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Language Use and Language Judgment

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During the past two decades, linguists in the tradition of generative grammar have made systematic use of their own "intuitions" as sources of data for understanding language organization. The term *intuition* refers to the basis for judgmental performances, in the terminology of these linguists. The judgments are usually restricted to a few topics: grammaticality, ambiguity, relatedness of sentences in form and meaning, and the like. The theories that are developed within generative grammar are, in the main, explanatory accounts of the structure of these judgments. This methodology is a familiar one in psychological studies, being in essence very little different from, say, judgments of brightness, hue, and saturation that are made in the color-vision laboratory. However, recently there have been a number of attacks on this method for studying language.

Sometimes the objections have come from within the cloisters of the grammarians themselves, and these are usually to the effect that the method lacks generality in one way or another, over the linguistic domain.

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After all, while it is plausible that all normally sighted men see alike and hence the visual judgments of one man are just like those of another, it is plain that all men do not speak alike. Thus some linguists have come face to face with the problem that their own judgmental performances do not accord too well with the judgments of the nonlinguist-in-the-street, even though he putatively speaks the "same" language. In fact, they sometimes even fail to dovetail with judgments from other linguists who are equally imbued with intuitive convictions (Ross, this volume; see also Gleitman and Gleitman, 1970). Another objection to the generality of theories based on intuition-derived judgments comes from the finding that these do not accord closely with data derived from naturalistic observation of speech; this result is sometimes said to show that the data source is biased and cannot be used to study human language *use* (Labov, this volume).

A different kind of attack on the intuitional approach has come mainly from psychologists studying nonjudgmental language tasks. Some objections center on the failure of derivational theories (such as that put forward by Brown and Hanlon, 1970) to organize tightly the naturalistic findings in language learning (Bever, 1970). Others concern the failure of these theories to account for the facts about language computations in real time, (for discussion, see Fodor and Garrett, 1966; Fodor, Bever, and Garrett, 1974).

In some quarters, the reaction to these complications has been to abandon all hope for learning about the mental organization of language by studying the structure of judgments. We have only to dig 30 or 40 years back into the history of language study to find that this scenario has been played out before. Surely the Bloomfieldian revolution was, in part, an attempt to get away from the enigmas of judgments and back to the "real" data of language: utterances said and heard by ordinary people (a group that clearly excludes academic linguists). Left to the social bigot were questions of "right" or "wrong" instances of language behavior. As E. A. Nida put it:

> If any judgments are to be passed upon the acceptability or so called correctness of some usage, these are left to the anthropologist and sociologist for an objective statement of the factors in the society which make certain persons more socially prominent and hence make their speech more acceptable, or to the man on the street, who is thoroughly accustomed to forming judgments upon the basis of his own egocentric attitudes and limited knowledge [Nida, 1949, p. 2].

In effect, many of the empiricists of a few decades ago evidently believed that no nonarbitrary formulation of notions of well-formedness, etc., were to be found, outside dialectology. Leonard Bloomfield more or less shared this view:

> The discrimination of elegant or "correct" speech is a byproduct of certain social conditions. The linguist has to observe it as he observes other linguistic phenomena, [but] this is only one of the problems of linguistics and, since it is not a fundamental one, it can be attacked only after many other things are known [Bloomfield, 1933, p. 22].

These voices from the past are reminiscent of recent comment to the effect that grammars constructed on judgmental bases are not psychologically "real"; are remote byways in the study of language; in short, are obscurantist and restrictive sources for a psychologically relevant study of language.

We do not agree that judgmental performances can be swept aside so easily in the search for an account of human language organization. The mental events that yield judgments are as relevant to the psychology of language, perhaps, as speech events themselves, even though the patterns of these two kinds of psychological response are demonstrably different. In any event, the burden of proof is on anyone who denies the psychological reality of linguistic judgments to explain their orderliness. In our view, the disparities between speech and comprehension on the one hand, and judgments on the other, require study and explication.

Accordingly, we have conducted a number of investigations into the ability of humans to give judgments about language, and compared these findings against individuals' abilities to use language in conversational exchange. Indeed, we too find differences in people's abilities to perform these two kinds of feat, differences that have to do with the ages and capacities of the subjects, and differences that have to do with the structure of the tasks that are put to them. But we do not consider such outcomes to be cause for dismay.

It always turns out that giving language judgments—retrieving and making use of one's intuitions—is relatively hard, compared to talking and understanding. Thus it is not surprising that we find extensive individual and population differences in performance on the harder judgmental tasks, compared to lesser differences in talking and understanding. We believe this is because judgmental performances require a higher order of self-consciousness than do speech performances. To give a language judgment, one must take a prior cognitive process (linguistic performance) as the object of a yet higher-order cognitive process (reflection about language performance or, as we have called it, *metalinguistic* performance) which may have properties of its own.

It is interesting that difficulties in forming judgments differ within the individual subject, depending on the level of language representation he must access for the task given to him. The *lower* the level of the language feature that must be attended to and focused on in any language-like task,

the more difficult the task and the more variable the performance; also, the lower the level of the language feature that must be attended to, the later in development a child is able to perform the task. Meanings are easier to access for the sake of making judgments than syntactic forms, and syntax easier than phonology. Stated another way, it is hard to access language information in relatively raw, partly processed forms, and easier to access fully processed language (i.e., the information at the stage of processing when it has been meaningfully interpreted).

We believe these facts about people's performances in laboratory situations are relevant to a number of more interesting facts about their language use in everyday life; for example, their differing responsiveness to language embroidery in certain kinds of poetry and wit; and their differing likelihood of grasping the ideas behind phonographies (i.e., their ability to acquire alphabetic reading).

In the sections to follow, the structure of our findings on these topics is summarized. However, we do not believe we have unraveled, at anything like the required level of specificity, the sources of differential human behavior in the language domains we have looked at. We put forward this summary of interim outcomes for the purpose that they may invite further inquiry in related terms.

1. POPULATION DIFFERENCES IN METALINGUISTIC PERFORMANCE, IN THE PRESENCE OF RELATIVELY INVARIANT LINGUISTIC PERFORMANCE

It is obvious that there are large differences among normal adults, and between adults and children, with respect to the meaningful content of their speech. But differences among adults, and between adults and children, are smaller and more subtle with respect to their syntactic usage and their phonology. Even many retarded individuals and most 4-year-old normals achieve adequate syntactic form in their speech (Lenneberg, 1967) but they are not usually profound in what they say. These facts contrast with those for judgment-giving. At least for certain kinds of materials, we have found striking similarities across adults in the ability to think about and comment on semantic novelty in language, but enormous differences in the ability to think about and comment on surface syntactic novelty. In Section 1.1, we describe such outcomes in the context of paraphrasing tasks. The same principles describe the outcomes of classification tasks and ambiguity-detection tasks performed by younger and older children, described in Section 1.2. Finally, the same principles describe aspects of children's differing success in tasks related to the acquisition of alphabetic reading (Section 1.3).

