LOGIC IN EARLY CHILD LANGUAGE*

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This paper addresses one central aspect of the development of negation in early child language: the emergence of uses of negatives such as "no" and "not" for the purpose of logical denial. Insomuch as this concern touches on the use of negation for logical purposes, I will develop several issues concerning the origins of rudimentary logical competence as reflected in children's speech.

Logic is traditionally confined to distinguishing correct from incorrect arguments, and a great deal of psychological research has focused on the development of logical thinking as it involves such skills.[1, 2] The proposition is a central component of such arguments, and propositions constitute the premises and conclusion of arguments. Such propositions, unlike arguments themselves, are considered to be true or false rather than valid or invalid. Very little attention has been paid to the origins of the child's conception of the truth and falsity of propositions, yet the grasp of this binary distinction is a fundamental touchstone of reasoning and language cognition. The experimental study to be described provides a detailed investigation of children's conceptions of the truth-values of sentences expressing simple propositions; the children studied ranged in age from 1½ to 3 years.

What would such a study tell us? First, it would provide insights into the origins of logical abilities in early language and reveal how the child conceives of the language she uses. Since this knowledge of language incorporates features specific to language, such as truth-conditions, it would further our understanding on metalinguistic development.

Negation is the focus of such an inquiry into the origins of logic and knowledge of language because it is basic to all forms of logic since truth and falsity are related by the logical operation of negation. If a sentence p is true, then its negative, ~p, is false, and vice versa. And the ability to logically negate is at the heart of our conceptualizations of the physical and social worlds, laying a necessary foundation for hypotheses and science by enabling us to posit what is not the case.[3, 4]

The development of logical negation, although not traditionally construed

in this vein, may be viewed as germane to the classic problem of establishing the emergence of sentences from the single words first produced by children. Preliminary to presenting an argument for this claim, however, I will outline the links between logical negation and predication. Sentences express relations of predication, and predications require the combination of two elements or ideas known as subject and predicate. Together these elements form a proposition that can, in two-valued logics, form a proposition that can be assessed as true or false. A proposition cannot be formed from either subject or predicate alone. The reason for this is that the subject points out some particular, such as " the ball," and the predicate applies a concept to that particular, like "is red." Thus, the predicative statement "the ball is red" is defined as true if the concept applies to the particular, and false if it does not. Since truth and falsity are mediated by the logical operation of negation, one can see that a fundamental tie exists between logical negation and predication. The set of rules that relate propositions to world-states are truth-conditions for utterances, and a substantial amount of what we know as speakers about language is captured in such rules.[5] The conception of the truth and falsity of propositions thus integrally involves an awareness of these truth-conditions, and the ultimate aim is to establish how and when very young children understand this important aspect of language.

The description of truth-conditions thus far has implied that only multi-word sentences can express predications. After all, how could both subject and predicate be expressed in a single word? But debates early in this century about the nature of the child's single-word speech challenged the rhetorical slant to this question.[6, 7] One contingent held that the child's single words were purely affective, expressing only internal states such as needs, whereas another claimed that the child could, with single words alone, emit "intellectual" speech that made rudimentary statements about the world. This latter group thought that the child speaking only single words could have a concept of predication even though not expressing it linguistically. For example, a child would approach a warm stove, say "hot", and be said to express a "holophrase" or rudimentary sentence, expandable into something like "the stove is hot." The subject was said to be implicit in the situation. Many reasons might underlie the child's curtailed expression, but one thing is clear: this controversy about single-word "predication" is fundamentally linked to whether the child is expressing propositions, which are subject to truth-conditions. The specific nature of this link is critical and will be defined later.

The controversy over "affective" and "intellectual" manifestations of thought in language has become topical once again upon the renewed interest in the language of the child since the 1960s. Oxford "ordinary language" philosophers, such as J. L. Austin, P. F. Strawson, and Paul Grice, focused their language studies on meaning as conveyed by utterances in the contexts of ordinary language use. Investigators into the language of the child have since discovered this work and have become convinced that the philosophers' techniques promised insights into early language meaning. The first studies with such an orientation dealt with children's single-word speech. Gruber[*] found that the child he studied first used words to indicate

things and only later to predicate attributes of those things. Both Bates[9] and Bruner[10] have provided evidence that early words first convey requests and direct attention to aspects of the world before they are used in the construction of propositions for predication. And Dore[11] has developed a theory of the growth of speech acts according to which the child first conveys the force of an utterance (such as whether it is intended as a request, demand, or comment) before conveying propositions with her utterances.

