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THE RELATIONSHIP BETWEEN THE COGNITIVE AND LINGUISTIC PLURALIZATION RULES IN 18-38 MONTH-OLD CHILDREN

by
Barbara Sim Phalirea Coffman

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Psycholinguistics)
in The University of Michigan
1974

Doctoral Committee:

Assistant Professor Scott Miller, Chairman
Assistant Professor Wilbur Hass, Shimer College
Professor Klaus F. Riegel
Professor Ronald Wardhaugh

DEDICATION

For Klaus Riegel, a kind, warm human being who, by example, showed me, in my moments of discouragement, that it was possible to combine academic and humanitarian values.

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Without the help of my two babysitters, Cindy and Peggy Lane; my advisor away from home, Katsuyuki Sakamoto; Marion Miller, typist and speller extraordinaire; and my committee members, this dissertation would never have been completed. And of course Steve.

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INTRODUCTION

History and Development of the Problem

Language acquisition research in this country has received its impetus from two historically diverse fields. The early thrust of research, which reached its peak in the 1950's, came from American developmental psychology with its maturational perspective. The second thrust, which began in the early 1960's and reached its peak at the end of the decade, drew its energy from the field of generative linguistics. In recent years, however, both developmental psychology and generative linguistics have shown renewed interest in epistemology, in how knowledge is gained. This is at present leading to a de-emphasis on the end product of the acquisition process ("what" is acquired) and concentration on the function of the language acquisition process ("how" it is acquired).

Research undertaken previous to the late 1950's and early 1960's guided by the spirit of developmental psychology which viewed language as a maturational process, saw language acquisition as the growth of the ability to put together longer and longer strings of words. Citing experiments by McCarthy (1930) and Davis (1937), Miller wrote:

> This increase in the ability to repeat immediately a sequence of sounds spoken by the experimenter is accompanied by an increased ability to turn out long patterns of words. Here again linguistic development seems to depend upon maturation. (1951, p. 151)

The application of learning theory to the process of language acquisition was integrally related to this aggregative concept of language development. Sentences were seen as a series of chained associations. According to Skinner (1957), the child was a tabula rasa and the problem

of explaining the process of language acquisition could be resolved by a specification of the stimulus situation which elicited the child's response. The job of the psychologist was to specify all the conditions leading to the commission of a particular verbal act. Cognitive psychologists such as George Miller were not entirely pleased with the application of learning theory to the language acquisition process. Miller critically wrote, "The association theorist approached the problems of language as he approached the lever-pressing rat" (1951, p. 189). However, they seemed unable to present a cogent argument in opposition to it.

Taxonomic linguistics indirectly lent further support to the aggregative approach to language acquisition in that it dealt with language in terms of sounds, morphemes, or words. Language was seen as a collection of classes of words, classes which were defined by patterns of usage. According to linguists such as Bloomfield (1933), the aim of the linguist was to discover and list these classes. Researchers, influenced by prevailing psychological and linguistic theory, concluded that the child's acquisition of his native language was a process of learning words and word patterns, and that prolonged training was prerequisite for the child's mastery of his mother tongue.

Language studies up to and through the 1950's were concerned, therefore, with counting vocabularies, categorizing utterances and looking for statistical associations between words and utterances (Brown, 1956; Smith, 1957; Velten, 1943). However, these studies themselves initiated a feeling of discontent with then prevalent theory, because they made it obvious that relationships between categories of words existed that were beyond those defined by simple statistical co-occurrence. In 1961, Deese

voiced a conviction held by many when, at a conference on First-Language Acquisition held in Dedham, Massachusetts, he began his final discussion with the remark that "I had the conviction before the conference-- and little has accrued to change that conviction -- that contemporary learning theory has little to contribute to the problem of the analysis of language acquisition." (Deese, 1964) Since language acquisition theory at that time did not provide a model which was able to generate research in the area of emerging language relationships, an approach other than learning theory was necessary in order to deal with them effectively.

That same year, Carroll (1961) wrote a review of the literature dealing with language acquisition. In the review, he several times credited McCarthy (1954) with having well summarized all the available experimental evidence bearing on gross indices of language acquisition, conditions affecting acquisition, and the function of language in the life of the child. That he could not expand upon McCarthy's summary of eight years previous and had so few new developments to report so long after McCarthy's review, was a strong indictment of language acquisition research during that period.

In 1957, the second important impetus to language acquisition research was given by the publication of Chomsky's Syntactic Structures. In it he proposed a linguistic model which placed its emphasis not on categories but on structural levels which were generated one from the other and on the transformations necessary to relate these levels. The theory of transformational grammar claims that every sentence has a deep structure and a surface structure and that the two are not identical; that the surface structure, which is akin to the spoken sentence, is generated by rules from the deep structure which is composed of the

broadest base structures of language. He proposed that these base structures were probably universal to all languages. Rules of transformation specified how the structural levels developed. Chomsky pointed out that previous grammatical theories which relied on surface structure analysis failed to clarify relationships between sentences of different surface forms which speakers of the language intuitively felt were somehow related. "The dog bit the boy.", and "The boy was bitten by the dog.", are examples of this phenomenon. Although these sentences are superficially dissimilar, the native English speaker intuitively feels that they are basically very similar.

The value of generative linguistics to those conducting language research was strongly stated by Brown and Fraser in a paper delivered at the same conference where Deese (above) had made his disheartened remarks. They wrote:

> The construction of rules of which speakers have implicit knowledge are, in their explicit form, the grammar of a language. As these rules have been written down in traditional grammars, they constitute a collection of largely unrelated statements about such matters as the parts-of-speech, paradigms of conjugation and declension, the marking of gender, and the agreement of adjectives and nouns. Chomsky (1957) has shown that it may be possible to systemitize the traditional grammar into a mechanism for the generation of all the sentences of a language that are grammatical and none that are ungrammatical. Grammar becomes a theory for a range of phenomena.....(1964, p. 43)

The description of the child's language rules and the description of how they related or became transformed into the body of rules which comprises the adult's language was the task which most linguists and psychologists interested in language acquisition now set for themselves. For example, Brown and Bellugi (1964) observed that the early sentences of their subjects were organized around a single class of words which contained such diverse adult speech items as possessives, articles and demonstratives. For a period of five months they studied the process of

differentiation of this original class and noted that five grammatical categories, similar to those of an adult speaker had emerged. They described this process of differentiation of the developing child's language in terms of transformational rules. The new direction of language acquisition studies was expressed by Klima and Bellugi in a paper they delivered at the Edinburgh Conference in 1966. "What we have set as our immediate goal is (a description of) the overall grammatical capacity of children -- their general linguistic competence (Klima and Bellugi, 1966, p. 183)."

Those who worked within this generative/transformational framework questioned the usefulness of the stimulus-response (S-R) model as an explanation of the language acquisition process. They pointed out that a child constructed language creatively, that he was capable of producing combinations of words, sounds, and morphemes that he had never heard before. These combinations could not then be the result of imitation. An S-R model with its emphasis on imitation, they argued, could not account for more than the acquisition of certain vocabulary words and phrases. They further concluded that the child must be genetically endowed with a competence for language because in addition to the above, 1) the grammar a child produced was not the same as an adult grammar and yet very similar to that of other children; 2) only humans had language; 3) even humans of below normal intellectual development had language; and 4) certain rules seemed to be universal to all human languages (Lennenberg, 1967).

Katz (1966) supported Chomsky's hypothesis that the child must be endowed with a Language Acquisition Device (LAD) which contained as its innate structure each of the principles stated within the theory of

language. David McNeill (1966) characterized LAD as a "little black box" which received adult speech as its input and produced a grammatical system as its output and stated that the job of those interested in language acquisition was to "infer the internal wiring." According to McNeill (1970), the growing child is exposed to a large corpus of language utterances. LAD must be so constructed that it can develop a theory of the regularities that underlie these utterances. The theory developed by LAD allows it to distinguish grammatical from non-grammatical utterances. He hypothesized that LAD had two major components. The first component consisted of a set of procedures for operating on the utterances it received, "inference rules." The second component consisted of specific linguistic information, e.g. each sentence must have a noun and verb phrase.

Transformational theory revitalized language acquisition research both by forcing adherents of learning theory to re-evaluate their positions and expand theoretically and by giving a new theoretical basis to cognitive and developmental psychologists. Learning theorists Staats (1964), Braine (1963), Osgood (1963), and Jenkins (1964) all produced interesting data, especially in the area of sentence processing. Other psychologists, who had become familiar enough with the details of generative linguistics, produced studies which offered interesting descriptions of syntactic development and contributed to an understanding of the relationship between the early language spoken by the child and his subsequent adult language (Klima and Bellugi, 1966; Menyuk, 1963, 1969; Miller and Ervin, 1964).

However, most recently language acquisition research has shown itself to be not fruitful in the sense of understanding the basic processes of

language acquisition. As scientists from such diverse areas as cognitive psychology, developmental psychology, sociology, socio-linguistics, and speech pathology have begun to deal with language acquisition they have pointed out that we know how language is not acquired and we know something about what is acquired, but we still know very little about the process itself. Dell Hymes (1971), Susan Ervin-Tripp (1971), and Courtney Cazden (1971) have suggested that linguistic rules alone are not sufficient to explain the language acquisition process, that the environmental influences must play an important role. Arguing against the simplistic notion that LAD operates on language with purely linguistic rules, Hymes (1971) pointed out that children who speak non-standard English hear as much standard English from radio and television and their teachers as do other children, yet their language production is quite different. Obviously, identification and motivation are having a great effect on how LAD works on the corpus it receives.

> The idealized conception (of competence) becomes inadequate as soon as it is confronted with real children in a real environment...We have to account for the fact that a normal child acquires knowledge of sentences not only as grammatical but also as appropriate (Hymes, 1971, p. 10).

