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Current Directions in Psycholinguistics

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1. Introduction

When asked to present a broad overview of any particular area, one is bound to expose his own biases, no matter how fair and objective he attempts to be. Nevertheless there are general themes, attitudes, and research paradigms which do characterize activity within a field at any given time, and it is these which I hope to capture, at least in part, in the present paper.

The goal of psycholinguistics is to discover those rules, mental representations, structures, and processes which humans employ as they produce, comprehend, and acquire language. In addition, however, psycholinguists are interested in formulating general theories, or subtheories, about language use and form, and in integrating these with other, well-established facts and theories about cognition.

It is convenient to begin this survey with a brief sketch of the history of psycholinguistics as a background against which contemporary perspectives and research can be clearly seen and understood. Then, to provide concrete illustrations of current work, I will focus on two examples of relatively well-understood psycholinguistic phenomena. These are intended to highlight both assumptions and attitudes shared by many researchers working in psycholinguistics today. In closing, I will offer a brief assessment of progress to date.

2. Background

Linguistics and psychology seem to have experienced a mutual love-hate relationship over the past century. In late nineteenth century Europe there was considerable interaction between the few psychologists and historical linguists. Indeed Wilhelm Wundt's chair at the University of Leipzig was made in conjunction with that of Hermann Paul, an important historical linguist. With the advent of American structuralism, however, linguists tended to dissociate themselves from the mentalism of Wundtian psychology and extolled the virtues of autonomy and purity of discipline. In this structuralist period emphasis was placed on a description of linguistic forms, with a crude version of behaviorism just about the only psychologizing allowed. Here the two disciplines tended to diverge, with each losing something in the process. Psychologists were more interested in "verbal behavior" while linguists were interested in describing the forms of languages, overtly rejecting mentalism as having any relevance to linguistics.

This situation remained pretty much unchanged even with the advent of

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transformational grammar, with Chomsky (1957) arguing strongly in favor of the Bloomfieldian anti-mentalism. It was only later in the development of generative grammar (e.g., Chomsky, 1965) that a renewed interest in psychological issues emerged. It is of course well known that Chomsky and his major followers have since claimed that linguistics is really a special case of theoretical psychology. Thus once again, at least in principle if not in practice, linguistics and psychology turned sympathetically toward one other. It is interesting to note that linguistics' interest in cognition emerged at about the same time as a growing interest in cognitive psychology was taking place. Indeed, Neisser's *Cognitive psychology*, that landmark of the reemergence of mentalism in psychology, was published in 1967.

Although linguists in the early and mid 1960s proclaimed allegiance to mentalism, much of the activity within linguistics proper remained quite untainted by either methods or concerns of psychology. Transformational grammarians continued research within a structuralist tradition, but now in terms of a theoretical framework in which syntax could be neatly treated. In fact, it can, and has been, argued (Prideaux, 1971; Steinberg, 1982) that work in generative grammar constitutes a logical extension of the structuralist enterprise rather than a revolutionary paradigm change.

For their part, psychologists quickly became enamoured with the apparent successes of transformational grammar and asked the obvious question as to whether actual language processing (that is, comprehension, production, and acquisition) might not involve those theoretical operations posited by linguists. Thus was born the (in)famous "derivational theory of complexity" and its language acquisition counterpart the "cumulative theory of language acquisition" (Brown & Hanlon, 1970). These theories, which hypothesized that language processing is a monotonic function of transformational complexity, prompted a flurry of psycholinguistic experimentation, much of which initially appeared supportive (e.g., Miller & McKeen, 1964; Savin & Perchonock, 1965; Clifton & Odom, 1966). After early successes, however, internal theoretical reasons and external experimental results came to suggest that the derivational theory of complexity was incorrect. Not only were some relatively complex sentences fairly easy to process, but also some relatively simple ones turned out to be quite hard to process (cf. Fodor, Bever, & Garrett, 1974). Unfortunately, the failure of the derivational theory of complexity and the cumulative theory of language acquisition tended to cause yet another rupture between some linguists and psychologists, with the result that, on the one hand many linguists once again ignored experimental results in their theorizing, while on the other, many psychologists ignored the role and importance of syntactic form in language processing.

