PHONOLOGICAL INFLUENCES ON CHILDREN'S SENTENCE REPETITION

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ABSTRACT

Seven language-disordered children repeated sentences varied in syllable complexity and representing eight types of grammatical constructions. Syllable complexity caused a significant increase in syntactic errors. The effects of syllable complexity on the sentence types were described and found to be largely quantitative effecting the eight grammatical constructs in differing degrees. Inadequacies in the length/complexity view of children's sentence repetition are discussed and a complexity compounding explanation is suggested.

Sentence repetition has been used widely to assess the expressive linguistic abilities of language-disordered children (Carrow, 1974). A child is directed to imitate a set of sentences containing a variety of developmental grammatical features, and omission, substitution, addition and transposition errors are noted. The sentence errors are evaluated, norms are consulted, and conclusions are reached about the child's language status.

There are two classic explanations of the sentence repetition errors language-disordered children make. The first is the sentence length explanation (Menyuk, 1969; Menyuk and Looney, 1972; Saxman and Miller, 1973; Weiner, 1969). This position holds that language-disordered children have limited short-term memory capacity for sentence material, and when this capacity is exceeded, the accuracy of sentence repetition deteriorates. Menyuk's (1969, pp. 123-143) early study provided support for this hypothesis. For a group of subjects between the ages of 3;0 and 5;10 years a significant correlation was found between the length of sentences repeated and incorrect production. The children, who did not appear to be processing the linguistic structure of sentences presented, tended to repeat the last words heard. One three-year-old (Menyuk, 1969, p. 139) was given the sentence, *I don't know what he's doing,* and said, "Doing".

The second explanation is the linguistic complexity explanation (Carrow, 1974; Menyuk, 1969; Menyuk and Looney, 1972). This position holds that it is in the internal linguistic complexity of sentences which determines the accuracy of children's sentence repetition. Menyuk with Looney (1972) provided support for this hypothesis too. Language-disordered children between the ages of 4;5 and 7;9 years repeated declarative, imperative, negative, and question sentences which were all within a controlled length of five words each. There was significant variation in the difficulty of the sentence types. Difficulty of repetition was attributed to the transformational complexity of the sentences, as sentence length was not a factor in repetition accuracy.

In this paper we present evidence from an investigation of phonological aspects of sentence repetition which prompts reevaluation of the length and the complexity explanations. Our study, conducted with young language-disordered children, was based on the working assumption that a subject repeating a given sentence must process, not only a string of morphemes marking syntactic categories, but also a string of syllables defining the phonological structure of the sentence (Panagos, Quine and Klich, 1979). Since language-disordered children typically display phonological deficits in addition to syntactic deficiencies (Menyuk, 1969; Menyuk and Looney, 1972; Panagos, 1974; Weiner, 1969), we reasoned that some of their syntactic inaccuracies could arise from difficulties *pronouncing* sentences. As it turned out, our suspicion was confirmed, and we are obliged to rethink existing explanations of children's sentence repetition.

METHOD

Subjects

The subjects were seven language-disordered children selected from the Kent State university Speech and Hearing Clinic. The three female and four male subjects ranged in age from three years eight months to five years two months (mean = 4;11). All of the children exhibited articulation and language deficits. Inspection of the test files indicated that all of the children's test scores fell below norms of either the Carrow Elicited Language Test or the Northwest Syntax Screening Test. In addition their hearing was reported to be within normal limits and no gross neurological, physical, or emotional impairments were noted. The children were from similar socioeconomic background.

Stimulus Material

Eight sentence types (six each or 48 sentences) were used: conjunction (*The car and bus stopped in the road*), reflexive (*The boy helped himself to the cake*), active (*The boy sipped the pop at the zoo*), negative (*The hat did not hang on the hook*), passive (*The soup was heated by the cook*), wh-verbing question (*What is the child kicking in the gym*), yes/no question (*Did the bird lay an egg in the nest*), and relative clause (*The nurse helped my pal who was sick*). Three sentences for each type were constructed to be either phonologically simple or phonologically complex. The simple-complex sentences were paired so that there was a complex sentence with the same syntactic structure as the simple sentence (*The baby hugged the toy which was soft* versus *The grandmother washed the mirror which was broken*). The 24 simple strings were eight or nine syllables in length (mean = 8.33). The 24 complex strings were composed of 12 or 13 syllables each (mean = 12.21). The majority of the sentences were eight or nine morphemes each. Sentences were randomized for presentation.

