ORIGINS OF VERBAL LOGIC:

SPONTANEOUS DENIALS BY TWO-AND THREE-YEAR OLDS

Roy D. Pea*

Clark University

Heinz Werner Institute of Developmental Psychology

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Proofs should be sent to: Roy D. Pea, Heinz Werner Institute of Developmental Psychology, Clark University, Worcester, MA 01610 USA

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Abstract

Children two to three years of age can spontaneously correct false statements and affirm true ones in a modified sentence verification paradigm. Such performances imply that very young children display knowledge of the rules of correspondence between language and reality (truth conditions) which are central to propositional logic, at an age when logical development in cognition has not been previously acknowledged.

Early Logical Competence in Children's Language Use

> To determine what it is that happens in the case of assent or dissent besides putting two ideas together is one of the most intricate of metaphysical problems.
>
> J.S. Mill (1843)

Young children seem to use the words "no" and "not" to deny false statements in conversations (Bellugi, 1967; Bloom, 1970; Leopold, 1949; Pea, 1980). For example, a child of two years may respond "it's not" to a parent's calling a truck a car. Such observations suggest that young children are able to use language to make metalinguistic comments about another person's language use. If such observations are more characteristic than anecdotal, they tell us something of considerable importance about early language cognition, because the use of negation to deny false statements is an important verbal index of the origins of logical abilities. Specifically, since the proposition "this is a car" is true if and only if the indicated referent is a car, and false if it is not (excluding metaphorical uses of the term), the child's use of negation to deny false statements reveals that she knows, in some sense, the rules or truth-conditions for the proposition "this is a car."

Though such early logical uses of negation may not surprise observant parents, they are at odds with accounts of early child cognition. Piaget (1962), for example, describes language use during the period from eighteen months to (at least) four years of age as "preconceptual," and "aiming at success and not at truth" (Piaget, 1954:406). On this theory, children's truth-functional use of negation should not appear until the period of

concrete operational intelligence, which "leads to knowledge as such and therefore yields to norms of truth" (Piaget, 1954:405), sometime around seven years of age (Piaget & Inhelder, 1969). An alternative view of child language cognition is suggested here: children's corrections of false statements indicate that they have available in memory information about language-referent relations which consists of not only affirmative specifications, such as the rule that "ball" is applicable to balls, but of negative specifications, such as the rule that "ball" is not applicable to cars. The mental registry of such affirmative and negative specifications concerning language-referent relations is tantamount to knowledge of language-qua-object in terms of truth-conditions. Just as importantly, such knowledge is fundamental to deductive inference and the basic building block of logic: "Perhaps the simplest possible deduction is negation: if the negation of a proposition is true, then that proposition is false" (Johnson-Laird & Wason, 1977:77).

The purpose of this paper is to investigate in an experimental setting the claim that young children have some knowledge of such formal conditions of language. The study is a modification of the sentence-verification paradigm (e.g., Chase & Clark, 1972) in order to bring the method closer to young children's experience with language in conversations. The principle data are children's spontaneous replies, without instructions, to indexical statements about the names and properties of objects and actions which are presented to the child.

In the late 1960's and throughout the 1970's, a great deal of effort was directed towards explaining the asymmetry in difficulty between

affirmative and negative sentences with the same truth values. Truth made affirmative sentences easier to verify, but negatives more difficult[1] (e.g., Wason, 1961). Wason (1965, 1972) proposed that something more than either syntax or semantics was needed to account for the interaction between truth value and negation. This factor was the actual use of negation in its normal context of denying some proposition which the speaker and listener mutually believe (also cf. Givon, 1975).

Wason (1965) dramatically demonstrated the workings of this hypothesized pragmatic factor in an experiment where he provided contexts of either "plausible" or "implausible" denial. Plausible denials should facilitate negative sentence comprehension. Wason's "exceptionality hypothesis" incorporated these notions:

> Given a set of similar stimuli, x_1, x_2,. . .x_n, and a stimulus, y, which is perceived to differ from these in one important attribute, it is more plausible to assert that y is not x than to assert that x_i is not y (Wason, 1965:8).

Wason's subjects in this study were shown a series of cards on which eight numbered circles appeared, one of a different color than the other seven. Their task was to complete sentences of the form "Circle #3 is. . ." or "Circle #3 is not. . ." by hitting one of two color-coded keys connected to a timer. In terms of Wason's hypothesis, the difference between RTs to negative (N) and affirmative (A) sentences regarding the odd-colored or dissimilar (D) circle should be less than the difference in RTs to A and N sentences about similarly-colored (S) circles: $(DN - DA) < (SN - SA)$.

Wason's prediction was confirmed,and the effect of pragmatic factors on negation thus demonstrated. Related studies by Greene (1970a, b) indicated that negatives are simpler to process when they are used to perform their natural function of signalling a change of meaning.[2]

Donaldson (1970) presented a task similar to Wason's (1965) to five to six year-olds by varying the plausibility of denial. The principle difference from Wason's paradigm was Donaldson's use of six rather than eight circles in the stimuli, but her subjects did not, unlike the adults, find it easier to complete sentences in the plausible than the implausible contexts. For these children, the two contexts were equally difficult, and they completed the negative sentence incorrectly 65% of the time for both conditions.

It would be incorrect, however, to conclude that five and six year-olds do not recognize the pragmatic conditions of negation. Using a clever variation in method, de Villiers & Flusberg (1975) experimentally demonstrated that two-and-a-half to four-year-old children are sensitive to the plausible contexts of denial. Reasoning that children did not find color an important attribute in Donaldson's study, they varied their stimulus classes along easily-named class dimensions. A typical stimulus set was made up of seven cats and a duck, all toy objects. The exceptionality hypothesis predicted that the children would find it easier to complete the statement "This is not a. . .?" when the duck (dissimilar item) was indicated than the same treatment when one of the cats (majority item) was indicated.

De Villiers & Flusberg (1975) found that three-and-a-half and four-and-a-half year-old subjects, like Wason's adults, took significantly longer to complete the implausible than the plausible negative sentences.

Implausible negative sentences were also the source of more errors than the plausible negatives. Of the 13 two-and-a-half year olds tested, only eight completed negative sentences at all. The responses of those who did carry out the task resulted in differences between the two types of negative sentences which were in the same direction as those of the older children, but nonsignificant. Error Data for the two-and-a-half year-olds indicated that plausible negatives were understood before implausible negatives, with 36% errors for implausible negatives compared with only 8% for the plausible ones. We can conclude from this study that apparently even two-and-a-half year-olds take into account the pragmatic conditions of negation in a simplified task environment.

This experiment by de Villiers & Flusberg (1975) cannot, however, be used as evidence for young children's sentence verification abilities, because a sentence completion task does not directly tap children's use of negatives to correct false statements. Instead, it only involves true descriptions utilizing negative statements.

More recent experiments have directly assessed children's abilities to judge the truth or falsity of sentences, though their central concern was developing a methodology for studying semantic development (Donaldson, 1972; Donaldson & Lloyd, 1974; Lloyd & Donaldson, 1976). The feature of these studies of importance here is the development of a technique for eliciting judgments from preschool children as to whether statements are true or false with respect to situations. Donaldson and colleagues introduced a "talking" panda-bear to the children, who were told that this panda could learn to talk if they would only help him get better. This "talking" panda-bear

made many mistakes in describing situations the child and panda could both see. Donaldson and colleagues then 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, they established that children as young as three-and-a-half years-old could signal the truth or falsity of affirmative statements by noting a mismatch between a statement and the situation it described.

