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Language in the two-year old

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Abstract

Two stages in the vocabulary development of two-year-olds are reported. In the earlier Receptive stage, the child says many fewer nouns than he understands and says no verbs at all although he understands many. The child then begins to close the comprehension/production gap, entering a Productive stage in which he says virtually all the nouns he understands plus his first verbs. Frequency and length of word combinations correlate with these vocabulary stages.

Young children are widely believed to understand a great deal more than they say (Ervin, 1964; Lenneberg, 1966; McNeill, 1966, 1970). This commonplace may mean a variety of things. For instance, parents frequently report that their children follow verbal instructions like "Go get the diaper and bring it to Mommy" long before the children actually say such sentences. More systematically, psycholinguists have reported that children understand utterances containing certain grammatical constructions before they say these utterances (Fraser, Bellugi & Brown, 1963; Brown & Bellugi, 1964; Lovell & Dixon, 1967; Shipley, Smith & Gleitman, 1969). For example, three-year-olds can point to the picture illustrating "the car is

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bumped by the train" before they themselves produce passive sentences. Because comprehension of such complex utterance types outstrips production, it has been assumed, though not demonstrated, that this is also true for vocabulary. Here we examine the two-year-old's comprehension and production of nouns and verbs, and the relationship of his vocabularies to the word combinations he produces.

We find that our subjects can be divided into two groups on the basis of their vocabulary comprehension-production data. A member of the Receptive group says many fewer nouns than he understands and says no verbs at all although he understands many. A child in the Productive group says virtually all the nouns he understands, and produces some verbs as well. The Productive child also tends to produce more and longer multi-word combinations than the Receptive child. Longitudinal data suggest that the child is a member of the Receptive group before he enters the Productive group. As a result of these data, we postulate two consecutive stages of language development in two-year-old children.

Cross Sectional Study

Method

Subjects and general procedure

The subjects were twelve white middle-class children ranging in ages from 14 to 26 months. Each child was tested individually in his own home. The testing was usually completed in three two-hour sessions, all held within a one-week period. Throughout the testing the experimenter encouraged the child and told him he was playing nicely, but no specific feedback was provided.

We used two basic procedures, the comprehension and the production tests, to determine each child's knowledge of both nouns and verbs. Comprehension and production questions for nouns and verbs were randomly distributed throughout the session, with the restriction that comprehension and production questions for a given word never occurred in immediate succession.

Two experimenters were usually present during each session. The first experimenter carried out the vocabulary procedures. The second recorded the child's spontaneous utterances along with their nonverbal contexts and noted general information such as the child's articulation skills and responsiveness to verbal probes. A taperecorder was operated during the session if the second experimenter was not present. The child's mother often remained in the room during the experiment in order to put the child at ease.

Stimuli

There were 70 nouns and 30 verbs presented at least twice to each child, once in the comprehension test and once in the production test (see Table 1). The sample words were selected as representative of vocabularies of two-year-old children on the basis of pilot work done by one of us (M.E.P.S.). In this at-home study, several children were followed for five to eight consecutive days while the experimenter assessed as exhaustively as possible their entire receptive and productive vocabularies. We further restricted the set of test items by including a noun in the study only if a toy could be found to represent that noun. Each of the nouns on the sample list was consequently represented by a familiar toy. The verb list was limited to verbs which could be portrayed in action either by a person or by a toy.

Comprehension Test

For each of the test nouns the child was asked, "Where's (point to, show me, or bring me) the _____", where the designated item was one of a large set of toys or part of the body. During the session, all of the toys were randomly spread on the floor around the child. Thus, for each comprehension question the child had to choose one object from among approximately 70 different objects. For verbs, we asked the child to perform the action indicated by the verb or to make a toy perform the action. For example, the child was asked to "Make the doll *lie down*", or to "*Lie down*" himself. Which of these instructions was given depended on the child's willingness to co-operate and the appropriateness of the agent for the action in question. Furthermore, for transitive verbs we asked the child to perform the action on an atypical object in order to prevent him from guessing the meaning of the verb from the accompanying noun. Thus the child was asked to "*Eat* the bear" or to "*Drink* the barrel"*. The response was counted correct if the child performed the action referred to by the verb, regardless of his choice of object or agent. Consequently, the child could either eat the bear or have the bear eat something, in order to receive credit for comprehension of the verb "eat".

