Interactions Between Fluency and Phonological Disorders: A Case Study

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The acquisition of the basic components of a native communication system evolves relatively quickly for most children. In fact, by the time they are of school age, children control most, if not all, of the major features (e.g., phonology, fluency, semantics, and pragmatics) of speech and language (Gleason, 1985; Smith, 1981; Stoel-Gammon & Dunn, 1985). These communication abilities develop and mature rapidly so that most children produce adult-like communication by 5–6 years of age (Brown, 1973; Kent & Forner, 1979; Smith, 1978). However, the apparent ease with which most children acquire normal communication may be somewhat misleading. Speech-language learning involves the development of a wide variety of complex intellectual, social, perceptual, and sensorimotor competencies. It seems likely then that any delay or disruption to one or more of these processes could be associated with a communication disorder. Additionally, there seems little question that the majority of communication problems have their onset in early childhood—a time of rapid development of these many interrelated competencies.

Traditionally, speech-language pathologists have tended to categorize communication problems in young children as being unitary; however, recent work in the areas of fluency and articulation/phonology has indicated that a considerable number of children have multiple or coexisting (e.g., stuttering and disordered phonology) communication disorders (Blood & Seider, 1981; Nippold, 1990; St. Louis, 1991; St. Louis & Hinzman, 1988). A series of studies by Conture and his colleagues (Conture, 1990; Louko, Edwards, & Conture, 1990; Wolk, Conture, & Edwards, 1990) has encouraged investigation into the coexistence of fluency and phonological disorders. Specifically, these researchers reviewed the literature from 1928 to 1990 documenting the coexistence of fluency and phonological disorders in young children. Although the estimates of the percentage of children having both disorders varied markedly from one study to the next (cf. Blood & Seider, 1981; St. Louis & Hinzman, 1988), in general, it appears that 30%–40% of young stutterers also exhibit articulation/phonological concerns. In contrast, the expected prevalence of phonological disorders in the nonstuttering population is
only 2%–6% (Sommers, Logsdon, & Wright, 1992; Wolk et al., 1990). The present writers’ clinical observations of children having coexisting communication problems have shown that these children are difficult to remediate and present challenging questions regarding their diagnosis, prognosis, and treatment to even experienced speech-language pathologists.

Although the coexistence of fluency and phonological disorders has been documented extensively, there is strikingly little research regarding possible interactions between these two disorders. First, studies would likely yield critical perspectives on the nature, course, and treatment of children with these types of communication problems. Second, research ultimately may provide important theoretical insights into the phonological (Wijnen & Boers, 1994) and/or speech motor (Caruso, 1991) processes in young children with both types of disorders. To our knowledge, there have been no published studies attempting to investigate the possible interaction of coexisting fluency and phonological disorders in young children. The purpose of this study was to examine possible interaction between disordered phonology and stuttering in a boy aged 4;1 (years;months).

**METHOD**

**Subject**

The child selected as the subject for this study was a boy who had been diagnosed at the Kent State University Speech and Hearing Clinic as having both fluency and phonological disorders. The child was given a battery of clinical tests that are routinely administered to children suspected of having both types of disorders. The instruments included in this battery of tests were the Peabody Picture Vocabulary Test–Revised (PPVT–R, Dunn & Dunn, 1981), Form M, the Test of Early Language Development (TELD, Hresko, Reed, & Hammill, 1991), the Goldman-Fristoe Test of Articulation (GFTA, Goldman & Fristoe, 1972), the Khan-Lewis Phonological Analysis (KLPA, Khan & Lewis, 1986), the Stuttering Severity Instrument (SSI, Riley, 1986), and the Columbia Mental Maturity Scale (CMMS, Burgemeister, Hollander Blum, & Lorge, 1972). The tests were administered individually during two 1-hour diagnostic sessions.

Results of the test battery are displayed in Table 1. The data displayed in Table 1 indicate that the child exhibits moderate to severe stuttering behavior, misarticulation of speech sounds, and usage of phonological processes. However, the child’s language and cognitive abilities appear to fall at the lower end of normal limits (within 1 standard deviation of the mean).