Additional objection to past research has come from Bloom (1970). She has criticized Brown and Bellugi (1964), McNeill (1966), and Miller and Ervin (1964) on the grounds that although supposedly generative, they were in fact taxonomic because they relied on distributional analysis and ignored the linguistic function of the data -- what the children were saying. She gave as an example the utterance "mommy sock" which appeared twice in two separate contexts in the speech of Kathryn, age 1½. The two contexts were: 1) Kathryn picked up her mother's sock, and 2) Mommy putting Kathryn's sock on Kathryn. Without contextual information, these utterances would be assigned the same structural description. Obviously

such a description would be a superficial one. She went on to point out that such structural descriptions have been consistently offered as proof of extensive rule similarity across children's speech, and this as pointing to a similar language capacity, which in turn, was supportive of a strong innate model of language acquisition. But as contextual information demonstrates that the two utterances are not similarly structured, it also points away from the hypothesis that language structures are innate.

> The fact that children's speech is very much tied to context and behavior was the major empirical influence on the study of emerging grammatical competence. The extent to which children's speech is stimulus-bound mitigates against the assumption of true linguistic creativity in early language. (Bloom, 1970, p. 233)

Ingram (1971) expressed many of the above mentioned oppositions and several other discontents with the innateness model of language acquisition in her statement concerning the research psychologist's requirements for a model of language acquisition. Among these requirements she listed stability, plausibility, relevance, and compatability with previously established data. Her criticisms unleashed from her conference colleagues a stream of remarks such as: "It sounds to me as though people are saying that you can't keep linguistics and psychology apart, but you can't find any real way of getting them together either." (Church, 1971, p. 152); "There is quite a lot of stuff around sentence-processing; it isn't all consistent unfortunately." (Mehler, 1971, p. 153), and "That's right, it's a big mess." (Bever, 1971, p. 153).

Much of the recent criticism of a strong innateness model rests on its lack of integration into general developmental cognitive theory and is a result of the growing influence of Piagetian theory in American

psychology. Although Flavell and Bruner did much to incorporate Piagetian theory into current developmental psychology, and Piaget's work on language has been available for several years, it has not been until more recently that Inhelder (1969) and especially Sinclair (1969, 1970) have published essays in English that deal directly with contemporary language acquisition issues within the framework of Piagetian cognitive theory. They have pointed out that there is a considerable time lag between the first manifestations of practical intelligence during the sensori-motor period and the first verbal productions, and that a language innateness model such as LAD takes no account of the structural richness of the learning organism, the intelligence acquisitions already present when language is being acquired. Language is viewed by them as emerging through integration of new experiences into the old structures into more general and higher-level mental constructs (Sinclair 1970).

Nelson (1971), Schlesinger (1971), and Bloom (1970) have offered experimental evidence which lends support to Sinclair's position. The value of their contributions is increased by the fact that they have attempted to integrate contributions from generative linguistics, learning theory, and Piagetian research.

Nelson (1971) chose to disagree with McNeill (1970), the strongest advocate of the innateness hypothesis. She defended Sinclair's position that language acquisition is related to sensory-motor development and the development of schemas and attacked McNeill's assertion that the category "noun" is a language specific universal, one of the components of LAD and could not arise from a non-linguistic base. She pointed out that McNeill himself inferred the child's implied linguistic category from the objects and events that the child relates to in his environment, e. g.,

> The one child said 'dough' (from 'drawer') as he reached for a drawer in order to open it himself. The word in the object of the unstated word 'open', which in turn is embedded in an unstated sentence meaning roughly 'I want to.....' (McNeill, 1970, p. 130)

while at the same time he denied that the child uses these same objects and events to define his categories.

Schlesinger (1971) proposed the existence of an I-marker deep structure, a deep-structure which contains the intentions of the speaker. Realization rules would transform this marker into an utterance. Schlesinger's I-markers and Chomsky's P-markers contain essentially the same information but I-markers contain this information in a form appropriate to a performance model because Schlesinger has hypothesized that the environment is perceived in terms of relations, not such categories as verbs and verb-phrases, that I-markers are determined by the cognitive capacity of the child. One important difference between Schlesinger and those psychologists whose research has been motivated by the innateness model is that he has attempted to account for the linguistic <u>performance</u> of the child and they have attempted to explain the grammatical <u>capacity</u> of the child.

Bloom's lengthy and well-documented study of (1970) the initial stages of the language acquisition process can be interpreted as giving empirical support to Schlesinger's hypothesis that the acquisition of underlying structure would occur as a second stage, by the way of 'inductive reference' from an already acquired stock of surface features (Schlesinger 1967). Her data dealing with the development of negation indicated that the children used the same linguistic form to express both rejection and denial and that the intention of these forms had to be understood in terms of the intentional context. Also, as the child acquired the syntactical forms of expression he applied them first to

the most familiar and earliest learned of the cognitive contexts. These forms followed only after the child had clearly acquired the cognitive distinction. In her support of Schlesinger, Bloom has clearly given credence to Sinclair as well, since Sinclair has acknowledged that Schlesinger is one of the few psycholinguists who seems to be working within a Piagetian framework (Sinclair, 1970).

The Piagetian Theory of Language Acquisition

Piaget's work concerning language generally focused on a later stage of development than is ordinarily thought of as the acquisition stage. The Language and Thought of the Child (Piaget 1949), for instance, is concerned primarily with the six year old, spanning the ages of four to eight. Sinclair (1969) reflects the problem of inconsistency of focus in her combining of theoretical statements with experimental evidence. Thus, on the one hand she states that

> In our view it is the way in which sensori-motor schemes, coordinated into practical groups, become transfixed into operations that would determine the manner in which the linguistic structures are acquired (p. 333).

while on the other hand she presents evidence to support this thesis which has been gathered from children 4½ years of age, an age at which language is already structurally quite advanced. Experimentally, she focused on the concluding aspects of the process, not the inception. The reasons for this seeming contradiction lie in gaps in Piagetian theory as it has been applied to language acquisition and in the weaknesses of the traditional Piagetian methodology.

According to Piaget (1953), thought has its roots in action. It

exists as a symbolic function which encompasses both the system of verbal signs and that of symbols. Language is a sign system which reflects the thought process. The process of getting from action to language per se involves the development from the use of actions, to symbols in the strict sense, to signs. Symbols in the strict sense, although they may be verbal, are part of the action, are inextricably bound up in the action, are idiosyncratic to the individual and the action and cannot be manipulated apart from the action. At the time of symbol development the schemas for objects are action schemas. Although object permanence exists and objects are seen as independent of the child himself, the concept of the object still involves the child's action relationship to the object which developed during the sensori-motor period. A sign is different from a symbolic signifier in that it is an abstract decentrated representation of some action separated from the action itself. Sign systems may develop apart from formal language. However, the social structure of man's existence has developed common sign systems convenient for communication among groups of peoples. The social pressures to communicate cause most children to acquire a specific sign system given to them by their social environment. The commonalities among specific sign systems, language universals, are however, due to the essential relationships of the sign systems to human intellectual processes.

> Language makes these structures more universal and mobile than the sensori-motor coordinations, but where do the constitutive operations of representational nestings derive from if their roots do not reach down to the sensori-motor coordinations themselves? (Piaget, 1967, p. 94)

Within the Piagetian model, logical thought is not considered to be possible until the operational stage. Schemas only prefigure logical systems and classes (Sinclair 1970). Syntax as viewed by Piagetians is a

reflection of logical thought (Piaget, 1967). Theoretically, it should not therefore be possible to acquire syntax before the operational stage with its incipient logic groupings. However, linguistic data have shown that pre-operational children already have consistent systematic syntactic relations in their utterances (Brown and Bellugi, 1964; Ervin, 1964; Miller and Ervin, 1964).

There are two possible channels of reasoning one might follow to extricate Piagetian theory from this internal contradiction. The first would involve the realization that logic is not limited to the classically formal system described by Piaget. That in other terms, language, with its consistent relationships, displays an internal logic. The consequence of this reasoning would be an enlargement of the concept of operations, the effect would be to move back the approximate age at which the child acquires operations. Specifically, the concept of reversibility, as described by Flavell (1963) would have to be redefined.

> In a general way, a thought form which is reversible is one, which is flexible and mobile, in stable equilibrium, able to correct for distorting superficials by means of successive, quick moving decentrations. But the turgid, slow paced and extremely concrete mental experiment of pre-operational thought is not reversible, parroting as it does irreversible events in reality (p. 159).

The addition and subtraction of morphemes involves some sense of the original item and reversibility. Flavell's definition, therefore, does not hold if one views a morphemic/syntactic manipulation as an event in reality in which the word as an object leaves and enters its class of items. There is strong evidence of grammatical reversibility, e.g., the addition of tense (Slobin, 1971), occurring in the language of children at an age before the onset of class reversibility claimed by Piaget.

The second way in which Piagetian theory may be reasonably changed

and yet basically supported involves a new approach to its traditional methodology which has so often ignored the role of language in the experimental situation. Basing their experimental work on the theory that language mirrors thought which has its roots in action, the Genevan psychologists have traditionally disregarded language itself as an object of study but have viewed it simply as a tool to achieve other insights and informational data. For example, Roberts (1971) conducted an experiment in which she examined the relationships between naming an object, object permanence, and object preference. Although she concluded that the child's preference for those objects which had been labeled by both the Experimenter and the child increased with the development of object permanence, she did not deal with the relationship between object permanence and labeling by the child, i.e., the crucial relationship of language development and the intellectual operation of object permanence.

