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Exploring the Oral and Written Language Errors Made by Language Disabled Children

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Clinical observation of children who exhibit both oral and written language disabilities has suggested that there may be parallels in their error patterns in speaking, reading, and writing that merit further investigation. The similarities are apparent in the problems these children have in many aspects of linguistic function—in word retrieval, morphology, phonology, and syntax. Thus, these children substitute "potato" for *tomato* in speaking, reading, and writing. They omit grammatical tense or plural markers when speaking and do the same when reading and writing. They order the sounds incorrectly when speaking certain words and also when reading and writing them. The word order they use is often faulty across these tasks. Functor words are used incorrectly whether they are spoken, read, or written. Similar observations have been made by other investigators who have noted that oral language deficits are often reflected in the written language behavior of language disabled children (Cicci, 1980). However, the nature of such a relationship has yet to be systematically investigated.

This study is the initial step in such an investigation. It proposes to analyze the picture naming errors made by language disabled children and to examine the relationship of these errors to their performance on written language tasks. Picture naming was selected as the stimulus material since research with other populations (Denckla and Rudel, 1976; Goodglass, 1980; Jansky and deHirsch, 1972; Katz, 1982; Wolf, 1981) has found it to be an informative starting point.

Because the field is relatively uncharted, it was first necessary to determine whether a naming problem indeed existed in these children. It

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was considered that if they were able to point to pictured objects that were named for them ("Show me the stethoscope") but were unable to name the pictures themselves at age-appropriate levels, a naming problem could be assumed. If, on the other hand, they were unable even to point to the pictured objects that they could not name, a general vocabulary deficit, rather than a specific deficit in naming, would more accurately account for their pattern of performance.

Having determined by this procedure that there may be a naming problem in these children, it was then necessary to develop a system of analysis that would characterize the naming errors accurately and that would facilitate an explanation of their nature. Finally, the system of analysis thus derived was applied to the errors these children made in written language in the expectation that it should be equally useful in interpreting those error patterns.

Method

Subjects

Thirty-four children, ranging in age from 4 years, 3 months to 12 years, 7 months, who were enrolled in a self-contained public school language disability program, were the subjects in this study. They demonstrated intelligence in the average range on either the Wechsler Intelligence Scale for Children-Revised or the Stanford-Binet Intelligence Scale and all had normal vision and hearing. Although they represented three ethnic groups (Black, Caucasian, and Hispanic), English was the dominant language for all and ethnic group was not a statistically significant factor in data analysis. All exhibited at least a two-year deficit on standardized expressive language and academic (or readiness) tests. Their receptive language levels were close to chronological age.

Materials

All the items included in the Boston Naming Test (Kaplan, Goodglass, and Weintraub, 1976) were used for the naming and recognition tasks. This instrument, standardized on children aged 6 through 14, consists of 85 individual line drawings of objects that are ranked in difficulty according to the frequency with which naming occurred in the standardization group. Some of the pictures were later selected for the spelling task. The Wide Range Achievement Test (Jastak and Jastak, 1965) was used to determine reading and spelling achievement levels.

Procedures

Subjects were tested individually for picture naming, recognition, and achievement, and in a group for spelling. In the *picture naming* task, they were asked to give the best name for each of the pictured objects. In the *recognition* task, they were asked to point to the picture named by the examiner. Here the pictures were grouped into sets of four of the same difficulty level. Every set was presented four times in randomized order; each time a different picture was named by the examiner. In the *spelling* task, nine subjects (with second to fifth grade achievement levels) were shown 25 individual pictures (selected by their mid-range difficulty level for naming) and were asked to spell the name of each one. *Achievement* in reading and spelling was tested by the appropriate subtests of the Wide Range Achievement Test (Jastak and Jastak, 1965). These subtests were given to only 25 subjects since it was not appropriate to test the nine preschool subjects for school achievement.

Results and Discussion

What is the normal process?

In order to discuss meaningfully the naming errors made by these children, it is necessary first to consider what might take place in the normal process of picture naming. When presented with a pictured object, we access its name, which has been stored phonologically (Barton, 1971; Brown and McNeill, 1966; Fay and Cutler, 1977). Having accessed this phonological representation, we must remember it until we actually produce the word. For this purpose, we hold onto the name in a phonological buffer zone, that is, in short term or working memory, while planning the production. Substitutions such as /gog/ for /dog/ and /nunch/ for /lunch/ that occur in early language acquisition provide direct evidence of a pre-production planning stage; it is more than coincidental that phonemes that have not yet been produced are substituted for others earlier in the word (Clark and Clark, 1977). Finally, we produce the name through coordinated articulatory movements.