1.1. Variation in Paraphrasing Skills among Adults

Gleitman and Gleitman (1970) and Geer, Gleitman, and Gleitman (1972) studied the abilities of adults to produce and recognize paraphrases of novel nominal sequences (compound nouns). The stimuli in the experiments generally consisted of sequences of three simple words. Two of the words were fixed nouns such as *bird* and *house*. The third word was another noun (such as *foot*) or a verb or adjective (such as *kill* or *black*); of course some of these words had alternate categorial status (e.g., *kill* can be used nominally). The three-word sequences were taped and presented orally, with either of two stress patterns (132 or 213 stress) that are common for compound nouns. As the words were combined in various orders, this procedure yielded some simple nominal phrases such as *black bird-house* and *black-bird house*, but it also yielded some sequences that are harder to interpret, such as *bird house-black* and *bird-black house*. After suitable instructions, subjects were asked to produce or recognize phrasal paraphrases of these sequences. That is, the subject is being asked to realize that a *black-bird house* is a *house for black-birds* or a *house where birds who are black live*.[1]

The task is, we believe, a relatively natural and transparent one with which to inquire whether people can think about the relatedness among sentences. Everybody has been asked, from time to time, to say something "in his own words." Thus it seems an easy matter, when asked for another phrase meaning the same as *black bird-house*, to respond "That's a bird-house painted black." Surely this is easy enough to do in the context of real conversation. Upon seeing a black bird-house, even for the first time, presumably an adult can say "Look: there's a black bird-house." No normal English-speaking adult would, we presume, say instead "Look! there's a bird-house black!"

[1]A question immediately arises whether subjects can discriminate among the stress patterns of contextless compounds. It is well known that the stress effects are subtle, and are often ignored depending on the context in which the phrase is used (Bolinger and Gerstman, 1957). The question here is what the subject will do if there is no biasing context to guide him: Can he retrieve a meaning for these sequences guided solely by the meanings of the words and the rule-governed clues of stress and serial order? In this series of experiments, a number of precautions were taken so as to make the results interpretable. First, the stimuli were submitted to judges who had to determine the stress patterns, until a completely reliable tape of the stimuli was achieved. Second, subjects' responses were submitted to internal analysis to see whether, in general, they responded to "easy" instances in terms of the stress and order patterns. That is, if the subject responded identically to *black bird-house* and *black-bird house*, he was thrown out of the subject pool, because if he did this it was possible he simply did not understand the instruction in the experiment. Finally, in some versions of the experiment, the subject was asked to repeat the stimulus item after paraphrasing it. If the subject misrepeated the stimulus with any frequency he was removed from the subject pool (or, in one analysis his data were analyzed in terms of this problem, for it may have reflected a relevant memorial difficulty that could account for some of the population differences we found; see Geer, Gleitman, and Gleitman, 1972).

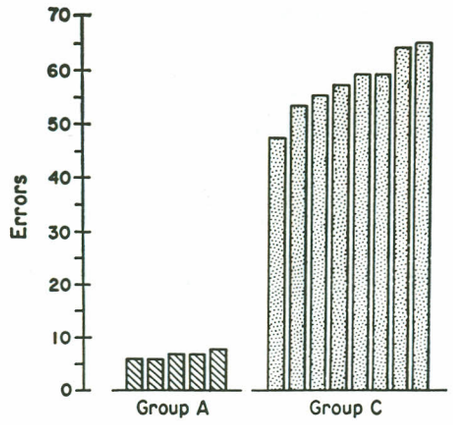

Figure 6.1. Forced-choice performance on a paraphrasing task by Ph.D. candidates (Group A) and clerical workers (Group C).

There were 144 stimulus items. As the Figure shows, the eight clerical workers in this version of the task came close to being wrong on half of them. That is, superficially, the performance of this group seems to be at chance levels. However, internal analyses of these results and those from a variety of other paraphrase tests reveals that both groups of subjects were highly systematic in their response styles, only they were different. Since scoring of "right" or "wrong" was in terms of syntactic, rather than semantic, analysis of the stimuli, the clerical group makes more of what we called "errors," but their performance was orderly nevertheless. Scoring in terms of plausibility or meaningfulness would approximately reverse the number of errors between the groups; that is, the *differences* between the groups in paraphrasing performance would be maintained. [From Gleitman, L. R., and Gleitman, H., *Phrase and paraphrase*, © 1970, W. W. Norton, New York, p. 133.]

Yet we found massive differences between two educational groups (clerical workers and Ph.D. candidates) in the ability to perform a variety of tasks related to paraphrasing compounds of this kind. On many occasions, the clerical workers *would* maintain that *bird-house black* was another way of saying *black bird-house*, contrary to what we believe their speech performance would be like. In fact, on a variety of paraphrasing tasks (even with simpler two-word compounds) there was no overlap at all in performance scores for members of the clerical and Ph.D. candidate groups. Figure 6.1 shows these population effects for a forced-choice task which required subjects to identify the correct paraphrases, from two choices, for three-word compound nouns.[2]

[2]It is of some interest that we could find no simple means to teach the clerical group to perform as the Ph.D. group performed. For instance, clerical workers listened to the stimuli over and over again, with feed-back as to correct choices and a financial reward for each correct choice made. Finally, their performance for a list of 72 stimuli came close to that of the uninstructed Ph.D. group. Then both groups were given a new, but closely equivalent, list of stimulus phrases from which to choose. Now the disparities in performance for the two groups appeared again, and in the same measure. Thus there is no easy way around the fact that these populations differed in their approach to paraphrasing.

A closer look at the findings reveals that the group differences were larger or smaller depending on the particular oddity in the stimulus phrase: The group differences were largely attributable to syntactic, not semantic, problems posed by the novel compound nouns. Thus the two groups paraphrased more or less equivalently such semantic oddities as *house foot-bird* ("a bird with large feet who lives in houses," or "a live-in livery-bird"). On the contrary, only the most educated group handled perceived syntactic oddity by changing the categorial assignments of words (e.g., *bird house-black* was paraphrased by an educated subject as "a blackener of houses who is a bird" and *eat house-bird* as "a house-bird who is very eat"). The response style of the clerical group was quite different. These subjects approached syntactic oddities by ignoring, rather than manipulating, their syntactic properties. *Bird house-black* was typically paraphrased by this group as "a black bird who lives in the house"; *eat house-bird* was paraphrased as "everybody is eating up their pet birds." In short, when taxed, the average group focused on meaning and plausibility, while the highly educated group focused on the syntax even when meaningfulness was thereby obscured (as in the response "a house-bird who is very eat").

Notice that the syntactic oddities in these materials posed greater problems than the semantic oddities for both groups; but also that the between-group differences were much greater for the syntactic oddities than for the semantic oddities. Manipulation and puzzle solving with low-level syntactic features seem to be attributes of linguistically talented people. This difference is apparent even in so far as one can show that the syntactic structures in question are handled adequately, in the context of normal speech and comprehension, by both populations.

Consider as an example Table 6.1 which lists the free paraphrases of both educational groups for the item *house-bird glass*. We can assume that every speaker of English, approximately, knows how to use *glass* both adjectivally (*a glass house*) and nominally (*a piece of glass; a glass to drink from*). Yet the less-educated subjects often interpreted *house-bird glass* as *glass house-bird*, a *house-bird made of glass*, or even as *glass bird-house*. Why not *glass used to make a house-bird* or *the glass used by the house-bird*, solutions which simultaneously resolve the semantic and syntactic properties of the stimulus item? (Notice particularly that there are no clear differences of semantic oddity for the two response types: Anyone who can conceive of and believe in a glass house-bird ought to be able to conceive of and believe in the glass which is used to manufacture such house-birds). But even in a forced-choice situation, when both options were displayed, the clerical group preferred the inversion still. The structure of these findings suggests that only the most-educated group will consider least-common categorial assignments for the component words of the stimuli (i.e., *glass* as noun rather than adjective) in this situation.

