CONTRASTIVE STRESS, PHONETIC CONTEXT, AND MISARTICULATION OF /r/ IN YOUNG SPEAKERS

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The purpose of this study was to examine the effects of contrastive stress and phonetic context on misarticulations of consonantal /r/. Subjects were 9 children between the ages of 4-5 (years:months) and 5-7 who exhibited normal articulation development but inconsistently misarticulated /r/. The experimental task was designed to elicit consonantal /r/ in two phonetic contexts ([rV] & [CrV]) and two stress conditions (primary & nonprimary stress). Three listeners who were naive to the experimental hypotheses judged the children’s productions for accuracy of /r/ production and for stress. Significant main effects were obtained for context and stress: /r/ productions were more often judged as correct in clusters than in singletons and in words not receiving primary stress than in words receiving primary stress. Results are discussed in terms of the possible effects of production and perceptual variables on listener judgments. Inferences are drawn concerning future research on speaker and listener effects in the study of articulation.

Inconsistency is characteristic of the sound productions of both children with impaired articulation (Curtis & Hardy, 1959; Siegel, Winitz, & Conkey, 1963; Spriestersbach & Curtis, 1951; Winitz, 1963) and children with normal articulation (Ferguson & Farwell, 1975; Local, 1983; Shibamoto & Olmsted, 1978). Considerable research over the past decade has addressed the possible sources of such inconsistency (e.g., Camara & Schwartz, 1985; Panagos, Quine, & Klich, 1979; Paul & Shriberg, 1982; Schwartz, Messick, & Pollock, 1983). Although a wide range of variables including phonetic context has been considered in this regard, the role of suprasegmental variables in articulatory inconsistency has only recently been addressed and then primarily for young, articulation-impaired speakers (Campbell & Shriberg, 1982). The present study was undertaken to examine the effects of a suprasegmental variable (contrastive sentence stress) and of phonetic context on rates of /r/ misarticulation in young speakers with otherwise normal articulation skills.

Contrastive sentence stress is characterized by the relative prominence of one word within an utterance, which contrasts that word with others that might have been used in its place. For example, in the utterance “Robert stole a Mercedes,” contrastive sentence stress on the word Mercedes can be used to indicate that Robert did not steal a Volvo or a Volkswagen. Linguists (e.g., Bolinger, 1958; Lyons, 1968) have noted that the linguistic function of contrastive sentence stress is to highlight new information.

In adult speakers, stress has been found to be associated with longer segment durations (e.g., Fry, 1955; Kent & Netsell, 1971; Klatt, 1976; Oller, 1973), with higher fundamental frequency (Gay, 1978; Lieberman, 1967), and with greater intensity (Fry, 1955; Lieberman, 1967; McClean & Tiffany, 1973). In addition, for adult speakers, the articulatory correlates of stress have included changes in the movements of the jaw, lips, and tongue (e.g., Kent & Netsell, 1971; Sussman & MacNeilage, 1978). Although the ability of young children to make use of contrastive stress to highlight new information has received some attention (e.g., Baltaxe, 1984; Hornby & Hass, 1970), relatively little is known about the effects of stress on the productions of young speakers.

Effect of Linguistic Stress on Speech Sound Production

Empirical evidence suggesting a relationship between contrastive sentence stress and the production of specific speech sounds in young children is provided indirectly by studies demonstrating differences in patterns of sound errors associated with lexical stress. Observers of normal and impaired articulation development have frequently identified patterns of sound errors that seem to be at least functionally related to lexical stress—for example, unstressed syllable deletion (Ingram, 1976, p. 29) or vowel deletion processes (Edwards & Shriberg, 1983, p. 97). Particularly relevant for the present study are findings that /r/ allophones in stressed versus unstressed syllables (e.g., [3]) versus [3]) may differ in the rates at which they are misarticulated by children with delayed articulation (Curtis & Hardy, 1959; Diedrich, 1984; Diedrich & Bangert, 1980) and in the rates at which they are acquired by children with normal articulation development (Hoffman, Schuckers, & Daniloff, 1980).

