THE PSYCHOLINGUISTIC BASIS OF LINGUISTIC AWARENESS*

Ignatius G. Mattingly+

Abstract. Two kinds of knowledge of language are distinguished: grammatical knowledge and performance knowledge. Grammatical knowledge is what a language learner acquires; performance knowledge is what a speaker-hearer uses to produce and understand sentences in real time. The reader, unlike the listener, must make direct use of both kinds of knowledge. Active language acquisition entails accessibility of grammatical knowledge. It is suggested that "linguistically aware" individuals are those who are continuing to acquire language, even though the minimal requirements of performance have been met.

If the generative grammarians (Chomsky, 1965; Chomsky & Halle, 1968) and the psycholinguists who have studied human sentence processing in the generative tradition (Podor, Bever, & Garrett, 1974) are at least roughly correct, the speaker-hearer of a language has two distinguishable sorts of tacit knowledge that may be called grammatical knowledge and performance knowledge.

On one hand, the speaker-hearer has knowledge of the grammar of his language. The grammar consists of a lexicon and sets of ordered rules. Each entry in the lexicon is a morphophonemic representation of a word together with associated syntactic and semantic information. The lexical forms for heal and health, for example, are /hɛl/ and /hɛl+θ/. The syntactic rules generate, that is, derive, the complex word-order patterns of actual sentences from elementary "deep structure" patterns by a series of structural transformations. The phonological rules generate the phonetic forms of words (which represent intended and perceived pronunciations) from morphophonemic forms by processes of substitution, insertion, and deletion. Thus the phonetic forms [hɪyl] and [hɛlə] are derived from /hɛl/ and /hɛl+θ/ by rules that shorten the long vowel of /hɛl+θ/ and diphthongize and shift the quality of the same vowel of /hɛl/. Notice that the morphological relationship of the two words, explicit in the morphophonemic forms, becomes opaque in the phonetic forms.

Grammatical knowledge is accessible, in the sense that the speaker-hearer has intuitions about which phonetic contrasts are distinctive in his language and which are not—and which syntactic patterns are acceptable and which are

*This paper was presented at the Twenty-Eighth Annual Meeting of the National Reading Conference, St. Petersburg, Florida, 30 November-2 December, 1978, and has been submitted for publication in the Conference Yearbook.
+Also University of Connecticut.
Acknowledgment: This work was supported in part by NICHD Grant HD-01994 to Haskins Laboratories.

[HASKINS LABORATORIES: Status Report on Speech Research SR-57 (1979)]
not. The validity of these intuitions is corroborated by the success of linguists in reconstructing descriptively adequate grammars from such intuitive data. Note, however, that there are limitations on the scope of grammatical knowledge. The speaker-hearer has very restricted intuitions, for example, about the acoustic properties of the speech signal that can be shown to determine his phonetic perceptions (Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967). Accordingly, the grammar has nothing to say about the complex relationships between the phonetic representation of a sentence and its acoustic realization.

A child acquiring the grammar of his native language is rather in the position of a linguist. Given a theory of language, specifying the structural properties that all grammars share, and data as to correspondences between sound and meaning, he proceeds to construct the lexicon and the rules. Thus, from the phonetic forms [hiyl] and [heθi], and a notion of their meanings (as well as other parallel data), he infers the morphophonemic forms /hēl/ and /hēl+θ/ and the rules of shortening, diphthongization and vowel shift that relate the two phonological levels. (Obviously, this particular example illustrates a fairly advanced stage of language acquisition.) The child's position is different from that of the linguist mainly in that his general theory of language is innately given and superior to any general theory so far explicitly formulated by linguists. But having a task similar to the linguist's, he must have psychological mechanisms for doing what linguists do: making hypotheses about rules and about the context of lexical entries, generating hypothetical utterances and comparing them with observed utterances. Having hypothesized morphophonemic /hēl/ and /hēl+θ/ and rules of shortening, diphthongization and vowel shift, he must have a specific mechanism that enables him to generate phonetic [hiyl] and [heθi], so as to test his hypothesis.

