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ABSTRACT

Sixty-five grade 5-6 children were tested on a verbal recall task involving material of varying semantic and syntactic content. There was no difference between best and poorest readers in their performance on random lists of words, but there were clear differences on meaningful sentences and on syntactically well-formed but semantically anomalous sentences. Semantic and syntactic regularities provide cues which may facilitate performance on all but the random lists of words, if the child has knowledge of the structural possibilities of English and the acceptable word combinations. The results on the recall task shows, therefore, that not all children are equally able to make use of semantic and syntactic knowledge in processing oral language and that this knowledge is related to their reading competence. The same linguistic information may be used by efficient adult readers in processing textual materials. Thus it seems likely that there may be a threshold level of proficiency prerequisite to reading development. (Author)

LINGUISTIC DEVELOPMENT AS A LIMITING FACTOR IN LEARNING TO READ

BY

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The research which I shall describe grew out of my interest in the work on reading strategies done by Kinsbourne (1975). He attempted to specify factors which might limit improvement of reading performance and reported some findings which provide insight into the early stages of the learning-to-read process. This study will examine the relationship between reading skill and language development during the later school years. We will show that older grade school children vary in their ability to make use of semantic and syntactic knowledge in processing oral language and that this ability is related to reading ability.

The literature provides some support for the existence of this relationship. It is known that in the beginning stages of reading acquisition, progress may depend on the development of a variety of psychological processes, both spatio-perceptual as well as linguistic. When the focus is on increasing fluency, general linguistic competence is clearly a prerequisite (Bakker, Teunissen and Bosch, 1975; Kinsbourne, 1975; Vernon, 1971).

The specific aspect of linguistic competence that could be critical in this regard, is presumably that aspect that also affects adult reading proficiency. On this point, there is almost universal agreement. The reader's knowledge of the semantic and syntactic rules of his language assist him in understanding printed prose. (e.g. Davis, 1971; Kavanaugh and Mattingly, 1972; Smith, 1973b; Vernon 1971). The more efficient the reader, the greater is his use of this non-visual information (Holmes, 1973; Smith, 1973a).

As children progress in reading, their strategies seem to become more linguistically directed and they show a greater exploitation of linguistic regularities. Children who are beginning to read may not use anything other

than orthographic cues. While Smith and Goodman (1973) claim they do look for and use semantic redundancy, others (e.g. Francis, 1972; Shankweiler and Lieberman, 1972) show that children in the first three grades exhibit little sensitivity to structure and may make little use of intra-sentence constraints. By around grade 4, most children do begin to take advantage of grammatical structure in their reading (Gibson and Levin, 1975).

The parallel development in the use of structures in oral language may support this shift. Although children's speech possesses structure, children under six tend not to perceive sentences as separate parts which are syntactically related (Vernon, 1971). The ability to use structure shows development at least to third grade (Entwisle and Frasure, 1974; Frasure and Entwisle 1973) and development of linguistic form continues to adolescence or beyond (Palermo and Molfese, 1972).

Entwisle and Frasure, (1973) noted the possible dependancy of reading that aspect of language development which interested us. In their study, children were asked to repeat short strings of words. Three types of strings were presented, as in the Miller and Isard (1963) study: random lists, syntactically well-formed but semantically anomalous sentences, and sentences which are both syntactically well-formed and meaningful.

Performance on random strings reflects verbal memory span. Semantic and syntactic regularities provide cues which may facilitate performance on the other string types. Without knowledge of the structural possibilities of English and the acceptable word combinations, all strings would be equally difficult. Therefore, any differences between the string types reflects the ability to use linguistic information, the same linguistic information that is used by efficient adult readers in processing textual materials, This

ability is slower to develop in lower-class children than in middle-class children. Since lower-class children also tend to lag in reading skills, the authors suggested that the skill measured by their task is one which helps the child as he learns to read.