Two studies examining stress and the misarticulation of /r/ in articulation-impaired children have reported conflicting results. In a classic study, Curtis and Hardy (1959) studied 30 articulation-impaired children (ages 5:6 to 8:6) who misarticulated /r/. They were interested in examin-
ing the relationship of allophone type to error rates and patterns. Based on a task in which children spontaneously named pictures containing different [r] allophones, the researchers identified four allophones associated with different error rates—consonantal [r], stressed vocalic [æ], unstressed vocalic [ə], and intervocalic [r]. Among other findings, they reported that unstressed [æ] was misarticulated more frequently than stressed [æ].

In another study containing information regarding stress and the misarticulation of /r/ in articulation-impaired children, Diedrich and Bangert (1980) studied 300 school-aged children who misarticulated /r/. The children’s articulation of /r/ was examined over the course of a second year using Sound Production Tasks (Elbert, Shelton, & Arndt, 1967), tasks in which target sounds are produced imitatively in isolation, in words, and in sentences. Diedrich and Bangert found that stressed [æ] was misarticulated more frequently than unstressed [æ] and that this order was not changed during therapy conducted over the school year (p. 178). Diedrich (1984) examined the correctness of /r/ productions in 3-min conversational samples obtained during the 1980 study for 93 children. He reported that although only small differences were noted in the error rates of different vocalic allophones of /r/, the unstressed [æ]s tended to be correct more often than the stressed [æ]s (p. 98).

In a developmental study, Hoffman and his colleagues (1980) documented the acquisition of /r/ allophones by 8 nonarticulated-impaired children (ages 3:6 to 5:2). Every 4 weeks for a total of three sessions, the investigators had the children repeat 22 sentences for each of three /r/ allophones: /r, æ, æ/. Their subjects tended to produce acceptable stressed [æ] and consonantal [r] before unstressed [æ], although considerable variability was noted between subjects. On the basis of their findings, Hoffman et al. suggested that initial intervention for /r/ misarticulation focus on stressed [æ] or prestressed [Cr] rather than unstressed [æ]. They also speculated that in stressed and prestressed positions, the longer segment durations associated with stress may result in a more complete realization of the underlying physiological target, and thus in perceptually more acceptable tokens, than can be achieved in segments of shorter duration, (i.e., relatively unstressed segments).

To date, Campbell and Shriberg (1982) are the only researchers known to us who have specifically examined the relationship between sentence stress (rather than lexical stress) and segmental articulation. They investigated the effect of sentence stress level (primary vs. nonprimary stress) on the frequency of four natural phonological processes in the spontaneous conversation of 5 articulation-impaired children. The processes considered were Final Consonant Deletion, Stopping, Palatal Fronting, and Velar Fronting (Shriberg & Kwiatkowski, 1980). In addition to obtaining listener judgments regarding stress and phonological process occurrence, Campbell and Shriberg hypothesized that words receiving primary stress would less often be associated with process occurrence than would words receiving nonprimary stress. In accordance with their hypothesis, the researchers found that phonological processes occurred in only 3% of comments produced with primary stress, but in 36% of those comments produced with nonprimary stress. Similarly, phonological processes occurred in 21% of topics produced with primary stress, but in 56% of those produced with nonprimary stress. Campbell and Shriberg proposed that the basis for this association may be attentional, with greater care being taken in the production of stressed words because they “carry the main semantic/pragmatic content of the discourse” (p. 548).

**Effect of Phonetic Context on Speech Sound Production**

A nonsuprasegmental variable thought to affect patterns of developmental speech sound errors is phonetic context (e.g., Curtis & Hardy, 1959; Diedrich, 1984, p. 114; Gallagher & Shriberg, 1975a, b; Spriestersbach & Curtis, 1951). For /r/ allophones, considerable individual variation has been observed in the effects of specific neighboring phones (Curtis & Hardy, 1959; Hoffman, Schuckers, & Ratusnick, 1977; Swisher, cited in Kent, 1982). A relatively consistent finding, however, has been higher proportions of correct /r/ production in syllable-initial clusters than in syllable-initial singletons (Curtis & Hardy, 1959; Diedrich, 1984, p. 98; Hoffman, Schuckers, & Ratusnick, 1977; Hoffman, 1983; Swisher, cited in Kent, 1982). In a discussion of the facilitative effects of context, Kent (1982) suggested that such effects may be multiply determined by physiological effects on speakers (e.g., resulting from changes in segment durations or coarticulatory adjustments affecting placement) and auditory effects on listeners (e.g., due to masking or shifts in judgment criteria).