Children as old as three-and-a-half years old, however, are somewhat distant in age from the population of two-year-olds who appear to use logical negation in their spontaneous language use to deny statements in natural conversations.

Summary

Previous experiments regarding preschool children's sentence verification abilities indicate that in simple experimental tasks, children at least three to four years of age display recognition of the pragmatic conditions of negation, as well as the ability to judge some sentences as true or false. But naturalistic observations of children as young as two years old suggest a much earlier competence in logical negation. The nature and form of such uses of negation, and their manifestation in an experimental setting is thus the focus of the current study.

Experiment: Children's responses to sentences of different truth-values and assertive forms

One of the hypotheses of this study, based on naturalistic studies of the early functions of negation (Bloom, 1973; Leopold, 1949; Pea, 1980), is that truth-functional negation is demonstrable in the speech of two and

three-year-old children. From a strictly logical perspective, evidence for such rudimentary logical abilities would derive from the children's use of negation to express judgements of "false" for false statements, and we might expect the correlative affirmations of true statements. But it has already been observed how the pragmatic features of negation in the ordinary use of language complicate this strictly logical account. Because negation in ordinary language normally functions to deny statements that someone has reason to believe are true, any developmental account of truth-functional operators must recognize the important interactions between semantic (truth-functional) and pragmatic (use) features of negation.

The oversimplicity of assuming consonance or homovalency between judgments of "falsity" with negation, and between judgements of "truth" with affirmation, is particularly evident in the "true negative" sentences found to be so difficult in earlier sentence-verification studies. Such sentences (e.g., "This is not a car" with reference to a ball) violate the pragmatic conditions for negation use by denying a statement no one could reasonably believe to be true. To be judged as true, the true negative sentence requires the child to transcend the communicative constraints on negation and focus only on the logical structure of the statement in relation to the referent. For this reason, the second principal hypothesis of this study is that the ability to judge true negative statements to be true will be a later development than the abilities of judging misnamings (false affirmative statements) or another's denials (false negative statements) to be false. The development of this coordination of pragmatic and semantic features of negation is investigated in this study by means of an analysis of the response patterns to true negative sentences by children in different age groups.

METHOD

Subjects

Ten children, five males and five females, were in each of four age groups: 18, 24, 30, and 36 months (mean ages: 1;6.5, 2;0.5, 2;6.5, and 3;0.5). Subjects were selected, with age and sex as the only constraints, from the Oxford Language Acquisition Group subject files, composed of cards given to and returned by mothers who visited the John Radcliffe Maternity Hospital in Oxford.

Design and Materials

An experimental session for each subject consisted of two different tasks: (1) a word-use pretest used to determine whether children knew the names of the objects, actions, and properties of objects which served as the referents of the stimulus sentences, and (2) a set of sentence-verification tasks, each with two phases. The first phase consisted of a word-comprehension task intended to direct the child's attention to a particular referent. The second phase, the presentation of a stimulus sentence concerning the referent of the word-comprehension task, followed immediately afterwards.

There were two variables in the stimulus sentences, statement type and word type. The statement type variable is based on two polar dimensions: true-false (T-F) and affirmative-negative (A-N), which respectively correspond to the truth-value of the stimulus statement in relation to the referent Object[3] depicted, and the assertive form of the stimulus sentence. There were thus four statement types: TA, FA, FN, and TN.

The word type variable concerned the type of word used in the word-use pretest, the comprehension phase of the sentence verification task, and

in the stimulus sentences: either noun, adjective, or verb. Word type was varied so that developmental data could be obtained on the verification of statements involving three major types of predication. Werner & Kaplan (1963) found that the earliest kind of predicative judgements are "identifying predications," corresponding to our NOUN stimuli, of the form "This is a NOUN." "Predications of action," corresponding to our VERB stimuli, are next articulated, followed by "predications of attributes," corresponding to our ADJECTIVE stimuli.[4]

Sixteen referent Objects were used as referents for the word-use pretest: 8 objects of various classes (body parts: hair, mouth; food: apple, biscuit[5], animals: cat, dog; toys: ball, car), 4 actions (transitive: eat, drink; intransitive: jump, sit), and 4 attributes (color: red, yellow; size: big, little). Referent stimuli were chosen on the basis of their salience in the perceptual/action world of children (Anglin, 1977), and the relatively high frequency with which the words appear in early vocabularies (Goldin-Meadow, Seligman & Gelman, 1976; Nelson, 1973; Rescorla, 1976), with the aim of maximizing word comprehension and production success among even the youngest children. Exemplars of the referent types were chosen so that they would be highly discriminable, the object attributes were accentuated and unique features of particular objects in the object set, and the actions were such that they could be illustrated by either a doll or the child.

The 16 words for the referent Objects and their respective word stimuli statement sets, composed of the four types of statements, were embedded in the two-phase word-comprehension/sentence-verification tasks. Stimulus sentences had the following form for the different word types: NOUN:

"That's the (NOUN)," VERB: "She's (VERB)ing" and ADJECTIVE: "That's the (ADJECTIVE) one." The negative in FN and TN sentence stimuli always appeared immediately after the contracted copula.

The full experimental protocol consisted of a set of 48 two-phase sequences (rather than 64, or 16 x 4) of a comprehension statement or question containing the test word (e.g., "Show me the ball," "Can you show me the ball?"), and then a statement from the test word's stimulus statement set.

There were four experimental groups: IA, IB, IIA, AND IIB. The 48 stimulus statements for each group were counterbalanced for order to eliminate the possibility of order effects, with the constraints that: (1) neither the same assertive form, word-type, nor truth-value occurred more than twice in succession, and (2) neither the same word, nor stimulus sentence type was repeated in successive sentence presentations. The primary motivation for grouping subjects was to get as many data points as possible for the total statement sets for each stimulus word, since it was expected that some subjects would not receive all 48 statements.

The difference between groups (I & II)A and (I & II)B was in the order of the sentences presented. In each case, A is the reverse of B. Groups I and II differ in the stimulus sentence set for their experimental sessions. Two word types, verbs and adjectives, did not have their full stimulus sentence sets represented in the set of 48 statements for any given group. That is, for a particular contrast set (for FAs and TNs), such as DRINK/EAT, one group A and one group B received both negative statements for one stimulus word (DRINK) and both affirmative statements

for the contrast stimulus word (EAT), whereas the other A and B group received both affirmative statements for DRINK and both negative statements for EAT. The design for verbs and adjectives is thus balanced for groups rather than individuals, unlike the design for nouns. Without this split, experimental sessions would have consisted of 64 statements, which pilot testing revealed to be more than most children would contend with. It would also have made the session well over an hour in length.

Procedure

For the word use pretest and the word-comprehension/sentence-verification tasks the mother, child, and one experimenter were seated together at a table (5' x 3' in area, 3' in height) in a carpeted playroom, with the child either sitting in a highchair next to the mother or on her lap. After completing the experimental session, the child, mother, and experimenter moved to the floor for free play with sets of toys (see Note 1 for details) and to collect a language sample from the child. The experimental period took from 20 minutes to an hour, and breaks were taken as needed.

Each child was first given a word-use pretest to find out whether they used the stimulus words. The experimenter either pointed to an object and asked "what's this?" for NOUN stimuli, engaged a toy doll in action and asked "What's the doll doing?" for VERB stimuli, pointed to a colored ball and asked "What color is this?" for ADJECTIVE (color) stimuli, or asked "What size is this?" or "Is this big(little) or little (big)?" while holding two balls, one little and one big (3" and 6"), and pointing to one of them for ADJECTIVE (size) stimuli. The question was repeated several times if the child did not respond, and was repeated again later in the session if there was no initial response.

