

Children's use of orthographic structure in word discrimination

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A series of experiments by Gibson found that children, in learning to read, come to extract English spelling patterns and that these patterns function as units in word perception. The present study attempted to replicate these results using a simultaneous discrimination task rather than a tachistoscopic recognition task. It was found that by third grade, children are able to use English spelling patterns to discriminate between nonsense words. This ability was not dependent on word length and was absent in first-grade children. Ss' verbal responses indicated that they had used orthographic patterns or its corollary, pronunciability, to distinguish between alternates.

Gibson, Osser, & Pick (1963) found that nonsense words which followed rules of English orthography were read more accurately under tachistoscopic conditions than were similar words which were not orthographically correspondent. This effect has been replicated several times. It has been shown, additionally, that this effect is obtained using deaf Ss, demonstrating that ability to pronounce is not a necessary aspect of this facilitation (Gibson, Shurcliff, & Yonas, 1970).

Although the Gibson et al (1963) results demonstrated an age trend both in the accuracy with which orthographically correct words were perceived and in the ability to extend this accuracy to longer words, it is unclear what these results depend upon. If certain spelling patterns come to function as processing units, one would expect that performance would improve with increasing reading ability and, consequently, with age. It is unclear, however, why utilization of these patterns should be restricted by young children to three-letter words. If spelling patterns influence perception, they should presumably operate on longer words as well.

The tachistoscopic identification task demanded of Ss may have influenced the age trends obtained. Since exposure time was constant over groups, differences in reading speed may have contributed to age and length effects. That is, once spelling patterns are extracted, they may be used in the perception of all words, but such use may take longer for younger children. Since it appears that orthographic patterns operate in word recognition, it is important to

determine the developmental trends in extracting these patterns.

The present experiment measured children's ability to discriminate between nonsense words on the basis of English spelling patterns.

METHOD

Forty-eight children served as Ss in the experiment—16 each from the first, third, and fifth grades. There were an equal number of boys and girls at each grade level. All testing was conducted in the last week of October, so all Ss had been at their grade level for approximately 2 months.

Twenty nonsense words of three, four, five, and six letters in length were randomly selected from the lists given in Gibson et al (1963) and Gibson, Pick, Osser, & Hammond (1962). Within each length category, the pronounceable and nonpronounceable variants of each word were randomly paired. The pairs were typed in uppercase letters on 5 x 8 in. cards. Spatial position of the pronounceable word was randomly determined with the constraint that it appear on the right and left sides equally often. Four random presentation orders were constructed. See Table 1 for the stimulus pairs used in this experiment.

Each S was seated at a table opposite the E. He was told that he would be shown two groups of letters and was instructed to point to the one that "was more like a real word." Ss were instructed to guess if they were

not sure. After each response, the E said, "Okay," or, "All right." After all the cards had been presented, each S was asked how he decided which group of letters was more like a word.

RESULTS AND DISCUSSION

A preliminary analysis revealed no significant effect of sex, so the data were pooled over sex. The mean number of correct responses by grade and word length are given in Table 2. A two-way analysis of variance with repeated measures on one factor (Grade by Word Length) was conducted. The effect of grade was significant ($F = 26.9, p < .01$), but neither the effect of word length ($F = 0.77, p > .05$) nor the interaction between grade and word length ($F = 0.77, p > .05$) were significant. The grade effect accounted for 55% of the between-Ss variance.

As can be seen from Table 2, the first-grade children performed virtually at chance levels, whereas third- and fifth-grade Ss' performance ranged between 69% and 80%. A Newman-Keuls analysis of the effect of grade revealed that first-grade performance differed from both third-grade and fifth-grade levels ($p < .01$).

As might be expected, many of the Ss were unable to verbalize their basis for discrimination. None of the first graders gave responses which referred to the stimuli. (Sample answer: "I've been going to school a long time.") All the answers from third and fifth graders indicated that either ability to pronounce or spelling patterns were used to discriminate words and nonwords (e.g., "I sound it out," "Spelling doesn't look right.").

It seems clear that in the course of learning to read, children extract the orthographic structure of English words. This extraction takes place between the beginning of the first grade and third grade. By third grade, children can distinguish pseudowords which differ only in their adherence to English orthography. Also, by third grade, such discrimination is not a function of word length.

Gibson et al (1963) found that first-grade Ss' recognition performance was partially affected by English spelling patterns. No such effect was observed for discrimination

Table 1
Stimulus Word Pairs by Length

Number of Letters			
3	4	5	6
TUP-NDA	DINK-XOGL	BESKS-MBAFR	BLASPS-LKISPR
NAD-NMA	VUNS-NKID	CLATS-TSALL	SPRILK-FTERKL
GIP-PTU	GLOX-NSUV	BRELP-SPIGR	BLORDS-SPSABL
NUS-GPI	SULB-DSOL	FRAMB-LPEBR	PREENT-DSORBL
NAM-NSU	LODS-LBUS	GRISP-SKSEB	KLERFT-NTEPR

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Table 2
Means and Standard Deviations for Numbers of Correct Responses as a Function of Grade and Word Length

Grade	Word Length in Letters							
	3		4		5		6	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
First	2.6	1.2	2.9	1.2	2.7	1.4	2.9	0.9
Third	4.5	0.6	4.2	1.1	4.4	0.9	4.4	1.3
Fifth	4.5	0.9	4.5	1.0	3.9	0.7	4.2	0.8

performance. This may be due to the fact that the present study was done at the beginning of the school year, whereas that of Gibson et al (1963) was conducted at the end of the school year. Extraction of orthographic structure may occur, in large part, during the first year.

To evaluate this hypothesis, the first graders used in this experiment were retested 1 year later. Only 9 of the

original 16 were still in the school system. No improvement in discrimination performance was found at any of the word lengths. It appears, then, that 1 year of experience is not sufficient to assure extraction of orthographic structure. Although the general pattern of results in the present experiment is consistent with Gibson et al (1963), a longer period than they suggest is necessary for

children to learn to perceive the regularities of English orthography. However, because of the small number of Ss and the fact that only those Ss who remained in the school system were retested, this conclusion must remain tentative.

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