It should be noted that the administration of the evaluation of the Stocker probe technique, which associates the level of communication responsibility with frequency of speech disfluency, was attempted. However, the results were considered invalid because of the subject’s consistent response of “nothing” to the majority of questions asked by the examiner (see Conture & Caruso, 1978, for a review of the Stocker probe technique).

Table 1. Summary of test battery results for a boy aged 4;1 (years;months).

<table>
<thead>
<tr>
<th>Clinical test</th>
<th>Raw score</th>
<th>Term score*</th>
<th>Percentile score/rank</th>
<th>Stanine</th>
<th>Age equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peabody Picture Vocabulary Test–Revised</td>
<td>33</td>
<td>89</td>
<td>24</td>
<td>4</td>
<td>3;6</td>
</tr>
<tr>
<td>Test of Early Language Development</td>
<td>8</td>
<td>91</td>
<td>26</td>
<td>NA</td>
<td>3;4</td>
</tr>
<tr>
<td>Articulation/Phonology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goldman-Fristoe Test of Articulation</td>
<td>24</td>
<td>NA</td>
<td>16</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Kahn-Lewis Phonological Analysis</td>
<td>25</td>
<td>NA</td>
<td>24</td>
<td>3</td>
<td>3;4</td>
</tr>
<tr>
<td>Stuttering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stuttering Severity Instrument</td>
<td>22</td>
<td>14</td>
<td>4</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>Cognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia Mental Maturity Scale</td>
<td>28</td>
<td>97</td>
<td>43</td>
<td>5</td>
<td>3;6</td>
</tr>
</tbody>
</table>

*Term test score is used to denote the derived scores from different tests. Test score represents the Peabody Picture Vocabulary Test–Revised standard score equivalent and the Test of Early Language Development language quotient.

Note. NA = not applicable.
**Data Collection**

The subject was audio- and videotaped during two 30-min recording sessions. One session involved interaction between the mother and the child and the other session involved interaction between the examiner and the child. During both interactions, the adult and child were seated at right angles to one another at a small table containing a set of toys and objects that were considered age appropriate for the child under investigation. They were instructed to talk and play using the materials on the table. The setup for the mother–child interaction and the clinician–child interaction was identical, with the exception of a slightly different set of toys and objects being used.

**Apparatus**

The child was recorded in a therapy suite at the Kent State University Speech and Hearing Clinic, which was specifically designed for such interactions (i.e., to maintain a clinical rather than a laboratory ambiance, yet also be suitable for recording acoustic signals; see Caruso, Conture, & Colton, 1988). Therefore, the only instrumentation in this room was a video camera (RCA, Model #V12.5-75M-3) mounted from the ceiling and a microphone (Sony, Model #EMC-50) placed within 6 inches of the subject’s lips.

The video output of the camera was connected via cable to a video control room adjacent to the therapy suite. The video control room contained a television monitor and a VCR that recorded the adult–child interactions used in the study, as well as controls positioning the camera on the child to provide a clear, adequately illuminated view of the youngster’s face and torso. The audio microphone (Sony Model #ECM-50) was part of an FM VHF wireless system (Samson Style TM series), and the audio signal was transmitted electronically to a receiver located in a room adjacent to the suite. A Bell and Howell audiotape recorder (Model #3185A) was connected to the receiver and recorded each interaction.

