Non-Word Repetition by School Age Children Who Stutter

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Introduction

Performance on nonword repetition has been linked to language acquisition, auditory memory ability and reading skills (Gathercole & Baddeley, 1990; Gathercole, Willis, Emslie & Baddeley, 1991; Snowling, Goulandris, Bowlby, & Howell, 1986). It has been speculated that children who stutter, or a subgroup of children who stutter, may have subtle phonological, language, or auditory memory issues. The Children's Test of Nonword Repetition (CNRep) involves repeating 40 nonwords, 10 each at the following syllable lengths: 2-syllable, 3-syllable, 4-syllable, and 5-syllables (Gathercole, Willis, Emslie & Baddeley, 1991).

Two investigations examined nonword repetition in children who stutter. Hakim and Ratner (2004) studied 16 children (8 who stutter; 8 control) 4 to 8 years of age. Children who stutter made more errors than controls, but differences were only significant for 3-syllable stimuli. Disfluency increased with increased nonword length for only 2 of the 8 children who stutter. Anderson, Wagovich, & Hall (2006) studied 24 children (12 who stutter; 12 control) 3 to 5 years of age. They found significant differences in number of words in error between the groups for 2- and 3-syllable stimuli only. Numbers of phoneme errors differed significantly only for 3-syllable stimuli. Specific types of phonemic errors or disfluencies were not analyzed in either study.

The purpose of this investigation was to examine nonword repetition performance in school-age children ages 8 to 12 who stutter, with special attention to the frequencies and types of phoneme errors and disfluencies.

Method

Participants. Participants were 14 children (11 males, 3 females) who stutter and 11 who do not (9 males, 2 females) between the ages of 8½ and 12½ years. All spoke American English as their primary language. The experimental group consisted of 8 Caucasian and 6 African American children. The control group consisted of 7 Caucasian and 4 African American children. The children who stutter had been identified as stuttering at the time of the study by at least one parent and two speech pathologists. All had been stuttering for at least one year. All the children were administered the Peabody Picture Vocabulary Test (PPVT). They scored within the range of 88 and 143 with a mean score of 110. The mean for the stuttering group was 109 (sd =13), and the mean for the control group was 113 (sd=16). Articulation was screened informally and judged to be normal based on a 600-syllable sample of spontaneous speech. All participants passed a bilateral pure tone hearing screening.

Testing Procedure. Participants were tested in a sound-treated booth in one session. The nonword repetition task was presented from audiocassette playback delivered via headphones. The stimulus set was presented in a standard randomized order, sequenced by syllable length, with a 3- to 4-second interval for response between nonword stimulus delivery. Simultaneous audiovisual recordings were made on VHS videocassette and DVD. The speech signal was transmitted via lapel and omnidirectional boundary microphones, and recorded on high quality audiovisual recording tapes and diskettes.

Scoring and Analyses. Responses were scored during replay analysis of the audiovisual recordings after the session. Examiners played back the production as many times as needed to be confident of scoring. The frequency of phoneme errors per nonword was scored based on types: substitution, deletion, and insertion. The frequency of disfluencies per nonword was scored based on types: sound/syllable repetition, multisyllabic repetition, dysrhythmic phonation. Differences in spoken productions that represented dialectal variations were not counted as errors. Sound/syllable repetition and dysrhythmic phonation are considered to be directly stuttering-related, but multisyllabic repetitions are considered to be accessory or secondary behavior. For purposes of statistical analysis, significance levels were set at .05.

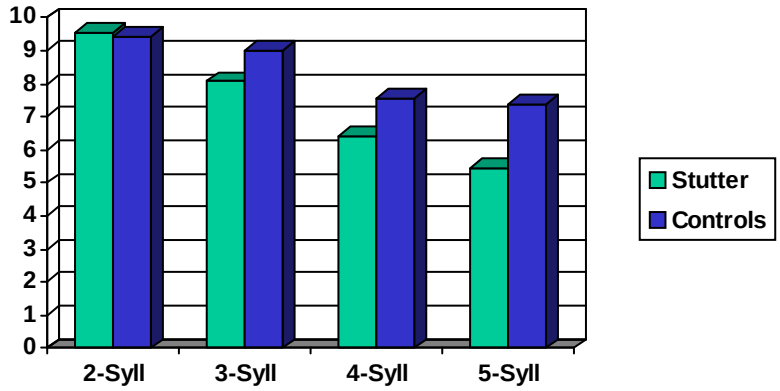
Reliability. Interjudge agreement was based on random selection from more than 30% of the

samples (4 children who stutter; 4 control). Point-to-point agreement for words correct was 96% for children who stutter and 88% for controls. For phoneme errors, it was 87% for children who stutter and 95% for controls. These levels were comparable to those reported in previously published research.

Results

Mean Number of Correct Responses by Syllable Length. Both groups produced fewer correct responses with increased syllable length. A repeated measures ANOVA revealed group differences were not significant. The main effect for syllable length, and the interaction were significant. Post-hoc analyses revealed all syllable length comparisons were significantly different except those between the two- and three-syllable length stimuli. At the 5-syllable level, controls had a significantly greater number of words correct.