After the word-use pretest was completed, the experimenter began to present the set of 48 two-phase word-comprehension/sentence-verification tasks. The structure of these tasks was an initial command or question, depending on word type: "Show me the (NOUN)" or "Can you show me the (NOUN?)," "Make the doll (VERB)" or "Can you make the doll (VERB)?", and "Show me the (ADJECTIVE) one" or "Can you show me the (ADJECTIVE) one?" The presentation of the stimulus sentence after the word-comprehension test phase was accompanied by explicit gestural reference to the referent Object: the experimenter either touched the object, demonstrated the action, or held the object within the space between the child and the experimenter. If the child's attention shifted before the sentence was presented, the experimenter either reinstituted the word-comprehension phase of the statement presentation or brought the child's attention back to the Object.

Children were never given any instructions, but frequently responded to the sentence presentations (cf. Note 7).

If the child did not respond to the sentence (often because of play with other objects), it was repeated. After 15 to 30 seconds from the last presentation of the stimulus sentence, the next two-phase comprehension and verification task was begun. This sequence of events was repeated until either the full set of 48 sentences was presented, or the child's patience with the experiment wore thin, and the session was terminated.[6]

The child's speech was then recorded for approximately fifteen minutes during play with objects in a carpeted floor area, so as to obtain a speech corpus for computing the child's mean length of utterance in morphemes.

All experimental tasks, with the exception of the word-production pretest, were videotaped from a sheltered corner of the playroom, where a second

experimenter operated the camera and transcribed the child's utterances and relevant nonverbal behaviors, such as pointing and gaze, in sequence as they occurred. Both experimental tasks and the language sample were recorded on a portable Uher taperecorder.

DATA ANALYSES

Computation of M.L.U. Audiotapes of the children's speech were transcribed by the author and the aid of the second experimenter. Mean length of utterance (M.L.U.) in morphemes was calculated for each child according to criteria specified by Brown (1973:5). The younger children spoke less often, so their M.L.U.'s are based on a smaller number of total utterances than M.L.U.'s of the older children. The mean number of utterances for each age group upon which group M.L.U.'s are based were: 18 months, 53 utterances; 24 months, 89.4 utterances; 30 months, 113.5 utterances, and 36 months, 97.7 utterances.

Coding of responses. Several major dimensions motivate the parsing of the children's responses to the stimulus sentences into categories. These are: (1) the focus of the child's attention after sentence presentation, (2) the syntactic complexity of the response, (3) logical complexity in sentence conjunction, and (4) illocutionary variation (i.e., a variation in what responses are meant as rather than in what is meant BY them; hence differences in illocutionary force, cf. Austin, 1975).

(1) Attentional focus. Children's responses to stimulus sentences may be directed to their current focus of attention rather than the referent indicated by the experimenter, with the consequence that the truth-value of the stimulus statement from the child's point of view is different than that intended by the experimenter (E). This is of particular importance

for stimuli of FA or TN form. For example, E may have produced the FA "That's a ball" with reference to a car, and the child may look towards the ball rather than the gesturally-indicated car and say "yes, it is." A disregard for the child's direction of gaze would result in an incorrect interpretation of such responses.

(2) Syntactic complexity. Three major divisions in the response categories correspond to varying degrees of syntactic complexity: a) Single words: "no," "yes," Object words; b) Operator plus name: "no" or "yes" plus name, or mentioned name (for FAs and TNs); and c) Copula addition: either copula (i.e., "is" or contracted "'s") plus name, or copula plus operator plus name. The complexity of responses of type (b) has both linguistic and cognitive consequences, e.g., the juxtaposition of negating and alternatively asserting "no, it's a ball" suggests that the child realizes the logical tie between assertion and denial in a way that a single word utterance could not. Similarly, the copula addition (c) provides evidence, as argued below, that the child is asserting and not merely naming.

(3) Logical complexity in sentence conjunction. A response categorization must be sensitive to responses which are multisentential. Numerous response protocols occur in which the child conjoins two statements that together express a logical relationship between the statement which the child interprets the experimenter to have made and one or more statements the child makes about the referent and/or mentioned object, such as the response "That's not a ball. It's a car" to a FA stimulus sentence. Coding each sentence separately would result in the loss of the information that two or more related statements were expressed. Such conjoined statements are designated here as "explicit oppositions."

(4) Illocutionary variation. Austin (1975), in focusing on the occasion of an utterance rather than its "timeless" meaning, distinguished between the meaning of an utterance and its force. For example, the same sentence can on different occasions have the force of an assertion, a warning, or a joke. The force of the children's responses is often relevant to their interpretation. In particular, children made comments, asked questions, and gave false responses.

Coding categorization systems

Given these four relevant dimensions for coding children's spontaneous responses to the stimulus sentences, two categorization systems were formed. The most detailed system consists of 43 basic and mutually exclusive categories, and is denoted as the BASIC coding system. Broader analyses of subjects' protocols were often required, however, that did not lose sight, as the BASIC system does, of general trends in, for example, "yes" and "no" use, regardless of response complexity, to different stimulus sentence types. For this purpose a COMPILED coding system of 13 categories was developed. The basic principle underlying this compilation was the consolidation of responses which had common features, such as the occurrence of a "yes," "no," or referent name, into more general categories. The coding system which was used is noted in the data tables, and the category systems are presented for reference (cf. Appendix).

Measures. The categorized responses were used to compute measures of the relative frequency of a particular type of response to different sentence types. The primary statistic used in the Results and Discussion section is the proportion of total statements presented which had a specific type of response to them. For example, one can compare the proportion of FAs versus TAs to which "no"was a response.

RESULTS AND DISCUSSION

General

Since only minimal differences demarcate the different stimulus statement types, e.g., the false negative only differs from the true affirmative in the occurrence of a negative morpheme after the copula, differences in children's response patterns to the different statement types provide evidence of ways in which they are differently interpreted. The central form of data presentation thus consists of comparisons between the predominance of responses of specific types to the different statement types. Because the overall number of statements for all statement types differed according to the age of the subject group, data are presented in terms of proportions rather than absolute frequencies. Specifically, out of a possible 480 stimulus sentences, the 18 month old group received 200; the 24 month olds, 334; the 30 month olds, 458; and the 36 month olds, 479. Although displaying some patterns of interest, the 18 month olds made few responses to any of the stimulus sentences; hence the generally low figures for any response type for this group (cf. note 7).

The average mean length of utterance in morphemes for the different age groups was 1.09 at 18 months, 2.24 at 24 months, 2.95 at 30 months, and 4.04 at 36 months. [The only dramatic sex difference in MLU was at 24 months: males, 1.56 MLU vs. females, 2.92 MLU.]

It may be useful to summarize briefly the experimental findings, since their details tend to obscure the general results. Most children 2 to 3 years old demonstrated an ability to correct false statements. False affirmative sentences were corrected with logical negations of increasing complexity

with age, and false negatives were also frequently corrected, by both negation and complex "yes" responses of oppositional function. Children's spontaneous responses to true negatives were difficult to interpret, but distinctive response patterns indicated that agreements with such sentences were prevalent by children 2½ to 3 years of age. Other findings of interest are the appearance of spontaneous false statement correction prior to true statement agreement, and the occurrence of false responses in which children play with truth conventions and produce insincere predications.