The items in the comprehension test were usually presented only once. However, an item was repeated at least twice** whenever the child either

*We realize that we are complicating the task by asking the child to perform the action on an unlikely object. However, Shatz (1975) has shown that young children are quite willing to respond with action to such bizarre requests as "Why don't you put your shoes on your ears?" Indeed, we found the children eager to co-operate and to respond to our somewhat unusual questions.

**Our intent was to continue retesting an item for as many as five trials. In practice, we seldom repeated the test item this often because the child usually lost interest in the item.

Table 1. *Number of cross-sectional children responding to each vocabulary item. The first number in parentheses shows how many children out of 12 knew the item receptively; the second number shows how many knew the item productively.*

A. Nouns

Parts of the Body		*Animals*		*Food*	
foot	(12,5)	fish	(11,8)	banana	(10,9)
head	(12,5)	cat	(10,10)	orange	(10,8)
hair	(11,7)	rabbit	(9,9)	grape	(10,6)
mouth	(11,5)	bear	(9,8)	cake	(9,7)
hand	(10,5)	cow	(8,7)	cereal	(8,5)
teeth	(10,3)	pig	(7,6)	sugar	(8,4)
finger	(9,4)	giraffe	(5,5)	mustard	(4,2)
arm	(9,3)	butterfly	(2,2)		
lips	(7,1)				
tongue	(7,1)	*Parts of the House*			
knee	(5,2)	clock	(12,9)		
elbow	(4,2)	chair	(12,9)	*Miscellaneous Articles*	
thumb	(4,1)	table	(12,9)	ball	(12,11)
armpit	(0,0)	door	(11,7)	pillow	(11,6)
		window	(11,5)	scissors	(10,8)
Articles of Clothing		house	(10,6)	flower	(10,7)
hat	(12,9)	floor	(10,1)	crayon	(10,4)
sock	(11,7)	wall	(8,5)	money	(9,9)
button	(9,8)	sink	(7,4)	paper	(9,8)
belt	(9,5)	lamp	(5,4)	plate	(9,5)
pocket	(7,6)	pot	(3,3)	mirror	(8,4)
scarf	(4,1)	couch	(1,1)	ladder	(8,3)
badge	(1,0)			broom	(7,6)
		Letters and Shapes		ring	(6,4)
Vehicles		A	(5,5)	cigarette	(3,3)
airplane	(11,10)	star	(5,4)	flag	(3,2)
train	(10,9)	M	(4,4)	tire	(1,1)
		heart	(0,0)	stamp	(0,0)

B. Verbs

Transitive Verbs		*Transitive Verbs*		*Intransitive Verbs*	
eat	(12,7)	pickup	(10,1)	sit	(11,6)
throw	(12,3)	shake	(9,2)	jump	(11,5)
open	(11,7)	touch	(9,1)	run	(11,3)
close	(11,6)	wash	(8,4)	stand	(11,2)
kiss	(11,4)	step on	(8,0)	lie down	(11,1)
drink	(11,3)	kick	(6,2)	fall	(9,5)
blow	(11,1)	push	(6,1)	turn around	(9,1)
drop	(10,2)	pull	(5,1)	dance	(8,1)
hug	(10,1)	point to	(4,0)	fly	(7,2)
				cry	(5,2)
				smile	(5,0)
				crawl	(3,0)

failed to respond to the item, or responded with the wrong object or action. If the child was then correct on one of the retests, he was given credit for that item.

Production Test

To test the child's ability to produce each of the test nouns the experimenter pointed to the object in question and asked, "What's this?" To test the child's ability to produce each of the action verbs the experimenter asked, "What am I (the experimenter) doing" or "What is the doll doing" while the experimenter either performed the action herself or maneuvered a doll to do so.

