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The Development of New and Old Information in Young Children's Early Language

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ABSTRACT

Infants can distinguish early in their first year of life sensory/environmental input that is newly presented to them as opposed to information with which they have become familiar. This new-old distinction plays an important role in children's language acquisition. Results of a longitudinal study of four children (approximately 17 months to 2 years, 9 months) indicate that children's linguistic selection at the one-word stage was governed by principles of informativeness. Children used their single-word utterances to report on or about new information. At the two-word stage, similar informativeness principles operated. The two words expressed new or a combination of new and old information, while totally presupposed information was omitted. Moreover omission or deletion of linguistic items to produce single-word utterances were of items related to old information. The function of early language thus is to produce new or changing information. The new-old distinction can be seen as the perceptual/cognitive foundation for the topic-comment and the presupposition-assertion distinctions in later language.

Our strategy in this article is to begin with a review of previous work on several related issues concerning functional, pragmatic influences on child language: Informativeness, old and new information, and topic-comment structure. Insofar as these factors turn out to play a role, we are at the same time studying areas in which perception and conceptual understanding have an influence on linguistic expression. The aim of our study, reported in the second part of the article, is to test out the numerous competing claims in the literature concerning the extent and nature of such factors at the moment the child has the first possibilities of productive syntax, the two-word stage.

Our literature review will place our study in a developmental framework; it presents the ontogenetic basis in perception and language which constitutes the foundation for the two-word stage to be studied.

ORIENTING TO NEW INFORMATION IN PERCEPTION AND LANGUAGE LEARNING

Children have a capacity to attend to new or changing information from the time they are young infants. The very first acts of perceptual activity in the neonatal period grow out of a pattern of fixation to a novel stimulus (or as one might call it new information) (e.g. Muir and Field 1979). When testing whether a baby has perceived a stimulus difference in laboratory settings, experimenters habituate the infant's orienting reflex to a certain stimulus and then introduce a new stimulus, testing to see if he/she orients to this new stimulus. If the infant orients, then he/she has perceived the difference between the two stimuli. The results show that an infant can and does perceive a difference between new and old information and that the infant orients to the new information (e.g. Kagan *et al.* 1978).

Greenfield (1982) suggested that the attentional system is geared to variability from the very beginning of life, and that, as language emerges, its use is coordinated with this attentional system. Most recently and interestingly, Hilke (1986) has shown that this coordination actually precedes language proper and is manifest in prespeech vocalization. He found that eight-month-old babies selectively use their vocalizations to mark two kinds of attentional change: Change in visual orientation (perceptual change) and change in facial expression (emotional change).

In the process of learning the first words, this orientation to the new or changing stimuli provides opportunities for learning the first word meanings, for the baby will more easily learn to associate word and referent if the referent's novelty has focused her attention on it at the same time she hears the name (Greenfield 1973). In that study, Greenfield systematically varied conditions for teaching her daughter Lauren, age 11 months, her first word, "dada". Pointing to father and saying "dada" in his static presence was ineffective in teaching her the meaning of the word. However, Lauren learned to attach meaning to the double syllable when her father appeared in the room, Lauren noticed his appearance, and the appearance was labeled "dada" by her mother. In other words, Lauren learned the meaning of her first word, "dada", when her father was a novel or changing stimulus, eliciting perceptual orientation.

Lempert and Kinsbourne (1985) make the general argument that early naming arises from selective orienting, where the orienting response is elicited by novelty, change and variability. Wachs and Chan (1986) found a positive correlation between the acquisition of new vocabulary and novelty and change in 12-month-old infants' physical environment. Indeed, Nelson's (1973) analysis of the first ten words in children's vocabularies showed that the early lexicon was heavily weighted toward dynamic objects or objects which change as a result of the child's own actions. (An example of the former is clock; an example of the latter is cookie.) Conversely, as Lempert and Kinsbourne (1985) point out, there is a whole body of research to show that early vocabularies rarely include names for common items that do not change, i.e. they are stationary and noiseless. Examples would be table, chair and tree. Static words continue to be infrequent, even when a child attains a vocabulary of 50 words.

New Information and Language Use at the One-word Stage

The important influence of the attentional system, tuned to novelty and change, affects lexical use as well as selection. Recently, Furrow and James (1985) showed that vocalization (at 15 and 18 months) and early speech (18 months) tend to occur at points of attentional change.

Additionally, when the child is at the one-word stage, researchers have found evidence from both naturalistic and experimentally manipulated studies, that he/she will verbally express the most informative element of the situation at hand, using language to reduce uncertainty (Bates 1976; Greenfield and Smith 1976; Greenfield and Zukow 1978; Snyder 1978; Greenfield 1979; Greenfield *et al.* 1985). Uncertainty exists when there is novelty or alternatives in the situation. Uncertainty is a subjective state posited to arise from these different forms of objectively defined variability.

When a child is at the one-word stage, he/she will express the most information possible by verbalizing the novel or changing element, or using a word to select from among possible alternatives (e.g. to select a desired agent when, from his perspective, more than one possible agent exists in the situation). Whereas the child is hypothesized to orient to novelty or change, he/she is posited to take for granted constant, unchanged or unique elements; these go unstated, even though the names for such elements are, at this point, part of the child's vocabulary.

Greenfield also posits that the child's message, being much more complex than his/her linguistic means, often combines the single word with at least one nonverbal element in the situation to form a semantic relation (Greenfield and Smith 1976). A semantic relation describes the relationship between two elements in an event. Both elements of a relation must be represented in the speech event but only one element is verbally encoded at the one-word stage. It follows from the informativeness principle that the verbally expressed element is the most variable aspect of the event.