**General Procedures**

The data analysis involved calculating several measures of language, phonology, and stuttering behavior. The audio- and videotapes of both the mother–child interaction and the clinician–child interaction were reviewed. For each interaction, the adult and child utterances were transcribed orthographically in their entirety. Following completion of the orthographic transcription, the total number of words and utterances for the child, mother, and clinician was determined for both interactions. This information was then used to calculate the number of words spoken per turn (WPT) and the number of utterances produced per turn (UPT) by each speaker. Additionally, the middle 300 words produced by the child and the corresponding adult utterances in each interaction were subjected to a number of language measures. These included the mean length of utterance (MLU) computed in morphemes, the type/token ratio, Brown’s 14 grammatical morphemes (Brown, 1973), and the developmental sentence analysis (DSS). These measures were used in the present study because (a) they have been used extensively by speech-language pathologists; (b) a large body of normative data exists, thereby permitting comparison across communication disorders; and (c) the procedures provide descriptions of language development that have been used with young stutterers (see Conture, 1990; Kelly & Conture, 1992; Miller, 1981; Nippold, 1990).

**Phonological Procedures**

Chomsky and Halle’s (1968) system of distinctive features was used to describe each errored phoneme that was produced by the child by the presence or absence of a set of features. The Chomsky and Halle system was selected for use in this study for the following reasons: (a) It proposed a set of binary features that are applicable to all English phonemes, including both vowels and consonants and (b) it is one of the more extensive analysis systems (Newman, Creaghead, & Secord, 1985). It is widely accepted that the number of features associated with a phoneme is related to the difficulty in correctly producing that phoneme and discriminating it from other sounds (see Newman et al., 1985). Therefore, applying Chomsky and Halle’s analysis of sound errors in a young stutterer may yield critical perspectives regarding the relationship between difficulty of phoneme production and presence of disfluency.

Each phonologically disordered word was placed into one of the following conditions:

I. Phonologically disordered and disfluent—words containing an errored phoneme and produced disfluently

II. Phonologically disordered and adjacent to disfluency—words containing an errored phoneme and produced fluently within three words of a disfluency

III. Phonologically disordered and surrounded by fluent words—words containing an errored phoneme and produced fluently not within three words of a disfluency

**Fluency Procedures**

For each interaction, stuttering behavior was analyzed during the middle 20 min of a 30-min taped session. Stuttering behavior was analyzed in this fashion because it has been suggested that during the initial minutes of communication interaction, the child may be adjusting to the task and environment, whereas during the last several minutes, the child may be more inattentive, fatigued, or restless (Zebrowski, 1987). To assess the nature and severity of the subject’s disfluency, the following measures (see Conture & Caruso, 1987) were obtained: (a) stuttering frequency (central tendency and variability) per 100 words of conversational speech, (b) stuttering duration (seconds, based on 20 randomly selected disfluencies in each interaction), and (c) stuttering type (percentage listed from...
most to least frequently occurring). In addition, measures of both the mother and the clinician’s speech rate and pause time were calculated (see Kelly & Conture, 1992).

**RESULTS**

Data gathered during the mother–child interaction and the clinician–child interaction were examined to determine if the proportion of total words produced by the different adults and the same child were significantly different. Tests of related proportions comparing the number of mother–child and clinician–child spoken responses never approached the .05 level of significance. Table 2 displays additional linguistic data, including words per turn (WPT) and utterances per turn (UPT), that were produced by each speaker within these two interactions. As shown, no significant differences existed in the linguistic complexity used by the different adults or the same child in the two interactions. Thus, the two samples were combined to form one data set.

**Phonology**

Table 3 displays the total number of words that contained an errored phoneme in Conditions I, II, and III. Condition I had 16 occurrences in which both misarticulations and stuttering were made on the same word. These 16 stuttered words contained a total of 9 errored sounds (/m w k l D r T n/). Condition II had 88 fluent words that contained speech misarticulations, and Condition III had 65 fluent misarticulated words. Next, Conditions II and III were reduced to 48 and 50 occurrences, respectively, in an attempt to include fluent words that contained the same 9 errored sounds that were present in Condition I (see Table 4). Unfortunately, the child did not produce all of the 9 errored sounds in Conditions II and III. Condition II contained 7 of the 9 misarticulated sounds found in Condition I (/m w/ were not produced in Condition II). Condition III contained all misarticulated sounds found in Condition I except /m n/. Subsequently, each word containing an errored phoneme was assigned a feature deviation score (FDS), which was calculated by dividing the number of changed features by the total number of features within the bundle for that particular errored sound. An FDS of 0 indicates that the features for the target sound are the same as those delineated by Chomsky and Halle (1968); an FDS of 1 indicates that all features were changed. In addition, each word containing an errored phoneme was analyzed for its consistency of sound production. These consistency scores (CS) were calculated by dividing the number of errored occurrences of a particular sound by the total number of occurrences of that same phoneme and indicating the percentage of time that a particular sound was consistently misarticulated. Table 5 displays the FDS and CS corresponding to the errored sounds in Conditions I, II, and III. Then, these data were collapsed to generate a mean and standard deviation score per condition for both the CS and the FDS (see Table 6). The mean CS for Condition I