If a child failed to give a conventional response to a test item, he typically did one of two things: either he remained silent or he gave a non-standard answer. In either case, the item was subsequently retested on at least two trials. If the child who was initially silent gave a standard response on a subsequent trial, he received production credit for the item. If, over repeated trials, the child appeared to consistently use his own 'idiosyncratic' word which we could interpret, he was likewise given production credit. As an example, one subject consistently said "nite-nite" for pillow and thus was considered to have a production word for the object pillow. In addition, the child received production credit no matter what form he used in producing an item. For example, the child who said "eating" was treated the same as the child who said "eat".

Results

Table 1 shows the number of children correctly responding to each productive and receptive item. In general, we found very few incorrect responses and most of the children's errors were those of omission rather than commission. There was no child who was correct on any given item on the production task and who failed that same item on the receptive task. Word frequency (as measured by Thorndike-Lorge lists from juvenile books) was found to correlate with the number of cross-sectional children who understood each of the 70 nouns ($r_s = 0.346$, $p < 0.005$) and with the number of children who produced these nouns ($r_s = 0.220$, $p < 0.05$). Parenthetically, our longitudinal vocabulary data show the same word frequency patterns as these cross-sectional data for both reception and production. That is, the words known by many cross-sectional children (the high frequency words on the T-L list) were the same words acquired early by the longitudinal children. Conversely, the words known by few cross-sectional children (the

low frequency words on the T-L list) were acquired later by the longitudinal children.

Table 2 shows the results of the vocabulary tests for each of the 12 children. The children were divided into two separate groups on the basis of these data. The Receptive group of children had ratios of noun comprehension to noun production of 2.7:1 or greater; that is, they understood almost three or more times as many nouns as they said. In addition, they produced no verbs at all although they understood many.

Table 2. *Vocabulary ratios of the children in the cross-sectional study*

Age (Mos.)	*Name*	*Noun Ratio* No. Comprehended / No. Produced	*Verb Ratio* No. Comprehended / No. Produced
26	Michael	7.7:1 (46/6)	– (22/0)
22	Lexie 1	5.0:1 (35/7)	– (22/0)
21	Melissa 1	4.4:1 (22/5)	– (14/0)
14	Jenny 1	2.7:1 (27/10)	– (9/0)
27	Ray	1.5:1 (49/32)	5.3:1 (21/4)
23	Sarah	1.3:1 (41/31)	5.0:1 (20/4)
24	Perry	1.3:1 (49/38)	2.8:1 (28/10)
26	Leah	1.3:1 (56/43)	2.7:1 (27/10)
25	Harry	1.2:1 (56/45)	2.9:1 (23/8)
26.5	Chris	1.2:1 (54/45)	3.3:1 (23/7)
23	Peter	1.1:1 (49/43)	1.7:1 (26/15)
26	Lee	1.0:1 (54/52)	1.8:1 (28/16)

These children stand in contrast to the Productive children who had noun ratios of 1.5:1 or less; that is, they said almost every noun they understood. They produced verbs although not as many as they understood, and consequently verb ratios were not as low as noun ratios in this stage. There was, however, a correlation between the Productive children's nouns and verb ratios (r_s = 0.695, $p < 0.05$), indicating that relatively low noun ratios occurred in children with relatively low verb ratios.

In addition to the vocabulary differences between the Receptive and Productive groups, the children differed in their production of word combinations*. Table 3 shows the average length of each child's multi-word combinations, and the longest utterance produced by each child during the testing sessions. The Receptive children's longest utterances ranged from one to three words, while the Productive children's longest utterances varied from four to eight words. Furthermore, the noun ratio, which defines the Receptive and Productive groups, was systematically related to the average combination length of these children's utterances. Specifically, a decrease in noun ratio correlated with an increase in the average length of word combinations (r_s = 0.874, $p < 0.01$). In other words, a prolific producer of nouns tended to be a producer of relatively long utterances. Utterance length has long been accepted as a gross measure of language development. Our data suggest that noun ratio can also be used to measure language development, at least at these early stages.