Topic-Comment

The topic-comment distinction is related to the informativeness principle. A topic is the part of the sentence which constitutes what the speaker is talking

about, whereas the comment provides new information about the topic (Hornby 1971). Bates and McWhinney (1979) believe that, at the one-word stage, the child expresses comments only, and Greenfield's data show that the child verbalizes new information. Therefore, at the one-word stage, comments can be viewed as new information. This distinction between new and old information in early language perhaps can be seen as the perceptual/cognitive foundation for the comment-topic division in later language.

Presupposition and Assertion

The analysis of old and new information also reveals the cognitive roots of presupposition and assertion in language. What is perceived as constant, old, or redundant tends to be linguistically presupposed. What is perceived as changing, novel, or one of several alternative possibilities tends to be linguistically asserted. At the one-word stage, presupposed information is simply omitted. Here we find the ontogenetic basis for the linguistic distinction between presupposition and assertion. It is probably a convenient assumption to see old information, topic, and presupposition as initially undifferentiated, with differentiation occurring in subsequent development. Similarly, it is probably best to see new information, comment, and assertion as initially undifferentiated, with differentiation taking place at later stages.

For the young child, the most constant element is the self. Except under the relatively rare circumstances when there is a challenging alternative to the self as actor or possessor, the self is heavily presupposed and not linguistically realized as a verbalized agent or possessor (Greenfield and Smith 1976; Greenfield 1982). This taking of the self for granted, in language as in cognition, is a primitive form of egocentrism which is gradually reduced with age (Miller 1979).

As sentence structure becomes more complex, linguistic devices such as using pronominalization to mark presupposed or old information are added to omission as ways of dealing with presupposed information. But how does this transition take place? The first question might be, "What happens at the two-word stage?"

The Two-word Stage

With the onset of two-word utterances, Brown (1973) concludes that English syntax regulates the order of the words verbalized. He feels that the empirical evidence collected from normally speaking English children and receptive aphasics supports this view. Later research has confirmed the importance of English word order use at the two-word stage (e.g. Greenfield *et al.* 1985). However, Bowerman's (1973) data show some examples from one English-speaking subject in which standard English word-order is occasionally reversed. Sinclair de Zwart (1973) has come to the same conclusion, based on data from French-speaking children. Examples of variable word order to express a given semantic or grammatical relation in early two-word utterances leave open the possibility that a pragmatic/cognitive factor such as informativeness is affecting word order.

When studying the development of the topic-comment distinction in Italian, Bates (1976) noticed a short period of time when the child blurts out the novel information first and then adds other units so that the end result is an utterance where the words are in decreasing order of interest. At this point, she feels the child knows nothing about semantic-syntactic constraints. Rather, this type of utterance, with comment-topic ordering, is plausible as a first strategy because it is a sensorimotor procedure. It reflects the automatic workings of the well-developed orienting and figure-ground mechanisms (or new-old information). The later appearing topic-comment order requires a suppression of this early sensorimotor procedure plus an awareness of the listener's informational needs (Bates 1976).

However, there is a problem with the interpretation. Bates has come to the conclusion of the comment-topic ordering in young children's speech by automatically calling the predicate a comment. This equation is continued in Bates and McWhinney (1979), in which the authors conclude that there is an initial comment-topic strategy in a variety of languages, including English, based on a tendency to place the verb first. The problem with automatically labeling the predicate as comment and the word in the secondary position as topic, without regard to the situation, is that the predicate or verb may not be a comment; it may also be a topic. Nor is a comment automatically new information in two-word speech, as we will see when we present our own data. Similarly, the other word may not be a topic just because it is a nominal. If the verbal and nonverbal context is considered, the utterance could actually have a topic-comment or comment-comment ordering. In our study, we will use both verbal and nonverbal context to make distinctions between new and old, as well as between topic and comment.

Goldin-Meadow and Mylander (1984), in contrast to Bates, found no evidence of new-old or old-new ordering in deaf children of hearing, nonsigning parents, children who created language without a model. They found that the dominant pattern for two-sign utterances was old-old. One problem with their analysis, though, was that they did not take the preceding linguistic context into account.

Thus at the two-word stage there is some controversy about the role of pragmatics in word order. It is claimed that Italian children have a newcomment-old-topic ordering strategy, followed by an old-topic-new comment

strategy and that deaf children creating an idiosyncratic sign language have an old-old ordering strategy. There is also a debate as to whether the early word orders of young English-speaking children are syntactically or pragmatically determined at the two-word stage. Note that Italian children are utilizing languages with at least relatively free word order, while the deaf children, lacking a fixed model, are free to create their own word-order patterns. English children, in contrast, are acquiring a language with quite fixed word-order rules.

Our hypothesis was that, although word order may be fixed for Englishspeaking children during this stage, informativeness or newness would continue to play a role in the selection of semantic elements for linguistic encoding. More specifically, the two words the child does verbally express would be the two most informative elements. Several lines of evidence support this idea.

Early Strategies to Mark New Information

Weisenberger (1976) studied children with a mean length of utterance (MLU) of 2.80 and found that the situation affected children's lexical choice in the following way: The elements that were situationally least redundant or that represented new information were most likely to be verbalized. Redundancy consists of either something obvious in the situation or something that has been previously mentioned.

Children also tend to use stress to signal the newest information in their two-word utterances (Weiman 1976; Clark and Clark 1977; MacWhinney and Bates 1978). Weiman (1976) studied two-word utterances of five children and found the children to be highly consistent in their stress patterns. From her results, she devised a stress hierarchy which could predict which of the two words will be most stressed. Weiman concludes that, underlying this hierarchy, is the distinction between old and new information. In fact, she found that new information is at the top of the hierarchy, always the most stressed of the two words the child says.

Another way a child who is capable of multi-word utterances might mark new information is with expressive focusing. Focusing is the use of a single-word utterance which represents an element central to the child's attention due to its newness in the situation. In their study of children's use of single word utterances after they had acquired the use of multi-word speech, Leonard and Schwartz (1978) found that children use single-word utterances for focus or linguistic emphasis on a new aspect of a situation. In their study, new information was more often expressed by single words than by longer utterances.