Is there a naming problem?

The pattern of results indicates a problem specifically with naming, rather than a more general vocabulary deficit. The subjects recognized an average of 71 percent of the pictured objects, but were able to name only 21 percent of the same pictures. Since it would not be meaningful to examine naming errors for pictures that were not recognized, non-recognized items were not analyzed further. Of those that were recognized, 34 percent were correctly named.

Since all children are able to recognize more pictured objects than they can name, it was necessary to compare the obtained scores with age-appropriate predicted scores. Figure 1 illustrates where these children stand in relation to age-matched controls, according to the norms provided by the Boston Naming Test (Kaplan et al., 1976). The number of correctly named items which were predicted and obtained for each child

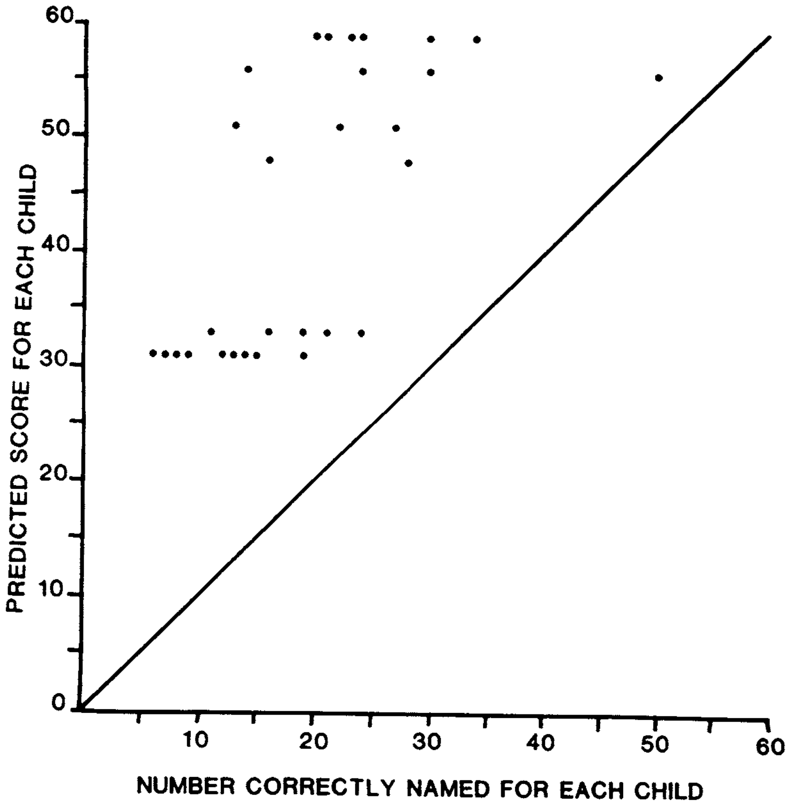

Figure 1. Scores (Based on Age) predicted by Boston NamingTest compared with scores obtained by Language Disabled Children

was significantly different, according to a one-sample T-test of the scores, $p < .0001$. Thus, not only do these children demonstrate a gap between the number of pictured subjects they recognize and the number they name, they also name significantly fewer items than age-matched controls.

What are the error types and frequencies?

The primary goal in developing an analysis system is to provide a means for examining the naming problem through an accurate and well-conceived description of error performance. Errors were characterized as phonetic, semantic, or circumlocutory. An error was considered to be phonetic if it shared 50 percent of the phonemes or one free morpheme with the target word. Four types of phonetic errors were delineated:

PH1 errors—real-word substitutions which were not semantically related to the target word, such as "sister" for *scissors* and "acorn" for *unicorn;*

PH2 errors—nonword substitutions for the target, such as "preztl" for *pretzel* and "helidakter" for *helicopter;*

PH3 errors—semantically and phonetically real-word substitution, such as "elevator" for *escalator* and "tornado" for *volcano;*

PH4 errors—semantically related real-word substitutions which then contained real-word and nonword phonetic errors, such as "narrow" for *dart* and "kaminal" for *rhinoceros.*

An error was considered to be semantic if it was related only in meaning to the target word, such as "airplane" for *helicopter* and "stairs" for *escalator.* A circumlocution is a combination of words that attempts to describe the target word, such as "thing to sit at when you hurt" for *wheelchair.* Table I provides examples and frequencies of these error types.

Semantic substitutions, representing 59 percent of the incorrect names, are by far the most frequent error type. Semantic substitutions which are phonetically deficient (PH4, "narrow" for *dart*) account for another 6 percent of the incorrect names.