TABLE 6.1

Responses of Two Populations to the Task of Paraphrasing the Orally Presented Novel Compound, *house-bird glass*[a,b,c]

Responses of Seven Ph.D. Candidates	
1.	glass for making house-birds
2.	a very small drinking cup used by a canary
3.	glass for house-birds
4.	glass for house-birds
5.	*a way of describing thickness of glass—glass as thick as (or in the shape of) glass of a bird-house
6.	glass that protects house-birds
7.	the glass that is produced by birds around the house
Responses of Seven Clerical Workers	
1.	*a glass house-bird
2.	*house-bird that's in a glass
3.	a drinking glass or a cup made out of glass of a bird in a house
4.	*a bird that is made of glass
5.	*a special glass to use in a bird's house
6.	*a house-bird made from glass
7.	*a glass house-bird

[a] From Gleitman and Gleitman (1970).

[b] Hyphenation in the cited form represents the internal subcompound (i.e., the stress on this whole compound noun is 132).

[c] An asterisk marks the responses that fail to take into account the fact that the last word in such compounds is the head noun and thus must be the first (leftmost) noun in a paraphrase (a relative clause or prepositional phrase) that mirrors its syntactic and semantic properties. Thus the head noun of this compound is *glass*. For the internal sub-compound (*house-bird*), the same principle should apply: The rightmost noun (*bird*) in the compound is its head, and thus should appear in the leftmost position of a relative clause or prepositional phrase paraphrase of it. One Ph.D. candidate, but six clerical workers, err in applying this principle consistently, for this example. Similar performance disparities were observed for 144 similar stimuli, as well as in simplified (two-word) versions of them, and under a variety of task conditions.

In short, the clearest difference between these populations is in *focusing* on the syntactic issues, accessing and manipulating language knowledge in a noncommunicative setting. Clearly this does not imply that adults are all equal in their ability to analyze complicated meanings in everyday life. But across a range broad enough to be of considerable psychological interest, all normal individuals can realize consciously that some expressions within their semantic compass (however limited this may be) are meaningless or odd in meaning. Everyone realizes that there is something peculiar about the sentence *George frightened the color green* and can "fix it up" via some semantic change. But not everyone can focus on a syntactic anomaly and perform an appropriate syntactic manipulation to repair it, even if they are in productive control of the construction during ongoing conversational exchange. In this sense, meaning can be brought

to conscious attention more readily than can syntactic form. Apparently, descending to phonological levels, the facts are similar. Jotto, Scrabble, anagrams, and cryptograms—all in part phonological puzzles—require skills that are probably unequally distributed in the population. One might conclude that puns are not the lowest form of humor after all.

The findings just presented seem to fit naturally with many experimental demonstrations that it is easier to remember and report on global semantic properties of heard or seen language than on its lower-level features. For example, Sachs (1967) and Fillenbaum (1966) demonstrated that subjects store the gist of connected discourse over indefinite periods of time but quickly lose hold of its exact syntactic form; Bransford and Franks (1971) in a quite different experimental setting showed essentially the same thing: When matters get complicated or time passes, linguistic stimuli are unavailable for verbatim report but the semantic facts remain. Reason dictates that phonological and syntactic analysis are implicated in the recovery of meaning from speech, but apparently these relatively early or "raw" stages of linguistic processing decay fairly quickly; perhaps this is why they are comparatively unavailable to reflection. Such familiar reading phenomena as the "eye–voice span" (Levin and Kaplan, 1970) and the word-superiority effect (e.g., Baron, in press) are probably subject to similar interpretation (for discussion, see Rozin and Gleitman, 1977).

1.2 Variations in Metalinguistic Performance as a Function of Developmental Level

The difficulty and variability of adult judgments about syntactic and phonological properties of their language are reflected in some aspects of development. Shatz (1972) and Gleitman, Gleitman, and Shipley (1972) asked children to detect and comment about anomalous sentences. The instructions were deliberately vague: "Tell me if these sentences are good or if they are silly." They found that children of 5 years typically were able to recognize and comment on matters of meaning and plausibility of the stimulus sentences. For example *The men wait for the bus* was rejected by some 5-year-old suburbanites on grounds that only children wait for busses. *The color green frightens George* was rejected on grounds that "green can't stand up and go 'Boo!'" But violations of syntax that scarcely affected meaningfulness went unnoticed by these kindergartners (examples are *Claire and Eleanor is a sister; Morning makes the sun to shine*), even though these children did not make such errors in their own spontaneous speech.

On the contrary, 7-year-olds usually accepted semantically odd or implausible sentences as "good" and "not silly." For example, a subject responded to *The color green frightens George* by saying "Doesn't frighten me, but it sounds OK." But these same subjects rejected meaningful but

syntactically anomalous sentences. For example, in response to *Claire and Eleanor is a sister*, a 7-year-old commented "You can't use *is* there: Claire and Eleanor *are* sisters." Sometimes these verbally talented 7-year-olds, like the highly educated adults described earlier, manipulated the categorial content of anomalous sentences in considering their acceptability. As an example, in response to *Boy is at the door*, a subject said "If his name is *Boy*. You should—the kid is named *John*, see? *John* is at the door or *A* boy is at the door or *The* boy is at the door or *He's* knocking at the door." Table 6.2 shows how these subjects' judgments accorded with adults' judgments, for all the stimulus sentences in the investigation.

Overall, these findings suggest that the surface structure anomaly is harder for the kindergartner to spot than the meaning anomaly, while the syntactic anomaly becomes more salient to the 7-year-old in response to vague instructions about "good" and "silly" sentences.

We achieved essentially the same result in a task that requires the detection and report of ambiguity. Forty-eight children, ranging from 6 to 11 years, were asked to explicate verbal jokes, presented orally. Ambiguities that turned on word-meaning (e.g., the two interpretations of *bank*) or underlying structure (e.g., *Would you join me in a bowl of soup?*) were easiest for all age groups, and accessible even to the youngest subjects. But phonological deformations and segmentation ambiguities (e.g., *You ate 10 pancakes? How waffle!*) and surface-structure ambiguities (e.g., *Where would you go to see a man eating fish?*) were hardest for all age-groups, and almost uniformly inaccessible to the younger subjects (Hirsh-Pasek, Gleitman, and Gleitman, 1978). Similar findings have been reported by others (Fowles and Glanz, 1977; Kessel, 1970), though some investigators of similar issues (e.g., Shultz and Pilon, 1973) have classified the linguistic stimuli somewhat differently, and consequently interpret the developmental sequence differently also.