All of these recent accounts place importance on the development of predication, yet no one has related the growth of predication to the truth-conditions basic to the assertion of propositions. Modern philosophical logic since Frege[12] is based on the principle that propositions are the bearers of truth-values. A basic tenet of this work is that the ability to conceive of propositions as true or false is one of the most central aspects of language comprehension and use. Marshall[13] anticipated the neglect of truth by the theories of predication development we have mentioned, and he pinned the problem down as one of deciding *what evidence* is relevant to the claim that the child has made the transition from the circumscribed ability of uttering appropriate single words on stimulus occasions (which the empiricist Quine[14, 15] sees as the nature of all early language) to creative and propositional language-use and the linguistic expression of judgments. The prototypes of linguistic judgment, in the writings of such philosophers as Kant who are concerned with this use of language, are judgments of the truth-values of sentences. One may consider statements that relate to stimulus-occasions or those that do not require a world-state for their verification, such as tautologies like "Either the ball is red or not red." Osherson and Markman[16] have found that being able to judge the truth or falsity of such analytic statements is a difficult task even for 7-year-olds. I will be considering only statements that relate to stimulus-occasions.

Statements such as "the ball is red" are true or false depending on the occasion when we use them. Judgments of the truth or falsity of such occasion-sentences reflect knowledge of the rule-governed and symbolic tie between statements and the world. We now return to Marshall's point. If a child can express judgments of truth or falsity about another's use of occasion-sentences, we could conclude that the child had made the major transition from affective language to truth-functional language. And we now return to the controversy of the "holophrase," for if the child has a concept of predication as revealed by the expression of truth-functional judgments, such as negations, we can infer that the child is asserting propositions in her use of single words.

<center>PREVIOUS LITERATURE ON LOGICAL NEGATION</center>

Several naturalistic studies of negation development and experimental studies of negation comprehension provide an empirical setting and some suggestive findings for an account of early logical negation.

Child-language diarists such as Leopold and Guillame observed that children as young as 18 months of age used negation to deny statements and to express the negative meaning "it is not so." These anecdotes cannot be independently assessed, however, because contexts of such one-word nega-

tive utterances were not provided. Clear examples of spontaneous negative use in sentences that deny propositions expressed by a previous speaker are provided by more recent studies of early language, such as the seminal observations of Bellugi[17] and Bloom.[18] In their data, exchanges such as the following are found in children's speech at age 2 years:

Adult: Daddy's getting old, huh?
Child: No, I get old[17] (p. 74)
Adult: Doesn't that look like scrambled egg? [referring to yellow wheel on a plate]
Child: That's not scramble[18] (p. 200).

Another common phenomenon observed at the same age is the practice of producing antithetical phrases.[7, 19-21] An example is provided by Snyder's child, who made the following antithetical statement about two different boats: "not that boat hot, that boat hot."[21] Weir[22] has also observed antithetical negations in the presleep monologues of her son. One of these consisted of a statement that is immediately contradicted and followed by an affirmative alternative:

Child: That light. No, is vacuum cleaner. Like vacuum cleaner here[22] (p. 107).

Examples such as these suggest that the 2-year-old child may be capable of utilizing negation for the logical purpose of denying a false statement and that he or she is highly aware of the contrast between affirmative and negative sentences. To firmly establish the soundness of these conjectures, though, substantial evidence is required from a controlled setting.

The first experimental attempt at asking children to judge the truth or falsity of sentences was published by Slobin[23] in 1966. Subjects ranging in age from 6 to 20 years verified simple passive and active sentences that varied in truth-value (either true or false) and that were either affirmative or negative in form. These two variables result in four types of sentences, which are presented in TABLE 1. These four types are true-affirmatives, false-affirmatives, false-negatives, and true-negatives, and simple examples (not the actual sentences Slobin used) are presented in the Table.

