Journal of
Education and Human Development ISSN 1934-7200
Volume 1, Issue 2, 2007

Syllable Constructs of Preschool Children and the Implications Regarding Speech Therapy

Larry Barnes, Assistant Professor, West Texas A&M University, lbarnes@mail.wtamu.edu

Abstract

Finding effective ways to remediate difficult phonemes for children with articulation deficits is the focus of this research paper. Emphasis was placed upon the syllable constructs of preschool children and the implication of these constructs on remediation techniques. Open (unchecked) constructs are favored for remediation targets. These constructs are recommended in combination with tense vowels. The insertion of a tense vowel (epenthesis) is also recommended for minimal closed syllable constructs (CVC). An age range table of syllable constructs is provided along with a table recommending specific constructs for initial remediation of difficult phonemes.

Introduction

Speech-Language Pathologists are continuously challenged to find effective ways to remediate articulation and phonological errors of school-aged children. Traditional therapy focused on place, manner, and voicing characteristics of speech sounds (phonemes) with a motor emphasis. The first step in the traditional method isolated production of target phonemes. Successive steps graduated toward production in syllables, words of various lengths and eventually sentences. Studies of co articulation and assimilation have assisted in targeting syllable constructs to aid in the ease of target productions. This study endeavored to provide the clinician with specific syllable constructs for use in remediation exercises.

When assessing and treating articulation delays of children, clinicians focus on phoneme production in the context of syllables. The reason is that syllables appear to be more easily recognized as a unit than the individual sounds themselves (Beasley et al., 1974). Preschool children typically use syllabification when breaking down a word into sound units. Only in latter development do children begin to recognize the individual sounds themselves within words. It has even been suggested that preschool children resist the notion of breaking a word into units smaller than the syllable (Ladefoged, 1993). For this reason the study of syllable development plays a pivotal role in identifying appropriate target units for consideration in articulation remediation.

Researchers have identified several variables that affect syllable production among young children: (1) the number of syllables contained in an utterance, (2) whether or not syllables contain codas, and (3) the degree of stress placed upon the syllable (Flemming, 1971; Kent, 1982, Cho, 2003). Each of these variables plays a key role in determining the child's articulation capabilities at both the word and small utterance levels. If the syllables become too phonologically complex then the sounds within the syllables are at risk of misarticulation and word length recall suffers (Service, 1998).

In addition, co articulation concerns affect a child's ability to accurately produce phonemes within syllables. Co articulation describes how the articulators continuously move into various positions from one segment of speech to another. As movements become more complicated from syllable to syllable assimilation occurs. Articulation movements begin to approximate each other from one sound production to another resulting in sounds that are similar or identical to the neighboring sound segment. When one sound segment influences similarity of the following sound segment it is called progressive assimilation. When one sound segment influences similarity of the preceding sound segment it is called regressive assimilation.

Several co articulation concerns have been noted among children with speech delays. Research has focused on the characteristics of consonant influences on neighboring sound segments in CVC

constructs such as: (1) predominance of voiceless stops to be voiced; (2) regressive velar harmony; (3) final stop deletions, and (4) stopping (Combs & Martin, 1987). Articulation errors have caused researchers to examine not only the coarticulation effects of onsets and codas but of vowels on consonants in various syllable constructs as well.

The importance of vowel characteristics as coarticulation influencers has come to light in recent years. Vowel length errors have been noted as low in early phonological acquisition of children regardless of the number of codas produced (Kehoe & Stoel-Gammon, 2000). This suggested that vowel length mastery is not secondary to coda acquisition but may hold a direct connection to the mastery of codas themselves. In addition, children produce voiceless obstruents as codas before sonorants (Kehoe & Stoel-Gammon, 2000). The voiceless obstruents share a notable characteristic with vowel length: tensing of the lingual structure during production.

Tense vowels are described as having: (1) higher muscular tension; (2) more extreme movement of the articulators; (3) longer duration; and (4) greater subglottal air pressure (Trask, 1996). Ultrasonic imaging revealed tense vowels have more anterior pharyngeal wall advancement compared to lax vowels with similar lingual height and front placements (MacKay, 1977). The anterior wall advancement of tense vowels suggests coarticulation influence depending upon voicing and specific placement. The implication is that tense vowels may have some effect on tense consonants (voiceless obstruents), early mastery of which was noted by recent acquisition studies (Kehoe & Stoel-Gammon, 2000).

