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A phonetic approach to consonant repetition in early words

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ABSTRACT

The goal of this study was to evaluate movement-based principles for understanding early speech output patterns. Consonant repetition patterns within children's actual productions of word forms were analyzed using spontaneous speech data from 10 typically developing American-English learning children between 12 and 36 months of age. Place of articulation, word level patterns, and developmental trends in CVC and CVCV repeated word forms were evaluated. Labial and coronal place repetitions dominated. Regressive repetition (e.g., [gag] for "dog") occurred frequently in CVC but not in CVCV word forms. Consonant repetition decreased over time. However, the children produced sound types available reported as being within young children's production system capabilities in consonant repetitions in all time periods. Findings suggest that a movement-based approach can provide a framework for comprehensively characterizing consonant place repetition patterns in early speech development.

1. Introduction

Consonant repetition in child speech refers to a speech form where two consonants across the intervening vowel within a word become alike (e.g., [gag] or [dad] for "dog") (Stoel-Gammon & Stemberger, 1994). At the onset of word use, young children often repeat the same consonant within a word (Davis, MacNeilage, & Matyear, 2002; Vihman, 1996), whereas words in adult language rarely show reduplication of consonant in a word (Ladefoged & Maddieson, 1996). Why young children produce consonant repetition for a word target and how they achieve target word accuracy have been of interest in phonological or speech development studies (e.g., Davis et al., 2002; Pater, 1997; Smith, 1973; Stoel-Gammon & Stemberger, 1994).

Many phonologically oriented researchers have proposed that consonant repetition in children is a realization of mental-level processes such as feature spreading or agreement across the vowel (e.g., Pater, 1997; Smith, 1973; Stoel-Gammon & Stemberger, 1994). Phonetically oriented researchers have reported that peripheral movement-based production system capabilities can account for the patterns observed in early speech forms (e.g., Kent & Bauer, 1985; MacNeilage & Davis, 1990; Studdert-Kennedy, 1987). However, no study so far has focused on movement-based production system capabilities in accounting for consonant repetition.

The present study explores consonant repetition in early words from a movement-based production system approach. Movement-based mechanisms as well as solely mental-level representation explanations may help to understand comprehensively the nature and characteristics of the observed early speech patterns.

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1.1. Consonant repetition

Consonant repetition in child speech has been termed 'consonant assimilation' or 'consonant harmony' in other literatures (e.g., Pater, 1997; Smith, 1973; Stoel-Gammon & Stemberger, 1994; Vihman, 1978). However, the present study adopts a representation-neutral term 'consonant repetition'. Consonant repetition in this study refers to a nonadjacent segmental sequence across the intervening vowel, which does not match the word target and is characterized by reduplication of a preceding or following consonant place and/or manner within a word (e.g., Davis et al., 2002).

In adult languages, assimilation is a phonological process in which one sound (i.e., target sound) becomes more like another sound (i.e., source sound) within a word or between words (McCarthy & Smith, 2003). The targeted sound becomes identical to the source sound (i.e., total assimilation) or takes on some of the characteristics (or features) of the source (i.e., partial assimilation). Consonant assimilation in language occurs mostly between two adjacent sounds (e.g., in + possible → [ɪmpasəbl]; in + credible → [ɪŋkrɛdəbl]). This adjacent (or local) assimilation was often considered to be the coarticulatory effect between the two neighboring sounds. In contrast, assimilation between nonadjacent consonants across the intervening vowel, usually called consonant harmony or long-distance assimilation rarely occurs in most languages (McCarthy & Smith, 2003). An exception includes a grammatical marker in Navajo (McDonough, 2003) (e.g., The prefix/ʃi-/as in [ʃi-tʃi:h] "my nose" becomes [si] when the following noun stem contains a [+anterior] sibilant such as [si-zid] "my scar"). Phonologists suggested that consonant harmony (or long-distance assimilation) in adult systems involves a mental-level process such as spreading (or agreement) of distinctive features from one sound to another one (e.g., Hansson, 2010; Pater, 1997; Stoel-Gammon & Stemberger, 1994).

Repetition of the same consonant place in early words may be different from repetition of two adjacent sounds at word boundaries in children (e.g., [braʊmbɛə] for "brown bear") (Newtone, 2012) or in adult languages (e.g., [ɪŋkrɛdəbl] for "incredible") (Hansson, 2010), which are coarticulatory speech outcomes. Unlike in languages, children often produce nonadjacent consonant repetition within a word. The repetition forms become variegated when the child accurately matches word forms with development. Phonological studies have termed these child forms as 'consonant harmony' and focused on relating the phonological process in adults' forms (Bat-El, 2009; Berg & Schade, 2000; Goad, 1997). However, the representation approach to consonant harmony in adult systems may not be relevant to describe the nonadjacent consonant repetition within a word in children. Such child-specific patterns may involve different underlying mechanisms from consonant harmony in adult systems.

In the present study place repetition indicates that a consonant is a repetition of the other consonant in place of articulation (i.e., labial, coronal, or dorsal). For example, [gk̂] for "duck" indicates dorsal repetition, while [dd̂] for "duck" indicates coronal repetition regardless of partial or total repetition. Regressive repetition indicates that the preceding consonant is produced at the place of articulation of the following consonant in a sequence (e.g., [gk̂] for "duck"). Progressive repetition is indicated for the reverse case (e.g., [dd̂] for "duck").

According to our study definition, all noncontiguous consonant repetitions within a word are considered to be consonant repetitions. Thus, coronal repetitions for dorsal–coronal target words may include cases of segmental-level patterns, termed 'velar fronting'. For example, [tat] for "cat" may be considered to be velar fronting in the phonological literature (e.g., Ingram, 1974; Inkelas & Rose, 2007), as well as coronal repetition by our definition. Because our goal is to evaluate movement-based mechanisms of sequential consonant patterns found in early speech forms, it is not necessary to assume two separate 'mental representations' for a speech behavior (e.g., velar fronting and coronal repetition for the case of [tat] for "cat"). Therefore, we use the term 'coronal repetition' for all the cases where the coronal consonant is repeated. In fact, these 10 children only produced a limited number of dorsal–coronal target words, and we did not observe a significant difference between the results including and excluding the velar fronting cases.

1.2. Theoretical approaches to consonant repetition

1.2.1. Phonological approaches

Phonological studies of consonant repetition in children have employed diverse theoretical frameworks based on linguistic knowledge representations. Early generative phonologists (e.g., Ingram, 1974; Smith, 1973) characterized consonant repetition via a set of phonological rules as the mental templates by which child output patterns were formulated. Dorsal (and/or labial) repetition targeting a coronal place (Ingram, 1974; Menn, 1975; Smith, 1973) was reported as a primary phonological rule in their case studies. However, individual variations among children have also been reported (e.g., Cruttendon, 1978; Vihman, 1978).

Underspecification theory (e.g., Kiparsky, 1985; Stoel-Gammon & Stemberger, 1994) incorporates phonological representations based on the degree of underlying feature specification. Repetition indicates a general mental-level pattern where *underspecified* phonemes tend to assimilate to *specified* phonemes. Stoel-Gammon and Stemberger (1994) investigated selected word samples from 51 English-learning children aged 9–24 months. They reported that more children showed a tendency for dorsal or labial (i.e., specified feature) repetition targeting a coronal place (i.e., underspecified feature). An under specification analysis does not explain which consonant would be repeated if the target word contained two specified categories, such as labial and dorsal.