In his documentation of the development of object identy, Piaget has ignored the fact that language is also developing and may affect the final stage by offering a convenient abstraction and aiding decentration. Also, the language system is never viewed as having an internal development and progress of its own, as participation in "action" in the Piagetian sense. That naming involves action just as moving one's hand involves action is not considered by Piaget. Language is viewed only as a completely developed and automatically acquired sign code which is somehow superimposed upon the intellectual system. In Plays, Dreams and Imitations in Childhood (Piaget, 1962), Pavli is quoted as saying "slug" each time he sees a slug in the garden. Piaget interprets this repetition of the utterance "slug" as evidence that the child thinks it is the same slug. Perhaps it was rather that the child's action schema, in this

case the verbalization, was limited. It is possible that the child knew the slugs were different but was not yet in control of the grammatical structures required to express this difference. If she had been presented with two slugs simultaneously, would she still have said "slug" upon noting each of them? Given experimental evidence such as has been offered, it is impossible to separate the variables of language and thought.

At present, then, the direction of psycholinguistic research dealing with language acquisition seems to point to the necessity of empirically exploring the relationship between cognition and language with the eventual goal of developing a model for linguistic competence that includes an account of psychological variables, of cognitive function.

Hypothesizing that linguistic structures are specifically innate and opposing the suggestion that cognitive abilities are basic to language acquisition, Mc Neill (1966) wrote:

> Although programmatic, the proposal is open to empirical tests of various kinds. Suggested cognitive abilities can be rejected by showing that they do not appear in non-linguistic development at the time that they appear in linguistic development (p. 114).

Using the same logic, a necessary condition for the reverse hypothesis to be true would be to demonstrate that certain intellectual concepts do not appear in linguistic development at a time when they do appear in non-linguistic, cognitive development. Furthermore, the growth of the linguistic ability should reflect the growth of the ability in cognitive development. This research project was undertaken in an attempt to bring empirical evidence to bear on the fundamental issue of the initial relationship between language and cognition. Based on the Piagetian assumption that knowledge of the child's cognitive structures allows us to see what kind of inferences he is capable of making at a

particular age, it examines the plural concept in the child's cognitive and linguistic development.

Cognitive and Linguistic Development of the Plural

The plural, as it appears in cognitive and linguistic structures, was chosen as the focus for this research project for four reasons: 1) The introductory nature of the study dictated the use of cognitive and linguistic structures which were comparatively easy to identify. The plural has shown itself to be so strongly determined by environmental and cognitive conditions that it manifests itself in language even when its standard linguistic expression is prevented. One of the children studied by Ervin and Miller (1963), Lisa, had a problem with final sibilants for a considerable period of time and thus was not able to employ the standard expression of the plural, the suffix "s". Lisa invented a substitute syntactic device, "one-two" to indicate plurality, e.g., "one-two shoe" meant more than one shoe. 2) Psychologists dealing with the semantic aspects of word classes have indicated that the plural has concrete references (Bar-Adon, 1971; McNeill, 1966; Vetter, 1971). They have also pointed out that the regular pluralized nouns occurred before other inflections.

> In general, the inflectional classes whose reference is most concrete are developed first (Cazden 1965; Slobin, in press). The plural inflection on the noun appears to be the first developed for both English and Russian children. (Dale, 1972, p. 54)

For example, the pluralization of nouns in one child's speech, Adam's, occurred eight months before the 3rd person verb inflection -- even though the phonological rule was identical in both cases (McNeill, 1966).

This evidence indicates an environmentally determined structure arising from real-life interactions. Such interactions lend themselves to a Piagetian interpretation of intellectual development. 3) Research evidence has been presented which demonstrated that the child is perceptually able to perceive the discrimination of line and repetitions of pattern which constitute the primitive plural by the time he is three months of age (Woodruff, 1972). 4) The distinction between morphological and syntactic classes has been diminished in recent linguistic research (Lakoff, 1968; McCawley, 1968). This means that conclusions about the plural, which was once thought to be a purely morphemic construction, could accordingly be inferred to other syntactic structures.

The development of the plural can be seen as related to the Piagetian concepts of object identity, class identity, and the acquisition of symbols and signs. Each of these intellectual abilities can be seen as vital for a complete explanation of the acquisition of the cognitive and linguistic plural. Object identity, in which the child is able to perceive an object as having an existance of its own, separate from the child's action upon it, is necessary for the child to grasp the notion of plurality. The development of object identity goes through several stages (Piaget, 1954): first the child begins to discern subtle relations between objects themselves; next he organizes them relative to each other and assigns similarities to them; then he begins seeing things that are the same and how they relate to each other; a short time later the child is able to understand invisible displacement in which the object is conceived of as having movement and position of its own, minute variations are no longer perceived by the child as removing the object from its basic identity; finally the child conceives of the object as being separate from and independent of the

activity which he intermittently applies to it. Using blocks as an example, one first sees the child hitting blocks one against the other; he then begins to stack and sort them, testing each one out for "blockness"; finally, each block, no matter what its size or color, is immediately perceived as being a block and with its characteristics is incorporated into the ongoing play. At this stage, in which the child is comprehending both similarities and latitude in the physical characteristics of objects, a conception of the plural is possible. This is in keeping with Martin (1971) who has pointed out that in order for there to be the explicit recognition of number as a characteristic of a given group, the observer must first discriminate the individual items which make up the group.

Linguistically, a parallel development seems to be reflected. The earliest plurals used by the child have been shown to be such words as "stones", "blocks", and "shoes". In the modern child's normal environment it is usually with these objects that the child experiences the interaction necessary for plural development. At this early point, the use of the linguistic plural might also be seen as reflecting the child's switch from the use of symbols to the use of signs. The plural expression is not yet a generalizable decentered morpheme but is idiosycratically tied to specific experientially determined situations.

The operation of class identity is basic to the child's acquisition of the plural concept. Piaget, however, states that class identity does not develop until the ages of 6 or 7 (Piaget, 1963). Looking back at the development of object identity one might suggest that the foundations for class identity are laid at a point much earlier than that discussed by Piaget. The point at which the child sees that, in spite of certain

differences in characteristics, objects may still be grouped together and treated as the same, is an indication of the development of class inclusion on the cognitive level.

An examination of the linguistic development of the child also points to the acquisition of class identity at an earlier age than that discussed by Piaget. Piaget's claim seems to be due to his lack of consideration of language as both object and action as discussed earlier. If language is considered in the anthropological sense as having an ongoing separate existence of its own, the operations which the child controls in his linguistic manipulations, e. g. , the addition and subtraction of tense, can be interpreted as indications of class concept. First, something stable, something enduring, is perceived by the child. This is followed by the formation of classes of similars and the awarenesses of differences. For the concept of class to be meaningful, then, the broad generalization must be narrowed down to the conception of specific instances. At a point when all animals are seen as "dog", the concept "dogs" has no relevance. There is a point, however, at which the child seems to note the differences, the separate instances of dog. At this point, the plural is possible.

An understanding of Piaget's seeming misjudgment of the time at which class identity is acquired may lie in the relationship between the particular experimental stimuli that he used and the differential effects of decalage. Decalage, according to Piaget (1954) is the differential acquisition of an intellectual concept, the various small steps which comprise the final stage acquired. Horizontal decalage involves a single level of functioning. For example, the child has an organizational schema which can be applied to certain stimulus characteristics

but not to others; or, to certain aspects of the environment but not to others. Fox example, Bell (1970) has shown that object identity relative to persons and inanimate objects develop at different times. Person identity occurring with the child's mother is often the earliest evidence of this intellectual acquisition. Bell attributes this to the fact that the mother is the most interesting object in the child's environment. The distinctive awareness of repetition indicative of class membership may only be made by the child in environmentally motivated situations. Thus plural decalage, the early use of the plural with limited objects and words, could be explained according to the varying press of the environment to make practical the ability to abstract.

Vertical decalage describes differences in the level of functioning. The cognitive structures may possess superficial similarity and the context operated upon may be the same but the child is performing on radically different planes of activity (Flavell, 1963). The relationship between symbols and signs as the child acquires language can thus be interpreted as a manifestation of decalage, the causes of which may be even more complex than that sketched above. For example, the full plural requires complete independence of the object. However, there is a half-way plural occurring before the acquisition of object permanence or the full linguistic plural in which certain objects have multiplicity by virtue of the S's actions upon them, e.g., "blocks", "stairs". This object specific plural has been observed and recorded by E both during this research project and in a diary of her son's speech. Early plurals seem to be things which can be handled, piled, manipulated. People and animals are rarely heard in early plural expression. The plural expression in such cases is in fact demonstrative of symbolic speech, an idiosyncra-

tic expression integral with the relationship between the child and the object (Sinclair, 1970). The cognitive schema is not yet fully generalizable and the linguistic expression is not a general rule but object specific.

> Certainly the same object reappearing in different practical positions or contexts is recognized, identified, and endowed with permanence as such. In this sense it is relatively independent. But, with being truly conceived as having several copies, it may manifest itself to the child as assuming a limited number of distinct forms of a nature intermediate between unity and plurality, and in this sense it remains part of its context. (Piaget, 1951, pp 62-63)

In summary, the linguistic expression of the plural is not the simple reflection of a perceptual ability. Perceptually, the child is able to perceive the discriminations necessary for plural perception before he is three months old. It is proposed that the final linguistic plural expression is a representation of a cognitive capacity; that this intellectual schema is the result of the intervention of a series of fresh contributions to the developing stages of object constancy and acquisition of early symbolic utterances which have separated the first perceptual constancies from the final linguistic operation. The purpose of this study was to ascertain whether or not one could find evidence in the cognitive and linguistic functions of the child to support the hypothesis that the occurrence of the cognitive plural concept was the basis for the linguistic manifestation of the plural expression.

THE STUDY

The present study consisted of two main tasks. The first (Task I) was concerned with the ability of the child to use a concept of plurality in a situation which did not require linguistic knowledge of the plural. Success in this task was dependent upon the degree to which S was able to use his perceptual knowledge of the plural to achieve a desired goal. In other words, it was dependent upon the degree to which he was able to incorporate the plural into a cognitive schema. Task I was a cognitive "shell" game in which S had to use plural information given in picture cues to find a hidden token.