There are two possible reasons for this type of focusing. First, when a child begins to use syntax, word order may be fixed (Leonard and Schwartz 1978). At

this point, a single word would allow the child to express the new information in a first-word position, in circumstances where it would otherwise be put second. Another reason a child might utilize a single word to focus on new information is because he/she feels more secure using an old (one-word) rather than a new (two-word) form to emphasize the newer information (Greenfield *et al.* 1985).

When a one-word utterance is used for expressive focusing, one possibility is that the child will then proceed to incorporate the word into a subsequent two-word utterance. This strategy yields the expansion sequence. The utterances appear in a sequence and seem to have the same meaning. For example, one child in our study pretended to eat a rock she was holding and commented,

> eat eat rock.

Reilly (1981) terms expansion sequences "repairs". To her, such sequences serve to clarify misunderstandings in discourse and also serve as a language learning device. She also feels that in the first utterance, the child focuses on encoding the most functionally salient element, while the second utterance serves simply to expand the first.

Atkinson (1979) reviews some literature on "replacement sequences", another term for the same phenomenon. He summarizes Braine's (1971) view that replacement sequences consist of one utterance expressing a predicate, followed by a second which adds the subject. On the other hand, Bowerman's data (1975) show that, in a number of instances, the subject was produced first and the predicate added in the second utterance. She had also observed the subject-predicate construction first and then a direct object or a locative added in the second utterance. Clark and Van Buren (1973) believe that the expanded sentences are independent of the underlying grammatical relationship. They feel that the first constituent is a practice attempt and this element comes at the end of the second utterance. For example,

> noisy/ man noisy/ (Atkinson 1979).

Atkinson (1979) and, more implicitly, Keenan *et al.* (1978) suggest that the initial one-word utterance of an expansion sequence is used to get the listener's attention on the topic and that the second, longer utterance goes on to predicate something of the topic. If we use a discourse criterion for topicalization, as Keenan and Schieffelen (1976) suggest, this conclusion concerning the establish-

ment of the topic must be true *ipso facto*, for the initial word provides the topical continuity between the two utterances.

Weisenberger (1976) has the most comprehensive information on replacement sequences. She reports two types. The first, not reported by the others, is when the child repeats a word after a better formed version due to stress, impatience, or the like. An example is,

> I wa go outside/ Outside/ Outside/ (Weisenberger 1976).

The result is that the child's speech becomes more telegraphic and functions to get a point across. This is called a reduction sequence.

The second type she discusses is the same type as other researchers have identified; the child expands his/her first utterance to form a fuller second utterance. Like Reilly, Weisenberger feels the function of this second type is due to the child's competence level and need for practice. The first utterance contains the most important constituents and, after they are processed, attention is turned to processing additional constituents.

The function of the first utterance is discussed by Leonard and Schwartz (1978) when they report on a child's use of single-word utterances after he/she is capable of more complex sentences (see above). Their viewpoint seems most plausible: The child is reacting to a change in informational focus. Using the single-word utterance to focus on the new information enables the child to alter the usual word order rules that might have otherwise put the word in a non-first word position. Thus, the function of the expanded sequences could be to highlight new information by placing it in a first-word position.

Some researchers treat expansion sequences as having multiple functions. Although Reilly (1981) emphasizes the repair and language learning functions, she also envisions a role for new information. Indeed, she sees the first utterance in the expanded sequence as the child's attempt to verbalize the most functionally salient element or elements. In her words, the child encodes the new information first. In her data, subsequent expansions were not new information, nor were they particularly salient, as they consisted of old information for all present. Weisenberger also points out that it is the "important" elements or aspects of the situation that were mentioned in the first utterance, later referring to this constituent as the new information.

From the above discussion, one can see that there is general disagreement as to what the function of these expansion sequences is. We hypothesized that the first utterance would be the newest and most informative element, with the subsequent utterances expanding on the first. The expansions would, it is hypothesized, add older information.

The reduction sequences, (e.g. *I wa go outside/outside/outside)* that Weisenberger reported, should also follow the same principle. Due to stress or some other factor, the child reduces his/her utterance. The word to which the child reduces should carry the most information possible, whereas the omitted words should be the older or more redundant information.

Multi-word Utterances and Later Language Development

Although there is not a distinct three-word stage, three-word utterances are common in children with MLU (mean length of utterance) in the 2+ range. Miller (1979), working with German-speaking children using three-word utterances, found that message elements assumed from an egocentric perspective tended to be omitted. The children did not mention themselves or their present location, and instead made it an implicit part of the message.

Children continue to use stress to mark the new information in their complex sentences. Hornby and Haas (1970) studied preschool children's use of stress when asked to describe pairs of pictures, the second of which differed in only one element. This element could either be the agent ("boy" changed to "girl"), action ("washing car" to "driving car"), or object ("girl petting dog" to "girl petting cat"). The results showed a highly significant trend for the children to stress this new element. MacWhinney and Bates (1978) have also found that children use stress to mark the new information, in both English and Italian.

The use of articles is another strategy of marking what the child views as new and old information. The definite article, "the", refers to a specific reference with distinctive properties that distinguish it from all the other members of its class. The indefinite article, "a", refers to no particular member but rather to a notion of one (Chafe 1976; Maratsos 1976). When "the" is used, it implies that the listener has in mind the same member that the speaker is referring to. The indefinite article is used with new information whereas the definite article is used with old information, old for both the speaker and the listener. Children use these articles soon after the two-word stage and, by around three-years-old, use the articles where adults would (Maratsos 1976; MacWhinney and Bates 1978; Keenan et al. 1979). But even though the children are using the articles in the correct place, they still make errors. Children overuse the definite article at the expense of the indefinite one. They treat some information as old when it should be treated as new for their listeners (Clark and Clark 1977). The errors seem to be due to the young child's egocentrism (Maratsos 1976). The experimental data do show that, by the time the child learns to use articles, he/she has

differentiated the dimension of specific vs non-specific. The contrasting uses of the definite for given and the indefinite for new information is not yet fully mastered at age five (Bloom and Lahey 1978).