Additional studies implicate tense vowels as having a direct coarticulation effect on neighboring phonemes. Using spectrographic analysis of sibilant fricative production in syllables, Soli (1981) discovered the formants of target consonants were acoustically changed as a result of the neighboring vowel context. Specifically, high tense vowels resulted in different fricative formant frequencies than did low lax vowels. Further study regarding the affects of coarticulation influence of tense vowels may shed light into the types of syllable constructs that aid in consonant production.

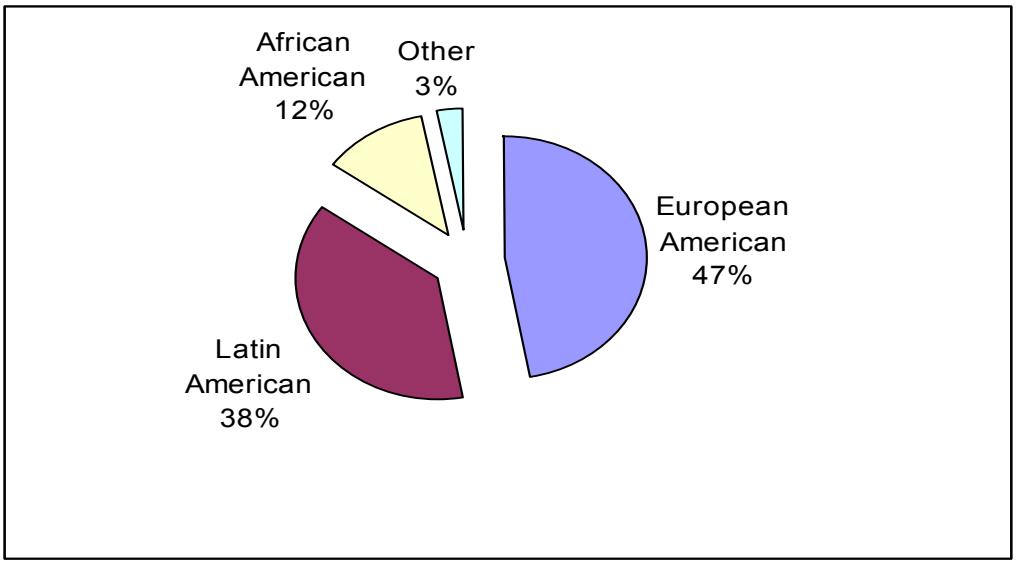
Due to the complicated movements involved in syllable production clinicians continue to seek out simpler constructs containing target phonemes that may aid in remediation. This research project examined the syllable construct patterns of young children with that goal in mind by specifically focusing on the effects of vowels on consonant production. It was hypothesized that in the normal developmental patterns of syllable constructs (a syllabic construct age range table was identified by this study) articulation errors would be associated with vowel characteristics.

Method

The researcher used a descriptive developmental design that employed a cross-sectional plan of study for a minimum sample group of 212 children. Subjects were categorized by age groups to include 3-, 4-, 5-, and 6-year-olds. Group placement was determined by children having birth dates within 6 months on either side of the target age group. Careful consideration was given to insure the subject population of this study represented the gender and ethnic demographics of the region comprising approximately 51% male students and 49% female students. Of these students, 47% were European American, 38% were Latin American, 12% were African American, and 3% were American citizens of other ancestries (Graph 1). The criteria for selection of subjects included normal hearing acuity and normal language development. No subject was selected for testing who had a known history of speech or language delays and all of the subjects were required to pass a hearing screening prior to articulation assessment.