It seemed plausible that the development of this particular competence might underly the transition to skilled reading. Perhaps the 11 and 12 years-old children who fail to make progress in reading still process oral language in an immature fashion. Since Entwisle and Frasure had not examined the relationship between individual performance on their task and reading ability, I decided to do so.

My procedure was similar to the earlier experiments although my materials were more varied both structurally and lexically. All the strings were six words in length and based on six different syntactic structures. For example, some meaningful grammatical sentences were, "Grandpa may have missed the train," "Some of these marbles rolled away." Anomalous sentences which retained the same phrase structure but violated standard semantic rules of English included, "Flowers would have sailed recent chickens," "Enough of burned sound saw last." The random strings were formed by randomly permuting anomalous strings. Examples of these are, "Will money replied have room tasty." and "Glass few see letters of while." Vocabulary was controlled for difficulty (Thorndike and Lorge, 1944) and no content words (nouns, adjectives, main verbs) were repeated.

The test was presented on tape, the words spoken without stress or intonation at the rate of approximately one word per second. Each test tape contained 36 strings, i.e. two examples of each list-type X structures combination. The task was presented as a "game with sentences" and the child

was instructed to "say the sentence right back" after hearing it. Each child had a practice session of variable length to ensure that the instructions were understood. All responses were recorded on transcripts of the test tape using a notational system similar to that used in scoring oral reading on the Durrell Analysis of Reading Difficulty (1955). The entire session was also tape-recorded and this record was used to correct any scoring uncertainties.

The scoring procedure followed the standard form in assessing ordered recall. Each word was scored as correct when it was the correct item in the correct ordinal position. Where there was an omission or an intrusion, not only that item but all the subsequent items were scored as incorrect. Where there was a substitution, that item was scored as incorrect but the following items could be scored as correct if they were correctly supplied in the appropriate order.

We tested 65 children enrolled in regular grade 5 - 6 classrooms in three working-class urban public schools. The mean age of the children was 11.4 years.

The mean scores for each of the string types was computed for each subject. For purposes of analysis, the results were grouped according to the children's performance on a group test of reading ability (Gates-MacGinitie Comprehension Test, 1964).

The best readers read at a mean level of grade 7.1 (range 6.1-11.6), that is in most cases a year or more above grade level. The medium group had a mean reading level of 4.8 (range 4.1-5.8), not more than one year below the expected level, while the poor readers had a mean reading score of 3.2 (range 2.5-4.0), that is more than one year below grade level.

The mean performance scores for the different reading groups are shown in Table 1. A 3 x 3 analysis of variance using reading scores and string

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Insert table 1 here

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types as fixed-effect factors in a repeated-measures design showed a main effect only for strings, F (2,124) = 581, $p < .001$. Because of the string X group interaction, F (4,124) = 18.47, $p < .001$, tests for simple effects were also computed (Winer, 1971).

The data were remarkably consistent with regard to differences between string types. There were actually only two cases in which there wes a deviation from the expected order, i.e. meaningful strings easiest and random strings hardest. The effect of string was significant at the .001 level for all groups, F (2,124) = 153, 178 and 185 for the low medium and high groups respectively. All children were able to use structure, both semantic and syntactic, to help them remember. By Entwisle and Frasure's standards, development was complete.

We found, however, that good and poor readers differed in their performance on structured strings although they did not differ in their memory for random lists. There was no difference between reading groups on the random strings, F (2,81) = 3.01, $p > .05$, but clear differences on the meaningful strings, F (2,81) = 5.67, $p < .01$, and anomalous strings, F (2,81) = 10.17, $p < .001$. Tests for the interaction showed that only the lowest group differed from the highest group, F (4,124) = 15.39, $p < .001$. We can conclude that our hypothesis has been supported. Not all children are equally able to make use of semantic and syntactic knowledge in processing oral language.

The ability to us this knowledge is related to their competence in reading.