The keystone of the derivational theory of complexity and its language acquisition companion was the central role played by syntax. Indeed, syntax was viewed as the driving force in language processing. However, just as psycholinguists came to recognize that other factors were also important from a psychological point of view, so did linguists begin to

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turn their attention to such matters as the complex nature of the lexicon, pragmatics, presuppositions, the role of context, the nature of discourse, and the like. Thus, advancements in both linguistics and psychology led to the realization that language is a complex set of subsystems, all of which not only interact but also influence one another in very important ways.

At this point, then, a broader approach to psycholinguistic research emerged -- an approach in which a variety of factors is seriously considered as being relevant to language processing. At the same time new and elaborate experimental methodologies have come to be developed to test hypotheses involving such factors.

3. Current Approaches

With the advent of a more eclectic attitude comes a series of basic assumptions, and since these are often only implicit in the work of many psycholinguists, it is useful to make them clear and overt. The first concerns the nature of language. While generative grammarians often treated a language as a formal object, namely a "set of sentences," most psycholinguistics view a language as a vehicle for communication, adopting a more functional and instrumental perspective on the nature and use of language.

As a corollary to the first assumption is a second, namely that language consists of a highly complex and interacting set of subsystems. This is often termed a "modular" view of language systems, and although the term means something rather different within formal linguistics, it is still a fruitful perspective to adopt in psycholinguistics, since it allows us to isolate various subsystems and examine their properties in detail. Moreover, this approach also permits us to examine more clearly the interactions and interpenetrations among the various subsystems.

A third assumption underlying most work in psycholinguistics is that research should be focused on the language user and not just on the form of sentences. After all, it is the speakers' and hearers' knowledge, rules, and structures, that we are trying to uncover.

A fourth assumption concerns the nature and location of meaning. While formal linguistics often treats meaning as a static, often literal, constellation of elements or features, the psycholinguist must accept the fact that meaning is a dynamic phenomenon residing in the speaker when he utters a sentence and which is reconstructed by the hearer as he attempts to comprehend. Moreover, as we all recognize, a given sentence can have vastly different meanings in different contexts. For example, "You played a great game" might be a sincere compliment in one circumstance and a cruel insult in another.

Finally, the psycholinguist recognizes the essential need for establishing empirical evidence in support of hypothesized explanations for linguistic phenomena. He realizes that it is not enough to speculate on how language might function; rather he realizes that he must produce scientifically viable reasons for his conclusions about those rules, structures, and processes which he claims are mentally real. Formal evidence
and argumentation alone is insufficient.

Since the modular approach to language looms so large in modern psycholinguistics, it is important to specify just what some of these components actually are. Perhaps the most obvious is that of the grammar, by which we mean that set of linguistic devices (structures, word order, morphology, etc.) which the language user employs to relate meaning and forms. We have no assurance that the formal grammar of the linguist is also that which is "internalized" by the native speaker, however. Rather, the linguist's proposals for rules or structures can at best serve as hypotheses which are to be evaluated empirically by the psycholinguist. After all, it is the psychologically viable rules and structures which the psycholinguist is attempting to find.

The lexicon, that mental dictionary in which the forms, meanings, and relations of words are stored, constitutes a second important component. Much research in psycholinguistics over the last several years has addressed the question of how and to what extent the child learns his inflectional and derivation morphology. What actually constitutes evidence for the claim that a mental relation exists between forms like wild and wilderness or galaxy and lactate, for example? Such questions provide information as to the nature of the mental lexicon.

Obviously, the speaker's knowledge of the sound system of his language, the phonology, is a further important component. It is crucial to learn, for example, whether the rules the linguist posits for such diverse phonological phenomena as voicing assimilation and vowel harmony actually represent the mental knowledge of the speaker and hearer.