Opposed to such grammatical knowledge about the structure of language is the performance knowledge that enables a speaker-hearer to produce and understand actual sentences in real time. What the psycholinguists have argued is that performance knowledge must be very different in form from grammatical knowledge, even though the speaker tries to produce grammatically well-formed sentences, and the listener understands sentences by constructing syntactic patterns that relate the meanings of individual words. But a speaker does not generate the sentences he utters, nor does the listener analyze the sentences he hears by applying the generative rules in reverse order. It appears, rather, the listener's sentence-processor uses various pragmatic, often fallible "parsing strategies" based on the surface orderings of possible constituents. Though there has been relatively little work on lexical search in sentence-processing, we might suppose that it is done without reference to morphophonemic forms. Phonetic forms are associated with lexical entries, and the sentence-processor, provided with a phonetic representation of an utterance by the speech-perception mechanism, finds the entries for phonetic [hiyl] and [heθi], and extracts the syntactic and semantic information it needs, without reconstructing morphophonemic /hēl/ and /hēl+θ/. Notice, though, that the lexicon is a link between the grammar and the sentence-processor.

It cannot be concluded, however, that grammatical knowledge is after all psychologically unreal or that is has nothing to do with understanding
sentences. Which parsing strategies will be appropriate depends in part on
the syntax of the language, even though the sentence-processor does not make
syntactic derivations. The semantic information available to the sentence-
processor in lexical entries depends in part on the semantic properties of the
morphemes from which words are formed, even though it does not do morpho-
phonemic derivations. It seems likely, therefore, that the function of grammati-
cal knowledge is to provide the sentence-processor, in the course of language
acquisition, with an optimal set of parsing strategies and an optimal set of
word-meanings. Having fulfilled this function, however, grammatical knowledge
has at most a vestigial role in the actual process of understanding a
sentence. (See the discussion of this point in Fodor et al., 1974, pp. 368-
372.)

A further difference between grammatical knowledge and performance knowl-
edge is that although the speaker-hearer has grammatical intuitions, he does
not have intuitions about performance. What is known about the procedures of
the sentence-processor, therefore, has been learned by experimental inference
rather than by linguistic analysis. In this respect, the sentence-processor
resembles the speech perception mechanism.

How much must an actual speaker-hearer know about the grammar of his
language to insure a set of parsing strategies and word-meanings sufficient
for ordinary understanding? Perhaps, relatively little, in comparison with
the ideal speaker-hearer of linguistic theory. It is quite believable, for
example, that a person might have parsing strategies that could cope, much of
the time, with passive constructions, without having grammatical knowledge of
the rules for generating passive sentences; and that he might have a
functional understanding of the meanings of [hīyī] and helō] but no knowledge
of the appropriate morphophonemic forms for these two words or of the
phonological rules relating them. There is nothing in the processes of
speaking and listening that compels him to learn such things.

To put the matter somewhat differently, the grammatical knowledge a
language-learner is potentially capable of acquiring far exceeds the function-
al requirements of the sentence-processor. But if this is so, we should not
find it surprising that some speaker-hearers, driven by an instinctive
linguistic curiosity, continue acquiring the grammar of their language inde-
finitely, while others essentially abandon language acquisition once the
sentence processor is adequately equipped for the purposes of ordinary
communication.

Reading necessarily differs from listening because it is not possible to
access performance knowledge directly with visual input. An orthography based
on visual displays of acoustic wave-forms or on sound spectrograms is hardly
conceivable, and even an orthography that was in effect a narrow phonetic
transcription, equivalent to what a listener's speech-perception mechanism
provides the sentence-processor, would be impractical. Instead, reading makes
direct use of grammatical knowledge and exploits performance knowledge in a
rather roundabout way.

As Chomsky (1970) points out, it is a general characteristic of orthogra-
phies that they appeal to the reader's knowledge of the morphophonemic forms
of words, and not to morphologically opaque phonetic forms. In English
orthography, the spellings heal and health correspond to morphophonemic /hɛl/ and /hɛlθ/ and not to phonetic [hɛyl] and [hɛθ]; and even in writing systems that leave segmental structure implicit, such as that of Chinese, it is obviously the morphological forms that are being transcribed. Apparent exceptions to this generalization—writing systems that are said to be "phonetic," turn out on examination to be used for languages that do not have highly elaborated phonologies, so that the morphophonemic forms themselves are fairly close to phonetic forms (Liberman, I. Y., Liberman, A. M., Mattingly, & Shankweiler, 1978).