The present study was designed to examine the effects of phonetic context and contrastive sentence stress on misarticulation rates of consonantal /r/ allophones in young speakers whose overall development of articulation appeared to be age appropriate. In particular, the following research questions were addressed: Does phonetic context ([rV] vs. [CrV]) affect the frequency with which misarticulations are judged to occur? Are words receiving primary stress more often associated with acceptable productions of consonantal /r/ than words receiving nonprimary stress? Are the effects of contrastive stress and phonetic context independent of one another?

**METHOD**

**Subjects**

Subjects were 9 children (5 boys & 4 girls) between the ages of 4:5 (year:months) and 5:7 (Median = 5:4) who attended a private preschool in the Tucson area. They were identified as possible subjects for this study by their teachers or other school officials who were asked to select
children thought to misarticulate /r/ frequently. Additionally, the subjects met the following criteria:

1. Articulation within the expected range for the child's chronological age, as assessed by a z score of no less than −1.0 on the Screening Test of the Templin-Darley Tests of Articulation (Templin & Darley, 1969) when the child's performance was compared to appropriate age norms;

2. No reported history of speech or language intervention;

3. Variable production of /r/ (i.e., both correct and incorrect productions) on 22 consonantal /r/ items from the Deep Test of Articulation (McDonald, 1964);

4. English spoken exclusively in the home by both parents, as reported by one of the parents;

5. No obvious deficits in vocabulary or syntactic abilities, as judged by the experimenters during conversation with the child and as reported by the parent;

6. Adequate vision, with or without correction, as reported by the parent;

7. Adequate hearing, as determined by a pure-tone screening at 25 dB (A: ANSI, 1969) for 500 and 4000 Hz and at 20 dB for 1000 and 2000 Hz in both ears; and

8. Good health, as reported by the parent.

Table 1 contains descriptive information about the 9 subjects including age, gender, raw score and z score for the Screening Test of the Templin-Darley Tests of Articulation, and a list of sound errors that occurred during administration of that instrument. In addition, this table lists the number and percentage of correct responses each child made to 22 items containing consonantal /r/ taken from the Deep Test of Articulation and to 19 items containing vocalic /r/ taken from the Templin-Darley Tests of Articulation (Items 84-102). Given the performance criterion set for the Templin-Darley Screening Test, the children were regarded as generally normal in their articulation skills.

Stimuli

Stimuli for the research task were twelve 3 x 5 inch picture cards selected from several commonly used sources including Fokes (1976). The cards were modified and colored to make one object more prominent. Eight target and four practice words were represented in the picture stimuli.

The eight target words used in the study had one of two syllable structures: [rVc] (r-vowel-consonant) (the Singleton Condition) and [GrVc] (the Cluster Condition). Words in the Singleton Condition were rake, wreck, rat, rain. Words in the Cluster Condition were grass, grape, dress, and drape. These words were chosen because of their syllable structure, because they contained front vowels which may be facilitative to correct /r/ production (Kent, 1982), and because they could easily be represented by a picture. The practice words also had a CVC syllable structure. They were cake, bat, bed, bag.

The eight target words were used to create 16 pairs of sentences used in the delayed imitation task. Each target word was presented four times in a context that was intended to elicit primary, or contrastive, sentence stress on the target word (Primary Stress Condition). Each target word was also presented four times in a context that was intended to elicit contrastive stress on another word in the sentence, and thus, to elicit nonprimary stress on the target word (Nonprimary Stress Condition). In both stress conditions, one sentence in each pair of stimulus sentences consisted of a statement by the examiner about a picture representing the target word (e.g., “The rake is big”). Depending upon the stress condition, the child was then asked, “Is the girl big?” (Primary Stress Condition) or “Is the rake little?” (Nonprimary Stress Condition) (italic type indicates the word receiving primary stress). The expected responses from the child were “No, the rake is big” for the Primary Stress Condition and “No, the rake is big” for the Nonprimary Stress Condition. The 16 pairs of sentences were repeated four times to form a set of 64 target, or nonfoil, items. Repetitions were included to increase the likelihood of obtaining at least a small number of responses with the desired stress pattern for each sentence pair. Appendix A lists the foil and target items.