The second task (Task II) attempted to assess the status of plural usage in the language of the child by assessing both the S's comprehension and production of the plural using "Ø" or "s". It attempted to differentiate the degrees of S's control by using these words with or without a marked number modifier and by asking S to go beyond his extant vocabulary by using the plural with unfamiliar nonsense words. Success in this task, therefore, would indicate that S had incorporated the plural into his linguistic structures to the point where that rule could be used creatively on unknown words. In Task II, pictures on 3 x 5 cards were used to elicit or confirm S's plural usage.

It was predicted that success on the cognitive task was a necessary prerequisite for success on the linguistic task. This would be shown by a significant increase in the ability of the successive age groups on both tasks, with success being achieved on the cognitive task prior to

success being achieved on the linguistic task. A leveling out of the two tasks was predicted at about age three, the age when linguistic competence should equal cognitive competence relative to this ability.

Task I

History

It was difficult to develop a formal non-linguistic cognitive task to demonstrate S's control of the plural. Although research in this area has been indicated for some time, little has been carried out. Beilin and Kagan (1969) conducted a research project within the psycho-linguistic framework which attempted to demonstrate the prior need of cognitive resources for language acquisition. Their tasks assessed children 3 - 5 years of age on their knowledge of language pluralization rules and the ability to attain simple number concepts. Non-criterion S's in one or both tasks, e.g., those who could not pluralize, were then trained in the task, or tasks, they had failed. Training consisted of reinforcement for the correct labeling of one or more than one figure. Those S's who received concept training did no better than a control group on the pluralization task. Those who passed the pluralization pre-test responded no better to concept training than the group that failed the pluralization task. Results for concept scores generally paralleled those for language. Beilin and Kagan concluded that the results of their study were ambigious. One may interpret this ambiguity as being evidence for the idea that acquisition of a trained concept does not necessarily mean acquisition of a cognitive structure capable of assimilation and accomodation. They did not examine S's ability to generalize the concept by measuring its incorporation into S's intellectual functioning.

In addition, the theoretical requirements of the present study made it necessary to work with children as young as 1½ years of age. Most experimental research has dealt with children younger than this age or with nursery school aged children, e.g., Gibson (1963), Kagan (1964). At age under 1½, the child is fairly immobile and more easily controlled by E. His response repertoire being limited, it is more conducive to measurement. The older children simplify E's task in that they are both more accessible as subjects in the numbers necessary for statistical design and also because they can be instructed in the required tasks through the language medium.

One still might think this lack of research surprising since so much of the child's cognitive development emerges in the 1½ to 3 year time span. However, if one has attempted to work with children this age, to evolve tasks which span this age range, the lack of experimental literature is not surprising. The task types described by Church (1971) and Mehrabian (1971) derived largely from Piagetian observations are interesting but do not lend themselves to traditional variable control and data gathering, and the child's new-found mobility, distractibility, and emotional stage of development all make a systematic repetitious task non-interesting. The stage in which the infant delights in repetition has passed and the child has passed into a stage of constant motion and physical involvement. And although Church states, "I wish to stress the wealth of techniques available to us (1971, p.193)." He also states elsewhere in the same article that he places more reliance than other researchers on affective indicators of what is cognized and how.

However, from European research came indications that the motivation to explore, control and interact with the environment is extremely strong

at this age. Babska (1969), in a Vygotskian type experiment, demonstrated that children of this age can even play games if the games are related to their stage of development. According to Piaget (1963), with the development of object identity, the magic of hide and seek takes on a new and exciting dimension for the child. From the above, Task I developed as essentially a "shell game."

Method

Task I consisted of presenting two square boxes with hinged lids to S. On the lid of one box S saw two identical figures; on the lid of the other box S saw a single third figure, identical to the first two figures. As S watched, the lid of one of the boxes was raised and a raisin was placed in the box. The lid was lowered and the boxes were shuffled. S was then allowed to try and find the raisin.

Predictions

It was predicted that the youngest children would enjoy the game and go through the motions of playing it but that they would not be able to utilize the plural cues, the singular/plural differences in the figures on the covers of the boxes to aid them in successfully finding the raisin. The plural concept would not be part of their schema except on a particularized basis. Their performance would show their choices to be random, or perhaps controlled by hand preference or initial position of the stimuli. An age related increase in task success was predicted as the plural concept became decentrated. It was also predicted that success in using the plural non-linguistically would precede the linguistic control of the plural which was to be evaluated on the second task. The age span 2-2½ was to be the crucial age for determining if in fact the plural usage did precede linguistic usage

since by 3 years of age most children have a fairly well established plural usage.

Subjects

Age. Thirty-two Ss were distributed over four age groups. Each age group of eight consisted of four males and four females. Mean age per age group is given in Table 1.

TABLE 1

Distribution of Ages in Experimental Groups

GROUP	AGE SPAN IN YEARS	MEAN AGE IN YEARS AND MONTHS		
		COMBINED	MALE	FEMALE
I	1½ - 2	1, 11	1, 11	1, 11
II	2 - 2½	2, 4	2, 4	2, 5
III	2½ - 3	2, 10	2, 10	2, 11
IV	3 - 3½	3, 5	3, 6	3, 3

Background. Since neither school playgrounds nor nursery schools could provide a subject pool for all those subjects under 3 years of age, E exploited personal contacts to find subjects. The resulting subject pool was thus composed of all white, native English-speaking children of graduate students and children of couples living in a wealthy suburban housing development.

Selection. A criterion task, administered before the experimental task, was used to determine whether or not E was communicating with S and whether or not S was able to comprehend the task and play the "game." The criterion task was a simplified version of the experimental task. Two boxes of equal size and color were placed in front of the subject. A small picture was attached to the lid of the other. E pointed out

the pictures and told S to watch the boxes. While S watched, E raised the lid of one of the boxes and placed a raisin in the box. The boxes were then shuffled and S was told to find the raisin. The predominant cue available to S was the picture on the box. Six successful trials out of seven were accepted as evidence that the child understood the task and was able to use the pictures as cues. Fifteen trials were allowed; if trial 15 was correct, the task was continued and stopped on the next error.

Due to failure on the criterion task, 3 girls and 1 boy, all between 1½ and 2 years of age, had to be eliminated from the experiment. Whether this was due to lack of rapport with E or cognitive immaturity is difficult to know. Out of curiosity, the linguistic part of the experiment was also administered to these Ss. Three of the children were not able to perform the linguistic task either. One girl was able to go through the linguistic task.

Although E made every effort to elicit Ss' cooperation, the data from two female Ss in Age Group IV and one female in Age Group I had to be eliminated because they would not complete the experiment. The youngest began crying when she did not get her reward and could not be made to stop. The older ones refused to sit still for the forty-five minutes necessary to administer the experiment. A play-break was given to these Ss but they remained uncooperative. A total of 3 female Ss was thus removed and completely replaced by others from the subject pool.

Controls and Design

Nineteen different 1¾ inch figures were used. Effects due to complexity of the figures were minimized by using different color combinations for each picture. It was believed that the complete randomness

of the colors being presented would minimize color complexity effect. Complexity of line was controlled by using extremely simplistic figures, all shown in pre-testing to be meaningful to children of the ages being examined. The figures used are listed on the score sheets reproduced in Appendix A.

As shown in Table 2, figures were arranged on the box lids in three ways.

TABLE 2

Sample Figure Arrangements

ARRANGEMENT	BOX 1	BOX 2
I	ball	ball truck
II	apple	apple apple
III	car car	car elephant

The conjunction of the three permutations was especially important to the concept of true plurality. It was considered possible that a young child might be able to perceive the differences in Arrangement I and Arrangement II without having a plural concept. A concept of "bigger glob" or general complexity notion might lead him to his successful uncovering of the raisin; however, this child would not be able to depend on such general conceptual notions when dealing with Arrangement III. In Arrangement III, he would have to find the plurality of figures as discriminated from singularity. The child with true plural concept development should thus be successful on all three arrangements. The child in whom plurality had not yet become clearly decentrated would

probably only be successful with Arrangement I and Arrangement II. This combination of Arrangements was thus intended to rule out complexity or "more space occupied" as an independent variable. Rather, two of the same thing, as we think of it in some ordinary way, provided the cues necessary for successful completion of the task.

To ascertain whether or not Ss could track the boxes which held the object without the aid of the picture cues, E ran pre-trials in which no pictures were used. Even the oldest Ss seemed to view the whole task as magic and appeared mystified by the movement of E's hands and the boxes. They were unable to successfully find the hidden object.

Sixteen trials were given each child: four trials of Arrangement I, eight trials of Arrangement II, and four trials of Arrangement III. Two random orders of the 16 trials were balanced for sex and age. The starting and final positions for the Stimulus Box, and the choice of Stimulus Box, were made using a random number table. Tasks I and Task II were presented in alternating order within each sex and subgroup of each age group.

Materials

Three 4½" square wooden boxes were constructed and covered with yellow contact paper. The sets of 1½" by 1" figures were constructed of heavy cardboard and colorfully painted. Each set consisted of three replications of the same figure. Although the figures were two dimensional, the thickness of the cardboard gave them some added dimensionality. Masking tape was attached to the back of each figure, enabling the figures to be stuck to the covers of the designated box and removed quickly and easily.

A raisin was used as the item to be hidden and searched for.

Procedure

The experiments took place in Ss' homes, usually on the livingroom floor. E entered the home carrying a large, colorful plastic bag and spent approximately 10-15 minutes talking with the S's mother, discussing the materials and making an acquaintance with S. This warm-up period was important for the successful completion of the rather long task. It was especially important in dealing with the youngest Ss that E exploit S's natural curiousity about what her colorful plastic bag contained, waited for S to approach E naturally, and began the criterion task only when S was sufficiently excited about the upcoming game to forget E's strangeness. The older Ss had usually been told by their mothers that E had come to play with them and these Ss were generally extremely cooperative and pleased by the amount of undivided attention they were receiving. Motivation was high when the experiment was begun.