Table 3. *Measures of utterance length correlated with noun ratio rank*

	Rank according to noun ratio	*Average length of combinations*	*Longest utterance*
Michael	1	2	2
Lexie 1	2	2.09	3
Melissa 1	3	–	1
Jenny 1	4	–	1
Ray	5	2.14	4
Sarah	7	2.71	4
Perry	7	2.48	4
Leah	7	2.87	6
Harry	9.5	3.18	8
Chris	9.5	2.34	4
Peter	11	4.48	7
Lee	12	4.20	7

In addition, we found that the Productive child tended to produce more multi-word combinations than the Receptive child: the Receptive children produced between 0 and 6 multi-word combinations per session (mean = 3.25 combinations), while the Productive children produced between 17 and 181 per session (mean = 58.12 combinations). Thus, the Receptive child not only produced shorter, but also fewer word combinations than the Productive child.

The two groups of children also differed in their production of 'idiosyncratic' words. All of the Receptive children responded with at least one 'idiosyncratic' word in the production tests, while very few of the Productive children did. These same Receptive children did, however, respond to the

*Previous research supports our findings of coincident vocabulary and syntax changes. See Nelson (1973) who found in her data a similar correlation between a jump in word production and the beginnings of phrase constructions.

conventional word in the comprehension test. For example, Michael responded correctly to 'clock', 'cat' and 'train' on the comprehension test; however, in the production test he called each toy, "tick-tock", "meow", and "choochoo", respectively.

Longitudinal Study

In order to demonstrate that these two groups constitute two consecutive stages rather than two different types of language learners, we studied three of the children longitudinally over a period of months. The testing procedure was identical to that described above.

Results

Table 4 presents the longitudinal data. All three children showed a shift from the Receptive to the Productive characteristics which define the groups found in the cross-sectional study. The three children began at a stage in which comprehension of nouns far exceeded their production, and verbs were understood but not produced. Over time, noun production scores started to catch up to comprehension scores and some of the tested verbs were produced for the first time. As in the cross-sectional study, the longitudinal data suggest that a decline in noun ratios correlates with a decline in verb ratios.

Around the time the child began to produce nouns and verbs in earnest, he also increased his production of multi-word combinations. For example, while still in the Receptive stage (Session 2), Lexie produced only five multi-word combinations during one session. He then increased his production to 36 multi-word combinations during Session 4 (one week after he began to produce verbs) and finally produced 111 combinations during Session 6. All the sessions were of approximately equal duration. Melissa said 20 combinations during Session 3, the session when she first began to speak verbs, as compared to two combinations the session before. Jenny went from uttering no combinations to producing some during the session when she first spoke verbs. Thus, around the time the child becomes a full-fledged vocabulary producer he also becomes a producer of a substantial number of word combinations.

However, a newly Productive child does not necessarily become an immediate producer of long combinations, as we might have predicted from our cross-sectional data. Lexie did not produce his first four-word utterance until Session 6 (5 weeks after verb production began), and Melissa and Jenny never produced more than two-word combinations during our entire testing period. Our data suggest that the increases in numbers of single- and multi-word productions do not coincide with, but rather herald increases in utterance length. We can well imagine that long utterances are difficult to produce without a large vocabulary. Thus, a good sized productive vocabulary may be necessary for increases in utterance length. However, the developmental delay between vocabulary production and length increases in our longitudinal study indicates that a relatively large store of productive nouns and verbs is not sufficient to bring about increases in utterance length.

Along with the beginnings of noun and verb production came a decline in idiosyncratic responses on the production test. As each child began to increase his production of nouns and verbs, he also abandoned his idiosyncratic words in favor of more conventional labels. Thus, Lexie in Session 3 not only responded to the word 'pillow' on the comprehension test, but also said "pillow" and no longer "nite-nite" on the production test.