Correction of False Affirmative Sentences with "No"

One central prediction following from the hypothesis that 2 to 3 year olds use negation as a logical operator to deny false statements is that negation will be a more frequent response to False Affirmative than to True Affirmatives. The difference between the proportions of stimulus statements of these two types which were responded to by "no" responses of some kind is highly significant for the 30 and 36 month old groups ($\alpha = .005$, Wilcoxon matched-pairs signed-rank test, one-tailed, n = 10), supporting the prediction. Four of the 24 month olds did not use negatives in response to either statement type, and two of the remaining six subjects (both female, with MLUs of 2.36 and 3.04) contributed most (17 of 21) of that age group's negation responses to FAs. This variation in performance for the 24 month-old group resulted in a nonsignificant group difference between FA and TA negation responses. These results are presented in Table 1.

(Insert Table 1 about here)

The 18 month old group differences are also not significant, but when the protocols of 18 month old females are analyzed as a group, FAs are responded to with negatives significantly more frequently than TAs ($\alpha = .05$, paired-difference t-test, one-tailed, df = 4).

The complexity of the "no" response to false affirmative sentences changes radically within the age range studied, as illustrated in Table 2.

(Insert Table 2 about here)

Whereas at 18 months almost all of the negative responses to FAs were solitary "no" responses, many of the negatives produced by the 24 to 36 month-old subjects consisted of "no" plus some form of elaboration, such as "no" plus the mentioned name of the FA, as in "not ball," "no" plus the referent name, as "no, car," or more elaborate denials with copula or multisentence expansions (e.g., "That's not a ball. It's a car").

The principal developmental patterns in sentence verification task performances for FAs are in the means of judgment expressions typical of the different age groups. Three age-related patterns of response emerged for spontaneously commenting on the falsity of false statements, revealing a progressive differentiation and integration of different means for conveying corrections. The 18 and 24 month olds corrected single aspects of referent misnamings (FAs), either denying the statement with "no" or correctly naming the referent. The second pattern involved a successive stringing together of denial of the statement and uttering the correct name, e.g., "No. . .biscuit." The last pattern may be designated as "explicit logical oppositions" or coordinated corrections. Responses of this type coordinated denial of the stimulus statement with assertion of the correct name of the referent, e.g., "Not a biscuit, it's an apple."

These explicit oppositions were prevalent at 30 and 36 months, but were made in two cases at 24 months. For example, subject DD (MLU: 2.36) responded to the FA "That's the pussy" said with reference to a dog by saying "No/doggy. That pussy (as she pointed to the cat)." Table 3 summarizes the group results:

(Insert Table 3 about here

Correction of False Negative Sentences: Two Forms of Denial

The false negative statement type calls for a more complex analysis than the false affirmative, for there are two quite different ways of truth-functionally denying FNs. One way is to negate the sentence as a unit with a negative morpheme, while another is to negate the morpheme "not" within the FN by asserting an affirmative morpheme which functions as an oppositional. The "yes" response with this denial function is important because it reveals the child's knowledge of the logical opposition of "yes" and "no" by pointing up the binary contrast between affirmation and negation as a truth-functional response system. But one consequence of these two options for denying FNs is that any simple comparison of the relative frequency of affirmative and negative responses to FNs is inadequate, for if the child only says "yes" in response to a false negative sentence, one should be wary of inferring that the child had denied the FN. The child may be mistakenly agreeing with the sentence instead. Similar problems occur in interpreting a solitary "no" response to FNs, since the child may only be imitating the negative morpheme in the sentence. But several predictions may be made which involve predicative elaborations of affirmation, negation, or referent naming.

"It is" and "it is not" are the prototypical forms of assertion and denial (Dummett, 1973; Strawson, 1974), and are logical counterparts in predicative function. The major role which the copula plays in the expression of judgements has an important consequence for the study of truth-functional correction. Whereas the "yes" alone is ambiguous with respect to logical function, the response "yes, it is" makes the logical opposition of its assertion with the false negative statement explicit in the copula. Since the FN only differs from the TA in the occurrence of the word "not," if the child is using the word "yes" to deny the FN rather than to mistakenly agree with it, the elaboration of such a "yes" response with the copula should be more frequent when the child is denying FN statements than when the child is agreeing with TA statements.

The responses relevant for this comparison are of the forms "yes, it is" or "yes" combined with the copula in either full or contracted form with the referent name or pronominal form. Data presented in Table 4 indicate that

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(Insert Table 4 about here)

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such elaborated "yes" responses were used significantly more often in response to FNs than to TAs at both 30 and 36 months (α = .01, Wilcoxon test, one-tailed, n = 7). Elaborated "yes" responses to any statement type were rarely produced by younger subjects. Another comparison involving the copula may be framed which does take into account the response patterns of the younger subjects. If referent namings are being used to correct the FN statements by oppositionally asserting the referent name, children should mark this assertion by using the copula. Once again, the comparison of responses to FNs and TAs

is the relevant one, since they differ only in the negative morpheme.

Data for this comparison consist of responses with referent naming predicative phrases as components, and as Table 5 illustrates, such responses are more frequently given to FNs than to TAs from 24 to 36 months of age. This difference is significant at 30 months (α = .005, Wilcoxon test, one-tailed, n = 9) and 36 months (α = .01, Wilcoxon test, one-tailed, n = 8). Three

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(Insert Table 5 about here)

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female subjects provided all the responses of this type for the 24 month-old group. Subject AG (M.L.U. 4.07) used referent naming predicative phrase responses in response to 7/12 FNs, but only 1/12 TAs; subject DD (M.L.U. 2.36) made such responses to 7/12 FNs and 0/11 TAs; and subject TS (M.L.U. 3.40) to 1/12 FNs and to 0/11 TAs. These results provide yet another piece of evidence that language is used for truth-functional denial by some two and three year-olds.

"No" responses to FNs were less prevalent, and when they occurred, often difficult to interpret, especially since they were rarely elaborated. Of 54 total "no" responses to FNs across all the age groups, 48 were single words.

There is some evidence that "yes" corrections of FNs are a more developmentally advanced response pattern than "no" responses. First, as shown in Table 6, from 30 to 36 months the predominance of "yes" responses sharply

---

(Insert Table 6 about here)

---

increases, while that of "no" responses decreases. At 30 months the "yes" response pattern becomes more frequent than the "no" response pattern, and this "yes" advantage becomes extreme at 36 months (α = .01, Wilcoxon test, one-tailed, n = 9), with 49% of the FNs receiving "yes" responses as compared to only 6% "no" responses. This developmental trend is also discernible in the distribution of individual response patterns for the age groups. If we represent the number of children who (a) used more "yes" than "no" responses, (b) used more "no" than "yes" responses, and (c) used equal numbers of "yes" and "no" responses as (a, b, c) triads, we can illustrate these shifts simply:

18 months (0, 3, 0)

24 months (2, 5, 2)

30 months (5, 5, 0)

36 months (8, 1, 1)

Subjects not represented in the (a, b, c) triads responded with neither "yes" or "no" responses to FNs (total N = 10 for each age group). "No" responses are the predominant early responses to FNs and by 36 months, 8 of 10 children predominantly used "yes" responses. Several children used responses revealing an intermediary stage between "no" and "yes" responding to FNs, e.g.:

JM (M.L.U. 3.57): No. . .yes she is sitting down.