A foil item was created for each of the eight target words to introduce open-ended and yes/no responses that would promote a conversational tone within the experimental task and thereby facilitate the use of contrastive
stress. For example, for the foil item associated with the word rake, the examiner said, "The rake is big. What do you do with a rake?" No specific response was expected. Similarly, for the word rain, the examiner said, "The rain is falling. Do you like rain?" Again, no specific response was expected. The foil items were repeated two times each to produce 16 foils in the 80-item experimental session. Practice items were similar to target items in structure.

Procedure

Screening. Each child who was recommended for participation in the study and whose parents had returned a signed consent form was seen for a 30-min screening session prior to testing. Screening consisted of the administration of the hearing and screening items from the Templin-Darley Tests of Articulation and the Deep Test. During screening and subsequent testing, a recording of each child's responses was made using a Sony (Model TCM 5000) tape recorder and high quality low-noise tape (Realistic Gold C90) with the tape recorder microphone positioned about 20 cm from the child's mouth. Each child's hearing sensitivity was screened using one of two Maico (Model MA110) audiometers.

Testing. Each child was tested individually in a quiet, well-lighted room at the preschool. The subject was seated across from the experimenter at a table on which the tape recorder and the stimulus materials were placed. After a brief conversation, the child was shown four practice pictures, one at a time, and asked to answer questions about them. The four practice items were presented to teach the child to respond in complete sentences that were delayed imitations of the experimenter's statement about individual stimulus pictures. During these items, the child was encouraged through modeling to use contrastive stress and to avoid pronominalization by being asked to "say the whole thing." For example, the child was encouraged to use responses such as "No, the rake is big" rather than responses such as "No, it's big" when answering the question "Is the rake little?" If the child did not perform the task adequately for the third and fourth practice items, the items were repeated until three consecutive correct responses were achieved. Prompting for complete sentences and avoidance of pronominalization was not continued during actual experimental items.

After the practice items, the experimenter administered the first 40 experimental items. Then, the child was given a brief rest period that was followed by administration of the last 40 items. Order of presentation varied according to three protocols in which items were ordered randomly.

Scoring. After the 9 subjects were tested, 3 listeners who were naive to the hypotheses of the experiment scored subjects’ responses twice—first for /r/ production and then for stress. The listeners were graduate students in speech-language pathology who had completed courses in phonetics and in articulation disorders. They were not trained in the particular experimental listening task but were considered to be relatively sophisticated listeners because of their formal training. Stimuli were presented to the judges using a Sony (Model TCM 5000) tape recorder in an IAC sound-treated room.

During the /r/ production judgments, the listeners scored responses to each target word for all of the subjects as correct or incorrect based on the acceptability of the /r/ production. (The written instructions, which were read to the listeners for each task, appear in Appendix B.) At a later session using a separate score sheet, the listeners indicated which word in each sentence received primary stress by circling that word in the corresponding stimulus sentence. For each task, listeners heard only the child's response; they did not hear the experimenter's production of stimulus sentences nor did they hear foil items. Based on the listeners' stress judgments, the experimenters determined whether the stress produced by each subject matched the intended stress (primary or nonprimary) for each experimental item. Only those utterances in which the stress of the target word was judged to match that of the intended stress by two of the three judges were used in subsequent analyses. The exclusion of items with incorrect stress was designed to avoid the inclusion of utterances in which no apparent primary stress was perceived and to standardize the location of primary stress in sentences in which the target word did not receive primary stress. Specific responses were also excluded from the analysis if the entire target sentence was not produced spontaneously by the child.

Listener Agreement

After data were scored for all subjects, the 3 listeners rescored two consecutive, randomly chosen responses for each subject, first for correctness of /r/ and then for stress.