Pronominalization, using pronouns, is also used to distinguish between new and old information. Pronouns are deictic words, words that point to things in relation to the participants in the speech situation. Pronouns are complicated from the child's point of view because of shifting reference (Clark and Clark 1977). Shifting reference means that the "name" doesn't go with the object designated; it depends on who the speaker is. For example, "I" refers to the speaker and if that person is being spoken to, he/she may be "you". The pronouns, he, she, and they, shift even more than "I" or "you".

Pronouns are used to mark and condense old information. MacWhinney and Bates (1978) and Keenan *et al.* (1978) have found that increased givenness results in increased pronominalization. Gordon (1977) looked at the distinction between old and new information and how it affected the structure of the child's utterances. She used a series of pictures where the last picture introduced one new element. Her results showed that children tended to omit old subjects to a significant degree. This would be due to the principle of informativeness. Regarding pronominalization, she found that oldness strongly influenced the use of pronouns and that there was a developmental trend toward more pronominalization as the children grew older.

As children learn more about the language through experience, they learn that sentence structure can be manipulated to convey old and new information. Hornby *et al.* (1970) show a developmental change in the relationship of words in sentences when they are presented out of context and with an even stress pattern. When asked what the most important word was, the five-year-olds treated the words independently, looking at the semantic content rather than syntactic structure. They tended to choose words by their degree of interest.

On the other hand, the seven-year-olds showed a definite shift towards the predicate as the most important part of the sentence. The authors attribute this change to the child's awareness of the sentence structure's role in the topic-comment distinction. They believe that the topic is frequently known from linguistic and extra-linguistic context and the comment, by presenting new information, is considered the important part. From their results, Hornby *et al.* (1970) feel that the seven-year-olds consider the grammatical predicate to be the comment; this conclusion is but an inference on their part, however.

Hornby (1971) gives some examples of how one can mark new and old information using different sentence structures. For example, in the pseudo-cleft sentence type (see scheme below), the new information is stated at the end of the sentence.

Sentence Type	Example	Method of Marking Information
Active	The boy is riding the	Old precedes new
	bicycle.	
Passive	The bicycle is being ridden by the boy .	Old precedes new
Cleft	It is the boy who is riding the bicycle.	New is complement of "it is" clause, all else is old
Pseudo-cleft	The one who is riding the bicycle is the boy .	Old is stated in the introductory phrase, new is complement of "is"

As a child's cognitive abilities and language abilities become more complex, so does the topic-comment distinction. The ways to mark the topic increase from when the child omits it and (later) puts it in a first word position (initialization), to making it the sentence subject (subjectivalization), pronominalizing it, and using the definitive (vs indefinite) article selectively. Methods for commenting include using a verblike surface device, indefinite reference, contrastive stress, and explicit lexicalization (Hornby 1971; Bates and MacWhinney 1979).

These methods closely parallel the methods the child uses to mark new vs old information. During the one-word stage of language development, it was shown that the topic is the same as old information and the comment is the new information. By this later stage of complex syntax, the distinctions are not quite as cut-and-dried, leaving one to believe that language is too complex to say that the topic and comment are old and new information, respectively. A closer look at the two-word stage in relation to the one-word stage which preceded it should give us information as to how the pragmatic subtleties develop and differentiate.

LONGITUDINAL STUDY AND RESEARCH BACKGROUND

Greenfield and Smith (1976) and Greenfield (1979) argue that children acquire the ability to express semantic functions during the period of single-word utterances and that the principle of informativeness explains which element the child selects to verbalize. These hypotheses were formulated *ex post facto* after naturalistic observation of two children.

From this research, Greenfield formulated specific rules to predict the element the child chooses to express. Greenfield and Zukow (1977) tested these rules through experimentally manipulated, mother-and-child scripted interactions. They found that the rules did account for a large proportion of the children's utterances.

Leaper and Greenfield (1980) conducted a study to further examine children's word choice, but this time in a nonverbal environment. The previous research of Greenfield and Zukow involved a scripted verbal description, by the mother, while performing a series of tasks with her child. It was felt that their results were limited due to the ambiguity as to what the children were responding to: The new information in the mother's speech or in the nonverbal task itself.

Using purely nonverbal imitation tasks (see below), Leaper and Greenfield found that children at the one-word stage of language development (17–19 months of age) adhered to the informativeness rules, with only ten disconfirmations out of a total of 117 utterances. At the one-word stage, children were encoding the new or variable aspects of the referential situation: Their speech was informative in the information-theory sense of the word.

The study to be described was a longitudinal follow-up of these children. The question to be addressed was, "What happens to informativeness and new information at the two-word stage, when it meets the constraints of English word order?" Would new information be expressed by the choice of two maximally informative lexical elements, as Weisenberger (1976) proposed? Or would sensitivity to the informational structure of the referential situation be manifest in pragmatic ordering rules, despite the constraints of English word order? Indeed, Braine (1963) and Bowerman's (1973) findings opened up this possibility in suggesting that children learning English occasionally deviate from standard word orders at the two-word stage. Another possibility was that a focus on new or variable information would not appear in two-word utterances at all, but would, instead, be expressed through single-word utterances used alone or in replacement and reduction sequences.

Method

Subjects

The parents were contacted by telephone and informed of the longitudinal study. Those parents who had moved were mailed a letter describing the nature of the study and requesting their participation. Four of the initial seven children were available for the second testing. Parents were paid a nominal fee for their participation.