Referent naming responses to false statements

The possibility of assessing whether very young children use single words other than "no" to correct false statements is provided by the statement type contrasts of the sentence verification task. Evidence for such a hypothesis derives from a comparison of the frequency with which children use referent names in response to FNs, or incorrect denials, and TAs, which are correct namings. A similar comparison may be made between naming responses to FAs

and TAs. The logic of the argument is that children will be more likely to use the name for the referent if an incorrect predication has been made about it than if it has been correctly named, if their namings are serving as corrections. The data for these comparisons are presented in Table 7.

(Insert Table 7 about here)

Significantly more referent naming responses were used in response to FN than to TA statements by the 24 month olds (α = .005), 30 month olds (α = .005), and 36 month olds (α = .005; all tests were one-tailed Wilcoxon).

Significantly more referent naming responses were also provided following FAs than TAs by the 24 month old (α = .025) and 36 month old groups (α = .05; both tests were one-tailed Wilcoxon). Eighteen month olds did not display a significant difference for this comparison, but of the four subjects who used referent names at all, all four displayed differences in referent naming responses in the direction predicted. The lack of a difference at 30 months is due to the fact that children at this age (see Table 2) were responding to FAs predominantly with negation, and less often with referent names.

Responses to True Negative Statements

The difficulty of verifying true negative sentences is a consistent finding in language comprehension studies. We predicted that spontaneous judgements of TNs as true would be a later-emergent ability than corrections of false statements. A number of interpretive difficulties arise, however, given the types of responses--principally single-word no's--which the preschoolers made to such statements. These difficulties effectively make a test of the stated hypothesis impossible with the methodology used in this modified sentence verification

experiment. Yet clear cases of agreement with TNs are present in response from some 2½ and 3 year olds.

Imagine a particular TN statement, such as "That is not a car," said by the experimenter in reference to a ball. There is an important advantage to having the child spontaneously respond rather than using the experimenter's words of "wrong" or "right," for by careful analyses, different uses of "no" responses which are elaborated into sentences can be distinguished, some which do agree with TNs, others which disagree. To see why this might be, imagine an adult's possible responses to the true-negative. In English, we use a positive-negative answering system for "yes/no" questions which is extended to responses made to statements when assent or dissent are called for (Clark & Clark, 1977). This answering system has the feature that an English speaker normally responds "yes" for positive answers, whether the question asked is of positive (e.g., "Is it hot today?") or negative form (e.g., "It's hot today, isn't it?") and "no" for negative questions of both forms (Pope, 1973). This stands in contrast to the Japanese system of agreement-disagreement in which one word, "hai," is used for both positive answers to positive questions and negative answers to negative questions, and another word, "iie," is used as a positive answer to negative questions and as a negative answer to positive questions (Pope, 1973). Akiyama (1979) notes that in the English system the alternative responses ("yes" and "no") are dependent on the speaker's intention, whereas in Japanese, the response turns on its agreement or disagreement with the statement form of the query.

The important feature of the English system for our investigation is that the same word, such as "no," can be used to agree or disagree with the true-negative statement. We have already noted the prevalent use of "no" to deny

FAs. But consider the potential uses of "no" to agree or disagree with a TN:

"No" as TN agreement

(1) Speaker: That is not an artichoke. (Speaker holding a sunflower)

Listener: No, it's not one. It's a sunflower.

"No" as TN disagreement

(2) Speaker: That is not an artichoke. (Speaker holding a sunflower)

Listener: No! Why should I think it is?

In (1), the listener responds with negative-agreement, whereas in (2), the listener responds with negative disagreement. In the former case, the agreement is with truth-value, in the latter case, the listener notes the lack of an appropriate conversational context for the negation. Do children use negatives in response to TNs only to reject the TN statements because they are not pragmatically appropriate, or do they in some cases use negatives to agree with TNs?

In fact, there is some evidence that the 30 and 36 month-old groups used negative sentences to agree with TNs. If the child, like the speaker, in example (1), is using negative sentences such as "It's not" to agree with the TN, such negative-phrase repetitions should be made more frequently to TNs, where the negative-phrase was true, than for FNs, where it was false. This prediction is borne out for the 36 month olds, where 15 of the 119 total TNs received such responses (totals from BASIC categories 15 - 18) as opposed to 3 out of 120 FNs (α = .025, Wilcoxon MPSR, one tailed test, n = 6), and the data for the four 30 month olds using this response at all displayed the difference in the predicted direction (TN: 14/115; FN: 3/117). The clearest cases of TN agreement were by one 30-month-old subject who responded to two

different TNs with "yes, it's not," where positive and negative agreement were used in concord.

The suggestion that when young children use negation in response to TNs they are always intending to convey that TNs are pragmatically inappropriate does not receive support. The 30 and 36 month olds sometimes used negations to agree with TNs. But only this much is clear. The pragmatics-of-negation interpretation would predict a large number of negative responses to TNs, and the data reveal such a pattern. The overall proportions of TNs to which some type of "no" response was given, whether single word or sentential were substantial: 15% at 18 months, 14% at 24 months, 50% at 30 months, and 52% at 36 months.[7] Apart from the negative-phrase repetition responses (which have been argued to function as agreements with TNs), virtually all of these negative responses to TNs are ambiguous in function. Discounting the negative-phrase repetitions, 75% of the remaining negative responses were the single-word "no."

Single word negations of course are ambiguous; they may have been used either to agree or disagree with TNs. The remainder of the negative responses are of the forms "No, (name of the referent)" or "No, it's (a) (name of referent)." Once again, the function of the negation for the child is indeterminable. The consequence of such prevalent negative responses to TNs, whose function is generally indeterminable (until the negative-phrase agreements at 30 and 36 months), is that our second hypothesis--that judgements of TNs are true would be a later developing ability than that of judging false statements (FAs and FNs) to be false -- cannot be assessed. The early negations of young children in response to TNs may be in agreement, but we cannot tell. So the

hypothesis regarding the temporal priority of the different judgemental abilities, as manifested in this task, cannot be tested.

One might expect that "yes" responses would be used to agree with TNs, but interpretation problems abound yet again. For "yes" responses to TAs, the emergence of agreement across the four age groups is striking and clear, from 0% (18 months), to 18% (24 months), to 22% (30 months) to 56% (36 months) of the total statements presented received "yes" responses, and 92% of the total number of yes responses were single words. But "yes" responses to TNs were unclear in function. Overall proportions of TNs to which "yes" responses were given were 0% (18 months), 16% (24 months), 21% (30 months), and 11% (36 months). Only 32% of the total number of "yes" responses were single words, whereas 68% were affirmative multi-word utterances with emphatic stress, such as "yes, it is!" The children seemed to use the "yes" responses to oppose the TN with an affirmative statement, as if disagreeing with some aspect of the TN. But they did not make clear what aspect it was that provoked their emphatic responses, and none of the children offered reasons such as "that's a funny [i.e., inappropriate] thing to say" which might support the suggestion that negative comments to TNs are responses to the violated pragmatic conditions for the utterance of the TN.