Slobin's research elaborated on a paradigm established by Miller[24] and Mehler[25] in which the difficulty of sentence comprehension was operationalized by the measures of reaction time and number of errors made. Subjects were asked to judge whether exemplars of a given statement-type were true or false with reference to a presented picture. Just as in the adult research, Slobin found that on average the affirmative sentences were verified more quickly and with fewer errors than were the negative sentences. He also found that the false-negative sentences were more easily comprehended than the true-negative sentences. The important finding for the issues of our concern is that significant agreement was displayed in the ranking of sentence-types for performance difficulty across the entire age-range of 6- to 20-year-olds studied: true-affirmatives < false-affirmatives < false-negatives < true-negatives. Slobin's study was the first direct test of children's comprehension of logical negation, but since the 6-year-olds revealed a comprehension-difficulty hierarchy that matched that of the adults', the ontogenesis of this ability is still an open question.

TABLE 1

STATEMENT TYPES, EXAMPLES OF TYPES, AND THEIR DESCRIPTIONS

Abbreviation	Statement Type	Example*	Description
TA	True affirmative	"That is a ball"	Fact
FA	False affirmative	"That is a car"	Falsehood
FN	False negative	"That is not a ball"	Denial of a fact
TN	True negative	"That is not a car"	Denial of a falsehood

* Stimulus condition: referent = ball.

One additional remark that Slobin[23] makes in passing is central to the development of negation. Several of his youngest subjects refused to accept any of his negative statements in the experiment as true. The reason for this considerably complicates our enterprise to investigate the development of logical negation. Propositions are not usually denied without an affirmative context, even when such negatives would be true. In traditional formulations of this social constraint, a proposition is not negated unless someone has asserted or presupposed it.[26-30] The social conditions for negation thus interact with the logical conditions, and this fact suggests that we must consider both pragmatic and semantic aspects of negation for any developmental account of logical negation. It will be particularly important to consider the cognitive difficulty of the social aspects of negation since it would seem to require a considerable degree of nonegocentrism with regard to knowing about the belief system and presuppositions of others.

The first study to demonstrate dramatically these pragmatic factors in negation comprehension was carried out by Wason,[30] who set up an experimental context in which he could systematically provide "contexts of plausible denial." These contexts, he reasoned, would facilitate the understanding of the "true-negative" stimuli found to be most difficult in sentence-verification experiments such as Slobin's.[23] Wason specifically proposed the exceptionality hypothesis, which claimed that "it is more plausible to deny that an exceptional item possesses an attribute which makes it an exception, than to deny that any unexceptional item possesses the discrepant attribute of the exceptional item."

Wason's hypothesis is best understood in the context of FIGURE 1. The single dark circle differs from the seven similar white circles in only one important attribute, color. The exceptionality hypothesis thus claims that it is more plausible to assert that "Circle 7 is not white" than to assert that "Circle 6 is not black." Wason found support for this hypothesis in that his adult subjects took longer to complete negative sentences that were inplausible according to the hypothesis, such as "Circle 6 is not _____," than to complete ones that were plausible.

Donaldson[31] later did a similar experiment with 5- and 6-year-old children in which the exceptional item also only varied in color from the similar stimuli. She did not find that the exceptionality context aided the completion of negative sentences by the children. However, using a variation in method, de Villiers and Flusberg[32] experimentally demonstrated that 2½- to 4½-year-old children are aware of the pragmatic conditions for negation. These investigators tested Wason's exceptionality hypothesis by varying the stimuli
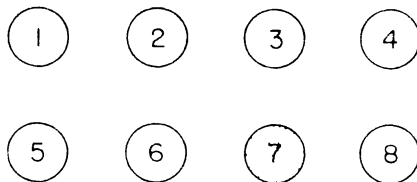

FIGURE 1. Wason's exceptionality hypothesis. It is more plausible to assert that "circle 7 is not white" than to assert that "circle 6 is not black." (After Wason.[30])

along easily-nameable class dimensions, with a typical stimulus set being made up from seven cars and one baby's bottle. Their 3½- and 4½-year-old subjects, like Wason's adults, took significantly longer to complete the implausible negative statements, such as "this is not a bottle" in the context of our example and they made more errors on them than on the plausible negative statements. Of the thirteen 2½-year-olds tested, only eight completed negative sentences at all. The responses of those who did carry out the task yielded differences between the two types of negatives; these differences were similar to those of the older children but nonsignificant. The error data for these 2½-year-olds, however, indicated that plausible negatives are understood earlier than implausible negatives since these subjects made errors for 36 percent of the implausible negatives compared with only 8 percent errors for plausible negatives. We can conclude from this study that apparently even 2½-year-olds are aware of the social, pragmatic conditions for negation. Results of this sentence-completion experiment, however, cannot be used as evidence for young children's knowledge of the logical conditions of negation because a sentence-completion task does not directly tap children's use of negatives to correct false statements. Instead, it only demonstrates their ability to complete true sentences, including negative ones.