Summarizing, differences in the levels of linguistic analysis accessible to reflection at various ages contrast with the facts of speech acquisition: Children learn to *speak* with adequate syntactic form well before they express very complex thoughts, but they come to *notice* oddities of thought (that are within their compass) before oddities of syntax and phonology, even for instances where they have productive control. Many findings in the literature dovetail with our own on this topic. Children of age 5 can be taught the difference between the concepts "word" and "sentence" with little difficulty, but it is hard for them to distinguish among such concepts as "word," "syllable," and "sound" (Downing and Oliver, 1973). Children of ages 5 and 6 have some mild difficulty segmenting speech into words (Holden and MacGinitie, 1972) often failing to isolate connectives and determiners as separate words. They have greater difficulty in segmenting words into syllables (Rosner, 1974; Liberman *et al.*, 1974). And they have

TABLE 6.2

Conformance of Children's Judgments of Grammaticality to Those of Adults[a,b]

Example sentences	Adult judgment	Subjects' ages in years						
		5	5	6	7	7	7	8
1. *John and Mary went home.*	wf	+	+	+	+	+	+	+
2. *John went home and Mary went home.*	wf	+	+	+	+	+	+	+
3. *Two and two are four.*	wf	+	+	+	+	+	+	+
4. *Claire and Eleanor is a sister.*	d	−	−	+	+	+	+	+
5. *My sister plays golf.*	wf	+	+	+	+	+	+	+
6. *Golf plays my sister.*	d	+	+	+	+	+	+	+
7. *Boy is at the door.*	d	+	+	+	+	+	+	+
8. *I saw the queen and you saw one.*	d	−	−	−	−	+	+	+
9. *I saw Mrs. Jones and you saw one.*	d	+	+	+	+	+	+	+
10. *Be good!*	wf	+	+	+	+	+	−	+
11. *Know the answer!*	d	−	−	−	+	−	+	+
12. *I am eating dinner.*	wf	+	−	+	+	+	+	+
13. *I am knowing your sister.*	d	−	−	−	+	+	+	+
14. *I doubt that any snow will fall today.*	wf	+	−	+	+	+	−	+
15. *I think that any snow will fall today.*	d	−	−	+	+	+	+	+
16. *Claire loves Claire.*	wf/d							
17. *I do too.*	wf	+	−	+	−	+	+	+
18. *The color green frightens George.*	wf	−	+	+	−	−	+	−
19. *George frightens the color green.*	d	+	+	+	+	+	+	+
Total "+" judgments for all sentences		12	10	15	15	16	17	17

[a] Adapted from Gleitman, L. R., Gleitman, H., and Shipley, E. The emergence of the child as grammarian, *Cognition*, 1972, *1*(2/3), 137–152.

[b] Children were asked to judge a list of orally presented sentences as "good" or "silly," and these judgments were compared to those of adults. The adult judgments were provided by three independent judges who indicated whether each sentence was well-formed (wf) or deviant (d). The children's judgments are marked "+" if they agree with those of the adult and "−" if they do not, regardless of their explanations. Sentence 16 cannot be scored in this manner; whether or not it is deviant depends upon whether the same referent is assumed for both nouns. The names in Sentences 4 and 9 were chosen to be familiar; in Sentence 16 the child's own name was used.

the greatest difficulty of all in segmenting words or syllables into phonemes (Elkonen, 1973; Rosner and Simon, 1971; Gleitman and Rozin, 1973a). In sum, the lower the level of linguistic representation called for, the more difficult it is for young children to respond to noncommunicative linguistic activities in these terms. We have claimed (Rozin and Gleitman, 1977) that a major cognitive problem in reading can be viewed as a subpart of this more general problem of "metalinguistic" awareness, where large individual differences coexist with identical tacit linguistic knowledge. Some evidence for this claim follows.

1.3 Learning to Read Is Harder Than Learning to Talk

One of the most striking examples of individual difference in language-like behavior is the acquisition of alphabetic reading. While a few individuals learn to read almost overnight and without instruction (Read, 1971), most require a substantial period of training, and a significant number fail to attain literacy even after years in school. The success and scope of reading acquisition varies as a function of intelligence (Singer, 1974; Thorndike, 1971), motivational and cultural factors (Downing, 1973), and internal differences in the nature of the writing system that is to be acquired (Gleitman and Rozin, 1973a; Rozin and Gleitman, 1977). This individual variation exceeds by orders of magnitude the differences that are observed in the acquisition of speech and comprehension of a first language.

Adequate speech is acquired over broad ranges of general intelligence; for example, spoken language of a character similar to that of normals emerges even among retardates, although progress is slower (Lenneberg, 1967; Lackner, 1976; Morehead and Ingram, 1976). Furthermore, despite many differences in cultural ambiance and differences in the languages that are being learned, normal children seem to pass through similar sequences of developmental accomplishments within the same narrow time-frame (Brown, 1973; Lenneberg, 1967; Slobin, 1973; 1975). Moreover, spoken language seems to emerge more or less equivalently under a variety of input content and presentation conditions; in both character and rate, language learning is remarkably insensitive to differences in the speech styles of caretakers (Newport, Gleitman, and Gleitman, 1977). Successful language-like communicative means are achieved even by children radically deprived of linguistic input (Herodotus, 460 B.C.; Feldman, Goldin-Meadow, and Gleitman, 1978). Finally, the spoken-language skills are resilient in early life, often surviving damage to the speech centers of the brain and to the speech apparatus (Lenneberg, 1967).

Summarizing, there are substantial differences among individuals both in acquisitional rate and in eventual level of attainment for written language, even though formal and specific training is usually available to the learner. In contrast, the similarities in rate and character of spoken language acquisition are striking, even though the conditions for acquisition are here variable and diffuse.

What account can be given for the fact that what appears to be the more general and complex task (learning to speak and understand) is less difficult and less variable than what appears to be a trivial derivative of this (learning to write and read a script based on a known spoken language by a learner who is certainly older and possibly wiser)? Clearly, the difference has only indirectly to do with the visual modality itself.

Manual–visual languages seem to be acquired in much the same way as spoken languages, by deaf children reared by signing parents (Newport and Ashbrook, 1977).

We believe that the major problem in learning to read has to do with the cognitive prerequisites to understanding alphabetic systems in particular: Properties of these orthographies require their users to become aware of and to focus attention on language in relatively raw or superficial representations, approximately at the level where *tap*, *apt*, and *pat* have the same components, only rearranged. Failure to achieve this fundamental insight about the nature of alphabets characterizes an overwhelming majority of individuals who do not achieve literacy (Firth, 1972; Liberman *et al.*, 1977; Calfee, Lindamood, and Lindamood, 1973). Thus the same approach that characterized our approach to the paraphrasing, ambiguity, and classification tasks seems useful in understanding the task of reading acquisition as well.

The aspiring reader is asked to reflect about language, and so to acquiesce in a number of judgments that make sense of alphabetic notation. The teacher asks him to realize that *pit* and *pat* start with "the same sound," that *pit* starts with what *tip* ends with, and that *pit* is decomposable into "p," "i," and "t." Such units are analyzed for spoken language acquisition without awareness, in terms of an evolutionarily old and highly evolved mental circuitry (for discussion in this evolutionary context, see Rozin, 1976); no conscious awareness or judgments are required. Prior evidence has been given that tasks that require judgments will pose greater difficulty than tasks that do not require judgments. Furthermore, we also have presented evidence that conscious recognition and awareness are especially hard to come by when the focus must be on molecular, rather than more molar, language representations. Taken together, these positions predict that learning to read should be harder and more variable than learning to talk, a fact we have just documented; furthermore, they predict that learning to read a script organized around word-meanings (a logography) should be easier than learning to read a script organized around phonology (a syllabary or alphabet), a claim which we document below (based on Gleitman and Rozin, 1977; Rozin and Gleitman, 1977).

1.3.1 Writing Systems, and the Acquisition of Reading

The natural history of writing reveals a conceptually orderly progression. Orthographic convention proceeds, almost uninterruptedly over time, in a single direction: At every advance, the number of symbols in the script decreases; concurrently, and as a direct consequence, the abstractness of the relations between the written symbols and the meanings increases. Pictographic scripts (which render "whole ideas") appeared earliest and were invented most frequently in separate cultural

developments; abstract logographies (which render meaningful words) tend to be later, but still are frequent; syllabic scripts are yet later and rarer; the alphabet (phonemic writing) seems to have been invented but once, and latest (Gelb, 1952; Jefferey, 1961; and for a review see Gleitman and Rozin, 1977).