The four children who participated in this study included two males, Chris and Ben, aged two years and two years three months, respectively, and two females, Kitti and Catherine, aged 2;0 and 2;3, respectively. All were first-born children, born in the Los Angeles area. Maternal educational level varied from

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high school graduate to the graduate level while paternal education included graduate school or, in three cases, a graduate degree. The children were ethnically mixed (White, Black, Asian-American). The amount of child care ranged from occasional babysitting to full time day care, and peer group contacts ranged from 5 hours per week to 33 hours. One set of parents resided in separate households, both spending equal time with the child. Three children had an MLU (mean length of utterance) of 2.0, while one, Catherine, had an MLU of 3.5.

All children were first seen when their speech consisted primarily of single-word utterances (Time 1) and again six months later (Time 2) at the telegraphic stage of language development (as ascertained from interviews with the child's parents). At the second visit, vocalizations ranged from one-word utterances to multi-word telegraphic utterances. These resemble adult English, but lack many function words such as articles.

Procedure

Time 1. Before the first visit, a parent of each child was interviewed to assess the child's non-imitative lexicon. The child's toys and household objects were noted; these could be used in the tasks if the child had a word in his/her lexicon for them. The semantic functions, described by Greenfield and Smith (1976) were detailed to the parent and the child's repertoire of these functions (e.g. agent, action) was determined.

Following the interview process, Leaper, the researcher for the first visit of the longitudinal study, made an individualized script for each child, based on the child's available vocabulary and toys. The script for the nonverbal imitation tasks consisted of a series of episodes where one semantic function varied while others remained the same. For example:

- 1, Toy cat eats a banana;
- 2. Toy cat eats a cookie;
- 3. Toy dog eats a banana;
- 4. Toy cat eats a banana.

From Step 1 to Step 2, the object (banana \rightarrow cookie) is the changing aspect. Whereas in Step 3, it is both the agent and the object (cat \rightarrow dog, cookie \rightarrow banana). In Step 4, the agent again changes (dog \rightarrow cat) and the object remains the same.

Each script had an average of ten of these episodes. A skeletal script was used to develop each child's individual script. It was modified to match the

child's linguistic abilities, semantic functions, and toys and household objects available (Leaper and Greenfield 1980). At each step, the task was written such that the child had in his/her lexicon the vocabulary for both the changing and stable elements and could vocalize these elements spontaneously. In the above

Table	1
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		[Parent's Nonverbal Script for Tasks] Kitti
I	1	Cover your ears with your hands
	2	Cover your eyes with your hands
	3	Cover your mouth with your hands
11	1	Put cups in box
	2	Put pens in box
	3	Put puzzle pieces in box
	4	Put key in box
Ш	1	Stack a few blocks up into a tower, one at a time
	2	Take these down, one at a time
IV	1	Place a few rocks in the bottle, one at a time
	2	Place a few rocks in the cup, one at a time
	3	Place a few rocks in the box, one at a time
V	1	(You and your child each have hand puppets on each of your hands)
	2	Dog jumps a few times
	3	Cat jumps a few times
VI	1	Toy bear eats cheese
	2	Toy monkey eats cheese
VII	1	Cat eats carrot
	2	Cat eats apple
	3	Frog eats carrot
	4	Cat eats carrot
VIII	1	(Set board up as ramp if this hasn't been done yet)
	2	Push Doggie (with wheels) down ramp
	3	Push Doggie up ramp
	4	Push Doggie down ramp
	5	Push Doggie up ramp
IX	1	Put hat on head
	2	Take hat off head
	3	Put shoe on foot
	4	Take shoe off foot

example, the child should be able to vocalize agent (cat, dog), action (eat) and object (banana, cookie). A sample script is presented in Table 1.

The individualized script and directions were provided one week prior to the taping date. General instructions reemphasized the need of the parents to familiarize themselves with the script but not to practice with their child.

The actual testing session was videotaped by an assistant to the experimenter. The equipment was set up and the child was allowed to wander around and familiarize himself/herself with it. Both the researcher and assistant interacted with the child until the child looked comfortable with the situation. During this time a consent form and background information sheet was filled out by the participating parent. Information obtained included birth order, siblings, time both parents and peers spend with the child, parental education level, caregiver information, and languages spoken in the home and by the child.

During the imitation task, the mother acted out each episode and solicited the child's nonverbal imitation by repeating, "Do what I do" or an equivalent phrase. The parents were told not to label toys nor mention action events. The experimental strategy was that the child would be stimulated to spontaneously verbalize selected portions of the scripted events and that these could then be analyzed with regard to their informational properties. Any objects or toys used in other episodes were kept out of the child's view to avoid distractions during a particular event sequence.

Time 2. The second step in this longitudinal research consisted of repeating the same procedure with the same children, approximately six months later. Knowing that their single-word utterances had focused on new information and variable aspects of referential situations, we wanted to find out the role of informativeness in the language of English-speaking children using two-word utterances. We now turn to presenting these results.

Transcription and Coding. Each child's utterances and nonverbal behaviors were transcribed from the videotapes. In addition, the verbal and nonverbal behaviors of others and the objects and events associated with each utterance were recorded. If there were any questions as to what the child vocalized, the participating parent was requested to come to the laboratory to "translate". All utterances were ultimately analyzed, except "yes" and "no" as responses to yes-no questions.

Results

Results will be discussed in three areas: The prediction of one-word utterances using Greenfield and Zukow's (1977) principles of informative-

ness, children's two-word utterances and the topic-comment distinction, and children's expanded and reduced sequences.

One-word Utterances

Greenfield's central hypothesis states that linguistic selection is a function of the informativeness of the elements. Confining themselves to events consisting of an entity undergoing a change produced by an agent, Greenfield and Zukow generated a series of fourteen predictions to demonstrate the relation between choice of semantic function and informativeness. These rules will be used to analyze the single word utterances in this study.

First or only event.

(1) An agent is making an object undergo a change of state at a distance from the child. The object becomes the topic that cannot be taken for granted and is expressed.

(2) An object that is in the child's possession or is acted upon by the child is taken for granted because of its connection with the self and will not be expressed. On the other hand, if the object is being acted upon, uncertainty occurs because of the change of state and, thus, change of state will be expressed.