Experiments have been devised by Donaldson and her colleagues[33-35] that do directly assess this logical aspect of negation performance. The feature of these studies of most interest for present purposes is a technique that was developed for eliciting judgments from preschool children as to whether statements were true or false. The investigator introduced the children to a talking "panda-bear" and they were told that he could learn to talk if they would only help him get better. The bear frequently made mistakes in describing situations the children could also see. Donaldson trained the children to press a bell when the panda said something "correct" and to press a buzzer when he said something "wrong." With this method she established that children as young as 3½ years could signal truth and falsity by noting a mismatch between a statement and the situation it describes. Younger children were unable to learn the contingencies between devices and judgments.

A talking-doll technique was also used in an unpublished study by De Villiers[36] in which children were explicitly told to tell the doll when he was right or wrong. As in the adult sentence-verification studies, stimuli were simple statements of the four types listed in TABLE 1. Detailed results were not presented in the paper, but De Villiers noted that 2-year-old children, when asked, "could accurately judge the affirmatives" as right or wrong and that 3-year-olds could "accurately label" false-negative statements as wrong, but did not correctly respond to true-negatives. Reaction-time data and error data for the 4- and 5-year-olds revealed the same ordering of statement-type difficulty that Slobin[23] found with older subjects. As one would expect, the greatest number of errors by far occurred in response to true-negative sentences.

In summary, previous experimental studies of children's performance with logical negatives have by and large either ignored very young children

or provided only suggestive evidence that 2- and 3-year-olds utilize logical negation. Very young children were instructed to give responses of "right" or "wrong" and generally failed, and their spontaneous use of negatives was never studied. The difficulty of the task may also have contributed to a lack of competent performance for these young children, who had to follow experimental instructions. The usual language experience of such young children consists of extended dialogues, and, as mentioned previously, when children this age are allowed to spontaneously negate false statements in naturalistic settings, they appear to succeed. These discrepancies between experimental and ethological data make it especially important to study the emergence of logical negation by approximating the child's normal language experience of dialogue as much as possible and to simplify the task environment by using simple words and referent stimuli.

THE EXPERIMENTAL STUDY

Given the need to simplify the judgment task for the children, several modifications of the standard sentence-verification paradigm were made. In pilot studies, a technique was developed for eliciting and coding spontaneous logical judgments, particularly the children's use of affirmative, negative, and referent words, in response to sentences of the four types listed in TABLE 1. The technique was a dialogue format for sentence presentations, and the experimental session was composed of a counterbalanced series of two-turn sentence presentations.‡ For the first turn, the experimenter (E) asked the child to give or show him a particular referent from a full set of referents on a table at which the child and E sat. After the child retrieved the referent, E made one of four types of statements (TA, FA, FN, TN; TABLE 1) about their jointly attended referent. This technique proved very successful in eliciting responses from the children, who seemed to interpret the experimental statements as comments upon the retrieval task they had just been asked to perform. Pilot studies indicated that without this dialogue-like setting, children's interest waned rapidly from the isolated-stimulus sentence presentations not preceded by the give/show orientation phase of the current procedure.

The referents for the stimulus statements—real objects such as a toy ball, car, cat, and dog—were chosen because of their frequent appearance among toys and household objects for young children and because words for them are frequently among the first 50 words acquired by children.[37, 38 §]

‡ This counterbalancing was pseudorandom, subject to the following constraints: the same truth-value or assertive-form never occurred more than twice in succession; the same referent word was never repeated in successive statements; and the same assertive-form/truth-value pairing was never repeated in successive statements.