Correctness of /r/. Eighteen pairs of judgments per listener (3.1% of the sample) were used to obtain measures of agreement for correctness of /r/ production. Intraobserver point-to-point agreements were 89%, 83%, and 100% for Listeners 1, 2, and 3, respectively. Interobserver agreements were 83%, 89%, and 94% for Listeners 1 and 2, 2 and 3, and 1 and 3, respectively. Mean interobserver agreement for correctness of /r/ judgments was 89% across the three pairs of listeners.

Stress. Intraobserver point-to-point agreements on stress for 17 pairs of judgments per listener (2.8% of the sample) were 94%, 94%, and 82% for Listeners 1, 2, and 3, respectively. The three listeners were unanimous in their selections of the word receiving primary stress for 14 of 17 items (76.5%). Interobserver agreements for stress were 94%, 76%, and 82% for Listeners 1 and 2, 2 and 3, and 1 and 3, respectively. Mean percentage of agreement was 84%.

RESULTS

Number of Scoreable Responses

Of the 576 responses elicited in this study, 135 (23.4%) were not scored for correctness of articulation. Items
were unscored either because the intended stress pattern was not elicited or because the experimenter erred in playback of those items to the experimental listeners. In order to rule out bias related to differential loss of items for different target words within each stress condition, a chi-square analysis was performed on the frequency of scoreable responses for the contingency table presented as Table 2. The results of the analysis revealed no statistically significant association between target words and stress condition \[\chi^2 (7, N = 441) = 3.179, p > .05\]. Therefore, mean percentages of correct production scores for each context and stress condition were calculated for further analysis by summing across target words within each stress condition for each subject.

**Percentage of Correct Production**

The percentage correct production scores for each subject were transformed using an arcsine transformation (Cohen, 1969). This transformation was performed to meet the homogeneity of error assumption of the analysis of variance (Winer, 1971, p. 400). Results of the Hartley test for homogeneity of variance (Winer, 1971, p. 206) suggested that such a transformation of the raw percentage data was warranted \[F_{max} (4,8) = 6.727, p < .05\]. In Figure 1, the mean percentage of correct production scores for each context and stress condition are displayed prior to transformation. The transformed data were analyzed in a 2 (Context) \times 2 (Stress) analysis of variance and covariance with repeated measures (Dixon, 1981). A significance level of .05 was set for each statistical procedure. Results of this analysis are reported in Table 3. All further references to percentage data refer to the untransformed data.

The significant main effect for Context indicates that productions of /r/ clusters were more often judged as acceptable \((M = 87\%)\) than the productions of /r/ singletons \((M = 47\%)\), regardless of stress. An estimate of strength of association for this effect was calculated (Hays, 1973, p. 513) \((\omega^2 = 0.437)\), suggesting that approximately 44% of the variance in percentage correct production not attributable to differences between subjects was due to the effect of context. Mean percentage correct productions for /r/ clusters was higher than for /r/ singletons for 8 of the 9 subjects.

**DISCUSSION**

The questions addressed in this study concerned the effect of contrastive stress and phonetic context on rates of misarticulation of /r/ in a small group of young children with generally normal articulatory development. Specific hypotheses guiding the experimental design were (a) that /r/ occurring in words receiving contrastive stress would be produced correctly more often than /r/ occurring in words not receiving contrastive stress and (b) that /r/ in clusters ([CrV]) would be produced correctly more often

**TABLE 2. Number of scoreable responses for each target word produced in Primary Stress and Nonprimary Stress Conditions.**

<table>
<thead>
<tr>
<th>Target word</th>
<th>Primary Stress</th>
<th>Nonprimary Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>rake</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td>rat</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>rain</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>wreck</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>grape</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>dress</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>grass</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>drape</td>
<td>26</td>
<td>29</td>
</tr>
</tbody>
</table>

**FIGURE 1. Mean percentage correct production of /r/.** The standard error of the mean is also reported for each mean.

The significant main effect for Stress indicates that /r/ in words receiving nonprimary stress \((M = 70\%)\) was more often judged as acceptable than /r/ occurring in words receiving primary stress \((M = 65\%)\). An estimate of strength of association was calculated \((\omega^2 = 0.012)\), which suggested a very weak association between stress and correct production of /r/. Mean percentage correct was greater for /r/ in words receiving nonprimary stress than for /r/ in contrastively stressed words for 6 of the 9 subjects.