The role of context and discourse is also an important consideration in psycholinguistics. After all, most sentences do not occur in isolation; they are rather integrated into various kinds of discourse, and the contexts in which they are found often strongly govern the particular forms sentences will take. Moreover, if we limit attention only to sentences in isolation, we will doubtless miss many important factors about the structure of sentences and their discourse functions.

A further, albeit somewhat vague, component of pragmatics must also be acknowledged. This refers to that general knowledge of the world, as well as of cultural and social conventions and situations, which aid us in constructing the meanings of sentences. We must admit that much of our knowledge of the world is to a great extent independent of our language (e.g., we all know that people can smile but stars cannot), but this knowledge is highly relevant in our interpretation of sentences (as in "The sun rose smiling in the east").

One final component, rather different from those cited above, is that of the processing strategies or heuristics which we employ as we construct, comprehend, and acquire language. These involve general cognitive processes which might have relevance in domains other than language, but which can be shown, for instance, to interact with language structures to facilitate comprehension.

Most of these notions or components are familiar, with the possible
exception of the last, those processing strategies which we employ in conjunction with our knowledge of our grammar, pragmatics, etc. as we encode or decode language. Once we adopt a modular view of language subsystems, we can then isolate and address research issues in a relatively straightforward manner, but when we adopt a position which holds that one or another of these factors is central or primary, we tend to pre-judge our results. It is important, therefore, not to assume we know the answer to our research questions prior to experimentally testing them, for if we did, then there is no point at all in such testing.

A further set of factors also characterizes current approaches to psycholinguistics, although these are not so easy to enumerate as those mentioned above. These include the fact that the interaction of components may be extremely complex, contrary to our a priori assumption that they are relatively simple. For example, native speaker judgements about relative acceptability of two different sentences may be a function not only of their structural differences but also of their relative semantic plausibility or even believability. Another important methodological aspect is that a particular linguistic phenomenon may result from several distinct causes or factors rather than from just one. Thus, not only the structure of a sentence but also the processing strategies and even lexical items involved may contribute to the processing ease or difficulty of the sentence. Similarly, in one context a sentence might be highly appropriate and easy to understand, but in another context, the same sentence might be viewed as utterly bizarre. Finally, within modern psycholinguistics considerable emphasis lies on establishing methodologically firm experimental techniques for acquiring reliable and valid data relevant to empirical questions. Without successful methods, psycholinguistics simply cannot progress.

These assumptions and methodological considerations at least partially characterize much of the current work in psycholinguistics, but in order to illustrate the kinds of research actually carried out, specific examples are needed.

The psycholinguistics literature is filled with examples of studies dealing with the role of syntax in comprehension, the acquisition of phonology, and the like. There is, however, relatively less published research dealing with either contextual constraints on the forms of sentences or with cognitive strategies. Therefore I have chosen these two areas to illustrate the directions and attitudes of much current psycholinguistic research. Rather than spend time on the details of various studies, I have instead chosen to focus on an interpretation of those results. The reader is referred to original sources for details. The specific examples discussed here are both well documented and fairly widely accepted, although there are, as is both healthy and necessary, some scholars who disagree with the interpretations offered here.

4. English Datives and the GIVEN-NEW strategy

English contains pairs of sentences like those in (1), beside each of which is a statement of the linear structure of the sentence in terms of functional notions such as subject (S), verb (V), direct object (DO) and indirect object (IO).
Such sentences contain both a direct and an indirect object, although the orderings of the two objects is reversed in the two sentences. Furthermore, in the structures like (1b), the indirect object marker to is eliminated. There are many verbs which can take both a direct and indirect object (e.g., sell, buy, lend, bring, take, etc.) and accordingly, the structural relationship between the sentences in such pairs is quite productive. Within transformational linguistics, the relationship has typically been treated in terms of a transformation of "Dative Movement," which under certain conditions optionally moves the IO to a position before the DO, with the concomitant loss of the preposition to.