This succession of historical insights seems noncoincidental to us: The more analytic the unit, the harder it is to bring to conscious attention; and surely the invention of a script has to count as a prime case of self-conscious language manipulation. It was evidently easier to see that language consists of a sequence of words than that it consists of a sequence of sounds. It is of some interest here that many syntactic as well as phonological facts were ignored in the early writing systems: The Aegean logographies and syllabaries did not represent grammatical function words and morphemes very systematically, but only the "meaningful" substantives, verbs, etc. Given that these analytic insights were ultimately achieved, however, it does not seem surprising that each primitive script gave way in time to its more analytic successor. Obviously, if the number of symbols in the script is reduced, learning is broader and the problem of memorization is diminished during the course of attaining full literacy.

However, in the view of Rozin and Gleitman, decreasing the number of symbols in a script came at a cost. If the writing system abstracts away from the meanings it conveys, the decipherer will have to recover the meanings from the now encoded form in which they have been rendered. Learners of an alphabet are required to recognize, quite consciously, the phonological and syntactic substrata of language. On the suppositions sketched above, this ought to produce wide variability in the success of reading acquisition, and success ought to be correlated with the ability to give phonological judgments. There is much evidence in favor of this position.

Eimas *et al.*, (1971) have shown that even 4-week-old infants can and will discriminate phonological properties of speech sounds relevant to language; they can discriminate, for example, between *ba* and *pa*. While humans are not the sole possessors of such discrimination skills (Kuhl and Miller, 1975) and although humans can also discriminate categorically among acoustic stimuli not relevant to speech (Cutting and Rosner, 1974), the findings of Eimas *et al.* clearly speak to the fact that the acoustic discriminative apparatus on which language learning is ultimately based are in place approximately from birth. But a well-known "reading-readiness test" (mis)named the Auditory Discrimination Test (Wepman, 1958) is based on the fact that some kindergartners cannot correctly say "different" or "same" in response to pairs of words that differ in one phonological segment (e.g., *pat* and *bat*) or are identical (e.g., *pat* and *pat*). From the demonstration of Eimas *et al.*, we know that these 5-year-olds can *hear* the differences in such stimuli. They can even correctly repeat the

stimulus items which they could not judge on the Wepman Test (Blank, 1968). Furthermore, the failing 5-year-olds do have the capacity to give judgments: they can correctly say "same" and "different" in response to written stimuli (e.g., they can discriminate between the visual displays BAT and PAT, and judge them to be "different," even though they cannot read them; Smith, 1974). Evidently the child who fails the Wepman test is very circumscribed in his deficits. His weakness appears only when he is asked to give a *judgment* about the sound properties of linguistic stimuli. Yet the Wepman test is a fairly useful predictor of early reading success, suggesting that the judgment faculty is implicated in learning to read.

In a similar vein, Firth (1972) has shown that groups of third graders matched for IQ, but differing in reading skills according to the estimates of their teachers, perform identically on such semantic tasks as guessing plausible completions of incomplete orally presented sentences; but the ability to provide consensual pronunciations for written nonsense words (such as *nide* or *prit*) appropriately classified these children in 98% of instances. It is of particular importance that the ability to perform word-segmentation and construction tasks continues to distinguish successful from unsuccessful readers all the way through twelfth grade (Calfee, Lindamood, and Lindamood, 1973; Rosner, 1972).

1.3.2. *The Conceptual Demands of Orthographies*

We have just argued that even at advanced stages and over a broad IQ range, the ability to think about phonology is a trait characteristic of good readers of alphabets. Rozin and Gleitman investigated this issue directly, by attempting to teach failing readers, and children with poor prognosis for reading acquisition, to read scripts of varying kinds. Their approach stemmed from the view that written language, for which there presumably exist no specific evolutionary adaptations, must be learned under the control of self-conscious, metalinguistic apparatus (whatever that may turn out to be). If so, the meaning-based scripts ought to pose less of a learning problem than the sound-based scripts, because of the relative difficulties of making judgments at these levels. Using a variety of notations, they attempted to teach logographies, syllabaries, and alphabets to Philadelphia-area school children.

Even those children with the poorest prognosis for reading success (inner-city children from schools whose reading achievement norms were catastrophically below national norms) acquired logographies with little difficulty. A logographic script taught by Gleitman and Rozin (1973a) was based on pictorial representations; more impressive, a script taught by Rozin, Poritsky, and Sotsky (1971) used Chinese characters with English translations; three examples of their sentences are shown in Figure 6.2. Children who had failed to acquire reading skills in first and second grades learned to recognize 30 characters in this script and read the

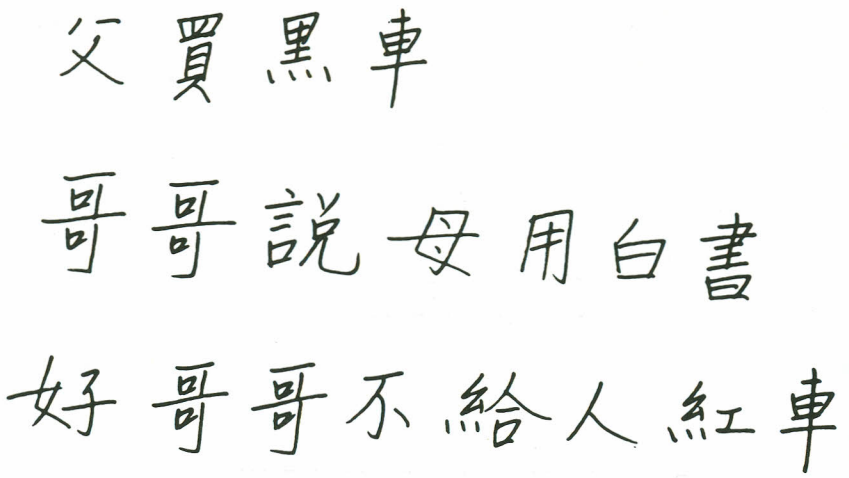

Figure 6.2. A few sentences in modern Chinese, with English interpretations.

Failing learners of an alphabet were taught to read Chinese characters, but with English interpretation. Samples are shown above. Reading across from left to right, these sentences can be translated as: *top*—father buys (a) black car; *middle*—older-brother says mother uses (the) white book; *bottom*—good older-brother (would) not give (the) man (a) red car. Note the approximately one-to-one mapping of English words to unitary Chinese characters (words in the translation that are not directly represented in the Chinese characters are included in parentheses). (From Rozin, P., Poritsky, S., and Sotsky, R., American children with reading problems can easily learn to read English represented by Chinese characters, *Science*, 1971, **171,** 1264–1267, Fig. 2. Copyright 1971 by the American Association for the Advancement of Science.)

materials with fair to adequate comprehension in from 5 to 8 hours of instruction.

The picture-based logography of Gleitman and Rozin was next expanded into a syllabary. See Figure 6.3 for samples of this script. Each item in the script represented a single syllable. Some of these were based on the logography; for example, an element such as *can* now represented the noun *can*, the auxiliary *can*, and the first syllable in *candy*. Some syllables had no word basis, such as the *dy* syllable which appears in *candy*. The children were taught both the syllabic elements and a convention for combining them. After 5–7 hours of instruction with 22 syllables and 16 polysyllabic words containing these, 5 inner-city kindergartners were able to identify *new* polysyllabic words (that they had not been taught, but which were in their oral vocabularies) in the syllabic notation (Gleitman and Rozin, 1973a).