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial position</th>
<th>Medial position</th>
<th>Final position</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>16</td>
<td>1</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>II</td>
<td>48</td>
<td>4</td>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>III</td>
<td>50</td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

Table 2. Data summary for various language measures including words per turn (WPT), utterances per turn (UPT), mean length of utterance (MLU), type/token ratio (T/T ratio), and developmental sentence analysis (DSS).

<table>
<thead>
<tr>
<th></th>
<th>Total words</th>
<th>Total utterances</th>
<th>WPT</th>
<th>UPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>1,381</td>
<td>177</td>
<td>7.80</td>
<td>1.69(72)</td>
</tr>
<tr>
<td>Child</td>
<td>686</td>
<td>176</td>
<td>3.90</td>
<td>1.28(72)</td>
</tr>
<tr>
<td>Clinician</td>
<td>1,717</td>
<td>245</td>
<td>7.01</td>
<td>1.69(105)</td>
</tr>
<tr>
<td>Child</td>
<td>752</td>
<td>245</td>
<td>3.07</td>
<td>1.10(105)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>MLU</th>
<th>T/T ratio</th>
<th>Brown’s morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>5.43 (Stage V)</td>
<td>3.50</td>
<td>Stage V + Stage IV</td>
</tr>
<tr>
<td>Child</td>
<td>2.79 (Stage III)</td>
<td>2.96</td>
<td>Stage III</td>
</tr>
<tr>
<td>Clinician</td>
<td>4.29 (Stage V)</td>
<td>3.76</td>
<td>Stage V + Stage IV</td>
</tr>
<tr>
<td>Child</td>
<td>2.78 (Stage III)</td>
<td>2.53</td>
<td>Stage III</td>
</tr>
</tbody>
</table>

Table 3. Number of words containing any and all errored phonemes produced by the child in Conditions I–III.
was 95.3% (SD = .034), which was significantly greater than that of Condition II (M = 65.3%, SD = .113) and Condition III (M = 69.8%, SD = .119). The mean FDS for Condition I was .394 (SD = .272), .565 (SD = .208) for Condition II, and .538 (SD = .222) for Condition III.

Disfluency

Tables 7 and 8 display measures of stuttering behavior for the child during each conversational interaction (mother–child and clinician–child). The mean stuttering frequency exhibited by the participant while interacting with the mother (11.2 stutterings per 100 words of conversational speech, range from 7% to 14% disfluent) and clinician (12 stutterings per 100 words of conversational speech, range from 8% to 15% disfluent) were similar. The duration of the disfluencies produced by the child ranged from the examiner’s reaction time to 5.28 seconds (M duration = .96 seconds) with the mother and 3.00 seconds (M duration = 1.15 seconds) with the clinician. The child produced the following disfluency types across the two interactions: inaudible sound prolongation, sound-syllable repetitions, whole-word repetitions, audible sound prolongations, phrase repetitions, and revisions. The stuttering behaviors demonstrated by the child did not differ significantly between the mother–child and clinician–child interactions.