Play breaks, during which the boxes were temporarily put out of sight, were allowed if S was not able to sit still for the 30 to 45 minutes required or if S began to play with the boxes without partaking in the game. In this way exposure to the materials was kept equal and the effect of familiarity was minimized.

S was seated on the floor opposite E. Often S's mother was seated next to him. If other children were present, they were seated in a semicircle around E and S. Everyone was warned not to give S specific information. The mother was asked to encourage S generally by saying such things as, "you know where to find it". When S failed to find the hidden object, the mother was allowed to concur with E and say, "too bad, let's try again". The mother was instructed to make general statements reflecting E's statements. If the younger S did not understand every word E

used, it was still obvious that they understood the spirit of the game situation.

E pointed out the pictures on the tops of the boxes and drew the child's attention to them without naming them specifically. Next, E held up a raisin and said to the child, "You like these, don't you? Look where I'm going to put it. Do you think you can find it?" With younger Ss, the mother was instructed to rest her hands on S's hands to keep S from reaching at this point. E continued with, "Oh, now I'm moving the boxes." Chatter was kept up to keep S's attention. The boxes were moved two or three times depending on positions and the stimulus box was placed in its final position. E told S, "Now you can have it. Go ahead, find it."

When S made an incorrect choice he was told he was wrong. E indicated to him that the stimulus was not in the box he had selected and showed him which box it was in. E then opened the box and gave the raisin to S. The awarding of the stimulus even for incorrect choices was based on: a) the younger children would have cried and fussed so much upon not receiving the stimulus that it would have been difficult to complete the experiment; b) the task was not a traditional concept learning task; i.e. E was attempting to tap an existing cognitive schema; and c) the motivation for S to perform correctly was based on social interaction, approval, and the challenge of the game itself rather than on stimulus value.

Scoring

Only correct choices were given credit. A perfect score was 16. If S's attention wandered while the boxes were being moved, everything was stopped, S's attention was regained and the trial begun again. This was

done twice. If, on the second trial, S's attention still wandered, E continued to the next array and the missed array was done again after the entire order had been completed. Score sheets for Task I are reproduced in Appendix A.

Task II

History

The traditional cloze procedure approach was employed to assess the production and comprehension status of the plural in S's language. It was selected as appropriate for such a task not only because of its past use in psychological assessment but also because it is an accepted linguistic field method for language assessment. Included in this procedure was Berko's (1954) nonsense-word paradigm which measured the ability of S to use the plural with unknown words and thus obtained a measure of how completely S had integrated the plural concept into his grammatical structure. For example, S was shown an irregularly shaped form and told it was a "gip." S was then presented with two examples of the form and asked to describe what he saw. The child who could produce the form "gips" or "two gip" was considered to have a more solid control of the linguistic plural usage than the child who could not produce these forms because he was able to use the plural creatively with new vocabulary words. It was predicted that the age groups would show a successive increase in their ability to pluralize nonsense words.

S's use of the singular "Ø" or plural "s" both with and without a number marked modifier was assessed. The modifier considered to be unmarked for number was "the" as it occurs in the following sentences:

Show me the card with the ball on it.

Show me the card with the balls on it.

Number marked modifiers were considered to be "a" and "two". The following sentences give examples of these modifiers.

Show me the card with a ball on it.

Show me the card with two balls on it.

In the second set of sentences S had two sources of plural information, the number marked modifier and the morphemic suffix.

It was predicted that on the comprehension part of Task II the number of correct trials involving the "Ø" or "s" without the number marked modifier, e.g., "the car," "the cars," would lag behind the number of correct trials involving the use of the number marked modifier, e.g., "a car," "two cars," because of the extra information offered in the latter structure.

On the production part of Task II it was also predicted that the number of correct trials involving the unmarked modifier would lag behind the number involving S's use of the marked modifier due to the feasibility of S having a strong, easily recognized sign with which to indicate a concept which was becoming salient. Bloom (1970) has pointed out that the first general linguistic production of the plural may consist of noting a distinction between "one" and "more than one". At a point of transition, when particular object expressions might still be symbols rather than signs, when the linguistic expression may still be idiosyncratically tied to the object as part of the action schema; the use of an arbitrarily given social sign to indicate a developing concept, such as "two" which is disconnected from the symbol, would seem to be easier and less confusing than the still symbolic "s".

Subjects

All Ss were given both Task I and Task II.

Materials

Twenty sets of two 3 x 5 cards each were used. Each set consisted of a figure drawn three times, once on the first card and twice on the second card. Fifteen of the figures used were selected from the pool of figures which had been assigned nonsense syllable labels. The final phonemes of all the figures were selected to reflect final phoneme occurrence in Standard American English. The Stimulus Card was that card which was intended to elicit the comprehension or production of a particular vocabulary item. The card sets for Task II are reproduced in Appendix A.

Design and Controls

The fifteen real and five nonsense vocabulary item sets were randomly divided into two groups of ten items each. One group was designated for the comprehension task, the other for the production task. This designation was reversed for half the subjects. The comprehension task was presented prior to the production task for half the Ss. The other sixteen Ss received the production task prior to the comprehension task. The hand in which the stimulus card was presented to the subject was randomly assigned so as to control for hand preference on the part of S.

Procedure

Two score sheets were prepared for each child. One was for the marked and one for the unmarked trials. On the score sheet was given the order of presentation, the presenting hand for the Stimulus Card, and the form which was to be elicited.

Comprehension. For the unmarked modifier, E held up both cards and said, "Show me the card with the truck on it". The presentation was varied slightly along the above lines for the 10 unmarked trials. If the child was having extreme trouble with the "show me" concept, the mother was instructed to say, "Get me the card with the trucks on it". The correctness of the child's response was recorded as well as the response itself where appropriate. Both sets of score sheets are reproduced in Appendix A.

For the marked modifier, the procedure was exactly the same as for the unmarked modifier except that the sentence frame was changed; "a" and "two" were substituted for "the". E said, for example, "Show me the card with a truck on it" or "Get me the card with two balls on it".

Production. For the unmarked modifier, the non-stimulus card was held up and E said, for example, "I see the car here," or "I see the cars here". The stimulus card was then held up and E said, "What do you see on this card?" or "Tell me what you see here". It sometimes happened that before E could talk, S volunteered a vocabulary item for figures different than the word E had chosen. When this occurred, E used the child's variation.

For the marked modifier, the procedure was identical to that with the unmarked modifier except that the sentence frames substituted "a" and "two" for "the".

Scoring

Correct replies and choices were given full credit. A perfect score was 40. Spontaneous labels were scored for the correctness or incorrectness of their morphemic suffix. The modifier "a" and "two" or "one" used with a noun were counted as correct when so indicated,

even if the plural suffix was not used on the vocabulary item. Those trials which elicited the plural of "fish" were discarded if S gave no number indication. (E used the word "fishy". For those Ss who had the plural rule, "fishies" was the commonest reply.)

RESULTS

A three factor repeated measures analysis of variance (Winer, 1971) using proportions computed from the task scores was the basic computation used. Two derived proportions were computed for all task scores. The first proportion was computed using S's number of correct responses over the total number of responses possible. The second proportion was computed using S's total number of correct responses over the total number of trials for which responses were attempted by S. The results based on these two proportions did not show differences. Complete tables for both sets of calculations are given in Appendix B. The tables used in this section are based on the first set of proportions.

Cognitive and Linguistic Relationships

A three factor repeated measures analysis of variance was computed with Age, Sex, and Task Type (cognitive, linguistic) being the main effects. Significant results were found for the main effects of Age ($F=21.92$, df 3, $p<.01$) and Task Type ($F=34.359$, df 1, $p<.01$). Significant results for the interaction effects of Age and Task Type were also found ($F=15.923$, df 3, $p<.01$). No significant results were found for the main effect of Sex ($F<1$). Mean proportional scores for the four age groups on the Cognitive and Linguistic Tasks are shown in Table 3.

TABLE 3

Mean Proportion Correct for Cognitive & Linguistic Tasks

	AGE GROUP I	AGE GROUP II	AGE GROUP III	AGE GROUP IV
COGNITIVE TASK	.774	.930	.922	.750
LINGUISTIC TASK	.144	.584	.840	.859

T-tests for correlated Ss showed that means for the Cognitive Task were significantly higher than those for the Linguistic Task for Group I ($T=6.774$, df 7, $p<.001$) and for Group II ($T=4.112$, df 7, $p<.001$). For these two groups the hypothesis that cognitive plural usage preceded linguistic plural usage was supported by the data. For Group III, the difference in means was non-significant, the rise in linguistic ability reaching the level of cognitive ability. These data agree with the time schedule of the acquisition of the linguistic plural usage as it has been observed in previous analysis (McNeill, 1966; Bar-Adon, 1971). The difference in means was also non-significant in Group IV.

T-tests for non-correlated Ss on the data did not support the predicted trend relationship because although the linguistic ability to use the plural increased as predicted, the difference in Age Groups on the Cognitive Task were less than expected. T-tests for uncorrelated Ss on the linguistic data supported the prediction that Ss' ability to use the linguistic plural would increase with age and then level out. Age Group

I was significantly lower than Age Group II (T=4.944, df 14, p<.001). Age Group II was significantly lower than Age Group III (T=3.335, df 14, p<.01). Age Groups III and IV were not significantly different from each other. The cognitive data showed that Age Groups I, II, and III were not significantly different from each other. Age Group IV was significantly different from Age Group II (T=2.857, df 14, p<.02) and Age Group III (T=2.929, df 14, p<.02). However, differences involving Age Group IV were not in the predicted direction.

Cognitive Arrangements

A three factor repeated measures analysis of variance was computed with Sex, Age, and Cognitive Levels as the main factors. Cognitive Levels consisted of three measures, Arrangements I, II, and III.