Real-word phonetic errors which are not semantically related to the target word (PH1, "acorn" for *unicorn*) represent only 4 percent of the incorrect names, the smallest proportion of the phonetic errors. Nonword phonetic errors (PH2, "preztl" for *pretzel*) represent 6 percent of the incorrect names. Real word substitutions which are phonetically and semantically related to the target word (PH3, "elevator" for *escalator*), or "tip of the tongue" errors (Brown and McNeill, 1966), represent 11 percent of the incorrect names. Circumlocutions account for another 13 percent of the incorrect names.

What do these error types mean?

The present analysis system can afford possible explanations for the incorrect names that are produced. It is conceivable that the reason an incorrect name is produced is that the correct name is not stored in the lexicon. However, since the errors being analyzed here occurred in naming pictured objects which were correctly identified when named by the examiner, storage per se does not seem to be at issue. The accuracy of the stored representation may tell a more revealing story, however.

The phonological representation of a word may not be accurate enough to allow for its successful access and preservation in short term memory prior to actual production. It has been suggested (Brown and McNeill, 1966) that as we acquire new words, we first store their "generic" characteristics, such as the first phoneme, number of syllables, and stress pattern. With repeated exposure to the word, we complete this skeletal representation, supplying the final consonants, then filling in the

Table I. Examples and Frequencies of Error Types

PH1 = Real word phonetic error, not semantically related		4%
sister/scissors	hammer/hanger	
saucer/saw	bathroom/mushroom	
acorn/unicorn	telescope/stethoscope	
candle/camel	wrench/bench	
PH2 = Nonword phonetic error		6%
kalmkeno/volcano	preztl/pretzel	
helican/pelican	maks/mask	
helidakter/helicopter	ocoputs/octopus	
PH3 = Semantically and phonetically related		11%
elevator/escalator	basket/racket	
popcorn/acorn	toothpick/toothbrush	
clam/camel	steering wheel/wheelchair	
snake/snail	tornado/volcano	
PH4 = Semantically, then phonetically, related		6%
narrow/dart	evevetor/escalator	
kaminal/rhinoceros	must/acorn	
speps/escalator	bed/toboggan	
row/dart	wheel/seahorse	
Semantic		59%
airplane/helicopter	stairs/escalator	
clothes/hanger	donkey/camel	
tennis/racket	boat/canoe	
cap/visor	bookbag/briefcase	
Circumlocutions	Target Word	13%
put it on a clothes	hanger	
thing to sit at when you hurt	wheelchair	
it call a chair, it greens	bench	
that you turn arounds	globe	
a pirate thing for looking something	telescope	

medial segments of the word. It is this completed phonological representation that we access easily in the normal naming process.

To the extent that the generic characteristics of the target word are preserved in the actual production, we can be confident that the word was in fact accessed and held in short term memory. Table II presents some generic characteristics of the incorrect names produced by the children. It is clear from Table II that the phonetic errors retain the generic characteristics of the target words much more frequently than do the semantic errors. This trend is supported by the figures for syllable and initial phoneme agreement: 54 percent of the phonetic errors had the same number of syllables as the target word as compared to only 25 percent of the semantic errors; 55 percent of the phonetic errors had the

Table II. Generic Characteristics of Naming Errors

	Phonetic Errors (PH1-PH4)	*Semantic Errors*
Syllable Agreement between Error and Target Word	54%	25%
Same Initial Phoneme in Error and in Target Word	55%	3%
Fewer Syllables in Error than in Target Word	25%	55%

same initial phoneme as the target word as compared to only 3 percent of the semantic errors.

In the case of phonetic errors, which tend to preserve these generic characteristics, it appears that the phonological representations of these names are either stored or held in short term memory more accurately than in the case of semantic errors, which do not tend to retain the basic phonological shape of the target word. To determine the breakdown point for both phonetic and semantic errors, we would need a more taxing recognition test to sort out whether the problem is really in accuracy of storage or in efficiency in short term memory coding. The present results, however, allow the conclusion that the target word has in fact been accessed when a phonetic error is made, because the generic characteristics are so frequently retained. This conclusion cannot be made about the semantic errors, since the retention of generic characteristics is so infrequent. For example, it is fair to assume that the child who says "capricorn" for *unicorn* has accessed the target word but no such assumption can be made about the child who says "horse" for *unicorn*. Further support for this position can be found in Table II; 55 percent of semantic errors contain fewer syllables than the target word whereas only 25 percent of phonetic errors demonstrate this pattern. These syllabically less complex substitutions are usually higher frequency words, like "horse" for *unicorn* and "cap" for *visor*. Thus, again, the semantic error more often suggests that the target word has not in fact been accessed, possibly because its phonological representation is too weak. Since children who are poor readers have been shown to demonstrate phonological deficits (Liberman, Shankweiler, Liberman, Fowler, and Fischer, 1977; Vellutino, 1977), it may be that a semantic naming error reflects a problem of that kind as well. Perhaps, then, the substitution that is similar only in meaning is not indicative of higher cognitive functioning, as might be assumed, but rather serves as a disguise for a phonological deficit affecting both oral and written language performance.