The interesting question for psycholinguistics is not why there are two such forms, since we know that in post-verbal position in English, there is considerable freedom of order of constituents, but rather what the difference represents. The answer to this question is that while in isolation both members of pairs like (1) and (2) seem to be equally good sentences, in contexts, it is often the case that one is appropriate while another is not. For example, in response to the question:

2. Who did John give the flowers to?

the following four sentences are potential answers, since they all represent the same basic message (where the underlined words indicate the location of primary sentence stress):

3 a. He gave the flowers to Mary.
 b. He gave Mary the flowers.
 c. He gave the flowers to Mary.
 d. He gave Mary the flowers.

However, only (3a) and (3d) are appropriate answers to (2). The other two forms are quite inappropriate. However, as responses to (4), sentences (3b) and (3d) are appropriate, with the other two quite inappropriate.

4. What did John give to Mary?

In order to account for these facts, it is important to look beyond the boundaries of the sentence. Indeed, the source for the relative appropriateness of such sentences can be found to lie in what has come to be called the GIVEN-NEW strategy (cf. Clark & Haviland, 1974). This strategy deals with the organization of discourse and the effect of context on the form of sentences. The strategy can be formulated roughly as follows:
GIVEN-NEW Strategy. GIVEN information (that known to the speaker but not to the hearer) is systematically separated from NEW information (that known only to the speaker). In English (and in most other languages) GIVEN information normally precedes NEW (order: G-N), but NEW information can precede GIVEN is special devices (such as stress) are used to signal the order N-G.

This strategy has been widely discussed and is of importance for a variety of different syntactic analyses in many different languages. For experimental evidence in support of its viability, see, for example, Clark and Clark (1977), Takahara (1978), Smyth, Prideaux, and Hogan (1979), and Bock and Irwin (1980).

The GIVEN-NEW strategy explains the relative appropriateness of the answers to questions (2) and (4) as follows. In (2), the questioner and the answerer both know that John gave someone some flowers, so that both John and flowers are given. However, the questioner does not know the recipient, though the answerer does. That is, in the appropriate answer Mary must be new. This is precisely the case in (3a) and (3d), but not in the other two sentences. However, in the question (4), it is flowers which must be new, since both participants in the conversation know that John gave Mary something, but both do not know what was given.

The point here is that if we look only at the forms of the sentences, all that can be said is that they differ in form but share the same basic propositional meaning. However, this is to say nothing about the uses of the different forms. At this point, then, we can see how discourse factors interact with the forms of sentences in order to satisfy the appropriateness requirements. That is, we have here a clear instance in which information from the discourse component, represented as a processing strategy, interacts with the grammar component to account for the data. It should also be mentioned that the GIVEN-NEW strategy has found further, widespread success in a variety of situations, as a quick perusal of the references cited above will reveal.

Here, then, is a clear example attesting to the success of the modular approach to language subsystems, and one which nicely illustrates how syntactic form is utilized by speakers and hearers to serve specific purposes, namely to facilitate and structure discourse. In order to do this, of course, the speakers and hearers must share both a knowledge of the relevant syntactic forms of the language and a knowledge of how they are selected and organized in the construction of discourse.

5. The Acquisition of Relative Clauses

English has sentence containing relative clauses (RCs) such as the following, where the underlined clause is a RC:

5 a. The man who brought the flowers greeted the hostess. S+RC V DO
   b. The hostess greeted the man who brought the flowers. S V DO+RC
English permits a relative clause to be attached to a noun phrase in virtually any position in a sentence. All appear to be well-attested in the language, although certain relative clause positions and forms are more frequent and natural than others.

In the area of language acquisition, children are known to pass through various stages with respect to their comprehension and production control of various forms in their language. The following four stages characterize the maturational sequence for the acquisition of relative clause structures (cf. Smith, 1970; Limber, 1973; Slobin & Welch, 1973):

Stage 1. The child controls only simple sentences ("Daddy brought flowers.").