A total of 14 syllable constructs were targeted in the context of 46 words (Appendix A). Visual stimulus consisted of colored pictures depicting common objects, the names of which carried the targeted syllable patterns. Production of words representing target syllable constructs was recorded in a data base noting the tense and lax characteristics of the vowels contained in each construct. Productions were also audio recorded for reliability purposes. From this data base a syllabic construct age range table was created to identify

Graph 1: Ethnic Characteristics of Subject Group



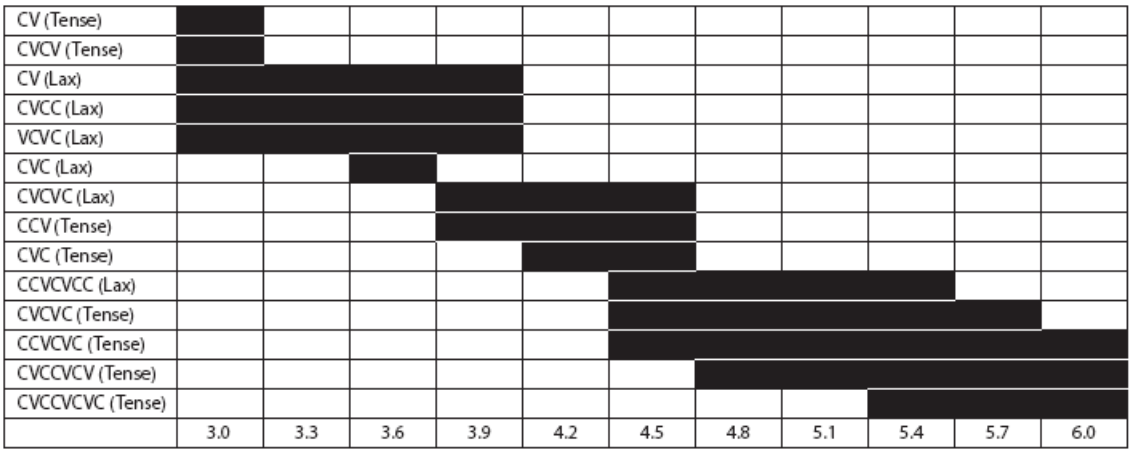
paradigms that suggested easier versus more difficult syllable units depending on the number of consonant errors noted. From the paradigms trends associated with production mastery were identified and analyzed for their implication on selecting therapeutic targets.

Procedure

Age appropriate target words were identified to represent each of the thirteen syllable constructs examined. Picture stimuli and verbal requests were used to elicit target words in isolation. Some of the picture stimulus contained carrier phrases to facilitate the elicitation of targets. If a subject provided no response or stated a non-target word, the testing clinician requested a direct imitation of the clinician's model with no teaching to error. All productions were audio recorded and then transcribed using a computerized version of the International Phonetic Alphabet. Inter-examiner reliability methods were employed utilizing approximately 10% of the subject group audio recordings to establish reasonable standard error of measurement data. Those recordings demonstrating reliability errors of greater than 1% of the recorded sample were not used in the analysis.

Target words were divided into groups representing their corresponding syllable construct and labeled as either "tense" or "lax" according to the vowel distinctive feature. A computer data base was established recording the number of articulation errors noted for each of the syllable constructs as produced by individual subjects. The data base also accounted for the variables of age, gender, and ethnicity. An age range of mastery for each syllabic construct was determined by noting the age at which 75% of subjects produced no errors and the age at which 90% of subject produced no errors (Table 2). Dependent variables of age and gender were recorded to assess correlation between age groups of children and mastery of syllable constructs. An age range table of syllabic construct was identified allowing for notice of paradigms specifically relating to vowel tensing.

Table 1: Age Range of Syllable Construct Mastery (years & months)



Analysis

A point value of 1 was assigned to each consonant present in each word. As phonemic errors occurred points were subtracted from the possible total. A tally of the total number of phonemic errors for each syllable construct could then be determined. An age range of mastery of a targeted syllable construct was determined by the ages at which 75% and 90% of subjects produced targets containing no errors.

To establish the significance of correlation between syllable construct mastery and age a Pearson *r* correlation (two-tailed) was used. A progressive linear correlation was established (coefficient $\geq$ .90) confirming mastery of syllable constructs as a result of the increasing ages of subjects. In addition, an Analysis of Variance (ANOVA) was used to test differences between the means of two or more of the age groups controlled. ANOVA results indicated significant differences between groups ($p < .05$).

Inter-tester reliability was assessed to determine the measure of error within the data that were gathered. Two speech therapists tested the same randomly selected sample of 20 children (10% of total sample) twice. The interval between the two samplings averaged approximately 20 days. Phonemic inventories for each retested sample were gathered. These inventories were compared with the original inventories, and the number of errors was recorded. In regard to 780 phonemes that were reassessed from the speech samples, 46 errors were noted. Percentage of error for this study was calculated to be approximately .058. This was considered an acceptable error rate.