Interaction Between Phonology and Fluency Measures

Because Condition I contained only 16 phonologically disordered and stuttered words, 16 words in the latter two conditions were selected using a table of random numbers. Thus, each of the three conditions had an N of 16 words. Next, Brown’s (1945) word weights were applied to each

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**Table 5.** Data summary of consistency score (CS) (in percentages) and feature deviation score (FDS) for the errored sounds found in Conditions I–III. For example, a CS of .98 indicates that a sound was misarticulated consistently 98% of the time. An FDS of 0 indicates that the features are the same as those delineated by Chomsky and Halle (1968); an FDS of 1 indicates that all features were changed.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Initial position</th>
<th>Medial position</th>
<th>Final position</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS FDS</td>
<td>CS FDS</td>
<td>CS FDS</td>
<td></td>
</tr>
<tr>
<td>Cond. I</td>
<td>m .98 .538</td>
<td>w .98 .385</td>
<td>k .98 .077</td>
</tr>
<tr>
<td></td>
<td>l .93 .692</td>
<td>δ .97 .077</td>
<td>r .98 .615</td>
</tr>
<tr>
<td></td>
<td>d9 .90 .231</td>
<td>θ .87 .154</td>
<td>n .98 .615</td>
</tr>
<tr>
<td>Cond. II</td>
<td>NA .538</td>
<td>50 .154</td>
<td>99 .615</td>
</tr>
<tr>
<td></td>
<td>NA .385</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cond. III</td>
<td>NA .538</td>
<td></td>
<td>.615</td>
</tr>
</tbody>
</table>

**Note.** NA = indicates that no instances of that phoneme occurred in the corresponding condition.

**Table 6.** Mean and standard deviation of consistency scores and feature deviation scores in Conditions I–III.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Consistency score</th>
<th>Feature deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 16 words</td>
<td>N = 48 words</td>
</tr>
<tr>
<td></td>
<td>(stuttered)</td>
<td>(fluent)</td>
</tr>
<tr>
<td>Cond. I</td>
<td>Mean 95.3</td>
<td>65.3</td>
</tr>
<tr>
<td></td>
<td>Standard deviation .034</td>
<td>.113</td>
</tr>
<tr>
<td>Cond. II</td>
<td>Mean .394</td>
<td>.565</td>
</tr>
<tr>
<td></td>
<td>Standard deviation .272</td>
<td>.208</td>
</tr>
</tbody>
</table>

**Table 7.** Mean and range of stuttering frequency and duration produced by the child in each interaction. Types of stuttering behavior are displayed from most to least frequently occurring.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Mother–child interaction</td>
<td>11.2%</td>
<td>7–14%</td>
</tr>
<tr>
<td>Clinician–child interaction</td>
<td>12%</td>
<td>8–15%</td>
</tr>
</tbody>
</table>

**Table 8.** Mean and range for speech rate and pause time demonstrated by the adults in each interaction.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Speech rate</th>
<th>Pause time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Mother</td>
<td>166 wpm</td>
<td>.15–6.59 seconds</td>
</tr>
<tr>
<td>Clinician</td>
<td>201 wpm</td>
<td>.31–19.22 seconds</td>
</tr>
</tbody>
</table>

**Note.** wpm = words per minute.
phonologically disordered word (fluent and stuttered) in the
three conditions. Table 9 shows the mean and standard
deviation for the CS and the FDS as well as word weight
values for the 16 words in Conditions I, II, and III.

A Spearman correlation coefficient of 0.067 was found
between word weight values (Brown, 1945) and CS and a
non-significant relationship between word weight measures
and experimental condition was also determined. The extent
to which measures of word weight and consistency were
significantly different across Conditions I–III was tested in
two analyses of variance (ANOVAs). Each ANOVA showed
significant heterogeneity of group variance; thus, the raw
scores were transformed into log scores and the ANOVAs
were repeated on logs, which then were found free of
heterogeneity of variances. The result of the ANOVA of
word weight measures across Conditions I–III was nonsig-
ificant \[ F(2, 45) = 32.03, p < .001 \]. Subsequent Newman-Kuels means
comparisons tests revealed that the mean CS for Condition
I of 93.5% (SD = 4.56) was significantly greater than that
of Condition II (M = 65.2%, SD = 12.81) and Condition III
(M = 64.8%, SD = 18).