Figure 1. Mean Number of Words Correct by Syllable Length on Nonwords by Children Who Stutter (n=14) and Controls (n=11).



Mean Phoneme Errors per Type per Syllable Length. Both groups evidenced an increased frequency in the various types of phoneme errors as syllable length increased. The most to least common error types for both groups of children were: substitutions, deletions, insertions. The two groups revealed a similar pattern in the relative proportions of the error types across syllable lengths.

Figure 2. Mean Phoneme Errors by Type by Syllable Length on NonWords by Children Who Stutter (n=14)

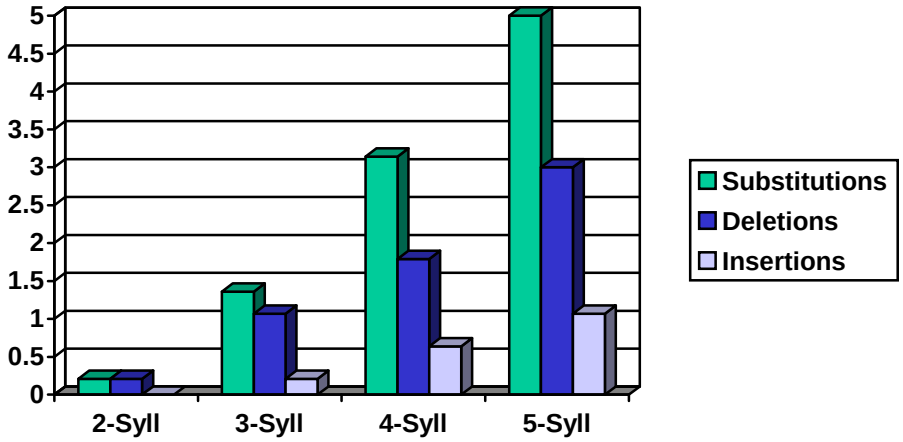
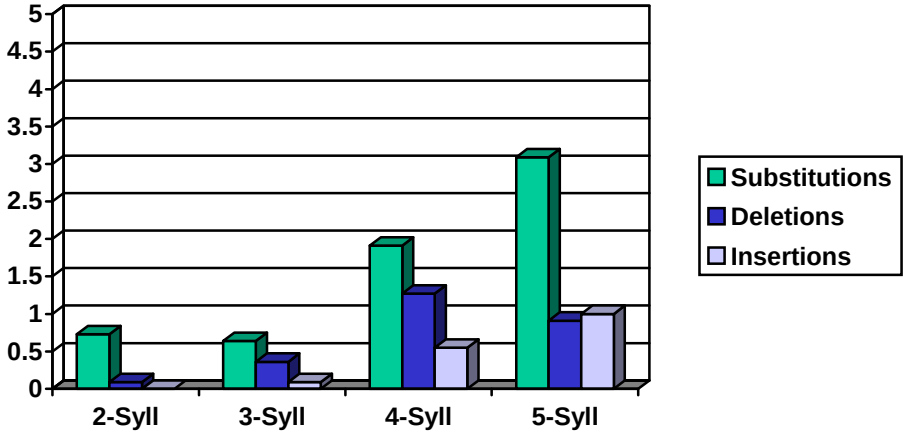
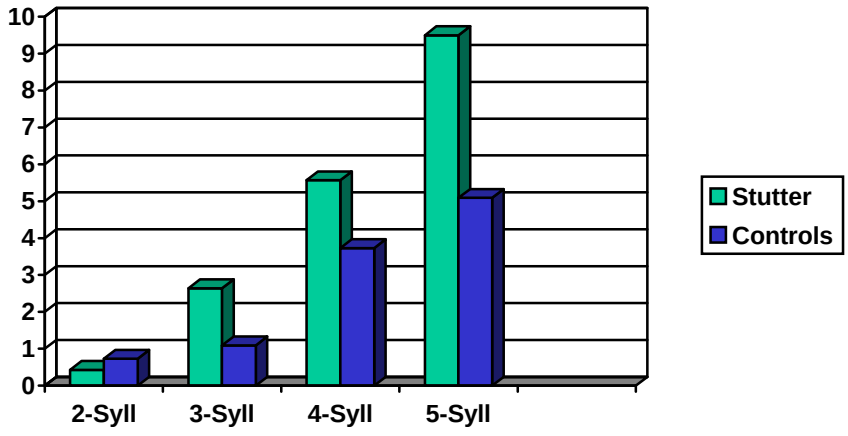


Figure 3. Mean Phoneme Errors by Type by Syllable Length on Nonwords by Controls (n=11)



Mean Phoneme Errors per Syllable Length. Both groups produced increased phonemic errors with increased syllable length. A repeated measures ANOVA revealed the main effect for group was not significant The main effect for syllable length was significant, but the interaction was not. Post-hoc analyses revealed significant differences among all syllable length comparisons.