The developmental relation between assent and dissent

Does the affirmation of true statements precede or follow the negation of false statements, or are these speech acts concurrent in development? We found that children negated more false affirmatives than true affirmatives with "no" responses, even at 18 months of age (females only). In contrast, none of the 18 month olds made "yes" responses to any of the true statements

(whether affirmative or negative in form). The appearance of false statement dissent with "no" temporally prior to true statement assent with "yes" corresponds to the order traditionally reported for the first uses of "no" and "yes" in children's speech productions (e.g., Greenfield & Smith, 1976; Jespersen, 1917; Leopold, 1939). Greenfield & Smith (1976) suggest that this temporal ordering is a result of markedness values of different communicative behaviors; since agreement is the unmarked or typical state of affairs in speaker-listener interactions, and disagreement is the marked state, the negative particle "no" will be a more essential lexical item for the child than the affirmative particle "yes." The construal of negation as the marked value of the yes-no opposition is consistent with Wason's (1965, 1972) account of the negative as marking departure from expectations, and with the cross sectional evidence presented here.

False Responses

An unexpected yet important response type was discovered in children's spontaneous responses to stimulus statements, and designated as 'False Responses.' False Responses provide further indication of preschoolers' knowledge about language at 2 and 3 years of age. They are utterances which spontaneously express false statements, e.g.

	Child	Utterance (Context)
(1)	EH:	That's a garden. (Child pointing at ball)
(2)	KM:	There's the doggy. (Child touches cat) There's the catty. (Child touches dog) (C laughs uncontrollably)
(3)	TS:	Biscuit. (Child looking at apple)

	Child	Utterance (Context)
(4)	SH:	Cat. (Child looking at ball)
(5)	SM:	It's a battery. Oh, it's a biscuit. (Child looking at biscuit) (C laughs)
(6)	SM:	It's a door. (Child looking at biscuit) It's a star.

A prerequisite for categorizing any response as a False Response was that the child have produced the name of the referent in question during the word production pretest of the experiment. Otherwise, we would have insufficient grounds for inferring that children are knowingly misnaming things.

False Responses began appearing in the responses of the 24 month old group (3 of 10 subjects), and were produced by a greater number of subjects at 30 months (7 of 10 subjects) and 36 months (5 of 10 subjects). The overall frequency of such misnamings was rare and relatively constant across this age range, occurring in response to approximately 3% of the total number of statements presented.

The importance of False Responses lies in their demonstration that children recognize the correspondence rules for truth which regulate language use in statements about the world not only implicitly, as shown by their denials of false statements, but reflectively, as evidenced in their systematic breaking of the correspondence rules in their False Response productions. Collins (1968) and Premack (1976) have provided compelling arguments that the ability to systematically break a rule and the ability to say when a rule has been broken jointly constitute evidence for reflective knowledge of that rule. More generally, nonliteral uses of language demonstrated in these preschoolers' False Responses, in early metaphorical namings (Winner, 1979), and insincere linguistic communications (Davidson, 1974) all reveal the activity of a mind

reflective on logico-linguistic knowledge structures. How truth conditions become knowledge structures for the child, and how the preschooler's primitive logic of affirmation and negation serves as building block for later logical development (e.g., Falmagne, 1975, 1980) remains to be determined. But the current findings indicate that the very young child, as developing epistemologist, is acquiring fundamental knowledge about the structure of language itself, as a system relating to the world through logical structure.

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Footnotes

[1]Under conditions where the sentence predicates are binary, such as odd/even, true negatives are verified more rapidly than false negatives, but this result has been shown to depend on a conversion of negative predicates such as "not even" into "odd" (Chase & Clark, 1972; Trabasso, Rollins & Shaughnessy, 1971).

[2]In general, information processing models of sentence verification postulate that the reason true negatives are more difficult than false negatives is that they require a greater number of mental operations, which are required in comparing the representations encoded from the sentence and the picture (e.g., Carpenter & Just, 1975; Chase & Clark, 1972; Trabasso, Rollins & Shaughnessy, 1971). Although such models tend to ignore the pragmatic inappropriateness which Wason and Greene each argue play such a large role in the difficulty of verifying true negatives, the two accounts are not mutually exclusive. The role of prior expectations in facilitating negative sentence comprehension (de Villiers & Flusberg, 1975; Wason, 1965) and in promoting the tendency of speakers to produce negative sentences (Osgood, 1971) has been acknowledged by Clark & Clark (1977, pp. 111, 240), and in principle could be incorporated into information processing models.

[3]"Object" with capital letter "O" is used throughout to refer generically to the referents of statements concerning names, actions, and properties of objects, in order to distinguish the general term from the descriptive term "object."

[4]The results are not described in terms of breakdowns of response-patterns for these three types of word-stimuli for several reasons. First, few of the 18 and 24 month olds either produced or comprehended the verbs or adjectives, and so stimulus statements for these words were rarely presented to these age groups. Furthermore, there were no clear differences between noun, verb, and adjective response-patterns or response-type frequencies in the 30 and 36 month olds. Data presented are thus collapsed across these word categories.

[5]'Biscuit' is the British term for 'cookie.'

[6]One exception to the procedure was a fairly regular occurrence for the 18 and 24 month olds. If a child neither produced a test word, nor comprehended it, the stimulus statements belonging to the statement set for that stimulus word were not presented to the child.

[7]The assertion that such occurrences were "substantial" is clearer when one knows that the youngest subject groups were very unresponsive in general. Specifically, at ages 18, 24, 30 and 36 months, the proportion of statements to which <u>no</u> categorizable responses were obtained were, respectively, 0.54, 0.28, 0.08, and 0.05. Once the proportions of "no" responses as described in the text are calculated with respect to a denominator of "statements to which <u>some</u> categorizable response occurred," rather than "statements presented," the values for occurrences of negation change to 0.32 (18 months), 0.21 (24 months), 0.54 (30 months) and 0.56 (36 months).

Table 1

Proportions of "No" Responses[a] for FAs and TAs

	Age in months			
Statement Type	18	24	30	36
FA	10/66	21/92	81/115	59/120
TA	2/41	6/77	6/111	3/120

[a]COMPILED Category B

Table 2

Complexity of "No" Responses to FAs:

Proportions of Solitary "No"[a] and "No" Plus Elaboration[b]

	Age in months			
Response	18	24	30	36
"No" alone	8/66	9/92	28/115	23/120
Complex "No"	2/66	12/92	53/115	36/120

[a]BASIC Category 7.

[b]BASIC categories 9, 11, 13, 14, 32-34.

Table 3

Each Subjects' Highest Level of Misnaming (FA) Correction by Age

	Age in months			
	18	24	30	36
No correction	5	1	0	0
Says "no" or gives correct name	3	6	1	2
Says "No. . .(correct name)"	2	1	2	3
Coordinated Correction	0	2	7	5
(Total # Subjects)	(10)	(10)	(10)	(10)

chi square (df = 9) = 25.29, $p < .005$

Table 4

Proportions of "Yes" Plus Predicative-Phrase Responses[a] for FNs and TAs

	Age in months			
Statement Type	18	24	30	36
FN	$\frac{0}{52}$	$\frac{2}{84}$	$\frac{14}{117}$	$\frac{28}{120}$
TA	$\frac{0}{41}$	$\frac{0}{77}$	$\frac{1}{111}$	$\frac{4}{120}$

[a]BASIC Category 5

Table 5

Proportions of Referent Naming Predictative-Phrase Responses[a] for FNs and TAs

	Age in Months			
Statement Type	18	24	30	36
FN	$\frac{0}{52}$	$\frac{15}{84}$	$\frac{52}{117}$	$\frac{60}{120}$
TA	$\frac{0}{41}$	$\frac{1}{77}$	$\frac{5}{111}$	$\frac{12}{120}$

[a]BASIC Categories, 5, 11, 21

Table 6

Proportions of "yes"[a] and "no" Responses[b] for FNs

	Age in months			
Response type	18	24	30	36
"yes"	$\frac{1}{52}$	$\frac{7}{84}$	$\frac{36}{117}$	$\frac{59}{120}$
"no"	$\frac{10}{52}$	$\frac{14}{84}$	$\frac{23}{117}$	$\frac{7}{120}$

[a]COMPILED Category A.