Computation showed significant results for the main effects of Age (F=3.55, df 3, p<.05), and Cognitive Levels (F=6.04, df 2, p<.01). The interaction effect of Age and Cognitive Levels was also significant (F=4.04, df 6, p<.01). There were no significant effects due to sex.

TABLE 4

Mean Proportion Correct for Cognitive Levels

ARRANGEMENT	AGE GROUP I	AGE GROUP II	AGE GROUP III	AGE GROUP IV	TOTAL MEAN
I	.594	.938	.906	.906	.836
II	.906	.984	.938	.734	.891
III	.625	.906	.875	.625	.758

Means for Cognitive Levels are presented in Table 4 above. It had

been expected that Arrangement I would be the easiest for all Ss and that Arrangement II would involve a higher degree of cognitive acquisition. Complete acquisition of the cognitive plural rule would be shown by the conjunction of success on Arrangements II and III. It was predicted that this would appear prior to linguistic control of the plural rule. The lack of significant differences between Cognitive Levels within Age Groups II and III supported this prediction. Age Group I did not respond in the expected manner, however. For this Age Group it had been predicted that Arrangement I would be the easiest, followed by Arrangements II and III in descending order. This prediction was based on the expectation that Age Group I had an incomplete grasp of the cognitive plural concept. Instead, Arrangement II was significantly higher than both Arrangements I and III ($T=3.137$, df 7, $p<.02$; $T=2.508$, df 7, $p<.05$).

Linguistic Task Types

Comprehension and Production. A three factor repeated measures analysis of variance was computed with Age, Sex, and Task Type being the main factors. The three measures of Task Types were Cognitive Task, Linguistic Production Task, and Linguistic Comprehension Task. The main effects of Age and Task Type were significant; Age ($F=32.375$, df 3, $p<.01$). Task Type ($F=25,667$, df 2, $p<.01$). The interaction of Age and Task Type was also significant ($F=11.708$, df 6, $p<.01$).

TABLE 5

Mean Proportion Correct for Cognitive, Production, & Comprehension Tasks

	AGE GROUP I	AGE GROUP II	AGE GROUP III	AGE GROUP IV
COGNITIVE TASK	.774	.930	.922	.750
PRODUCTION TASK	.156	.525	.813	.850
COMPREHENSION TASK	.131	.644	.869	.863

It had been predicted that comprehension of the plural would precede production of the plural in the younger age groups, and that all groups would show higher mean comprehension scores than production scores. This prediction was not completely supported by the data. There were no significant differences within Age Groups I, III, and IV on the Comprehension and Production Tasks. Only Age Group II scored significantly higher on the Comprehension than the Production Task ($T=2.54$, df 14, $p<.02$).

Plural Marking Type. A four factor repeated measure analysis of variance was computed on the linguistic data. The four main factors were, Order of Task Presentation, Age, Linguistic Mode, and Morphemic/Syntactic Marking. Task Presentation referred to the order of presentation of the items with either the morphemic marking alone being presented first or those with the addition of the marked number modifier being presented first. Age consisted of the four basic Age Groups. Linguistic Mode consisted of the Production and Comprehension measures. Morphemic/Syntactic Marking consisted of either the marked number article or the suffix "s" or "Ø". Significant effects were found for the main factors

of Age (F=36.139 df 3, $p<.01$) and Morphemic/Syntactic Marking (F=40.647 df 1, $p<.01$). No significant effects were found for the main effects of Order of Presentation, and Linguistic Mode. Significant interaction effects were found for Age, and Morphemic/Syntactic Marking (F=9.059, df 3, $p<.01$). Mean proportions for Morphemic/Syntactic Markings by age are given in Table 6 below.

TABLE 6

Mean Proportions for Morphemic/Syntactic Markings

	AGE GROUP I	AGE GROUP II	AGE GROUP III	AGE GROUP IV
MARKED NUMBER MODIFIER	.113	.719	.938	.969
"s" OR "Ø"	.169	.463	.756	.763

T-tests computed for Morphemic/Syntactic Markings showed that the use of the modifier "two" or "a" contributed significantly to S's ability to use the linguistic plural correctly (T=4.81, df 31, $p<.01$). This finding supports Bloom's statement (1970) that the "one" "more than one" distinction is basic to plural usage. Significant results were obtained when the number marked article was used for: Age Groups II (T=9.951, df 7, $p<.001$), III (T=4.662, df 7, $p<.01$), and IV (T=3.044 df 7, $p<.02$).

Vocabulary Item Type. A three factor analysis of variance with repeated observations on the last two factors (Winer, 1971) was computed with Age, Word Type, and Morphemic/Syntactic Markings being the main factors. Statistical significance was found for the main factors of Age (F=34.32, df 3, $p<.001$), Word Type (F=28.00, df 1, $p<.01$), and Morphemic/

Syntactic Markings ($F=42.679$, df 3, $p<.001$). Mean scores for nonsense and regular vocabulary words by age are shown below in Table 7.

TABLE 7

Mean Proportions for Nonsense and Regular Vocabulary Words

	AGE GROUP I	AGE GROUP II	AGE GROUP III	AGE GROUP IV
NONSENSE WORDS	.138	.350	.725	.750
REGULAR WORDS	.146	.654	.887	.913

Control over plural usage with familiar words was significantly higher for Age Group II ($T=4.866$, df 7, $p<.01$), Age Group III ($T=2.644$, df 7, $p<.05$), and Age Group IV ($T=3.785$, df 7, $p<.02$). The differences in Age Group I's use of the plural with nonsense and regular vocabulary words was negligible and not significant.

The interaction of Morphemic/Syntactic Markings and Word Type did not reach statistical significance. These results were not in accordance with what previous analysis of the literature (Berko, 1958) would have led E to expect. The effect of the use of the number marked modifier was very strong. This being so, it should have aided Ss' use of the plural with nonsense words, especially in the older age groups. Although the trend is in the expected direction, see Table 7, the effect seems to have been masked by a combination of limited trial numbers and strength of the nonsense word effect.

DISCUSSION

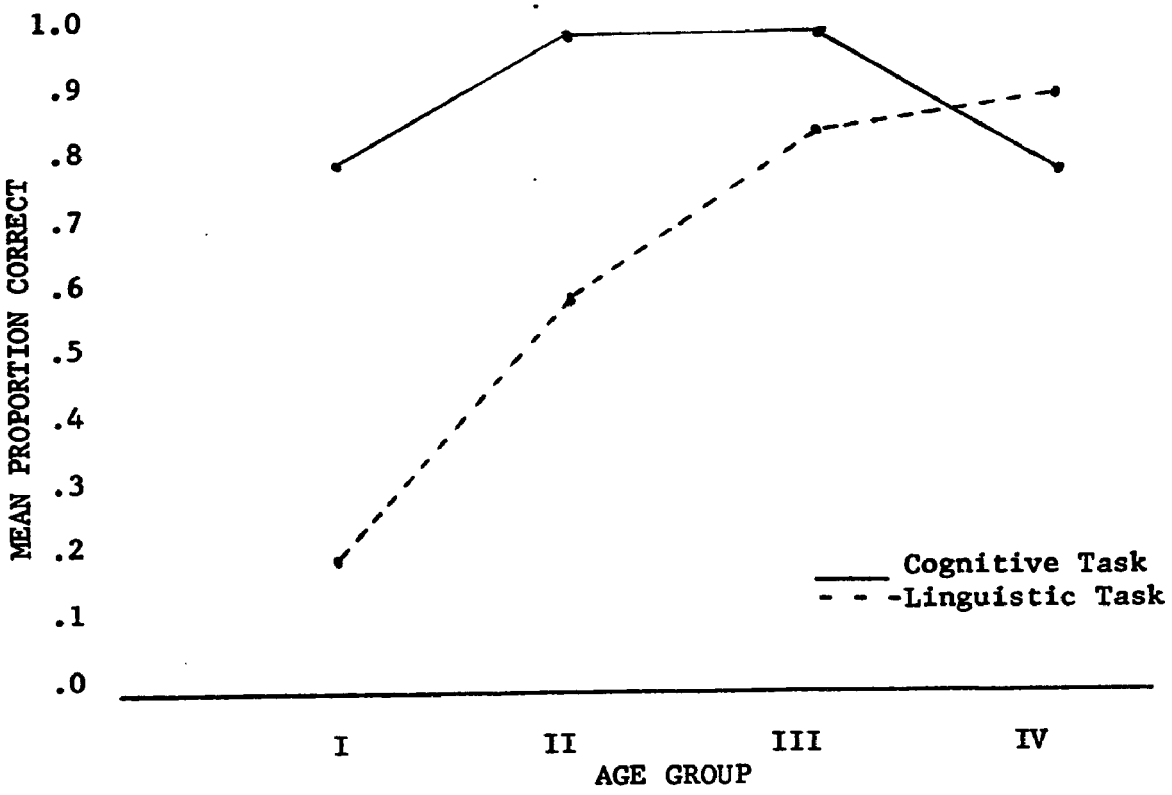


Figure 1 Mean proportion correct for cognitive and linguistic tasks

The hypothesis that acquisition of the cognitive plural schema preceded acquisition of the linguistic plural, which had its theoretical basis in Piaget's concept of intellectual development, was supported by the data. As seen in Figure 1, Age Groups I and II, which included children from 1½ to 2½ years of age, showed a much higher degree of success on the Cognitive Task than on the Linguistic Task, their linguistic scores revealing a very low level of linguistic plural acquisition. All individuals in these Age Groups were more successful on the Cognitive than on the Linguistic Task (see Table 8) As the

TABLE 8

Proportions Correct for Individuals on Cognitive and Linguistic Tasks

	1	2	3	4	5	6	7	8
	AGE GROUP I							
COGNITIVE TASK	1.000	.813	.563	.938	.500	.500	.938	.938
LINGUISTIC TASK	.000	.025	.100	.475	.200	.125	.200	.025
	AGE GROUP II							
COGNITIVE TASK	1.000	1.000	1.000	.813	.938	.813	.938	.938
LINGUISTIC TASK	.750	.800	.150	.475	.575	.550	.575	.800
	AGE GROUP III							
COGNITIVE TASK	.875	1.000	1.000	1.000	1.000	.938	1.000	.563
LINGUISTIC TASK	.800	.800	.825	.875	.850	.950	.875	.750
	AGE GROUP IV							
COGNITIVE TASK	.688	.750	.750	.563	.563	1.000	1.000	.688
LINGUISTIC TASK	.850	.975	.825	.950	1.000	.800	.700	.775

cognitive scores leveled off in the older groups, indicating a stable acquisition of the schema, the linguistic scores rose and equaled them so that the differences between the cognitive and linguistic tasks for Age Groups III and IV were non-significant.