§ The full set of referents was: apple, ball, car, cat, dog, hair, mouth, jumping, sitting, eating, drinking, big, little, red, and yellow. The hair and mouth belonged to a doll, and the actions could be executed with the doll. The colors and sizes applied to contrasting sets of balls (four total): small yellow, large yellow, small red, large red; only one ball was on the table for nonadjective-stimulus statement presentations, and the two relevant balls were presented for both the size and color statements. The

Forty children were the subjects of this study: five males and five females at 18, 24, 30, and 36 months of age. Subjects were first given a word-production pretest in order to find out whether they used the referent words. During the experimental session proper, subjects received a maximum of 48 two-turn sentence presentations, 12 of each of the four statement-types (TABLE 1). Children were tested individually, and the sessions were video-taped from a corner of the room.

The videotaped sessions were then transcribed into narrative form and used to determine, for example, the focus of the child's attention during our dialogues. Because the children's responses were often very complex, a detailed coding scheme was devised that classified responses into categories. This system captured the structural complexity of the responses and allowed very specific comparisons of response patterns to the different statement-types.

RESULTS AND DISCUSSION

The logic of analysis in discussing the children's responses is straightforward. The paradigm compares the relative frequencies of a particular kind of response to each of the four different statement-types, rather than the traditional method of tallying the number of correct answers by the experimenter's indices of judgement values, such as "right" or "wrong."[36] Since only minimal differences distinguish the four different statement types, differences in the children's response patterns to the different statement-types provide evidence of the ways in which the statements are differently interpreted by the children. For example, the FN statement in TABLE 1 only differs from the TA in that a negative morpheme occurs after the copula "is." The primary form of data presentation thus consists of comparisons between response-patterns to different statement-types as categorized in the response coding schemes already mentioned. The coding results that follow are presented in proportions rather than as absolute frequencies because the 18- and 24-month-old subjects received fewer overall test sentences. Specifically, 18-month-olds on average received 20 sentences each and 24-month-olds received 32, whereas the 30-month-olds received 46 and the 36-month-olds the full set of 48 sentences.

A brief review of the statement types as they relate to the questions raised earlier about the development of knowledge about the social and logical conditions of negation will usefully frame the results. The different statement types entail increasingly complex processing abilities for comprehension, as expected given the ordering of statement-type difficulty in sentence-verification studies with adults and older children. *True affirmatives* are correct assertions. *False affirmatives* are misnamings requiring correction. *False*

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use of noun, verb, and adjective stimuli was motivated by Werner and Kaplan's[38] finding that predications emerge in this order, but since few of the 18- and 24-month-old children either produced or comprehended the verbs and adjectives, and since few differences occurred between the types for the 30- and 36-month-olds, the data presented are collapsed across these word categories.

negatives are perhaps the most important type of statement for our concerns about logical development because they not only require correction, but in addition, they involve understanding the negative internal to the sentence. The negative of the false-negative statement is also a denial, an opposition of a true statement. *True negatives*, the fourth type of sentence, also necessitate understanding the negative morpheme as oppositional, but they are removed from the usual affirmative context of denial. No one is proposing that the statement denied by a true negative is true since it is an obvious falsehood, so an understanding of true negatives involves transcending the communicational context of negation and focusing on logical form alone. As seen in studies involving children older than these, such implausible negatives are difficult to understand. To be made more comprehensible they require a plausible context, one not provided by the dialogue format of this experiment.

The results of primary interest concern the children's corrections of the false statement types. One prediction is that if the children are using the negative morphemes they produce to deny false statements, they will use these negations more frequently in response to false affirmatives than to true affirmatives. These statements differ only in truth-value as a result of the different lexical items. Results are presented in FIGURE 2. When the category of response is the use of all responses that contain negative morphemes, this prediction is confirmed most strikingly for the 30- and 36-month-old groups ($\alpha = 0.005$, Wilcoxon matched-pairs sign-rank test) and for the 18- and 24-month-old females ($\alpha = 0.05$, paired-difference t test). Children rarely negated true affirmatives at any age, yet they frequently denied false affirmatives. The complexity of such misnaming corrections radically changes during the period from 18 to 36 months, as one would expect, with
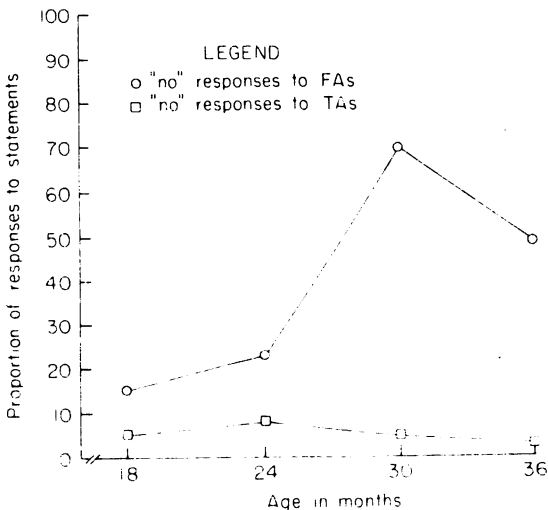