Procedure

Each child was tested individually in a clinic room. The child was instructed to say the sentence after the experimenter. Three practice sentences were given prior to testing. Each sentence was read to the subject and the subject's error responses were noted on a prepared score sheet. The sentence was presented a second or third time upon request, or when no response was made. All responses were tape-recorded. After testing, the written record of responses was compared with the tape recording and corrected for accuracy. Repetition errors included words omitted, substituted, added or transposed. The response, "A cook was heated up by soup", to the simple passive type sentence, *The soup was heated by the cook*, has an error in each of the four categories. In the example *a* is substituted for *the, cook* and *soup* are both transposed, *up* is added and *the* is deleted.

RESULTS

Of the total 336 sentences repeated by the seven children, 69% had one or more syntactic errors. Omission errors comprised 78% of the total errors, followed by substitutions with 17% and additions and transpositions with 4% and 1% respectively. Thus simplification of sentence structure in the form of syntactic omissions was the major error process operating during sentence repetition.

All seven children made more syntactic errors in the complex strings than in the simple ones. Table 1 presents a description of the error patterns observed for the eight sentence types. The omission of function words, particularly articles, prepositions, pronouns, and auxiliaries, accounted for most of the errors noted in the simple strings. In the complex strings those errors occurred more frequently without noteworthy shifts in the

pattern of response. The interpretation that the effect of phonological complexity on sentence repetition was chiefly quantitative in nature was reinforced by a high subjects correlation ($r = .95$) between simple and complex strings.

TABLE 1

PATTERNS OF SYNTACTIC ERRORS FOR SIMPLE AND COMPLEX PHONOLOGICAL STRINGS

Sentence Type	Simple Strings	Complex Strings
Conjunction	article deletion; few cases of *the* addition; subject transposition noted twice	article deletion increased; addition of *the* and transpositions remained constant; increase in deletion or substitution of one of the two nouns appearing in the subject position
Reflexive	tendency for article deletion; deletion or substitution of *himself, herself*	slight decrease in article deletion; slight increase in *himself, herself* deletion
Active	tendency to omit articles, few errors of nouns, verbs, or prepositions	increase in article deletion; substitution or deletion of nouns, verbs, and prepositions increased slightly
Negative	tendency to delete articles; contraction of negative (scored as correct); some *not* deletion	pattern remained the same
Passive	mainly errors of article and auxiliary (*was*) deletion	slight increase in article and preposition deletions; *was* deletion remained the same
Wh-Verbing	article and *is* deletions	slight decrease in *is* deletion; slight increase in *the* deletion
Yes/No	errors mainly article and *did* deletions	pattern remained the same
Relative Clause	greatest number of errors of deletion or substitution of pronouns (*who, that, which*); article and auxiliary (*was*) deletions	approximately the same number of article, pronoun, and auxiliary errors; tendency to delete complete clauses or phrases

Table 2 presents a summary of the error data for sentence types and phonological strings. The number of errors noted in the simple strings ranged from 24 errors (conjunction) to 46 errors (relative clause). The mean number of errors was 33.75. In the complex strings errors ranged from 28 (reflexive) to 64 (relative clause) with 43.63 as the mean. The difference overall between the simple and the complex strings was statistically significant ($t = 2.45$, $df = 6$, $p = 0.05$). Linguistic complexity added to the phonological component of sentence repetition caused the children to make many syntactic errors which cannot be attributed to the syntactic properties of the target sentences.

TABLE 2

DESCRIPTIVE STATISTICS FOR SENTENCE TYPES AND PHONOLOGICAL STRINGS

Sentence Type	Rank	f	Median	Mean	SD
		Simple Strings			
Conjunction	1	24	2	3.43	3.26
Reflexive	2	26	5	3.71	3.04
Active	3.5	29	2	4.14	4.52
Negative	3.5	29	2	4.14	4.85
Passive	5	36	6	5.14	3.76
Wh-Verbing	6	38	4	5.43	5.38
Yes/No	7	44	6	6.29	5.50
Relative Clause	8	46	7	6.57	3.99
		Complex Strings			
Conjunction	4.5	44	7	6.29	3.82
Reflexive	1	28	4	4.00	2.89
Active	7	53	6	7.57	5.44
Negative	2	31	2	4.43	4.65
Passive	3	39	8	5.57	4.12
Wh-Verbing	6	45	3	6.43	7.37
Yes/No	4.5	44	6	6.29	5.15
Relative Clause	8	64	9	9.14	6.47

The rank order of sentence types, combining the error data for the simple and complex strings, was as follows: reflexive, negative, conjunction, passive, active, wh-verbing, yes/no, and relative clause. This hierarchy of sentence production difficulty roughly parallels the findings of Menyuk and Looney (1972) where phonological complexity was not considered. Inspection of the rank orders (Table 2) shows that the sentence types were not affected by complexity to the same extent. Passive, negative, reflexive, and yes/no sentences showed slight increases at most, whereas active, relative clause, conjunction, and wh-verbing sentences showed substantial increases. There was a moderate sentence types correlation ($r = .57$) found between the simple and complex versions of the sentences. The relative difficulty of a sentence construction does not appear to depend solely on syntactic patterning.