### DISCUSSION

The present investigation examined the possible interaction
between disordered phonology and stuttering in a
preschooler’s speech production. Results of the present
study indicated that words containing those speech sounds
that the child consistently misarticulated had a greater
probability of being produced disfluently as compared to
words that contained sounds that the child inconsistently
misarticulated. Furthermore, when controlling for the
number of fluent and stuttered words, FDSs were highest
for words that were adjacent to stuttered words. This
finding suggests that the occurrence of a disfluency
contaminates or exacerbates phonological production in
adjacent, fluent words. Finally, results of this case study
argue for further investigation with large groups of children
having coexisting fluency and phonological disorders.

### Implications for Future Investigations

To date, much literature is available regarding the nature of
speech disfluencies in young stutterers and the nature of
phonological difficulties in young children; moreover, there
is a still growing body of literature documenting the
coexistence of these two disorders in young children (e.g.,
Wolk et al., 1990). Unfortunately, the number of studies
investigating the possible interaction between fluency and
phonological disorders has not kept pace with the studies
documenting their coexistence.

The present findings, albeit limited to a relatively small
speech sample from only one child, are nonetheless compel-
ling and argue for further research on large numbers of the
following: (a) children with normal fluency and phonology,
(b) children with disordered phonology, (c) children with
disordered fluency, and (d) children with both disordered
phonology and stuttering. Such research may yield critical
perspectives regarding the nature of speech misarticulations
produced by young stutterers. In essence, it remains to be
determined if the nature of stutterers’ speech misarticulations
is different in degree or kind from those of normally
nonfluent children with and without disordered phonology.

It should be noted that we are not the first to advocate
studies designed to examine the communication abilities of
different groups of children (e.g., Louko et al., 1990;
Nippold, 1990). There are several reasons why a study like
the one described herein has been suggested more often
than it has been realized. First, such an approach requires
researchers in the areas of stuttering and phonology to
adhere to a unified theoretical framework regarding the
timing and positioning of the articulators. Second, it
necessitates the availability of large numbers of various
groups of children for investigation. Finally, it requires that
both phonology and fluency characteristics be measured in
a consistent, uniform manner across the different subject
groups.

Studies looking at the four groups of children described
above would likely contribute to important clinical gains. It
may be that there are unique diagnostic, prognostic, and
treatment implications for children who exhibit both
stuttering and disordered phonology, and that the current
level of sophistication of our clinical tools for communica-
tion disorders is not refined enough to detect possible
differences among “subgroups” of stutterers (Conture &
Caruso, 1987; Preus, 1981; Schwartz & Conture, 1988). As
stated previously (Caruso, 1991), the idea that there are
subgroups of stutterers has influenced both our clinical and
our research endeavors to such an extent that nowadays,
most clinicians/researchers would agree that all stutterers
are not uniformly comprised or impaired in one or some
combination of the various abilities involved in speech

Table 9. Mean and standard deviation of the 16 words in Condition I–III corresponding to the
consistency score, word weight value, and feature deviation score.

<table>
<thead>
<tr>
<th></th>
<th>Condition I</th>
<th>Condition II</th>
<th>Condition III</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>93.5000</td>
<td>65.2000</td>
<td>64.8000</td>
</tr>
<tr>
<td>SD</td>
<td>4.5610</td>
<td>12.8130</td>
<td>18.000</td>
</tr>
<tr>
<td>Consistency score</td>
<td>93.5000</td>
<td>65.2000</td>
<td>64.8000</td>
</tr>
<tr>
<td>Word weight value</td>
<td>3.1250</td>
<td>3.0000</td>
<td>3.3750</td>
</tr>
<tr>
<td>Feature deviation score</td>
<td>.3941</td>
<td>.6007</td>
<td>.3413</td>
</tr>
</tbody>
</table>

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production (e.g., articulatory, neuromotor, cognitive, and linguistic). This current thinking indicates that differences among children who stutter (e.g., those with and without phonological disorders) are just as important as differences between young stutterers and their normally fluent peers. Moreover, it seems apparent that clinical procedures used to document changes in stuttering throughout the course of fluency development or progress as a result of treatment need to be developed further so that they are more appropriate for children with multiple communication disorders.