FIGURE 2. Proportion of "no" responses compared for false-affirmative and true-affirmative statements.

the youngest children almost always providing single-word "no" responses to false affirmatives. Children 24- to 36-months-old, however, often elaborated their corrections of false affirmatives by saying things like "no, it's a ball" or "that's not the car." Many responses to false affirmatives made by these older children consisted of conjunctions of two sentences, one right after another, that make explicit the logical relationship between denial, where the child corrects the false affirmative, and assertion, where the child is correctly naming either the referent, the thing referred to in the misnaming, or both. Such logical conjunctions are explicitly oppositional, so that in a typical example when E held up a ball and called it a car, a child said "that's not a car; that's a ball." Explicit oppositions were extremely rare at 18 months of age, but constituted responses to 21 percent of the false-affirmative statements by the 36-month-old children.

The other kind of false statements the children heard were false negatives, which falsely deny a true statement as in "that is not a car" when in fact it was a car. The prediction made earlier for the predominant negation of false-affirmative statements was straightforward because of the interaction of the statement type and the affirmation-negation response system. That is, "no" responses to true affirmatives would be rare, it was predicted, because such responses would be tantamount to falsely denying a true statement. But complications arise with false-negative statements, which can be corrected in two quite different ways. The example to be considered is the stimulus statement "that is not a ball" said in reference to a ball. One can correct this statement by saying "no, it is a ball" and negate the sentence as a whole with the negative morpheme, or one can say "yes, it is" and negate the negative morpheme internal to the false-negative statement with an affirmative morpheme, which serves an oppositional function. Given this two-choice set of correction devices, it becomes clear that any simple comparison of the relative frequency of single-word affirmative and negative responses is uninterpretable. In particular, if the child provides only a solitary "yes" in response to a false-negative statement, one should hesitate to conclude that such a child had "truth-functionally" denied the statement with an affirmative of opposition. Similar problems beleaguer interpretations of solitary "no" responses to false-negative statements, for one could not rule out the possibility that the child might be imitating the negative component of the sentence, an objection that cannot be pressed against the same response to the false-affirmative statements. Several predictions may be fruitfully proposed, however, when the children's responses are sentences rather than single words.

The analysis thus far has centered on "yes" and "no" responses, but the copula also plays a major role in the expression of judgments. The prototypical forms of assertion and denial, according to both classical and modern conceptions of language,[12, 40] are the predicate phrases "it is" and "it is not." These phrases are counterparts in logical function; one asserts, the other denies. The copula thus plays a pivotal role in the investigation of truth-functional assent and dissent, for while the single word "yes" is ambiguous with regard to its logical function in response to false-negative statements, the child's response of "yes it *is*" renders explicit the logical opposition to

the false negative by the use of the copula. This is important in an analysis of responses to true-affirmative statements with false-negative statements, which differ only in the word "not." If the child is using the word "yes" oppositionally to deny the false-negative statement rather than to agree mistakenly with it, one would predict that the elaboration of such a response by means of the copula should be more frequent when the child is denying false-negative statements than when the child is agreeing with true-affirmative statements. In FIGURE 3, the data indicate that elaborated "yes" responses, consisting of "yes" and a predicative statement with the copula such as "yes, it *is* a ball," are more frequently used as responses to false negatives than to true affirmatives at both 30 and 36 months of age (α = 0.01, Wilcoxon matched-pairs sign-rank test). Elaborated "yes" responses to any statement type at all are rare for the younger groups, so they cannot count as evidence for false-negative statement correction by such children.