It is interesting to note that Age Group IV, the oldest group, actually showed a reversal of direction, with six out of eight Ss doing slightly better on the Linguistic than the Cognitive Task. Although the differences in tasks were non-significant as has been previously stated, this reversal might indicate that once complete intellectual control of both

the cognitive and linguistic modes has been established, the linguistic system may be the preferred mode of operation. This has been suggested by Bruner (1964) in his attempt to integrate Piagetian theory with the mainstream of American cognitive and linguistic research. However, based on the data at hand, this is purely speculative and can only indicate that further research is needed.

It had been expected that each age group would show an increase in the ability to handle both the Cognitive and the Linguistic Tasks, with the tasks becoming equal at about the age of 3 years. This prediction was based on Piaget's descriptions of the progressive acquisition of object permanence (1963) and class concept (1963), and on literature analysis which showed that the linguistic plural rule was acquired progressively with complete rule acquisition (except for phonetic variations) not occurring until the age of three years. Although the data confirmed this prediction for the linguistic plural acquisition, it did not confirm it concerning the acquisition of the cognitive plural concept. The youngest Ss (Age Group I), did almost as well on the cognitive task as the older groups, the overall similarities on the performance data suggesting that all Ss were equally in control of the cognitive plural schema. Unlike the linguistic plural data, the cognitive plural data indicate an "all or nothing" schedule of acquisition.

Although the cognitive data do not contradict the main hypothesis that the cognitive plural is acquired before the linguistic plural, the seeming differences in the modes of acquisition of the two tasks weaken the theoretical supposition that both cognitive and linguistic concepts can be explained by one unified theory of intellectual development as has been proposed by Piaget (1963). However it may have been that the lack

of differences in the cognitive performance of the age groups lay in the construction of the study. Three possible methodological explanations may have obscured the differential abilities of the children to handle the cognitive task: a) if the task had been administered to children even younger than 1½ years of age, perhaps the expected differentiations would have been found; b) the figures used in the task may have been so overly familiar that the predicted idiosyncratic decalage, indicative of a symbolic stage, was not manifested; c) the difficulty of the criterion task may have created a highly selective group of Ss and enhanced the possible success of those Ss finally chosen for the study, especially Ss in the youngest age group.

An examination of possible causes for the similarities in performance of Age Group I and Age Group IV, the youngest and the oldest, offers another explanation for the lack of predicted differentiation between Age Groups on the Cognitive Task. E noticed in administering the task that the youngest children were completely engrossed in the experimental game. Even those who became physically restless and tired continued to enjoy the game playing situation. Once these Ss' cooperation had been elicited, they generally found the game interesting and challenging. This was not true for the oldest children. E noticed that Age Group IV seemed to be going through the motions as quickly as possible. Although they were cooperative, the requirement of simplicity in the task which was imposed by the age levels spanned, obviously caused some boredom. Thus with Age Group I, one sees the results of a highly motivated group of children and with Age Group IV one sees the results of bored Ss, the differences in motivational levels obscuring functional differences. Another interesting possibility is that the high degree of motivation in Age Group I may have

actually caused further expansion of the cognitive plural concept in these Ss during the course of the experiment. Support for this idea is found in Bell's study (1970) in which it was found that motivation was the factor behind the decalage evidenced in the early acquisition of person permanence as opposed to object permanence.

Data from the different pictorial arrangements, intended to ascertain the degree of acquisition of the cognitive plural concept, also do not support the "all or nothing" description of cognitive acquisition. Although E predicted otherwise, based on the idea that discrimination of two different objects would be easier than the discrimination between one and two occurrences of the same object, the results of the computations dealing with Cognitive Task Type indicate that the plural which involved repeated presentations of the same object, Arrangement II, was easier for the younger Ss to handle cognitively than that which involved one object versus two different objects, Arrangement I. This may have been due to the concentration of the Ss on the repetitious plural prior to their acquiring control of the entire concept, due to the saliency of the developing schema. It is also in keeping with the formulation of the development of class concept as outlined earlier in this study, in which it was pointed out that the noting of similarities may be the first step in the acquisition of the concept of class and basic to the development of the plural. That the entire plural schema has not been acquired is evidenced by the drop in scores from Arrangement II to Arrangement III. The latter necessitated discrimination of the plural from objects presented in two groups of two objects each and required Ss to be able to handle both similarities and differences at the same time.

Although the data from Ss in Age Group IV do not fit this explanation

(they did well on Arrangement I and did poorly on the other two arrangements), this may have been because the Ss in Age Group IV were no longer in the acquisition phase of plural development. Saliency of a particular step in development was no longer relevant and they functioned in a manner similar to that of an adult and more similar to that predicted by E. If they were bored, as discussed earlier, it would seem that their attention was low and that they showed success only on those tasks which could be accomplished with minimal involvement.

Linguistically, Age Group I's use of the plural seemed to be either very personal, indicating idiosyncratic symbolic usage as predicted by Piagetian theory, or random. John, for example, gave the incorrect response of "ball, a ball, ball" when presented with a Stimulus Card with two balls on it but said "keys" when a key ring with only one key was shown to him. His linguistic use of the plural "s" was typical in that it was integral only with specific words. The fact that neither linguistic mode, plural marking type, nor vocabulary item type had any effect on correct scores for this group is further indication that the plural at this stage is not yet a de-centered sign.

Also typical of this stage was Ss' ability to imitate the plural indicating perception of the morpheme and readiness to use it. This was especially evidenced in the Production Task where the vocabulary item with a number marking was given to S and S was then asked to give the appropriate response. In several children, almost all errors were explained by their imitation of E's pronunciation of the vocabulary item. Their imitation of the Morphemic/Syntactic Marking obviously had no significance to them even though it was produced by them. These observations were in keeping with those made by Brown, Cazden, and Bellu-

gi (1968).

Age Group II's linguistic scores were significantly higher than those of Age Group I, indicating a growing grasp of the linguistic plural. As these Ss carried out the Cognitive Task, they further demonstrated their increase in linguistic plural ability. For example, three out of the eight children in Age Group II spontaneously labeled the figures on the boxes, e.g., "a apple", "two apples".

An interesting phenomenon in this age group was the occurrence of grammatical practice similar to that discussed by Weir (1962). This practice was seen in Mike's complex response to the Stimulus Card intended to elicit the singular of "cat". His initial response was wrong, perhaps imitative of E, "kitty cats". However, he followed this with, "a kitty cat, a kitty cats, one two kitty cats". Since his cognitive score indicated he was in control of the plural cognitively, he seemed to be attempting to focus and fit the sign system available to him to his cognitive schema.

Further inspection of the responses of this group showed partial but incomplete linguistic plural acquisition in many of the Ss. These children could go from the singular to the plural, e.g., given "cat" they could add the "s" but not from the plural to the singular, e.g., given "cats" or "two cats" they could not produce "cat". If reversibility is essential to the complete acquisition of the linguistic plural as hypothesized, it seems that these Ss' inability to use the linguistic plural correctly is linked to their, as of yet, incomplete acquisition of class. Further research in this direction is suggested by the study.

Finally, Age Group II, not yet very successful in its control of linguistic plural usage, showed a significant difference between its

plural usage with regular and nonsense word items. These 2 to 2½ year old children were successful mainly on familiar vocabulary items. These data give strong support to Piaget's theory of intellectual development which states that idiosyncratic symbolic acquisition precedes the use of decentered signs. This difference extended to the older groups also and suggests that complete control of the plural is not achieved even by the age of 3½ years. The use of nonsense cognitive figures would be necessary if one were to explore these results further.

Age Group III did very well on the linguistic task. These children's control of the plural, both to and from the singular construction was excellent except on nonsense words, indicating that reversibility had been acquired but that the de-centration process, the change from the symbol to the sign, was not yet complete. The most salient characteristic of this group was its linguistic consciousness. Fox example, when Elizabeth was asked during the Comprehension Task to choose the card with "the ball" on it, she wisely said, "They all have 'the ball' on it". Pointing to the figures on the two cards before her, she said, "Here's the ball, here's the ball, here's the ball, but you want the card with 'one ball' on it." The language system per se seemed to be very much in focus in her environment.

The children in the oldest age group, Age Group IV, talked incessantly during the Cognitive Task and spontaneously labeled the figures on the boxes. It seemed that they were using linguistic cues in a mediation process to help them solve the cognitive problem. This new dependency on linguistic cues may have indicated a switch in the preferred mode of operation. The acquisition of linguistic signs may not have been completely acquired yet; however, their position in this netherland of tran-

sition may in part explain their decline on the Cognitive Task. This transition stage suggests further research and perhaps a reformulation of Piagetian theory in accordance with suggestions made by Luria (1961) who hypothesized that the child used labels profered by the mother to organize his perceptions.