(3) An object belonging to someone else is being given or it has been given to the child; the object is taken for granted and the possessor is expressed.

(4) The child shows an object to another person. Since no change of state occurred, the object is named.

(5) Another animate being is acting and since the child is focused on the actor (a constant), he/she goes unexpressed and the action receives expression because it represents a change.

(6) When the child is acting, the child takes himself/herself for granted and the action is expressed.

(7) If the child is unsuccessful in expressing the most uncertain or informative element, it remains uncertain and informative and, if the child continues to encode the situation, he/she will continue to express the element until successful or the situation changes.

(8) If the event is repeated, there is no change in the relative certainty or informativeness of the different elements and thus, if the child continues to encode the situation, he/she will express the same element. (The likelihood of any verbalization, however, should decrease).

(9) After the most uncertain of informative elements has been expressed and if the child continues to encode the situation verbally, he/she will express the second most informative element. Later events in sequence.

(10) In a sequence of events where the action remains the same and the object varies, the object will be given verbal expression.

(11) In a sequence of events where the object remains the same and the action varies, the action will be given verbal expression.

(12) In a sequence of events where the object remains the same and the location varies, the location will be verbally expressed.

(13) In a sequence of events where the possessor remains the same and the object varies, the object will be given verbal expression.

(14) In a sequence of events where the object remains the same and the possessor varies, the possessor will be verbally expressed.

When two rules apply to the same situation, rules 10–14 override rules 1–9. Note, too, that, in all these rules, there is not one that predicts that agent will be linguistically realized. As Greenfield (1982) pointed out, the child, egocentrically taking himself or herself for granted as an agent under most circumstances, does not generally verbally encode self as agent. Insofar as the mother is a constant in the situation, as was the case in our experiment, the child may also take her agency for granted and not verbally encode mother as agent either.

The isolated one-word utterances vocalized by the children were analyzed for their conformity to the above rules. The utterances were separated into the categories of confirmations, disconfirmations and no-rules-apply. Where the rules applied, a binomial statistics test was conducted. As hypothesised, the rules formulated by Greenfield and Zukow predicted the actual data very well. Table 2 presents the results for three children (the fourth did not produce enough isolated single-word utterances to analyze.). These results clearly show that

Table 2

One-word Utterances			
	Child 1	Child 2	Child 3
Confirmations	17	12	8
Disconfirmations	2	1	1
Total	19	13	9
No-rule-applies	3	1	0
	p<.001	p<.002	p <.02

children utilize one-word utterances at the two-word stage to encode new or uncertain information. When children can produce multi-word utterances, their single-word utterances continue to function as they had at the one-word stage.

An example from the data will illustrate these findings:

Preceding Context: The mother and child have pushed a bug toy up and down a wooden ramp. Child pushes a truck up the ramp.

Nonverbal Situation and Applicable Rules	Child's Utterances	
Mother pushes the truck down the ramp.	Down	
Rule 11		
Child pushes it up.	Up	
Rule 2,11	-	
Child parks the truck on top of the ramp.	Park	
Rule 11		

Rule 11 states that in a sequence of events where the object (truck) remains the same and the action varies (down, up, park), the action will be given verbal expression. Although the rules were formulated to cover situations in which the agent is a constant, that is not the case in the first and second events above. Consequently, agent as well as action constitutes new information. However, according to Rule 2, the child takes self for granted as agent and will not express self-agent linguistically. As mentioned before, mother is also seen as constant in this situation. Hence, the only possibility is to express the action, as predicted by Rule 11.

Expansion Sequences

Some of the above single-word utterances occurred in expansion sequences. In an expansion sequence, a child vocalizes a single word and then uses this word as part of the following sentence. As predicted, the results show that the children did verbally express the new or changing information (as analyzed above) in the first utterance and expanded on this by adding older or more redundant information in the subsequent utterances. The corpus of expansion sequences for the two children who produced them is shown in Table 3. All six of these examples fit the prediction of starting with the least redundant or most informative information and adding more redundant information in the second utterance. We will pick out one example with which to illustrate the process:

The child walks to the camera; camera/see camera/I see camera.

In this example, "camera" is the newest information. In each of the following utterances, the child added more certain information; in this case, more certain

Table 3 Expansion Sequences

Chris		
Α	Child parks a truck on top of a wooden	
	ramp and starts to walk up	up/Chris up a wood
В	Child takes rocks out of a cup and puts	
	them next to the wooden ramp	no/step/rock/this
		rock/this/this is step
Kitti		
Α	Kitti puts cups in box	
	Mother puts pens in box	pen/a pen
В	Mother puts pens in a box	
	Child opens box	pen/right there a pen
С	Mother puts rocks in cup	
	Child picks up cup with rocks	eat/eat rock
D	Child puts hat on her head	
	Child takes it off	
	Child walks to camera	camera/see camera/I see
		camera

because "I" and "see" were being expressed nonverbally. Because "I" represents the child, this is the oldest, most constant information of all. This example therefore demonstrates three levels of perceived variability.

Reduction Sequences

Weisenberger (1976) noted a type of sequence in which the child repeats a word after a better formed version, resulting in a more telegraphic sequence (e.g. *Make a road/road/road*). Some of the one-word utterances analyzed occurred in this type of sequence, called a reduction sequence. However, there were only three instances, all produced by one child. The relative rarity in occurrence of this type of sequence, as opposed to expanded sequences, explains the lack of mention of this phenomenon in the literature. Nevertheless, as one can see from Table 4, the repeated word seems to carry the most information while the more certain words are deleted. This is the same pattern found in the expansion sequences.