Two incidental findings bear comment. Despite all of these simultaneous developments in the child's language, one which was not observed was a con-

Table 4. *Vocabulary ratios of three children followed longitudinally*

Age (Mos. Wks.)	*Name*	*Noun Ratio (Comprehended/Produced)*	*Verb Ratio (Comprehended/Produced)*
22.0	Lexie 1[a]	5.0:1 (35/7)	– (22/0)
24.2	Lexie 2	3.1:1 (54/17)	– (26/0)
25.0	Lexie 3	2.1:1 (58/28)	9.0:1 (27/3)
25.1	Lexie 4	1.5:1 (61/40)	3.9:1 (27/7)
25.3	Lexie 5	1.3:1 (61/48)	(not recorded)
26.1	Lexie 6	1.0:1 (61/59)	(not recorded)
19.1	Melissa 1	4.4:1 (22/5)	– (14/0)
21.1	Melissa 2	4.4:1 (40/9)	– (16/0)
22.0	Melissa 3	1.6:1 (46/29)	(not recorded but produced verbs spontaneously at this time)
14.0	Jenny 1	2.7:1 (27/10)	– (9/0)
16.0	Jenny 2	1.7:1 (33/19)	– (14/0)
17.0	Jenny 3	1.3:1 (38/29)	4.5:1 (18/4)
17.1	Jenny 4	1.3:1 (45/34)	3.0:1 (18/6)

[a] An exhaustive study was done by author M.E.P.S. on Lexie's noun vocabulary at age 20 months, 1 week. Applying our sample list to these data, Lexie's comprehension/production noun ratio at this age was 49:1 (34/7). Thus Lexie's noun ratio remained relatively stable during the two month interval between the exhaustive study and Session 1.

current improvement in the child's articulation. For example, Melissa was a poor speaker during Sessions 1 and 2 and remained so after she began to produce vocabulary words in Session 3. Lexie, on the other hand, was a clear speaker from the very beginning.

Lexie's constant receptive vocabulary size between Sessions 4 and 6 raises the possibility of a ceiling effect; that is, that the change in noun ratios is caused by the child reaching asymptote on the receptive noun list and not by a new productive strategy of vocabulary acquisition. In order to discount the ceiling hypothesis of diminishing ratios, we tested Lexie on a supplementary sample of 40 nouns during the longitudinal study at times 5 and 6. Lexie's noun comprehension did not approach the ceiling of this new list at either of the additional testings, and his ratios were identical to those obtained with the standard 70 noun sample. These identical results from the new list suggest that presenting the same test lists to one child many times in succession does not produce spuriously low vocabulary ratios.

Discussion

Our study substantiates the commonplace with which this paper began: at a certain stage in development children do understand many more nouns and verbs than they say. We then find that, at a subsequent stage in development, children become reasonably competent language producers; that is, they develop a productive skill which works to close the gap between their comprehension and production vocabularies. This skill is tied neither to a particular lexical category nor to single unit utterances, an observation that we now focus on.

The Productive Skill

Lexical Categories

We have evidence of the productive skill in both of the two lexical categories included in this study, nouns and verbs. The children increased their noun production almost to the level of their noun comprehension at the same time as they began verb production. In addition, noun and verb production was correlated after the onset of the productive skill; the high noun producers also tended to be relatively high verb producers.

Additionally, we found quantitative differences in the extent to which the productive skill affected the two lexical categories. All of the children's noun ratios were considerably lower than their verb ratios: nouns were easier to produce than verbs. It is possible that this discrepancy between a child's noun and verb ratios may be due to a fundamental difference between simple nouns and simple verbs, i.e., we can point to a concrete noun's referent, but not to any instantaneous referent of a verb. Of course, we realize that such differences between nouns and verbs also lead to task differences in our testing procedures. These task differences, however, seem unavoidable and to a certain extent are part of the phenomenon itself.

Multi-Unit Combinations

The appearance of the productive skill in single word vocabulary was not an isolated development in the child's language. At about the time the child became a proficient single-word vocabulary producer, he increased his production of multi-word utterances as well. Thus, the productive skill that develops during the transition from the Receptive to the Productive stages is evidenced in multi-unit, as well as in single-unit utterances.