Conclusion

Results of this study demonstrated that children possess a cognitive plural schema before they possess the linguistic pluralization rule, that an increase in the strength and generality of the cognitive rule preceded an increase in the use of the linguistic plural. This evidence was taken as being consistent with the basically Piagetian formulation that language has its basis in cognitive thought which is interactive with the environment (Bloom, 1970; Ferreiro, 1971; Nelson, 1970; Piaget, 1967; Sinclair, 1968). The data lent further support to Ferreiro (1971) and Sinclair (1968) who have suggested that it is the laws of cognitive development which allow children to make inferences about the language they hear and that linguistic rules are acquired in this way. Thus, although the visual ability to perceive the complexities of the plural are well developed in the child by three months of age (Woodruff, 1972), the ability to use the linguistic noun plural is not well established until at least three years of age. The process of intellectual development, especially the acquisition of object permanence and the concept of class as described by Piaget and elaborated upon in the introduction to this study, best describes the process which links perception and its linguistic expression, that process which makes up the interaction between the child and the environment. The evidence from this study was in direct contradiction to the view which has sometimes been attributed to Chomsky and his followers that linguistic

rules are innate and uniquely programmed to develop in ways unrelated to the child's general intellectual development (Chomsky, 1957; Katz, 1966; McNeill, 1970).

The change in direction of the cognitive-linguistic relationship in the oldest group of children in this study suggested that there is a stage of transition in which the linguistic mode becomes the preferred mode for the child's interaction with the environment and that it occurs at a time when both the cognitive and linguistic schemas have become equally established. It is interesting to speculate that it is perhaps possible that, given certain cognitive foundations, children can acquire as a whole the language system which includes rules that might not yet have been mastered on the cognitive level. Using Piaget's concept of decalage it could be argued that decalage exists across modes of intellectual functions as well as within modes.

This elaboration of Piagetian theory as proposed by E is in keeping with that suggested by Riegel (1971). Riegel has proposed a dialectical interpretation in which both the organism and the environment are active participants in a two-way interactive process. The results of this study lend support to this theory of dialectical process in that language, a social sign system, is seen not only as an acquired object as in traditional Piagetian thought, but also as an active system of its own, an integral part of the complex environment which the organism relates to by way of intellectual functioning. As part of the environment, language forces the organism to accommodate and becomes a catalyst in the growth process. The process of intellectual functioning is thus changed by the system with which it becomes capable of interacting.

APPENDIX A

Cognitive Arrangement 1

Score	Configuration	Comments
	bird bird SE	bird girl
	fish S	fish balloon E
	cat dog SE	dog
	elephant elephant E	elephants S
	butterfly S	butterfly butterfly E
	ball ball SE	ball
	truck truck E	truck S
	cat fish SE	cat cat
	apple	apple apple SE
	house house S	house boat E
	flower balloon E	flower flower S
	girl ball E	girl S
	face face SE	face
	tree tree S	tree E
	elephant	elephant boat SE
	car car E	car S

Cognitive Arrangement 2

Score	Configuration	Comments
	boat E	boat balloon S
	face	face face SE
	fish SE	fish balloon
	house E	house house S
	flower cat	flower ES
	tree fish	tree tree SE
	butterfly SE	butterfly butterfly
	truck truck E	truck ball S
	bird bird	bird SE
	girl girl SE	girl
	car car SE	car elephant
	apple apple S	apple E
	ball boat S	ball ball E
	dog car S	dog E
	elephant elephant E	elephant S
	cat S	cat cat E

Linguistic Arrangement 1

	STIMULUS	HAND	RESPONSE
Production			
PIPE	sing	R	
HOUSE	plural	R	
TREE	sing.	L	
FISH	plural	L	
FACE	plural	L	
DILL	sing.	R	
GIRL	sing.	L	
HICK	sing.	R	
CAR	plural	R	
CAT	plural	R	
Comprehension			
DOG	plural	R	
LAT	sing.	R	
ELEPHANT	plural	L	
WUG	sing.	R	
BALL	plural	L	
TRUCK	sing.	L	
BOAT	plural	L	
FLOWER	sing.	L	
BALLOON	sing.	L	
WEN	plural	R	

Linguistic Arrangement 2

	STIMULUS	HAND	RESPONSE
Production			
CAT	plural	R	
FISH	sing.	L	
FACE	sing.	L	
GIRL	plural	L	
ELEPHANT	plural	L	
WUG	sing.	L	
BOAT	plural	R	
DILL	sing.	R	
CAR	plural	R	
HOUSE	sing.	R	
Comprehension			
TRUCK	sing.	L	
BALLOON	plural	R	
TREE	plural	L	
PIPE	plural	R	
DOG	plural	R	
HICK	sing.	L	
WEN	sing.	R	
FLOWER	plural	L	
BALL	sing.	R	
LAT	sing.	R	

APPENDIX B

TABLE B.1

Analysis of Variance
of Task Type for Sex and Age Based on Total Responses Possible

SOURCE OF VARIATION	SS	df	MS	F
Sex	.003	1	.003	1
Age	1.644	3	.548	21.92**
Sex X Age	.018	3	.006	1
Task Type	.898	1	.898	34.359**
Sex X Task Type	.005	1	.005	1
Age X Task Type	1.241	3	.414	15.922**
Sex X Age X Task Type	.080	3	.027	1.039

TABLE B.2

Analysis of Variance
of Task Type for Sex and Age Based on Total Responses Attempted

SOURCE OF VARIATION	SS	df	MS	F
Sex	.001	1	.001	1
Age	1.207	3	.402	28.71**
Sex X Age	.030	3	.010	1
Task Type	.518	1	.518	24.667**
Sex X Task Type	.001	1	.001	1
Age X Task Type	.644	3	.215	10.238**
Sex X Age X Task Type	.158	3	.053	2.52

1 Task type= cognitive, linguistic
** $p \leq .01$

TABLE B.3

Analysis of Variance
for Cognitive Levels' by Age and Sex Based on Total Responses Possible

SOURCE OF VARIATION	SS	df	MS	F
Sex	.000	1	.0	0.0
Age	.927	3	.309	3.55*
Sex X Age	.189	3	.063	1
Cognitive Levels	.278	2	.139	6.04**
Sex X Cognitive Levels	.023	2	.012	1
Age X Cognitive Levels	.558	6	.093	4.04**
Sex X Age X Cognitive Levels	.091	6	.016	1

TABLE B.4

Analysis of Variance
for Cognitive Levels' by Age and Sex Based on Total Responses Attempted

SOURCE OF VARIATION	SS	df	MS	F
Sex	.008	1	.008	1
Age	.941	3	.314	4.758**
Sex X Age	.312	3	.104	1.576
Cognitive Levels	.248	2	.124	5.67**
Sex X Cognitive Levels	.024	2	.012	1
Age X Cognitive Levels	.539	6	.090	3.75**
Sex X Age X Cognitive Levels	.128	6	.021	1

1 Cognitive Levels= Arrangement I, II, III
* $p < .05$
** $p < .01$

TABLE B.5

Analysis of Variance
for Task Type by Sex and Age Based on Total Responses Possible

SOURCE OF VARIATION	SS	df	MS	F
Sex	.00	1	.00	0.0
Age	3.884	3	1.295	32.375**
Sex X Age	.021	3	.007	1
Task Type	1.233	2	.616	25.667**
Sex X Task Type	.026	2	.018	1
Age X Task Type	1.688	6	.281	11.708*
Sex X Age X Task Type	.131	6	.022	1

TABLE B.6

Analysis of Variance
for Task Type by Sex and Age Based on Total Responses Attempted

SOURCE OF VARIATION	SS	df	MS	F
Sex	.006	1	.006	1
Age	2.681	3	.894	22.92**
Sex X Age	.027	3	.009	1
Task Type	.790	2	.395	14.107**
Sex X Task Type	.020	2	.010	1
Age X Task Type	.939	6	.157	5.607**
Sex X Age X Task Type	.304	6	.064	2.286

Task Type= cognitive, production, comprehension
* $p < .05$
** $p < .01$

TABLE B.7

Analysis of Variance for Linguistic Mode and Morphemic/Syntactic Marking by Order of Presentation & Age Based on Total Responses Possible

SOURCE OF VARIATION	SS	df	MS	F
Order of Presentation	.005	1	.005	
Age	10.949	3	3.65	36.139**
Order of Presentation X Age	.044	3	.015	1
Linguistic Mode	.025	1	.025	1
Order of Presentation X Linguistic Mode	.012	1	.012	1
Age X Linguistic Mode	.089	3	.030	1.035
Order of Presentation X Age X Linguistic Mode	.061	3	.020	1
Morphemic/Syntactic Marking	.691	1	.691	40.647**
Order of Presentation X Morphemic/Syntactic Marking	.011	1	.011	
Age X Morphemic/Syntactic Marking	.463	3	.154	9.059**
Order of Presentation X Age X Morphemic/Syntactic Marking	.032	3	.011	1
Linguistic Mode X Morphemic/Syntactic Marking	.025	1	.025	2.273
Order of Presentation X Linguistic Mode X Morphemic/Syntactic Marking	.045	1	.045	4.091
Age X Linguistic Mode X Morphemic/Syntactic Marking	.021	3	.007	1
Order of Presentation X Age X Linguistic Mode X Morphemic/ Syntactic Marking	.032	3	.011	1.00

** $p < .01$

TABLE B.8

Analysis of Variance for Morphemic/Syntactic Marking by Age and Word Type Based on Total Responses Possible

SOURCE OF VARIANCE	SS	df	MS	F
Age	9.986	3	3.329	34.32***
Word Type	.812	1	812	28.00**
Age X Word Type	.351	3	.117	4.034*
Morphemic/Syntactic Marking	.614	1	.614	7.580*
Age X Morphemic/Syntactic Marking	10.37	3	3.457	42.679***
Word Type X Morphemic/ Syntactic Marking	.010	1	.010	1
Age X Word Type X Morphemic/Syntactic Marking	.063	3	.021	1

* $p<.05$

** $p<.01$

*** $p<.001$

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