The evidence of orthography suggests that a reader looks up words in his mental lexicon morphophonemically, making use of his grammatical knowledge. On the other hand, sentences are not written in a way that makes their deep structure manifest, and it does not seem likely that the reader, any more than the listener, analyzes sentences grammatically. Instead, the reader presumably uses the same parsing strategies that he uses as a listener. In order to do so, he has to provide the sentence-processor with a phonetic representation of the sentence. This can readily be done once lexical search has been accomplished, since the lexicon is linked to the sentence-processor. In the case of a known word, its phonetic form is already associated with the lexical entry, if our account of lexical search in listening is correct.

The case of an unknown word is more interesting because it provides further support for the grammatical character of reading. In this situation, the reader is obliged, having established a new lexical entry, to generate a purely hypothetical phonetic form, using the phonological rules. The mechanism that permits him to do this is not part of performance knowledge. Nor is it a special trick he learns as a reader. It is rather, we suppose, the mechanism we have already considered that enables him to test candidate morphophonemic representations in the course of language acquisition. Note that the listener, hearing a new word, is not under similar pressure to analyze it morphologically, or to use this generative mechanism.

It appears then, that the reader uses grammatical knowledge as well as performance knowledge when he reads; and that on occasion, he is obliged to rely on the same mechanisms by which this grammatical knowledge was acquired.

What has been said suggests that a good reader must know the phonology of his language to a substantially greater extent than suffices for mere speaking and listening. He is "phonologically mature" not only in the sense that the morphophonemic forms in his lexicon correspond to a large extent to the relatively abstract forms transcribed by the orthography, but also in the sense that he knows the rules that relate these forms to phonetic forms. But it would be a mistake to regard such maturity as a prerequisite for learning to read. On the contrary, as we will see, phonological maturity develops as a consequence of reading.

What does seem to be an essential prerequisite is what we have called "linguistic awareness" (Mattingly, 1972): the ability of a speaker-hearer to bring to bear rather deliberately the grammatical, and in particular, the phonological knowledge he does have in the course of reading. To the linguistically-aware child, the phonological segmentation and the morphological structure of words is intuitively obvious, and the orthography seems
reasonable, even though there may be substantial discrepancies between the orthographic transcriptions of words and his immature morphophonemic forms; to the child not thus aware, the principles by which the orthography transcribes words seem quite mystifying. If the child's production and understanding of spoken language seem normal, we must suppose that he knows a reasonable amount about the phonology of his language. But he is unable to make effective use of it in reading, the task with which he is now confronted.

I believe that the considerable differences in degree of linguistic awareness that are observable in children are related to different patterns of language acquisition. As we have seen, some children seem to learn only enough of the grammar of their language to satisfy the functional requirements of the sentence-processor, and then to abandon the task of language acquisition. In such children, one might expect that at the age when reading instruction begins, grammatical knowledge would be not only more limited, but less accessible, and that acquisition mechanisms such as we have discussed would have atrophied. This mental state I would equate with lack of linguistic awareness. Such children might well have difficulty accessing the knowledge and reawakening the mechanisms required for reading, even though their speaking and listening might seem adequate.

Children of another sort, who have continued to learn the grammar of their language even after the minimal demands of the sentence-processor are satisfied, will be "linguistically aware." Their acquisition mechanisms are still in working order. Not only will they have greater phonological maturity than the first class of children, so that the orthography will correspond more closely to their mental representations of words, but also, these representations will be more accessible. Moreover, they are in a position to increase their phonological maturity. If a child does not already have the morphophonemic forms /hēl/ and /hēl+θ/ in his lexicon, and the associated rules in his phonology, he is quite likely to acquire this grammatical knowledge through reading (Moskowitz, 1973). Finally, since these children are still actively acquiring their language, they will see reading as a source of fresh data. The linguistic curiosity that motivates their continuing language acquisition will thus motivate them in learning to read as well.

My contention, then, is that linguistic awareness, essential for reading and for learning to read, is only indirectly related to speaking and understanding. It is more directly related to active language acquisition, and the awareness in question is an awareness of grammatical knowledge, of language in the form in which it is acquired. Such awareness, presumably intense in every child during the period when he learns to talk, has waned in many children by the time reading instruction begins. The reading teacher's task, essentially, is to rekindle this awareness by getting the language acquisition machinery started again.

REFERENCES

Row, 1968.