However, if a child is using a statement to name the referent with the intent of correcting the false negative by oppositionally asserting its name, one would predict that naming statements with a denial function would frequently include the copula. The relevant comparison involves false negatives and true affirmatives again, and it is predicted that such elaborated referent naming phrases, such as "that is a ball," would be more frequent to false negatives than true affirmatives if they are in fact being used for denial. Analysis of the data presented in FIGURE 4 indicates that 24-month-old females, as well as the 30-month-olds (α = 0.005, Wilcoxon matched-pairs sign-rank test) and 36-months-olds (α = 0.01, Wilcoxon matched-pairs sign-rank test), frequently corrected the false-negative statements by asserting propositions with the referent name and the copula.

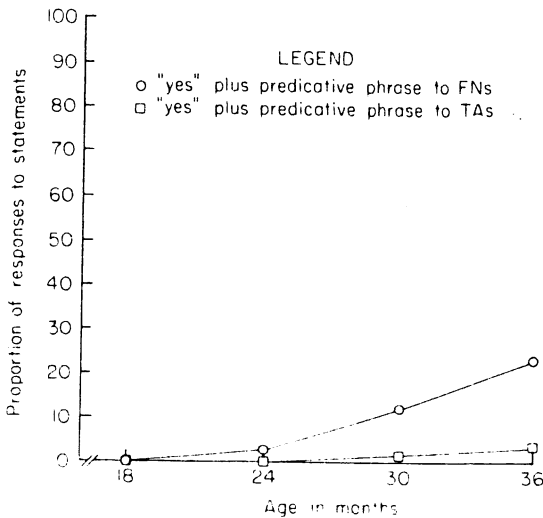There are several reasons for emphasizing this last result. One is that the

FIGURE 3. Proportion of "yes" plus predicative phrase responses compared for false-negative and true-affirmative statements.
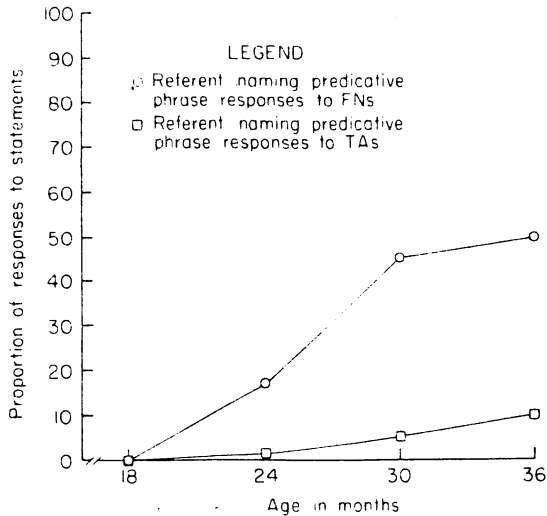
FIGURE 4. Proportion of referent-naming predicative phrase responses compared for false-negative and true-affirmative statements.

data provide another indication of the use of language by very young children to correct false statements. But just as importantly it demonstrates a comprehension of sentence-internal negation by the age of 2 years. This finding stands in contrast to suggestions made by Bellugi[17] that children at that age do not understand internal negation.

One additional finding of interest suggests that 18-month-olds are sensitive to negative morpheme of the false-negative statement type. Such subjects provided the name of the referent in response to 17 percent of the false-negative statements compared with 7 percent of the true-affirmative statements, even though these statement-types only differ in the presence of the word "not." Although still only uttering single words, these children seem to be asserting the referent name to correct the false negative, which suggests a preliminary resolution of the controversy over the nature of the child's knowledge of language and language use during this single-word utterance period. If the 18-month-old is asserting rudimentary propositions and if subsequent research supports this preliminary finding, controversies over whether such children are or are not predicating would be more profitably shifted to questions about *why* they are not expressing predications with sentences.