Origin of the Skill

We know from observations of our longitudinal subjects that this newly developed productive skill is not merely an outgrowth of motor development. The motor hypothesis maintains that the child develops sufficient control of his articulatory motor apparatus and thus is able to produce nouns, verbs, and combinations. However, we found no noticeable change in articulation over the course of our longitudinal study. Consequently, the onset of production cannot be explained at a motor coordination level, but must find explanation at another level of analysis, e.g., a linguistic or cognitive level.

The Nature of the Production Vocabulary

The productive skill not only affects the size of the child's production vocabulary, but the nature of the production vocabulary as well. Before the children became language producers, their production vocabularies were qualitatively different from their comprehension vocabularies. The Receptive children, who understood and responded to the conventional labels for objects, concurrently produced idiosyncratic labels for many of the same objects. Thus, we found that in the Receptive stage the child's lexical comprehension did not necessarily correspond to his lexical production. This lack of lexical correspondence also appears in the literature on overextension in child language (the extension of a label beyond the conventional definition limit). Huttenlocher (1974) found overextension in the child's production of words but not in his word comprehension.

We find that with the advent of the productive skill, the lexical disparity between comprehension and production disappears; that is, idiosyncratic responses disappear in favor of conventional labels. Bloom (1973) also notes development during the early stages of language acquisition from a non-cumulative production lexicon to one that is relatively permanent. Clark (1973) reports similar results in a brief survey of the diary data on child language. According to Clark, the diary studies show that overextension in child language ends as the children experience increases in production vocabulary. Thus, the children's comprehension and production vocabularies appear to align during the production spurt.

We can conclude from these data that, during the Receptive stage, the child's production vocabulary is not merely a subset of his comprehension vocabulary, but is in part qualitatively different from his comprehension vocabulary. The onset of the productive skill heralds the elimination of this disparity.

Implications for Theories of Language Acquisition

Our original commonplace now appears to be somewhat incomplete. Children not only understand more words than they say, but at a certain stage they also understand different words than they say, even for the same referent. This finding has implications for theories of language acquisition in general, and for any particular theory which purports to account for a comprehension/production gap during the two-year-old stage.

In general, our data suggest that we cannot easily infer comprehension knowledge from production data, nor can we readily infer production knowledge from comprehension data. If comprehension and production of vocabularies can be out of phase at one period of development, it is entirely possible that comprehension and production of other linguistic skills will not be synchronous at other stages. Thus, we require a description of both comprehension and production knowledge and of the relationship between the two in order to theorize about language acquisition.

In particular, a theory to explain the onset of vocabulary production during the two-year-old period must account not only for the changes in production, but also for the lack of changes in comprehension. For example, Bloom's (1973) explanation of the onset of naming production is based on production data alone; the hypothesis appears insufficient when comprehension data are considered. Bloom would explain the appearance of object and action naming (the productive spurt) in terms of the child's acquisition of a belief in object permanence. However, any child who is a vocabulary comprehender (regardless of whether or not he is a vocabulary producer) must possess some permanent representation of objects and actions in order to understand words. The acquisition of object permanence must therefore coincide with, or precede, the beginnings of vocabulary comprehension. We have found that single word comprehension, and therefore some sort of object permanence, precedes single word production. For these reasons we conclude that the development of object permanence cannot account for the appearance of the child's new productive skill.

Our data suggest that the child's early production vocabulary is not merely a deficient comprehension vocabulary, but is to some extent a different vocabulary. Two questions are crucial for language acquisition theorists: (1) Why are comprehension and production vocabularies out of alignment during the early stages of language acquisition? and (2) How does alignment of the two vocabularies eventually come about? Any theory professing to account for the comprehension/production gap in early vocabulary acquisition must address these two questions.

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Résumé

Nous analysons ici le développement du vocabulaire de l'enfant de deux ans, en deux stades. Au cours du premier stade, "réceptif", l'enfant dit beaucoup moins de noms qu'il n'en comprend et ne donne aucun verbe bien qu'il en comprenne beaucoup. Ensuite, on assiste à une coordination compréhension/production et c'est le stade "productif" où l'enfant dit presque tous les noms qu'il comprend et utilise ses premiers verbes. La fréquence des combinaisons de mots ainsi que leur longueur est fonction des deux stades décrits.