Is there a relationship between naming performance and reading performance?

Reading levels ranged from kindergarten to fifth grade for the 25 subjects whose achievement was tested. These children demonstrated a positive and significant relationship, r = .54, $p < .005$, between their reading performance and their picture-naming performance. It is interesting to note that although these children demonstrate severe deficits in both oral and written language, the relationship between naming and reading found here is similar to that found in good and poor reader groups (Jansky and deHirsch, 1972; Katz, 1982; Wolf, 1981).

What might account for this consistent pattern is the fact that the same critical components are required in the naming and reading processes (Katz, 1982). As we noted earlier, in naming, we proceed from the phonological representation of the name which best fits the picture to a phonological buffer zone in which we hold the representation until we actually produce the word. In reading, we decode the word, translating it into its phonological representation, and hold this representation in the phonological buffer zone until it is mapped onto its stored counterpart in the lexicon. Therefore, naming and reading are both linguistic processes that depend on accurate phonological representations and short term memory coding.

Is there a relationship between naming performance and spelling performance?

Spelling the name of a pictured object requires orthographic rule knowledge in addition to all of the previously outlined constituents of the naming process. Considering this additional requirement, it is not surprising that there was virtually no relationship, r = .24, between correctly named and correctly spelled items. In contrast, there is a high positive correlation, r = .81, $p < .008$, between the number of items that have been accessed in naming ("preztl" for *pretzel*) and the number that have been accessed in spelling ("cml" for *camel*). Similarly, there is a high positive relationship, r = .78, $p < .01$, between the number of semantic errors in oral naming and in spelling of a pictured item. Such correlations provide strong preliminary support for the hypothesis that similar error patterns are found across spoken and written language tasks.

Conclusions

Role of phonological processing

Phonological deficiencies in the accuracy of stored representations and in short term memory coding are proposed as a likely explanation of naming, or word retrieval, problems in this group of language disabled children and in other poor reader groups (Katz, 1982; Wolf, 1981). The critical facet of this explanation is the short term memory function; efficient phonetic coding seems crucial for both initial storage and eventual production of language segments. Initial acquisition of lexical items requires phonetic short term memory coding to insure storage of an accurate phonological representation, first of generic and then of additional segmental information. Successful retrieval of stored names for production depends on both the accuracy of the initial representation and the efficiency of the phonetic short term memory coding. In turn both storage and production of language segments depend on accurate and efficient perception of speech sounds. The perception of speech sounds has been found to be deficient in poor readers (Brady, Shankweiler, and Mann, in press). Considering the evidence for the role of phonological coding in the reading process, it is anticipated that future research studies will also demonstrate a phonological basis for syntactical and morphological deficits in children with oral and written language disabilities.

Implications for assessment and instruction

Results of the error analysis developed here suggests that a phonetic error reflects a higher level of phonological competence than does a semantic error. Such a position is in agreement with research studies that have repeatedly demonstrated that poor readers are less sensitive to phonetic structure and less efficient in phonetic processing than are good readers (Stanovich, 1982). Diagnostically, this explanation suggests that phonetic naming errors represent more advanced phonological processing than do errors which do not bear any phonetic resemblance to the target word. It is expected that such a pattern will prove to be diagnostically significant in oral reading errors and written formulation errors as well. It would seem reasonable to suppose that substitutions that represent only a semantic association with the target word, as in reading or spelling "cat" for *dog* will indicate not higher cognitive functioning but rather a guessing strategy which may be masking a phonological deficiency. Furthermore, the present interpretation of error production makes questionable the commonly used instructional technique of providing semantic prompts such as category, location, or function, to facilitate attempts at naming, reading, or written formulation. Instead, it would seem more appropriate to provide phonetic prompts, such as the initial phoneme, number of syllables or stress pattern.

Future research

The next stage in this investigation should be the development of a more sensitive recognition task to determine the breakdown point for errors in oral and written language productions. Specifically, it is necessary to differentiate a linguistic deficit due to an inaccurate phonological representation from one due to inefficient phonetic coding in short term memory. It is anticipated that different error types result from deficiencies at different points in the process, but that such breakdown points will remain constant across oral and written language tasks. It is also anticipated that the results of this proposed next step will shed further light on appropriate diagnostic and instructional strategies.

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