Stage 2. The child controls simple sentences plus some conjoined structures ("Mommy brought a flower and Daddy brought some candy.").

Stage 3. The child controls the above, plus some sentences with a relative clause attached to the final NP, but not with an internal, interrupting relative clause ("Mommy chased the dog that scared our cat.").

Stage 4. The child controls the above, plus sentences containing internal, interrupting relative clauses ("The dog that chased our cat was naughty.").

What is to account for this well-documented sequence of stages in the acquisition of relative clauses? If all the structures are acceptable for adults, why does the sequence cited here seem to obtain universally in English and in other languages as well. The answer to this question depends both on the development of cognitive capacities in the child and on general cognitive processing principles. Slobin (1973) has observed that children typically control cognitively simpler structures before more complex ones, and he adduced evidence for this seemingly obvious fact from studies carried out in a variety of languages. This principle of cognitive precedence, which is something like "Easy stuff is mastered before harder stuff," readily accounts for the fact that simple sentences, which typically represent one semantic proposition, are mastered before complex sentences of any kind, which represent two or more propositions.

Thus, Stage 1 should precede the others by the principle of cognitive precedence. Moreover, the same principle seems to support the emergence of conjoined structures before those containing relative clauses since conjoined structures involve a simple linking of notions rather than an embedding which involves the modification of a noun by a full clause.

But why do final relative clauses appear before interrupting ones? The answer to this question resides in a general processing strategy of CLOSURE, which can be formulated as follows:
The CLOSURE strategy. A given unit (clause, phrase, etc.) which is interrupted by another unit is harder to process than a unit which is not interrupted.

CLOSURE, which seems dependent to some large extent on short term memory factors, suggests that the language user attempts to complete a unit he is processing as early as possible. Abundant empirical evidence for CLOSURE has been adduced by Bever (1970), Slobin (1973), Prideaux (1984), and many others. Moreover, the strategy appears to be a very general cognitive information processing principle operative in music, visual perception, and in a host of other cognitive domains.

CLOSURE accounts for the emergence Stage 3 before Stage 4 in an obvious way: Stage 3 permits only non-interrupting relative clauses while Stage 4 contains both interrupting and non-interrupting ones. It is clear that CLOSURE predicts this order since Stage 3 structures are simpler to process, with non-interruption, than those of Stage 4.

Interestingly, CLOSURE is also operative in adult language processing. For example, in text counts based on written and oral language, by far the larger proportion of relative clauses is attached to sentence-final NPs, with relatively few attached to internal NPs. In production data, it has been found that most relative clauses are attached to final NPs (cf. Prideaux, in press; Prideaux & Baker, in press).

In this example the principle of cognitive precedence and the processing strategy of CLOSURE interact with the grammatical structure of the language to account for an otherwise mysterious developmental sequence in the acquisition of English.

6. Conclusions

These two brief examples illustrate nicely the overall success of a research strategy which assumes a modular view of language subsystems. Moreover, these illustrate the emphasis currently being placed on an understanding of those cognitive principles and processing strategies which are so intimately bound up with language processing and acquisition. Obviously, research in psycholinguistics is underway in a wide variety of areas other than those mentioned here. For example, much current research is being devoted to such areas as second language acquisition, language pathology, reading, sign language, sociolinguistics, and a host of other areas.

It should be clear that while for decades and even centuries, linguists have restricted their attention to the sentence itself, it is in only relatively recent times that we have looked beyond the boundaries of the sentence, that is, to discourse and to considerations other than those of the structural properties of sentences themselves. We have over the past several years begun to probe into those areas of general cognition where numerous answers appear to lie concerning language processing. Even though this research is in a relatively early stage, it is clear
that progress is being made.

In summary, not only is psycholinguistics alive, it is also thriving in a myriad of places. The comments offered here can, accordingly, only be seen as having scratched the surface of a vibrant and exciting enterprise.

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