Discussion

The study of syllable constructs among preschool and school aged children may help in identifying simplified patterns for eliciting phoneme targets during remediation exercises. Constructs acquired earlier were considered to be the easiest to produce and thus may serve as the most productive constructs for eliciting phonemic targets. With this is mind, fewer errors were noted with open (unchecked) syllable constructs. This implies that syllables ending with a consonant prove more difficult for children. This implication is validated by evidence that consonant phonemes are typically mastered in the initial position of words prior to mastery in final position.

Fewer errors were also noted in those syllable constructs containing tense vowels. Vowels produced with greater muscular tension, more extreme movement, and with longer duration had a more positive coarticulation effect on neighboring consonant production. This would suggest that targeting syllable constructs containing tense vowels may aid in articulation placement of target phonemes.

With an understanding that unchecked syllables combined with tense vowels favor phoneme production, specific syllabic constructs can be recommended as therapy targets (Table 2). When difficulty arises in eliciting consonant phonemes in syllables the introduction of a tense vowel following the consonant may prove to be therapeutically useful. In the context of words ending with checked syllables this would allow for the syllable to move from a closed to open construct simplifying the construct and potentially maximizing correct production of the target.

Table 2: Suggested Constructs for Phoneme Remediation Exercises

Monosyllable Construct	Bisyllable Construct
/c/ i	c v /c/ i
/c/ e	c v /c/ e
/c/ u	c v /c/ u
/c/ o	c v /c/ o

Note: /c/ denotes the target phoneme. Tense vowels are represented in International Phonetic Alphabet.

Several child phonology studies support this conclusion. Demuth and Fee (1995) proposed that children demonstrate vowel epenthesis (adding a speech sound that doesn't belong) if coda consonants are difficult to produce. Examining vowel epenthesis qualities from loan words of various languages, Uffman (2006) revealed epenthetic vowel patterns result from the complex interactions of distinct phonological processes. The implication is that children simplify difficult articulation productions in loan words by using epenthesis. Taking this information and applying it to this study, specific syllabic constructs can be formulated by focusing on tense vowel targets in unchecked positions. It is anticipated that applying these recommendations will result in easier and thus more accurate production of target phonemes.

References Cited

Beasley, D., Shriner, T., Manning, W., & Beasley, D. (1974). Auditory assembly of CVCs by children with normal and defective articulation. Journal of Communication Disorders, 7, 127-133.

Cho, T. (2003). Prosodically conditioned strengthening and vowel-to-vowel coarticulation in English. Journal of Phonetics, 32, 141-176.

Combs, C. & Martin, J. (1987). The pronunciation of stops in consonant-vowel-consonant (CVC) words: A comparison between normal and speech-disordered preschool children. Journal of Communication Disorders, 20, 281-294.

Demuth, K. & Fee, E. (1995). Minimal words in early phonological development. Ms., Brown University and Delhousie University.

Kehoe, M. & Stoel-Gammon, C. (2001). Development of syllable structure in English-speaking children with particular reference to rhymes. Journal of Child Language, 28, 393-432.

MacKay, I. (1977). Tenseness in vowels: An ultrasonic study. Phonetica, 34, 325-351.

Service, E. (1998). The effect of word length on immediate serial recall depends on phonological complexity, not articulation duration. The Quarterly Journal of Experimental Psychology, 51, 283-304.

Soli, S. (1981). Second formants in fricatives: Acoustic consequences of fricative-vowel coarticulation. The Journal of the Acoustical Society of America, 70, 976-984.

Trask, R. L. (1996). *A Dictionary of Phonetics and Phonology.* London: Routledge.

Uffman, C. (2006). Epenthetic vowel quality in loanwords: Emperical and formal issues. *Lingua*, 116, 1079-1111.

Appendix A

Words Used To Elicit Target Syllable Constructs

---

pig toe toes tub duck mommy yard gum nose fish fishing

soap whistle house zipper shoe van TV chicken watch

watches jam cage book pages laugh ribbon thumb teeth that

feather star slide swimming queen present tree glove kangaroo

computer hand canoe again balloon gorilla muffin bye