A much more extensive syllabic script was acquired during the first year of schooling by inner-city 6-year-olds taught in a normal classroom setting by their own teachers. Figure 6.4 shows a page from an intermediate-level reader used in this project. Adequate fluency was achieved in this notation; but during this same time, neither these children nor a matched

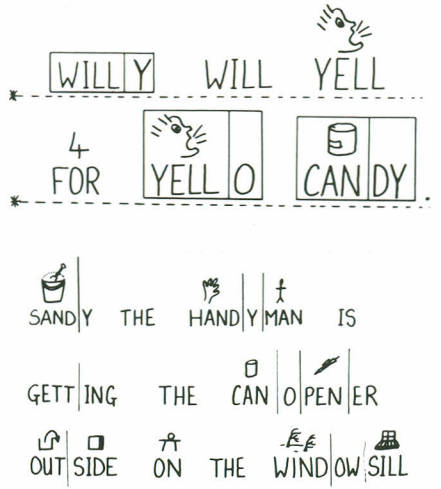

Figure 6.3. Samples of writing from a syllabary script used by Gleitman and Rozin for initial reading instruction.

Pictorial clues were used, as shown above, to help the children identify the syllable units. Boxes, lines, or dots were used to supply syllable segment boundaries. In some versions of this curriculum, boundary and picture clues were dropped out later in the instruction period. After 5–7 hours of instruction with 22 syllables and 16 polysyllabic words containing these, 5 inner-city kindergartners were able adequately to identify *new* polysyllabic words (that they had not been taught, but were in their oral vocabularies) in the syllabic notations. [From Gleitman, L., and Rozin, P., Teaching reading by use of a syllabary, *Reading Research Quarterly*, 1973, **8**(No. 4), p. 471, Fig. 4.]

group of control children learning to read by traditional means, adequately acquired the phonemic concepts of an alphabet (Rozin and Gleitman, 1977).

Summarizing, the logography was easier to acquire than the syllabary, which is based on the phonological properties of words. But the syllabary is a gross, molar representation of phonology. It was easier to acquire than the more analytic phonemic (alphabetic) script. Thus the population with poor reading prognosis differed from successful readers most in acquiring the phonemic concepts of an alphabet, and least in acquiring the ideas behind a logography: Phonology, not meaning, is at the crux of the early reading problem. The essential difficulty for poor readers seems to be in accessing their own phonological machinery. They have the requisite phonological organization in their heads; their problem is how to get to it.

Our supposition, then, is that unsuccessful beginning readers are generally characterizable as those who fail to acquire the alphabetic insight and thus read logographically. It is striking that failing readers are not people who literally can read nothing. They can read many hundreds of words but (as this is often put) they stop learning at about the "fourth grade level" of reading achievement. This level involves reading with

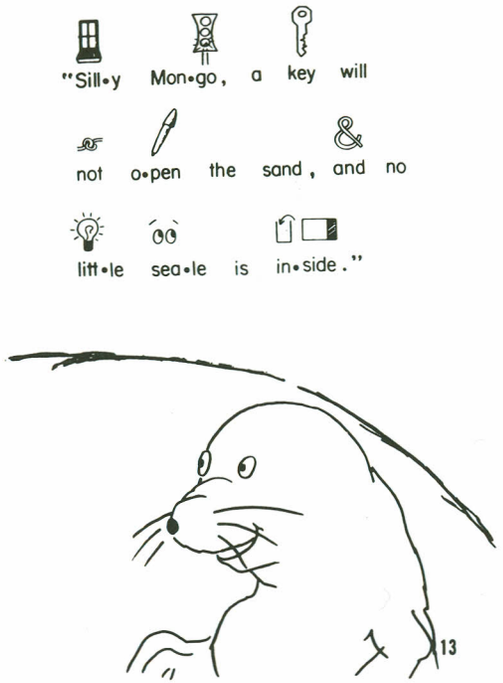

Figure 6.4. A page from an intermediate-level reader in the syllabary curriculum for reading acquisition.

This kind of writing was used by classroom teachers as a preliminary instructional device, in a number of Philadelphia-area kindergartens and first grades. Adequate fluency was achieved with this notation in from one to nine months, depending on the population of learners. About 70 syllabic elements are used in this version of the *Syllabary* reading curriculum. In the example here, some pictorial clues have been dropped out of the notation: the word *sand* was initially introduced with a pictorial hint (a sand bucket), but by this point in instruction is recognized from the letter array alone. From Rozin, P. and Gleitman, L. R. The structure and acquisition of reading II: The reading process and the acquisition of the alphabetic principle. In A. S. Reber and D. Scarborough (Eds.), *Toward a psychology of reading*. © 1977, L. Erlbaum Associates, Fig. 6, p. 120.] Hillsdale, N.J.

comprehension a couple of thousand (at most) simple words, in context. It is of some interest that normal readers of logographic scripts (Chinese readers) acquire a recognition vocabulary of only a few thousand items (Leong, 1973), this number apparently representing a limit on rote acquisition of arbitrary visual displays. Similarly, most deaf readers of English script (who are clearly denied the phonological route to reading acquisition) learn to read very slowly and generally do not attain as high a level of skill as hearing individuals (Furth, 1966; Gibson, Shurcliff, and Yonas, 1970). Gleitman and Rozin concluded that the failing American reader has learned a logography, not an alphabet.

2. ARE THE METALINGUISTIC FUNCTIONS RELATED TO LANGUAGE USE AND LEARNING?

We have speculated elsewhere (Gleitman, Gleitman, and Shipley, 1972) that the metalinguistic function may be a single example of a more general metacognitive organization in humans. That is, a variety of cognitive processes seem themselves to be the objects of higher-order cognitive processes in the same domain—as if the homunculus perceived the operation of a lower-order system. Examples of metacognition in memory would be recollection (when we know that we remember) and intentional learning (when we know we must store the material for longer retrieval). On this view, there need be no formal resemblance between metacognition and the cognitive processes it sometimes guides and organizes. Rather, one might expect to find resemblances among the higher-order processes themselves, a general executive function which may take on aspects of what is sometimes called "the self." Thus language-judgment functions, in particular, could be orthogonal to language functions. One need have no disposition to think about language in order to use it appropriately.

The recent literature in psycholinguistics largely supports this interpretation. A wide variety of experiments effectively demonstrate that the structural relationships among sentences described in generative grammars (derived from the data of *judgments*) are not the same relationships required to describe language information-handling in real time (for which the data are *speech* and *comprehension* measures; for discussion see Bever, 1970; Fodor, Bever, and Garrett, 1974). As we mentioned in introductory comments, some have concluded from such facts that grammatical descriptions lack psychological reality. But it seems more realistic to conclude only that their relevance is not to speech and comprehension directly. Rather, grammars reflect the judgmental ("metalinguistic") aspects of language knowledge more directly than they do knowledge of language itself. Whatever resemblance exists between language processing strategies and grammars may derive from the fact that the human builds his grammar out of his observation of regularities in his own speech and comprehension. Whatever differences exist between these organizations may derive from the fact that the "executive" thinking capacities have properties of their own, which enter into the form of the grammars they construct.

Although we have argued that the metafunctions, if they exist, need not enter into the deployment of the cognitive processes they subserve, sometimes they may. Though one often remembers without awareness that one is remembering, more self-conscious activities are possible, and seem to be implicated in the structure of findings in memory experiments. For

example, it is apparently possible to report what is in one's memory store ("yes, I'll recognize it if you mention it") without being able to retrieve the information (Hart, 1967). Furthermore, adults perform better on intentional memory tasks than on incidental memory tasks, presumably because they can willfully institute such strategies as rehearsal in aid of the memory functions when the task demands this. Analogously, metalinguistic functions may enter into speech and comprehension on those occasions when one wishes to pun or orate, or to read or write poetry; that is, when language manipulations are part of the definition of the task.

