changed the initial /θ/ to /d/ in *through* when singing "The Wheels on the Bus."

Cluster Simplification

- Five words beginning in /br/ were simplified to begin with /bw/: *Brett, bridge, bring, broke,* and *broom*.
- Two other consonant clusters were each simplified in four of the data samples: /fr/ became /fw/ (*fries, from, fruit, refrigerator*) and /tr/ became either /tw/ or /sw/ (*train, trash, tree, truck*).
- Other common changes were /pl/ to /pw/ in three words (*airplanes, please, Playstation*) and /kr/ to /kw/ in two words (*cry, ice cream*).

Comparing Results with the Trends

Using the data in conjunction with the ten trends from McLeod et al. (2001a, 2001b), the following conclusions can be made about my nephew's pronunciation of consonant clusters.

Trend 1

- *"Two-year-old children can produce consonant clusters, but these clusters may not be of the same form as the ambient language" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - This trend held true for my nephew's pronunciation of several consonant clusters. He produced some clusters that are found in English (e.g., /tʃ/ and /ʃ/) but often created his own clusters that are against the phonotactics rules of English.
  - He frequently used C+/w/ combinations that are not used in English such as /bw/, /fw/, /pw/, /sw/ and /tw/ in his simplified versions of certain clusters. He also pronounced the initial /tʃ/ in *church* as /sj/ several times.

Trend 2

- *"Word-final consonant clusters generally appear in inventories earlier than word-initial clusters" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - I was unable to determine this based on the data since the recordings were primarily done when my nephew was age 2;6, and he produced words with both word-initial and word-final clusters.

Trend 3

- *"Two-element clusters are generally produced and mastered earlier than three-element clusters" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - This trend also appears true for my nephew; he does not produce any three-element clusters. The initial /skw/ in *squirrel* was reduced to /k/, and the initial /str/ in *strawberry* was reduced to /s/ or /t/.
  - Likewise, the initial /str/ in *strong* was simplified to /sw/. However, these are the only four samples of three-element consonant clusters found in the data, so this result could change if I had more results.

Trend 4

- *"Consonant clusters containing stops (e.g., /pl/, /kw/) are acquired generally before consonant clusters containing fricatives (e.g., /st/, /θr/)" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - My nephew has acquired 8 clusters containing stops in comparison to 21 clusters containing fricatives; four words had clusters without a stop or a fricative.
  - Twenty of the words containing consonant clusters my nephew cannot say contain clusters with a stop, while 38 of them contain clusters with a fricative.
  - I can tentatively conclude that Trend 4 is correct in my nephew's case, even though he has mastered the pronunciation of 21 words containing fricative clusters.

Trend 5

- *"Young children typically delete one element of a consonant cluster (cluster reduction)" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - My nephew exhibited 23 examples of cluster reduction, so for him, Trend 5 is accurate.
  - For example, he reduced the initial /gr/ in *green* to /g/ and the initial /fl/ in *flower* to /f/.

Trend 6

- *"Homonymy occurs in young children's attempts to produce consonant clusters. Homonymy frequently occurs as a result of cluster reduction; however, homonyms can also occur as a result of cluster creation" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - The data showed several examples of homonymy in my nephew's speech. His pronunciation of *crawl* was more like [kal] *call*, and his pronunciations of *sleep* and *sweep* were both more like *seep*.
  - He also said *tick* instead of *stick*, *top* instead of *stop*, *tore* instead of *store*, *drew* instead of *through*, and *tank* instead of *thank*.

Trend 7

- *"There are a number of other nonadult realizations of consonant clusters; the most common is cluster simplification, with others including epenthesis and coalescence. Metathesis is rare" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - My nephew's speech does fit this trend since 34 of his mispronunciations were as a result of cluster simplification. In fact, he used simplification more times than he used cluster reduction, which he only used 23 times.

Trend 8

- *"The acquisition of consonant clusters is gradual, and there is a typical developmental sequence. It is not an all-or-nothing process. For word-initial clusters, children may initially delete a member of a consonant cluster (one-element realization); then preserve the members, but one may be produced in a nonadult manner (two-element realization); and finally they will produced the consonant cluster correctly (correct realization). Other developmental sequences are possible, particularly for word-final consonant clusters" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - Since the data was collected within a short time frame when my nephew was 2;6, it is difficult to track his progression using the samples gathered for this case study. Therefore, I cannot provide concrete results for this trend.

Trend 9

- *"There is an interrelationship among cluster reduction, cluster simplification, and correct productions of consonant clusters. Initially, most children reduce consonant clusters. Over time, the occurrence of cluster reduction diminishes, whereas the occurrence of cluster simplification increases. Simultaneously, the occurrence of correct productions increases, until eventual mastery of production" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - My nephew appears to be in the cluster simplification phase.
  - However, since I do not have longitudinal data for his production of consonant clusters, it is difficult to determine how my nephew relates to this trend, but he appears to be progressing normally.

Trend 10

- *"Despite there being a typical developmental sequence, the acquisition of consonant clusters is marked by reversals and revisions, with considerable individual variation" (McLeod et al., 2001a; McLeod et al., 2001b).*
  - This trend was shown in my nephew's changing pronunciations of *something, strawberry,* and *sweep/sweeping*. He was not consistent in his pronunciation of these words, which implies he was trying new ways to say the clusters.
  - The recordings are also marked by my nephew repeating words with clusters several times in different styles while he tries to master the correct cluster pronunciation.

Conclusion

By examining my nephew's production of consonant clusters at age 2;6, I am able to set a benchmark for future studies of his speech as well as provide additional data to the study of the acquisition of consonant clusters among English-speaking children.

Conclusion

- The data collected in this study can serve as a benchmark for future studies of my nephew's speech. This is significant for me as an aunt because my sister, the subject's mother, needed speech therapy as a child to correct serious pronunciation errors.
- In addition, there is scant data on how two-year-olds acquire consonant clusters, so this research should provide additional insight into how one such toddler produces consonant clusters.
- Finally, by comparing my results to the ten trends described by McLeod et al. (2001a, 2001b), I am adding information to the field of early childhood language acquisition, although the results are limited by the small scale of this project and the single participant.

Difficulties and Limitations

- In addition to only studying one subject, another limitation to this study is my close familiarity with the subject. While I was able to obtain spontaneously generated speech, it was difficult to separate my role as "Aunty Tata" from my role as data collector. My nephew's parents often needed me to intervene in behavior issues, such as trying to get him to take a nap or put away his toys, which often interrupted data collection.

Suggestions for Future Research

- Future studies into consonant cluster acquisition should include larger sample sizes and a mix of male and female subjects, as well as considering age, socio-economic, and cultural differences when generalizing about consonant cluster acquisition.
- By expanding our knowledge of consonant cluster acquisition, insight can be made into language acquisition in general, as well as how non-native speakers of a language learn to reproduce consonant clusters in their new language.

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