Figure 4. Mean Number of Phoneme Errors by Syllable Length on Nonwords by Children Who Stutter (n=14) and Controls (n=11)



Mean Disfluencies by Syllable Type. The children who stutter produced more disfluencies overall on the non-words than the non-stuttering children. Their stuttering-like disfluencies of sound/syllable repetitions and dysrhythmic phonations occurred more frequently than multisyllable repetitions (not stuttering-like). Disfluency frequency increased with syllable length for the children who stutter. A similar but less linear pattern across syllable length was produced by the controls.

Figure 5. Mean Disfluencies by Type by Syllable Length on NonWords by Children Who Stutter (n=14)

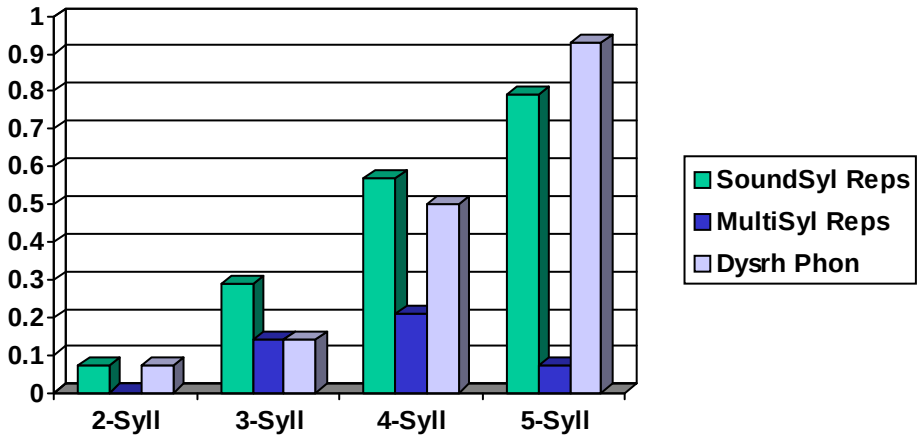
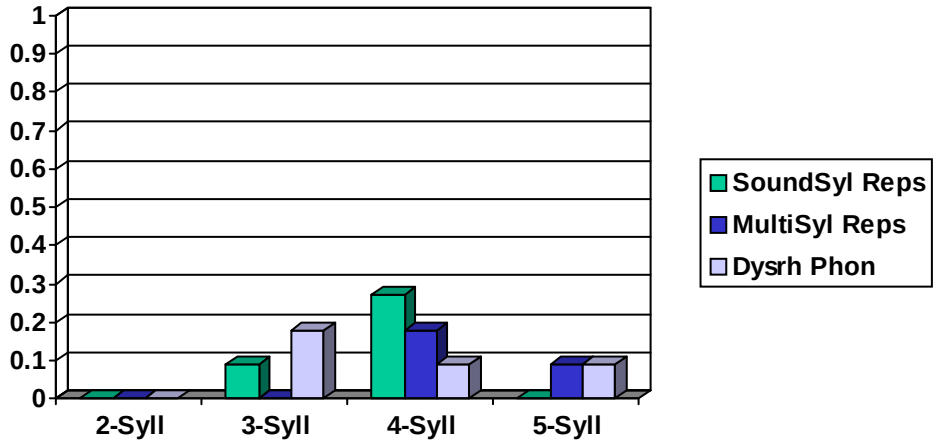


Figure 6. Mean Disfluencies by Type by Syllable Length on Nonwords by Controls (n=11)



Cluster Analysis. Cluster analysis was performed to examine potential subtypes based on their performance on the CNRep. Results differentiated two groups of children based on their frequencies and pattern of phoneme errors across syllable lengths. One cluster of children who made the fewest errors consisted of 5 who stutter and 8 controls. A cluster with greater errors was comprised of 8 who stutter and 3 controls. Finally, one child who stutters, who made the most errors, was in a cluster by himself.

Discussion

This investigation suggested that overall, the nonword repetition abilities of school-age children who stutter may not differ from those of children who do not stutter. Additionally, both groups demonstrated increased:

a) frequency of phoneme errors with increased syllable length
b) substitution phoneme errors compared to insertions or deletions
c) disfluency frequency with increased syllable length

The findings suggest there are apt to be subgroups of children who stutter comprised of some

who are stronger and others who are weaker in nonword repetition ability. The existence of the different groups implies clinicians must not approach therapy as if "one size fits all.

In this study a majority of the subgroup with lower performance on the nonword repetition task were children who stutter. Although weaker nonword repetition ability can not be considered to characterize children who stutter, a weaker ability may represent a risk factor for stuttering. That is, children with a weaker ability may be more vulnerable to persistent stuttering.

Additional research is needed to replicate these findings with greater numbers of participants. Additional ages should also be studied. The loci of phoneme errors on nonword repetition should also be examined.

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Acknowledgments

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