The children's spontaneous responses to true-negative statements were in general difficult to interpret. One child, a 30-month-old, was forthright in her agreement with such statements in responses such as "yes, it's not." Single-word negative responses were very common from all age groups, and given that the English assent-dissent system allows the use of "no" either in agreement or disagreement,[11] these responses are ambiguous in function. Given the predominance of single-word as opposed to elaborated "no" responses among the 18- and 24-month-old groups, the origins of true-

negative statement agreements are made obscure by their brevity. But one form of response to true-negative statements does show that the 36-month-olds utilize negative agreement, in that negative-phrase repetitions, such as "it's not" (in response to, for example, "that is not a ball") are more frequently made to true negatives, where the negative phrase is true, than to false negatives, where it is false ($\alpha = 0.025$, Wilcoxon matched-pairs sign-rank test). It is also clear that the children found true negatives very difficult, for one kind of response was an emphatic and incorrect "yes it *is!*." This response occurred for 15 percent of the true negatives presented to 30-month-olds (compared with 7 percent at 24 months and 5 percent at 36 months) and has the appearance of disagreement. But the focus of disagreement is unclear, and no children offered reasons such as "that's a funny thing to say," which would suggest that the children were commenting on the pragmatic inappropriateness of true negatives.

The most unexpected responses occurred when 2- and 3-year-olds misnamed the stimulus objects, producing their own false statements. In a pretest, the children's use and understanding of the stimulus words from which the test statements were formed were assessed. Otherwise, the putative misnamings might be interpreted as imitations of words the children did not know. The importance of such misnaming responses is best placed in perspective with the findings of false-statement corrections. The children's denials of false statements demonstrate that they recognize the truth-conditions that regulate normal language use in our statements about the world. Such denials utilize truth-functional language, such as affirmation and negation, and express judgments concerning the language use of another person. The denials also reveal the children's implicit awareness of truth-conditions, much as our use of language demonstrates implicit awareness of the rules of grammer in Chomsky's[42] account of language knowledge. When these children also systematically break the correspondence rules of truth by spontaneously saying, as one child did during this study, "this is a garden" while pointing to a ball, they are explicitly showing a reflective knowledge of truth-conditions.

This new form of linguistic knowledge is an important development in the language and thought of the child. It broadens the scope of language cognition beyond the plane of interaction and immediate means-end satisfaction to allow a qualitatively new form of language cognition that is rule-regulated, and in this respect exemplifies critical features of the Soviet "second signal system."[43] Language theorists have thus dwelt upon the importance of lying, a distortion of reality by means of language, and the development of lying was once a topic of great interest. In the work of the Sterns[14] early in this century, lying was said to presuppose a stage of psychic development involving three components: "(1) a consciousness of falsity, (2) intentional deception, and (3) a distinct purpose in view." The children's explicit awareness of the contrast between truth and falsity in their intentional production of false statements in this study shares only the first of these components of lies, a consciousness of falsity. The children did not intend to deceive because the objects were in clear view, not displaced, and displacement is a critical feature of lying.[3,15] In addition, their false responses

were frequently accompanied by laughter, a very loud voice, accentuated intonation, and coy looks to their mothers. No one was being fooled. The children also had no distinct purpose or vested interest in having the experimenter believe their false responses, unlike the lying child who has broken a glass and disclaims herself as agent. But these instances of misnaming do show in an innocent way that the children realize that language can be used untruthfully, and that this realization presupposes a conception of truth and falsity.

IMPLICATIONS

These findings suggest a modification of our conceptualization of the modes of thought available to the very young child. The developmental theories of Piaget and Werner indicate a major development in representational intelligence at 18 months of age, in which a simultaneous differentiation and coordination occurs between signifiers (such as words or other symbols that serve only a representational function) and what they signify (such as objects or events). Language development in the several years after this onset of what has been called "the semiotic function" is typically construed as "preconceptual" and more idiosyncratic than collective in meaning.[46] This view is coincident with descriptions of the young child as egocentric, claims that have seriously eroded in recent years by research indicating that very young children take into account the linguistic, intellectual, and physical skills of other individuals.[47, 48] These previous research efforts focused upon social rule-cognition and were aimed at illuminating what competence children have when allowed to manifest their skills in the domain of simple tasks. The findings of this study indicate that the notation of a logical system, the conception of sentences as true or false, is yet another form of early rule-cognition that the 1½ to 3-year-old has available for conceptualizing the world. This idea should not be surprising when one considers that a capacity for understanding corrections is fundamental to any learning endeavor. This is particularly true in the case of language, where it is crucial to align, at least in part through negative sentences, the new and often idiosyncratic meanings held by the child with the conventional meanings held by the adult.

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