Table 4 Reduction Sequences

Chris		
Α	Mother takes the wooden ramp down	make a road/road/road
В	Child puts a cup on top of a jar and	
	looks for the real lid	that's no top/top/top
С	Mother has made Bert puppet talk.	
	Child has Bert	no talk/no

Two-word Utterances

The children's two-word utterances were categorized into topic-comment and comment-topic as defined by Hornby (1971) and into comment-comment. Topic is what the speaker is talking about, but it is not necessarily old information. The comment adds new information about the topic, but once it has exceeded a length of one word, it can itself be composed of new and old elements. It should not, however, be composed of entirely old elements. (For a complete categorical breakdown of two-word utterances, see Table 5.)

Note first from Table 5 that there is not one topic-comment structure. When both topic and comment are linguistically realized, comment precedes topic, as Bates (1976) had first suggested for Italian-speaking children. However, comment-topic is not synonomous with new-old. Thus, for example, in the utterance "Ernie talk", both elements are new in the situation, while in "ugly-bugly up", both elements are old.

Nor is topic synonymous with noun, comment with verb, counter to the assumption of Bates (1976) and Bates and MacWhinney (1979). In all five instances, the topic has been established in previous discourse (as described by Keenan and Schieffelin 1976), but in only one ("two steps") is the topic a noun. Thus, for example, the sequence "ugly-bugly up/Chris up" (talking about first the bug, then the self going up a ramp) establishes "up", an action, as the topic of conversation.

The necessity for a comment-comment or expanded comment category arose when most of the two-word utterances did not fit into topic-comment or comment-topic categories. An utterance was labeled as an expanded comment or comment-comment when, from the videotapes, the "unspoken topic" was easily seen. By unspoken topic, we mean the object or person the child was commenting on but not verbalizing, thus making it the topic. These nonverbally represented topics are in parentheses in Table 5.

	Comment-Topic	Expanded Comment
Chris		
	ugly-bugly up (2X)	(truck) ¹ down wood (3X)
	Chris up (2X)	(bug) no here
	Ernie talk	(bug) hind Chris (2X)
	two steps ²	(Chris) drink it
	this rock	(cup) on top
		(Chris) almost brush (hair) (2X)
		(Chris) brush hair
		(Chris) comb hair
		(Bert) no talk
		(Bert) no working (2X)
Kitti		
		(Kitti) eat rock (3X)
		(Kitti) see camera
		(Kitti want) more rocks
		(Kitti want) more cheese
		a pen (in box)
Ben		
		(block) on top
		(Ben makes car) roll down
		(Ben) be back
		(Ben) kiss doggie
		Ben (makes car) roll
Catherine		
		(Catherine) want read
		(book)

Table 5Two-word Utterances

¹Parentheses indicate unspoken topic

²In response to a question, "It's a step?"

A statistical test showed that this comment-comment type of utterance was used significantly more than would be expected by chance by each of the three children who produced more than one two-word utterance. The probabilities of this occurring by chance were .0006 for Chris, .0002 for Kitti and .0016 for Ben (using a two-tailed significance of proportion test). Since the category of comment-comment has not been covered in the literature, this result was totally unexpected.

At the same time, there is an interesting individual difference: Chris is the only child to combine topic and comment. In each case, comment precedes topic, and this ordering tendency is statistically significant at the .025 level (using the same statistical test as above).

In every case of the expanded comment (21 out of 21), the unspoken topic is old or uninformative according to the informativeness rules presented earlier. The probability of this proportion occurring by chance is .001 (according to a one-tailed significance of proportion test). In each case, the unspoken topic was the child him/herself or an object in his/her hand—the old information.

By contrast, in the five utterances where the topic is made explicit (left column of Table 5), in every case with an object, the object was not in the possession of the child speaker. In the one case where the child-speaker is the topic, child as agent is new information in the situation ("Chris up", said right after the "ugly-bugly" has gone up a toy ramp, as the child went up the ramp). Overall then, topics are verbalized when they are newer information, information that is less presupposed.

If we look at the expanded comments in more detail, our results also show that, while the unspoken topic is normally old information, the comment is not necessarily composed of entirely new information. Nine utterances follow a new-old pattern, 7 follow a new-new pattern, 2 follow an old-new pattern, and 2 consist entirely of old information. The 21st utterance, "a pen", is interesting: "pen" is new; "a" is the indefinite article used to mark new information.

Although in 13 out of 20 utterances,¹ there is some old information present in the comment, there is also a strong tendency to avoid information that is **completely** old (old-old). Basing a statistical test on a chance probability of .25 for an old-old combination, the observed proportion of 10% old-old comments is significantly below chance (p < .03, one-taled test). There is also a statistically significant tendency for expanded comments to begin with new, rather than old information. Eighty per cent (16 out of 20) of the observed two-word comments begin with new information. If we consider the chance probability of placing new information first to be 50%, then the observed probability is significantly greater (p = .005, two-tailed test).

In sum, old topics tend to be deleted at the two-word stage. In other words,

that the situation affects the child's lexical choice—new information was verbalized by children at the early two-word stage of development. We found this to be true of some utterances, but the majority of two-word utterances combined new and old information.

However, we do agree that the unspoken topic of the two-word sentence is the most heavily presupposed or constant information. In the overwhelming number of cases, this topic was the child-speaker or an object in the child's possession. Hence, we have strong evidence in English for Miller's (1979) conclusion based on German children that the egocentric assumption of self plays a strong role in the structure of early word combinations.

The children in this study also verbalized many isolated single-word utterances which, in keeping with Greenfield's principle of informativeness, marked the new or changing element. This same result was found by Leonard and Schwartz (1978); they showed that children who verbalize one word when capable of complex utterances do so to highlight the new information. Even adults continue to use single-word utterances to fulfill this function (Vygotsky 1962). Consider the following utterance: "Help!"

Taken together, the data from the isolated single-word utterances, twoword utterances, and sequences show that the selection of words in young children's speech is guided by the uncertainty of the situation. Thus, when a child is capable of more complex utterances and he/she intentionally verbalizes a single word, he/she uses the utterance to highlight and mark the uncertain or new information.