Speculations About Speech Sound Consistency and Concurrent Disfluencies

This child’s tendency to become disfluent on words that begin with more consistently defective consonants may relate to less knowledge and skill in the production of such sounds. The deficiencies associated with consistent versus inconsistent speech sound production are largely unknown. It is common in articulation therapy to assume that speech sounds that are defective consistently may be more resistant to normal developmental changes in young children (Brungard, 1961; McDonald & McDonald, 1974). Thus, consistency may address a “developmental readiness condition” and may be considered more of a measure of defectiveness per se than severity, because it has been linked to continued difficulties in accurate sound production over various spans of time.

If the auditory image of a phoneme is in conflict with a child’s production abilities, as may be the case when a child has a consistently defective production variant, greater anxiety about speech performance may be created. Thus, disruptions in the speech signal and resultant awareness on the part of the child related to inadequate phoneme production may manifest themselves in even greater difficulties in speech motor control, because many parameters of accurate speech production related to phonology and fluency are impaired concurrently. This notion, of course, implies causality, because the defective phonological aspect is thought to “trigger” the occurrence of the defective fluency skills. Because few if any hypotheses related to the coexistence of the two speech disorders appear to have been stated, this speculation is offered rather cautiously at this time. We believe, however, that an advantage of this speculation is that it is testable as stated and empirical data could address this notion and others to aid in the understanding of this duality of communication disorders.

A Speech Motor Coordination Perspective

Accurate *positioning* and precise *timing* are obligatory for articulatory coordination underlying fluent speech. As stated previously (Caruso, Abbs, & Gracco, 1988), one of the most widely accepted hypotheses regarding stuttering is that this disorder is associated with a breakdown in articulatory coordination. It appears, however, that stuttering *differentially* affects temporal and spatial parameters of coordination. This dichotomy is consistent with the hypothesis that articulatory timing is controlled separately from positioning in normal adult speakers (Gracco & Abbs, 1986). Indeed, a distinctive characteristic of stuttering is the ability to reach the correct articulatory target for a particular speech sound coupled with an inability to time the movement into or away from that position to the position for a subsequent sound (see Caruso, 1991). Thus, stuttering is often referred to as a disorder of timing.

Extending this framework to articulation disorders would lead to a classification as a disorder of positioning. In essence, children with articulation disorders have the ability to time the movements into or away from articulatory postures, but an inability to achieve the correct or precise position for a particular sound. The coexistence and interaction between misarticulation and stuttering in a child may be associated with a more complete breakdown in articulatory coordination in which temporal (stuttering) and spatial (misarticulation) are impaired more equitably. If so, the child with these two coexisting disorders may be less able to make adjustments or compensations during speech production. This may be one reason why, in our clinical experience, it is difficult to document progress in the treatment of children with coexisting articulation/fluency disorders.

CONCLUSION

It is tempting to speculate that the present findings support the hypothesis that stuttering is associated with a “central deficit” involving difficulties in the process of phonological encoding (Wijnen & Boers, 1994). Alternatively, it is tempting to speculate that the present findings support the hypothesis that people who stutter are impaired in coordination for speech (Caruso, 1991). However, definitive conclusions based on the findings of this limited speech sample from one young child are premature. If these findings are replicated with large groups of normally fluent children and young stutterers, with and without coexisting phonology disorders, researchers may be forced to modify their view of the underlying processes involved in the programming and execution of speech. Subsequently, clinicians could no longer treat the manifestations of coexisting fluency and phonological disorders sequentially or as autonomous problems, but instead would address a common underlying process that either is associated with or contributes to timing and positioning errors in these young children.

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