Could the metalinguistic functions enter into the process of learning a first language? The studies we have cited would argue not, for the language functions seem developmentally to precede the metalanguage functions, with only some rare exceptions. The children we studied judged sentences for syntactic form only some years after they used these forms correctly; they organized speech-sounds phonologically years before they could bring this organization (or a related one) to bear on the problem of understanding alphabets. There are some similar findings for other putative metafunctions. For example, unless specially instructed to rehearse, young children do no better in intentional learning tasks than they do in incidental learning tasks (Yendovitskaya, 1971). Perhaps this is because they have no functioning "metamemory" that spontaneously institutes the appropriate strategies available to memory.

Summarizing, we take the evidence to suggest that judgmental functions in language are separate from the language functions both on descriptive grounds (the data of linguistic judgments do not organize the findings for speech and comprehension in real time) and on developmental grounds (the presumed metafunctions are developmentally late to appear).

Some arguments can be made in favor of a more intimate connection between language and metalanguage, although these are perhaps not logically compelling. Some parallels exist between the development and use of restricted language-specific syntactic devices and the development and deployment of metalinguistic skills, as we have defined these. That is, certain elaborate inflectional devices appear only under special linguistic–cultural circumstances (present in creoles but not in pidgins, Sankoff and Laberge, 1973; present in speech but not in early writing systems, Gelb, 1952), are late to develop in the history of the individual (Slobin, 1973), and show extensive individual variation in rate of development, owing to environmental effects (Newport, Gleitman, and Gleitman, 1977) and, possibly, capacity differences (Lenneberg, 1967). The same is true for the metalinguistic functions which show extensive variability (Gleitman and Gleitman, 1970) and environmental sensitivity (reading disabilities of the sort we have described are largely isolated within restricted socioeconomic groups). Approximately these same aspects of language are those which seem to make trouble for the judgment-giver (he has more difficulty making syntactic judgments than semantic judgments; etc.).

3. SUMMARY AND DISCLAIMERS

We suppose that individual differences in language behavior occur more severely at the judgmental level than at the speech and comprehension level. We have invoked such ill-defined notions as "metalinguistic awareness" and "accessibility" to describe such findings. That is, we claim the differences in tacit knowledge are small in comparison to differences in the ability to make such knowledge explicit. We have some evidence that suggests greatest judgmental difficulty with least processed linguistic representations. However, our descriptions of these matters are at present merely metaphorical and not a little fuzzy. But the facts of individual language difference suggest that we will have to look seriously at the problem of "conscious knowledge."

ACKNOWLEDGMENTS

We wish to express our great intellectual debt to two colleagues whose collaboration with us is directly responsible for many of the ideas expressed in this paper. Many of the positions taken were developed in a collaboration with Paul Rozin, in the context of studies on the acquisition of reading (Gleitman and Rozin, 1973a, 1973b, 1977; and Rozin and Gleitman, 1974, 1977; see Section 1.3 of the present paper for summary discussion). A rather different physiological approach to the questions of *accessibility* and *metacognition* appeared in Rozin (1976) where many of our findings on reading are also discussed. Other contributions to the ideas discussed here come out of our collaboration with Elizabeth Shipley on topics in child language learning (Shipley, Smith, and Gleitman, 1969; Gleitman, Gleitman, and Shipley, 1972). The work described in this chapter was funded by Grant #5 R01 MH 23505 from the National Institutes of Health and The William T. Carter Foundation, whose support we gratefully acknowledge.

REFERENCES

Baron, J. The word-superiority effect. In W. K. Estes (Ed.) *Handbook of learning and cognitive processes*. Hillsdale, New Jersey: Erlbaum. In press.

Bever, T. G. The cognitive basis for linguistic structures. In J. R. Hayes (Ed.), *Cognition and the development of language*. New York: Wiley, 1970.

Blank, M. Cognitive processes in auditory discrimination in normal and retarded readers. *Child Development*, 1968, **39**, 1091–1101.

Bloomfield, L. *Language*. New York: Henry Holt, 1933.

Bolinger, D. L. and Gerstman, L. J. Disjuncture as a cue to constructs. *Journal of the Acoustical Society of America*, 1957, **29**, 778.

Bransford, J. D. and Franks, J. J. The abstraction of linguistic ideas. *Cognitive Psychology*, 1971, **2**, 331–350.

Brown, R. *A first language: The early stages*. Cambridge, Massachusetts: Harvard University Press, 1973.

Brown, R. and Hanlon, C. Derivational complexity and order of acquisition in child speech. In J. R. Hayes (Ed.), *Cognition and the development of language*. New York: Wiley, 1970.

Calfee, R. C., Lindamood, P., and Lindamood, C. Acoustic–phonetic skills and reading—kindergarten through twelfth grade. *Journal of Educational Psychology*, 1973, **64**, 293–298.

Cutting, J. E. and Rosner, B. S. Categories and boundaries in speech and music. *Perception and Psychophysics*, 1974, **16**, 564–570.

Downing, J. (Ed.), *Comparative reading: Cross-national studies of behavior and processes in reading and writing*. New York: Macmillan, 1973.

Downing, J. and Oliver, P. The child's conception of "a word." *Reading Research Quarterly*, 1973–74, **9**, 568–582.

Eimas, P. D., Siqueland, E. R., Jusczyk, P., and Vigorito, J. Speech perception in infants. *Science*, 1971, **171**, 303–306.

Elkonin, D. B. USSR. Trans. by R. Raeder and J. Downing. In J. Downing (Ed.), Comparative reading: *Cross-national studies of behavior and processes in reading and writing*. New York: Macmillan, 1973.

Feldman, H., Goldin-Meadow, S. and Gleitman, L. Beyond Herodotus: The creation of language by linguistically deprived deaf children. In A. Lock (Ed.), *Action, gesture and symbol: The emergence of language*. New York: Academic Press, 1978.

Fillenbaum, S. Memory for gist: Some relevant variables. *Language and Speech*, 1966, **9**, 217–227.

Firth, U. *Components of reading disability*. Unpublished Doctoral dissertation, University of New South Wales, Kensington, N.S.W., Australia, 1972.

Fodor, J. A., Bever, T. G., and Garrett, M. F. *The psychology of language: An introduction to psycholinguistics and generative grammar*. New York: McGraw Hill, 1974.

Fodor, J. A. and Garrett, M. F. Some reflections on competence and performance. In Lyons, J. and Wales, R. S. (Eds.), *Psycholinguistic papers*. Edinburgh: Edinburgh Univ. Press, 1966.

Fowles, B. and Glanz, E. Competence and talent in verbal riddle comprehension. *Journal of Child Language*, 1977, **4**, 433–452.

Furth, H. G. *Thinking without language: Psychological implications of deafness*. New York: Free Press, 1966.

Geer, S. E., Gleitman, H., and Gleitman, L. Paraphrasing and remembering compound words. *Journal of Verbal Learning and Verbal Behavior*, 1972, **11**, 348–355.

Gelb, I. J. *A study of writing: The foundations of grammatology*. Chicago: University of Chicago Press, 1952.

Gibson, E. J., Shurcliff, A., and Yonas, A. Utilization of spelling patterns by deaf and hearing subjects. In H. Levin and J. P. Williams (Eds.), *Basic studies on reading*. New York: Basic Books, 1970.