DISCUSSION

Our findings concerning children's repetitions of selected types of sentence constructions are consistent with the traditional work. Subjects simplified sentences in production and

made an increasing number of errors as a function of the internal linguistic complexity of the eight sentence types. Relative clause, for example, is an embedded sentence which proved to be much more difficult to repeat than some of the simple constructions. However, beyond the syntactic influences operating on sentence repetition, the addition of phonological complexity to the sentences caused even greater simplification of structure. Moreover, the two factors of syntactic and phonological complexity combined to further disrupt sentence productions. Clearly, when we say that children's phonological deficits are interrelated with their syntactic deficits (Menyuk and Looney, 1972; Panagos, 1974) we must go a step further and say that the relationship is a casual one (Panagos, Quine, and Klich, 1979).

To return to the issue of the inadequacies of the length and complexity explanations we see that the flaw in both is a simple one: syntactic structure in sentences is only one source of length and complexity. Crystal, Fletcher and Garman (1976, p. 10), in their critique of complexity models have this to say about the problem of measuring the linguistic properties of sentences:

> ". . . even assuming that the units to be measured have been agreed, one still has to decide which units of measurement to use, and attempt to apply this measuring-rod consistently. There are many possible contenders for units of measurement — words, morphemes, intonation-units, syllables, stressed syllables, phonemes — and results will vary depending on which unit you choose."

Variations in structural complexity and length, therefore, can occur at several levels of sentence organization and any level of structure could disrupt a child's sentence production.

In a previous study (Panagos, Quine, and Klich, 1979) similar in many ways to the present one, a group of language delayed subjects made more articulatory errors when syntactic and phonological complexity was increased. As in this study, the two sources of complexity "ganged up" on the children to reduce the accuracy of production. We suggested an explanation of the data which is applicable here. The total complexity of a sentence should be analyzed in terms of a single hierarchy of linguistic elements extending from syntactic constituents to phonetic features. Because of the interdependence of structural elements, complexity added at any one level adds complexity to the entire sentence and may disrupt processing at other levels of the sentence. A degree of parallel processing much like that which takes place during sentence comprehension (Marslen-Wilson, 1975) would appear to be required during sentence formulation.

An analysis of the relative clause, *The nurse helped my pal who was sick*, used in our study, should serve to clarify the problem. The sentence is analyzed at both the syntactic and phonological levels, two distinctly different levels of linguistic representation.

Syntactic Representation: NP + V + NP + S

Phonological Representation: /ðə nɜs hɛlpt maɪ pæl hu wʌz sɪk/

When a child reproduces this sentence he must process simultaneously the syntactic elements, including the embedded sentence, and the phonological elements, including syllables, segments and features. Complexity on either level may disrupt performance on the other.

There is some evidence from the developmental literature which lends support to the parallel processing view of sentence formulation. Clark (1974) argued that young normal children with limited sentence processing capacities face the problem of controlling and integrating semantic, syntactic and phonological elements which compete during encoding for processing space. Clark's son Adam, for example, developed phonetic control over tense forms while showing little or no semantic processing of them. Waterson (1978), likewise, described instances of syntactic and phonological trade-offs in the speech of her son. When the child was attempting to produce more complex phonological structures his syntactic structures become more

repetitive and simple. Waterson argued for the position that levels of linguistic structure develop in parallel and interact considerably during sentence formulation. The effects observed in this study, therefore, may have significance beyond clinical theory.

We offer a final note about assessing the clinical status of the language-disordered child with sentence repetition tasks. It seems that practitioners would be well advised to evaluate, in addition to separate components of structural deficit, the manner in which such deficits interact during sentence production. For example, the omission of the article *the*, a commonly observed linguistic error, may well indicate a deficiency in the formulation of noun phrases as traditionally assumed (Menyuk, 1969). However, it may also indicate that the child is having difficulty saying the *th* consonant and simply omits the word containing it. Sorting out such details at the two levels of expression should lead to more accurate diagnostic and remedial decisions.

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