The interaction between Stress and Context was not significant. Thus, the effects of stress and phonetic context appear to have been independent.

**TABLE 3. Analysis of variance results for transformed data.**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>0.30</td>
<td>1</td>
<td>0.30</td>
<td>5.15</td>
<td>.05</td>
</tr>
<tr>
<td>Error</td>
<td>0.50</td>
<td>8</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Context</td>
<td>9.02</td>
<td>1</td>
<td>9.02</td>
<td>27.18</td>
<td>.0008</td>
</tr>
<tr>
<td>Error</td>
<td>2.66</td>
<td>8</td>
<td>0.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress x Context</td>
<td>0.09</td>
<td>1</td>
<td>0.09</td>
<td>0.84</td>
<td>NS</td>
</tr>
<tr>
<td>Error</td>
<td>0.89</td>
<td>8</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
that /r/ in singletons ([rV]). No specific expectation regarding the nature of an interaction between contrastive stress and phonetic context was held.

The results of this study of 9 children supported only one of the two experimental hypotheses—higher rates of correct /r/ productions were obtained in clusters rather than in singleton contexts. Curtis and Hardy (1959), Hoffman et al. (1977), and Swisher (cited in Kent, 1982) reported similar findings for misarticulating children. The effect of higher rates of correct production of /r/ in clusters was quite strong, accounting for almost 44% of the variability in the proportions of correct responses not attributable to differences among subjects.

Instead of the expected finding of higher proportions of correct production for words receiving primary (contrastive) stress than for words receiving nonprimary stress, higher proportions of correct /r/ productions were obtained in words receiving nonprimary stress than in those receiving primary stress. Although this finding is similar to results of studies of lexical stress on /r/ production described by Diedrich and Bangert (1980) and Diedrich (1984), it runs counter to expectations based both on the effects of lexical stress reported by Curtis and Hardy (1959) and the effects of sentence stress reported by Campbell and Shriberg (1982).

Two possible sources for contextual facilitation of correct sound production have been discussed by Kent (1982); those were (a) production factors affecting misarticulating speakers and (b) perceptual factors affecting their listeners. Although Kent was alluding to direct physiologic effects of context on production, another possible factor that may have played a role in the present study is attentional. In their study of sentence stress produced in conversation, Campbell and Shriberg (1982) hypothesized that the pragmatic function of stress; that is, its role in emphasizing important information in a message, may result in more accurate productions because of increased attention to the act of speaking. The experimental task in the present study was intended to elicit contrastive stress, including concomitant increased attention; however, it may not have done so. It was hoped that the children would employ contrastive stress in the experimental play interaction as a means of contradicting the examiner in response to the examiner's question (e.g., "No, the rake is big" in response to the prompt: "The rake is big. Is the girl big?"). Although the experimental listeners readily accepted what they heard as contrastive stress, the fact that one of the eight target words appeared in each of the 64 experimental items may have eventually caused the children to consider those words as old rather than new information. Furthermore, the behavior of several children suggested that the experimental task may not have evoked the highlighting function of stress and may instead have been treated as a delayed imitation task. For example, one child frequently omitted the negative particle that would have been expected as part of the response to the examiner's yes/no question. Other children occasionally repeated the examiner's question, appearing to have lost track of the target of their imitative production.

It is also possible that stress judgments in the present study may have been influenced by acoustic variables. Mouth-to-microphone distance was controlled by standard placement of the tape recorder microphone, yet subjects were free to move their heads. Head movement could result in relative amplitude changes during the recording of the task and could thereby affect listener perceptions of stress. However, it is difficult to imagine that such an artifact would have occurred systematically and to a degree capable of differentially affecting unstressed over stressed syllables; instead, one would have expected such an artifact to have resulted in a finding of no significant difference related to stress.

Another possible explanation for the finding of slightly but significantly higher rates of judgments of correct /r/ articulation in syllables not receiving primary stress may be a shift of listeners' standards in their judgments of such syllables. Although listeners made judgments related to stress and correctness of /r/ in two separate procedures and made the correctness judgments first, the fact that they heard target words within sentences may have allowed them to use different standards in judging stressed and unstressed syllables. Listeners may adopt more lenient standards of articulation "correctness" in unstressed productions because less precise articulation is usually observed in such cases in adult speakers (Kent & Netsell, 1971). In addition, because syllables with lower levels of stress are usually associated with lower intensity, listeners may have lowered their standards of correctness for less stressed and presumably less intense stimuli.