The function of the single-word utterance is the same in the expanded or reduced sequence. Thus, in the expanded sequence, the child verbalizes the most informative element and, after this highlighting, expands on it by adding relatively more certain information. Atkinson (1979) sees the first utterance in an expanded sequence as an attempt to attract the listener's attention to a topic, later to be commented on. Although we have not studied this communicative function directly, the fact that the initial single word is generally new information means that it could indeed function to attract the listener's attention to a new topic. However, the fact that old, situationally redundant, rather than new information, is generally added to form the second, expanded utterance makes a primarily communicative function of the expansion sequence a less plausible interpretation.

This point, that in the expanded sequence, the most informative element is verbalized and then more certain information is added, implies that there are degrees of uncertainty; uncertainty is not an all-or-none matter. From all the data presented above, one can see three degrees of uncertainty, from most to least informative (with the least informative unspoken);

(1) The isolated single- and many two-word utterance. (Mother puts puzzle pieces in a box and takes them out. Mother puts keys in the box.) Child: Keys.

(2) The added word(s) in the expanded sequences. (Mother puts a rock in a cup. Child picks up cup with rock.) *Eat/eat rock*. "Rock" is an old element in this situation, for mother has just previously manipulated the rock.

(3) The unspoken topic. (Mother puts a rock in a cup. Child picks up cup with rock.) Child: *eat/*(Kitti) *eat rock*. This latter illustrates that, at the two-word stage, the most constant and therefore presupposed element is the child-speaker as agent.

In examples (2) and (3), the first utterance of the expanded sequence is the most informative, the child is verbalizing about her imaginary game to "eat" rocks. The second utterance adds "rock", an object that is relatively more certain than "eat" because of its visibility. Both utterances left out the unspoken agent, the most certain or constant information of all.

In example (1), the same principle holds as for the one-word utterance in (2) and (3). The newest information is verbalized, while the oldest element (agent) and next older element (action) are both deleted.

For a more thorough examination, the use of stress and intonation should be analyzed as to their roles in informativeness. This would be an extremely useful way to ascertain whether there is in fact a hierarchy in the verbal expression of new information.

In past decades, researchers in child language development have often concentrated on the structure of language (e.g. syntax) while overlooking its function. This article has argued that a major function of language in young children's utterances is to verbally express new information. The argument supports Bruner's (1975) belief that knowledge of the function of language is crucial to the understanding of how language is initially used and, thus, acquired.

Whereas at the one-word stage (and in one-word utterances at the stage of early combinations), the child uses language exclusively to highlight new information, he or she begins to linguistically realize some old information in two-word utterances.

The only truly conflicting evidence in the literature comes from Goldin-Meadow and Mylander (1984), who found that deaf children acquiring sign language without a model emphasize old information in their language, which is of a rather primitive nature. Perhaps these results can be understood in relation to the finding that other children with below normal linguistic function—specifically, low functioning autistic children studied by Baker and language-delayed children studied by Snyder (1979)—also fail to emphasize new information in their linguistic productions.

The following question remains to be answered by future research: Given the observed tendency for new information to go first in two-word sentences in our data and our subjects' consistent adherence to possible English word orders, how do young children manage to harmonize these two sets of constraints in their actual speech production?

Finally, a different ordering principle at the early two-word stage, action ordering, was proposed by McNeill (1974). The idea was that word order would follow the order of elements in the action being linguistically described. If, as we have found, both novelty and English syntax influence children's word order, it is hard to see where there would be room for a third principle to operate. In any case, most of the two-word utterances in our data did not encode a pair of elements in which one element clearly preceded the other in a real-world sequence. Hence, McNeill's proposal is difficult to test with naturally occurring data.

Leaper and Greenfield (1980), in the first stage of this longitudinal study, applied the principle of informativeness to children at the one-word stage, where the new or changing nonverbal elements were experimentally manipulated in a controlled setting. They found that the children verbalized the new or changing elements. Later, as we have reported, Baker retested four of the children at the two-word stage. In an analysis of those few situations that elicited verbalization from the same child at both testings, functional continuity in the operation of informativeness emerged (Greenfield *et al.* 1985). In the present article, we have analyzed the full corpus available at the two-word stage. The results confirm the general picture that emerged from the more limited longitudinal comparison and add additional detail. Specifically, we find that informativeness, as well as English syntax, play a role in the word order of two-word utterances. We have also emerged with a picture of how single-word utterances become a pragmatic choice, rather than a linguistic necessity, when the child moves to the two-word stage.

Thus, we conclude, from this study and other research in child language development, that the function of early language is to express new or changing information. We also believe this response to the new to be based on an innate capacity. Humans as a species would not have evolved very far had we not been finely tuned to the changing elements in the surroundings. This monitoring of the environment continues today as we participate in our daily activities. Indeed, this concentration on the new rather than the redundant continues to be reflected by a relative emphasis on the linguistic realization of new and variable elements in the speech of older children and adults (Vygotsky 1962; Rommetveit 1968; Greenfield and Dent 1980). It seems only natural that, since as neonates we innately respond to novel stimuli, this awareness of new or variable

information manifests itself in the young child and that early language functions to communicate this information.

However, it is also important to note that, even at the two-word stage, language begins to transcend its link to the attentional system and that, as will be the case in adult language, speech, while emphasizing new information, also becomes capable of transmitting various combinations of the new and the old. Greenfield and Savage-Rumbaugh (1983) found that symbol-trained chimpanzees (*Pan paniscus*) are like humans in selectively symbolizing the new and variable information in their one-symbol utterances. However, unlike the children in our study, the chimps continued to restrict themselves to expressing new information in their longer utterances (Greenfield and Savage-Rumbaugh 1983). It may be that a distinctively human quality is that our speech can ultimately transcend what is probably an evolutionarily primitive link to the novelty orienting response.

NOTES

1. "A pen" is omitted because "a" cannot be classified as new or old.

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