Gleitman, L. R. and Gleitman, H. *Phrase and paraphrase*. New York: W. W. Norton and Co., 1970.

Gleitman, L. R., Gleitman, H., and Shipley, E. The emergence of the child as grammarian. *Cognition*, 1972, **1**, 137–164.

Gleitman, L. R. and Rozin, P. Teaching reading by use of a syllabary. *Reading Research Quarterly*, 1973a, **8**, 447–483.

Gleitman, L. R., and Rozin, P. Phoenician go home? (A response to Goodman). *Reading Research Quarterly*, 1973b, **8**, 494–501.

Gleitman, L. R. and Rozin, P. The structure and acquisition of reading I: Relations between orthographies and the structure of language. In A. S. Reber and D. Scarborough (Eds.), *Toward a psychology of reading*. Hillsdale, New Jersey, Erlbaum, 1977.

Hart, J. T. Memory and the memory-monitoring process. *Journal of Verbal Learning and Verbal Behavior*, 1967, **6**, 385–391.

Herodotus. *The Persian Wars*, c. 460 B.C., Rawlinson, G. (Tr.) New York: Random House, 1942.

Hirsh-Pasek, K., Gleitman, L. R., and Gleitman, H. What did the brain say to the mind? In A. Sinclair, R. Jarvella, and W. J. M. Levelt (Eds.), *The Child's Conception of Language*. Berlin, Heidelberg, New York: Springer-Verlag, 1978.

Holden, M. H., and MacGinitie, W. H. Children's conceptions of word boundaries in speech and print. *Journal of Educational Psychology*, 1972, **63**, 551–557.

Jeffery, L. H. *The local scripts of archaic Greece*. Oxford: Clarendon Press, 1961.

Kessel, F. S. The role of syntax in the child's comprehension from ages six to twelve. *Monographs of the Society for Research in Child Development*, 1970, **35**(6).

Kuhl, P. K. and Miller, J. D. Speech perception by the chinchilla: Voiced–voiceless distinction in alveolar plosive consonants. *Science*, 1975, **190**, 69–72.

Labov, W. Locating the frontier between social and psychological factors in linguistic variation. This volume.

Lackner, J. R. A developmental study of language behavior in retarded children. In D. M. Morehead and A. E. Morehead (Eds.), *Normal and deficient child language*. Baltimore: University Park Press, 1976.

Lenneberg, E. H. *Biological foundations of language*. New York: Wiley, 1967.

Leong, C. K. Hong Kong. In J. Downing (Ed.), *Comparative reading: Cross-national studies of behavior and processes in reading and writing*. New York: Macmillan, 1973.

Levin, H., and Kaplan, E. L. Grammatical structure and reading. In H. Levin and J. P. Williams (Eds.), *Basic studies on reading*. New York: Basic Books, 1970.

Liberman, I. Y., Shankweiler, D., Fischer, F. W. and Carter, B. Explicit syllable and phoneme segmentation in the young child. *Journal of Experimental Child Psychology*, 1974, **18**, 201–212.

Liberman, I. Y., Shankweiler, D., Liberman, A. M., Fowler, C., and Fischer, F. W. Phonetic segmentation and recoding in the beginning reader. In A. S. Reber and D. Scarborough, (Eds.), *Toward a psychology of reading*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1977.

Morehead, D. M. and Ingram, D. The development of base syntax in normal and linguistically deviant children. In D. M. Morehead and A. E. Morehead (Eds.), *Normal and deficient child language*. Baltimore: University Park Press, 1976.

Newport, E. L. and Ashbrook, E. Development of semantic–syntactic relations in the acquisition of American Sign Language. Manuscript, University of California at San Diego, 1977.

Newport, E., Gleitman, H. and Gleitman, L. R. Mother, I'd rather do it myself: Some effects and non-effects of maternal speech style. In C. E. Snow and C. A. Ferguson (Eds.), *Talking to children: Language input and acquisition*. Cambridge, England: Cambridge University Press, 1977.

Nida, E. A. *Morphology: The descriptive analysis of words*. Second ed. Ann Arbor, Michigan: University of Michigan Press, 1949.

Read, C. Pre-school children's knowledge of English phonology. *Harvard Educational Review*, 1971, **41**, 1–34.

Rosner, J. *The development and validation of an individualized perceptual skills curriculum*. Learning Research and Development Center, University of Pittsburgh. Publication 1972/7. 1972.

Rosner, J. Auditory analysis training with prereaders. *The Reading Teacher*, 1974, **27**, 379–384.

Rosner, J., and Simon, D. P. *The auditory analysis test: An initial report*. Learning Research and Development Center, University of Pittsburgh, Publication 1971/3, 1971.

Ross, J. R. Where's English? This volume.

Rozin, P. The evolution of intelligence and access to the cognitive unconscious. In J. Sprague and A. N. Epstein (Eds.), *Progress in psychobiology and physiological psychology*, Vol. 6. New York: Academic Press, 1976.

Rozin, P. and Gleitman, L. R. The structure and acquisition of reading II: The reading process and the acquisition of the alphabetic principle. In A. S. Reber and D. Scarborough (Eds.), *Toward a psychology of reading*. Hillsdale, New Jersey: L. Erlbaum Associates, 1977.

Rozin, P., Poritsky, S., and Sotsky, R. American children with reading problems can easily learn to read English represented by Chinese characters, *Science*, 1971, **171**, 1264–1267.

Sachs, J. S. Recognition memory for syntactic and semantic aspects of connected discourse. *Perception and Psychophysics*, 1967, **2**, 437–442.

Sankoff, G. and Laberge, S. On the acquisition of native speakers by a language. *Kivung*, 1973, **6**(1), 32–47.

Shatz, M. Semantic and syntactic factors in children's judgment of sentences. Unpublished manuscript, University of Pennsylvania, 1972.

Shipley, E. F., Smith, C. S. and Gleitman, L. R. A study in the acquisition of language: Free responses to commands. *Language*, 1969, **45**, 322–343.

Shultz, T. and Pilon, R. Development of the ability to detect linguistic ambiguity. *Child Development*, 1973, **44**, 728–733.

Singer, H. IQ is and is not related to reading. In S. Wanat (Ed.), *Intelligence and reading*. Newark, Delaware: International Reading Association, 1974.

Slobin, D. Cognitive prerequisites for the development of grammar. In C. A. Ferguson and D. I. Slobin (Eds.), *Studies of Child Language Development*. New York: Holt, Rinehart and Winston, 1973.

Slobin, D. I. The more it changes . . . on understanding language by watching it move through time. In *Papers and Reports on Child Language Development*, No. 10. Department of Linguistics, Stanford University, Sept. 1975.

Smith, J. A. The relationship between phonemic sensitivity and the effectiveness of phonemic retrieval cues in preliterate children. Unpublished Doctoral dissertation. University of Pennsylvania, 1974.

Thorndike, W. E. Reading as reasoning: A study of mistakes in paragraph reading. *Journal of Educational Psychology*, 1971, **8**, 323–332. (Also in *Reading Research Quarterly*, 1970–1971, **6**, 425–434.)

Wepman, J. M. *Wepman auditory discrimination test*. Chicago: Language Research Associates, 1958.

Yendovitskaya, T. V. Development of memory. In A. V. Zaporozhets and D. B. Elkonin (Eds.), *The psychology of preschool children*. Cambridge, Massachusetts: M.I.T. Press, 1971.