[b]COMPILED Category B.

Table 7

Frequencies and Proportions of Referent Naming Responses[a] to TAs, FAs, and FNs

Statement Type	Age in months			
	18	24	30	36
TA	.07 ($\frac{3}{41}$)	.20 ($\frac{9}{77}$)	.15 ($\frac{17}{111}$)	.14 ($\frac{17}{120}$)
FA	.20 ($\frac{13}{66}$)	.38 ($\frac{35}{92}$)	.17 ($\frac{20}{115}$)	.56 ($\frac{67}{120}$)
FN	.17 ($\frac{9}{52}$)	.39 ($\frac{33}{84}$)	.57 ($\frac{67}{117}$)	.56 ($\frac{67}{120}$)

[a]COMPILED Category D

APPENDIX

Decision Criteria for Coding Categories

1. The BASIC coding categories

One distinction which demarcates a large number of categories is the PRIMARY/SECONDARY, or I/II scheme division, which concerns the child's attentional focus after the statement is presented. Responses are PRIMARY (I) unless the child shifts attention to the mentioned Object (in the case of FAs and TNs), in which case the response was coded as SECONDARY (II). Schemes I and II are only noted in section headings in the category criteria.

Definitions of terms such as "head-nodding" are given once and subsequently mentioned.

A hierarchical principle is utilized throughout decision-criteria formulations, according to which responses are categorized at the level of greatest complexity whenever they could potentially be decomposed and categorized separately. For example, "yes, it's a ball" could have been dissected and analyzed as YES, (I), together with Referent + Copula (I), but is instead coded as the more complex YES + Referent Name + Copula (1).

1. Solitary YES: Primary (I)

For a response to be included in this category, it must be either:

(1) the word "yes" or "yeh" alone,

(2) the idiom "uh-huh" with fall-rise intonation,

(3) the gesture of head-nodding, consisting of at least two rapid, distinct contradirectional head movements in the vertical plane.

In addition, to avoid "eh"-like grunts from being counted as "yeh", the paternal interview must note the use of the type of affirmation in question.

2. Solitary YES: Secondary (II)

Criteria are as in 1., with the exception of scheme (II).

3. YES + Referent Name: I

The response must be either a combination of (1) and (2) in a sentence

(i.e., within sentential intonation boundaries and not with separate intonation contours):

(1) "yes," "yeh," or "uh-huh," or headnodding,

(2) the referent name.

4. YES + Referent Name: II

Criteria are as in 3, with the exception of scheme (II).

5. YES + Referent Name + Copula: I

The response must be a combination of (1), (2a) or (2b), and (3) in a sentence:

(1) "yes," "yeh," "uh-huh," or headnodding,

(2) (a) the referent name,

(b) the pronoun "it" or some other pronoun referring to the referent Object.

(c) the pronoun "it" or some other pronoun referring to the referent Object.

(3) the copula "is," or its contracted form "'s."

6. YES + Referent Name + Copula: II

Criteria are as in 5, with the exception of scheme (II).

7. Solitary NEG: Primary (I)

For a response to be included in this category, it must be either:

(1) the word "no" or "not" alone,

(2) the idiom "uh-uh" with rise-fall intonation,

(3) the gesture of headshaking, consisting (roughly) of at least three rapid, distinct contradirectional head movements in the horizontal plane.

There are cases where the child uses negatives for pragmatic ends, such as to accompany pushing something, to disagree about an Object's place or manner, or to protest. Such cases are not coded as negatives for the purposes of the categorization.

In addition, to avoid "ne" or other nasal grunts from being counted as "no" or "not," the paternal interview must note the use of the negative in question.

8. Solitary NEG: Secondary (II)

Criteria are as in 7, with the exception of scheme (II).

9. NEG + Referent Name: I

The response must be a combination of (1) and (2) in a sentence (cf. 3):

(1) "no," "uh-uh," or headshaking,

(2) the referent name.

10. NEG + Referent Name: II

Criteria are in 9, except for scheme (II).

11. NEG + Referent Name + Copula: I

The response must be a combination of (1), (2a) or (2b), and (3) in a sentence:

(1) "no," "uh-uh," or headshaking,

(2) (a) the referent name,

(b) the pronoun "it" or some other pronoun referring to the referent Object.

(3) the copula "is" or its contracted form "'s."

(For example: "No, it's the ball.")

12. NEG + Referent Name + Copula: II

Criteria are as in 11, except for scheme (II).

13. NEG + Mentioned Name

The response must be a combination of (1) and (2a) or (2b) in a sentence:

(1) "no," "not," "uh-uh," or headshaking,

(2) (a) the name mentioned, when it differs from the referent name (FAs; not TNs, since this is categorized as 16 below),

(b) the pronoun "it" or some other pronoun referring to the referent Object.

(For example: "not the car.")

14. NEG + Mentioned Name + Copula

The response must be a combination of (1), (2a), or (2b), and (3) in a sentence:

(1) "no," or "not," or "uh-uh," or headshaking,

(2) (a) the name mentioned, when it differs from the referent name (FAs; not TNs, since this is categorized as either 15 or 16 below),

(b) the pronoun "it" or some other pronoun referring to the referent Object.

(3) the copula "is" or its contracted form "'s."

(For example: "no, it isn't," "isn't ball," "isn't it," "it isn't the ball.")

15. NEG- phase: repetition (duplicate)

This response must be a near or exact duplicate of the negative statement presented as the stimulus, where the following sequence is present in a sentence: an initial pronoun (e.g., "it" or "that"), "is" or the contracted form "'s," "not" or the contracted form "n't," and the mentioned name.

(For example, "that isn't the car.")

16. NEG-phrase: repetition (different)

This response may be either the combination of (1) and (2), or (2) alone in a sentence:

(1) an initial "*no*," or headshake,

(2) a phrase which preserves the FN or TN statements' semantic structure, but not its lexical items: typical examples are "it isn't" or "it's not" or "isn't a_____" or "that's not a _____."

17. YES + NEG-phrase: repetition (duplicate)

This response must be the combination of "yes" or "yeh" with the response-type defined by 15.

18. YES + NEG-phrase: repetition (different)

This response may be either the combination of (1) and (2), or (2) alone in a sentence:

(1) an initial "yes" or "yeh,"

(2) a phrase which preserves the FN or TN statement's semantic structure, but not its lexical items: typical examples are as in 16 (2) above.

19. Solitary Referent Name: I

The response must be the use of the referent name alone.

20. Solitary Referent Name: II

The response must be the use of the referent name alone, in accord with the secondary scheme (II), and hence focusing on the mentioned Object (where it differs from the referent Object).

21. Referent Name + Copula: I

The response must be either (3), or a combination of (1) and (2) in a sentence:

(1) the *referent name*,

(2) the copula "is" or it's contracted form "'s" (usually) in combination

with the pronoun "it" or "that," or another pronoun referring to the referent Object.

(3) "it is," or "tis."

22. Referent Name + Copula: II

Criteria are as in 21, except for scheme (II).