Further research is needed to provide basic information about production and perceptual factors influencing articulation. Additional information regarding physiologic and acoustic correlates associated with linguistic stress used by young speakers is essential to a better understanding of speech production. Although much information is available for adults, it is still almost wholly lacking for children.

Other studies investigating production might involve modification of the methods used to elicit stress in order to explore the possibility of attentional effects on children's articulatory productions. The purpose of such modifications would be to increase the child's use of contrastive stress to highlight new information. This alternative would also require restricting listener judgments of correctness to /r/ in single words in order to reduce the likelihood of changes in listener criteria.

Listener criteria for perceptual judgments of articulation also warrant further investigation. One such task might involve the addition of a third judgment task, related to the correctness of /r/ productions. In that task, listeners would be asked to make their judgments for the individual target words, excised from the sentences in which they were presented in the judgment task used here. If revised listener criteria were responsible in the present study for the higher percentage of "correct" judgments for /r/ in words receiving nonprimary stress, one would expect a replication of the findings reported here for the condition in which target words are heard in
sentences, but not for the condition in which the target words would be heard alone. Instead, in that condition one might expect either no effect due to stress or the facilitative effect of primary stress reported elsewhere.

Finally, the children observed in the present study were selected in a way designed to assure that they were generally normal in their overall development of articulation skills. Comparable information for children who are not developing normally in this respect may have important implications for both assessment and intervention.

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REFERENCES


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APPENDIX A

FOIL AND TARGET ITEMS

The same experimenter statement was used for all items associated with a stimulus picture. Expected responses are given in parentheses. Stressed words are indicated in italics.

P = Primary Stress Condition; N = Nonprimary Stress Condition; F = Foil Condition

rake

The rake is big.
P: Is the shoe big? (No, the rake is big.)
N: Is the rake little? (No, the rake is big.)
F: What do you do with a rake? (open-ended response)

rat

The rat likes cheese.
P: Does the dog like cheese? (No, the rat likes cheese.)
N: Does the rat like beans? (No, the rat likes cheese.)
F: Do you like cheese? (yes/no response)

rain

The rain is falling.
P: Is the man falling? (No, the rain is falling.)
N: Is the rain stopping? (No, the rain is falling.)
F: Do you like rain? (yes/no response)

wreck

The wreck is bad.
P: Is the window bad? (No, the wreck is bad.)
N: Is the wreck good? (No, the wreck is bad.)
F: What happened? (open-ended response)

grape

The grape is sweet.
P: Is the apple sweet? (No, the grape is sweet.)
N: Is the grape sour? (No, the grape is sweet.)
F: Do you like grapes? (yes/no response)

dress

The dress is nice.
P: Is the girl nice? (No, the dress is nice.)
N: Is the dress ugly? (No, the dress is nice.)
F: What else is the girl wearing? (open-ended response)

grass

The grass is long.
P: Is the sidewalk long? (No, the grass is long.)
N: Is the grass short? (No, the grass is long.)
F: What does grass look like? (open-ended response)

drape

The drape is open.
P: Is the window open? (No, the drape is open.)
N: Is the drape closed? (No, the drape is open.)
F: Are drapes and curtains the same? (yes/no response)

APPENDIX B

Instructions for Scoring Correctness of /r/ Articulation

You have in front of you the child's target responses. Your task is to judge the accuracy of the child's production of /r/ in each sentence. Please score a "+" if the production is acceptable and a "-" if it is not acceptable. Place your assessment to the right of the target sentence. Do not score items for which no target sentence is listed. Please make your judgment immediately. Do you have any questions?

Instructions for Scoring Stress

You have in front of you the child's target responses. Your task is to circle the word which receives the primary stress in the target sentence. When no target sentence is listed, you will not hear the child's response. Ignore that item and I will give you the next item number. Please make your judgment immediately. Do you have any questions?