The fact that a relationship exists between two variables does not necessarily imply a causal connection nor does it provide any information about the direction of the causality should it exist. Does reading fluency influence oral language skills, do oral language skills influence reading competence, or are both capabilities related through some common factor? Examination of individual scores showed that while some poor readers scored relatively high on all three string types, none of the good readers performed poorly on the structured strings. Thus while the ability to make efficient use of linguistic structure is no guarantee of reading proficiency, inadequate development of this ability may hamper the acquisition of fluent reading. In some cases, at least, the ability tested by the experimental task could be a performance-limiting factor in learning to read. That is there may be a threshold level of proficiency prerequsite to reading development.

This linguistic deficiency may be most closely related to one form of reading difficulty, namely the failure to organize input of reading material into meaningful units. Such poor readers may have difficulty comprehending because they tend to read word by word rather than in phrases or larger units. (Steiner, Weiner and Cromer, 1971). In the context of our experimental task, poor readers appeared to process oral language one word at a time as well.

At the present time, I have only anecdotal support for this statement. During the testing session, it seemed as if some children were using one type of learning strategy for all string types, a strategy that was appropriate for a serial-list task. These children rehearsed each word as they

heard it and their responses had a list-like quality. Other children apparently reacted to word strings as hierarchically-ordered potentially, meaningful linguistic units and attempted to preserve the form of the unit, albeit incorrectly in part. For example, the serial-list learner might typically respond, "Babies...trees...loud...trees." The linguistic-unit learner on the other hand might say, "Babies may have plowed something trees." using a normal intonation pattern. The scoring system penalized the first reply and as you already know, the children with lower scores were the poorer readers.

Following each testing session, we tried to engage each child in an informal discussion of the test. There were differences in the extent to which children could express a conscious understanding of the task they had been presented with. Many of the more competant children would say that there were three types of sentences, some were regular, some were funny because they didn't make sense and some were just a whole bunch of words all mixed-up. The less competant children tended to say things like "Well some were easy because they didn't have so many words. Some were really hard though they had a whole lot of words." For them, familiar linear sequences dis combine into larger units, but even meaningful sentences were still linear lists. It was only with this group that I found nonsense words being substituted for some words in the anomalous sentences. The other children always substituted real words which tended to improve the meaningfulness.

In a pilot study conducted prior to this study, I used a less sensitive scoring system and found no between-group differences in the number of words recalled. We examined the errors and found that the poor readers tended to omit words while good readers lost points because they tended to transpose or

substitute words. Even on the random lists, they were trying to fit words into more typical language patterns.

It has been suggested (Perfetti, 1976) that the process of comprehension may be described in terms of successively deeper levels of processing, the probable order being, phonemic, syntactic, semantic, interpretive and thematic. The last two are extraneous to our discussion. In normal oral speech, supra-segmental features, such as intonation, stress and irregular pause durations augment linguistic regularities and may allow the child to by-pass the syntactic level. The normal spacing of speech divides the verbal strings into syntactic or action segments. Thus, the unit size most appropriate for semantic processing is preformed for the child.

In our experimental materials as in graphic language, these "primary structure guides" (Steiner et al, 1971) are missing and the task of forming the appropriate multi-word units falls on the child. For some children this presents no problem, others as we have seen are frequently stuck at the phonemic level or single-word unit. The more able children possess a readily-accessible repetoire of language structures which they can map or project onto verbal material which has no overt organization. This allows them to proceed to the comprehension level in reading and provides order information to reduce the memory on the experimental task.

I am presently designing materials which should allow me to provide more rigorous tests of what admittedly are speculative notions. Should they turn out to be supported, then we will be in a better position to give educators more of the kind of information they need. If we can specify the nature of particular blocks to learning we may not only increase our understanding of the reading process but also provide guidelines for instruction.

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Table 1. String means by group

Test Sentences	Poor readers	Average readers	Good readers
Random	1.99	2.36	2.76
Anomalous	2.90	3.26	3.83
Meaningful	4.32	4.83	5.23