23. Mentioned Name

The response must be the name mentioned, where it differs from the referent name (FAs and TNs), and where there is not a shift to scheme (II). If the child has demonstrated a comprehension and production of the words, this is one of 36-42, unless it is part of a "response-change" such as "car. . .ball" (without shift or scheme), in which case it is not listed in any *category*, but is discussed separately in the text.

24. Mentioned Name + Copula

The response must be the combination of the response-type defined by 23, the copula "is" or its contracted form "'s," (usually) in combination with the pronoun "it" or "that," or another referring to the referent Object.

25. Other Name: Elaboration

The response is the correct name of an Object other than the *referent* Object, or (if they are non-coextensive) the mentioned Object. This response-type is not restricted to names in the referent set: other cases are "claws," "eyes," "laying down."

The response is also not an exemplar of either the referent Object or mentioned Object types. This response-type includes cases where the response made (a name) is applicable to the referent (or mentioned) Object itself, but which actually concern a different feature than the one focused on by the referent (or mentioned) Object name presented (e.g., "ball" as a response when the referent Object was "a red one," but also a ball).

26. Other name: Generalization

The name of the referent Object (or the mentioned Object if they are non-coextensive) is applied correctly to an exemplar of that Object type different from the referent Object (or, again, the mentioned Object if they are non-coextensive). This category does not discriminate between schemes I and II.

27. Referent word questions

The response is a question, marked by terminal rising intonation, that contains the referent word.

28. Mentioned word questions

The response is a question, marked by terminal rising intonation, that contains the mentioned word, when it is different than the referent word (i.e., for FAs and TNs).

29. Other questions

The response is a question, again marked by terminal rising intonation, which contains neither the referent word nor the mentioned word (e.g., "Hey?", "say?", "Eh?").

30. Child indicates referent Object

The response consists of a point to, a taking of, or in general, an indication of the referent Object, which was initiated after the statement was presented. The child may have indicated the Object for the comprehension-phase of the experimental task, but must have withdrawn it before the statement was presented for this response to have occurred.

31. Child indicates mentioned Object

Criteria are as in 30, except for scheme (II).

32. Explicit Opposition: Type A1

This response must be a conjunction formed by two sentences, one of type (1) and one of type (2). It is assumed that the mentioned name is different than the referent name.

(1) "not (mentioned name)," or "it('s) not": where the referent Object is the focus of attention,

(2) either mentioned name + copula, mentioned name + pronoun, or mentioned name + pronoun + copula; where the mentioned Object is the focus of attention.

The order of (1) and (2) is not considered for coding purposes. If this response-type occurs to a TN, (1) is classified as either 15 or 16, and whichever category of 20 or 22 is applicable for (2).

(Example: "not a dog," where the child is looking at the CAT, followed by "that's dog" where the child is looking at the mentioned Object, DOG.)

33. Explicit Opposition: Type A2

This response must be a conjunction formed by two sentences, one of type (1) and one of type (2). It is assumed that the mentioned name is different than the referent name.

(1) "not (mentioned name)" or "it ('s) not" (scheme I),

(2) either referent name + copula, referent name alone, referent name + pronoun, or referent name + pronoun + copula; where the focus of attention has not shifted from the referent Object to the mentioned Object.

The order of (1) and (2) is not considered for coding purposes. If this response-type occurs to a TN, it is classified as either 15 or 16 (for part [1])

and in whichever category of 19 or 21 is applicable for (2).

(Example: "not a dog," where the child is looking at the referent CAT, followed by "it's a cat," with the same focus.)

34. Explicit Opposition: Type A3

This response must be a conjunction formed by a negation (1), and two sentences, one of type (2) and one of type (3). The negation must be the initial part of one of the two sentences. It is assumed that the mentioned name is different than the referent name.

(1) "no,"

(2) either referent name + copula, referent name alone, referent name + pronoun, or referent name + pronoun + copula, where the referent Object is the focus of attention,

(3) either mentioned name + copula, mentioned name alone, mentioned name + pronoun, or mentioned name + pronoun + copula; where the mentioned Object is the focus of attention.

The order of (1) + (2) and (3), or (1) + (3) and (2), is not considered for coding purposes.

(Example: "no, that's ball," where the child is looking at the referent BALL, followed by "that's car," where the child is looking at the mentioned Object, CAR).

35. Explicit Opposition: Type B

This response must be a conjunction formed by two sentences, one of type (1) and one of type (2). It is assumed that the mentioned name is different than the referent name.

(1) either referent name alone, referent name + pronoun, referent name + copula, or referent name + pronoun + copula; where the referent Object is the focus of attention,

(2) either mentioned name alone, mentioned name + pronoun, mentioned name + copula, or mentioned name + pronoun + copula; where the mentioned Object is the focus of attention.

The order of (1) and (2) is not considered for coding purposes.

36. False Response: Type 1

One criterion to be satisfied before a response is coded as any type of False Response (thus for all of 36-42) is that the child must manifest production and comprehension of the words involved.

This response is a misnaming of the referent alone, and not merely an imitation of (or agreement with) the misnaming rendered by a FA statement (42) or a TN (41).

(Example: Referent Object: DOG
Stimulus: "that is a dog"
Child's response: "that's a cat" [about a dog])

37. False Response: Type 2

This response is an application of the referent Object name to an Object other than the referent which itself is not a different exemplar of that Object-type.

(Example: Referent Object: DOG
Stimulus: "that is a dog"
Child's response: "that is a dog" [about ball])

38. False Response: Type 3

This response is an application of the mentioned Object name to an Object which is neither the referent Object, the mentioned Object, or another exemplar of those two Object-types.

(Example: Referent Object: DOG

Stimulus: "that is a cat"

Child's response: "that is a cat" [about CAR]

39. False Response: Type 4

This response is the conjunction of two sentences: one which is a False Response Type 1, and another which is either:

(1) a False Response Type 2,

(2) a False Response Type 3,

(3) an incorrect application of some other stimulus word which is neither the referent name nor the mentioned name to an Object other than the referent Object.

(Example: Referent Object: DOG

Stimulus: "that is a cat"

Child's response: "that's a ball" [about DOG],

"that's a dog" [about CAT])

40. False Response: Type 5

This response is a negation of the true-affirmative (TA) stimulus statement either by:

(1) "no," "not," "u-huh," headshaking, or

(2) the combination of (1) with the copula "is" and a pronoun referring to the referent Object (e.g., "it's not") or the referent name (e.g., "that's not a ball").

(Example: Referent Object: BALL

Stimulus: "that is a ball"

Child's response: "that's not a ball")

41. False Response: Type 6

This response is a denial of a true-negative statement (TN) by a false-affirmative statement by the child. It is a misnaming just as exemplars of False Response Type 1 (36) are, but of interest as a separate category due to the difficulty of the TN stimulus statements. The child's FA may take the following forms:

(1) the mentioned word alone,

(2) the copula "is" alone,

(3) a pronoun referring to the referent Object in combination with (2): "it is,"

(4) the mentioned word conjoined with (2) and (3): e.g., "it is a ball,"

(5) "yes" (or the other affirmatives) in combination with any of (1)-(4).

The child's attention must not have shifted to the mentioned Object (schemo II).

(Example: Referent Object: BISCUIT

Stimulus: "that's not an apple"

Child's response: "it is!")

42. False Response: Type 7

This response is basically an agreement with the false-affirmative (FA) stimulus statement, and consists of either:

(1) the mentioned word alone,

(2) "yes," "yeh," "uh-huh," or head-nodding,

(3) the copula "is," pronoun + copula (referring to the referent Object,