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A preliminary investigation into certain developmental aspects of young children's comprehension of phrasal verbs

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A PRELIMINARY INVESTIGATION INTO CERTAIN DEVELOPMENTAL ASPECTS OF YOUNG CHILDREN'S COMPREHENSION OF PHRASAL VERBS

by

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B.A., Communication Disorders and Speech Science
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An Abstract

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ABSTRACT

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To date, researchers in child language acquisition have paid only limited attention to children's acquisition of a common English verb type, the phrasal verb (PV). A PV, generally, combines a simple verb (SV) (e.g. "take") and a particle (e.g. "off") to form a new verb (e.g. "take off"). One syntactic quality of transitive PVs is that the particle may appear immediately following the SV (e.g. "take off the coat") or be separated from the SV in an utterance (e.g. "take the coat off"), yet the PV retains essentially the same meaning. The purpose of the present research was to study developmental trends in young children's comprehension of PVs. The subjects (Ss) were thirty-six normal children, twelve each in 3 age groups (mean ages: 3:1; 5:0; 6:11). Ss were given a comprehension test to determine how well they understood ten common PVs and the ten corresponding SVs from which the PVs were derived. Significant developmental changes in children's ability to comprehend the verbs were found. Results indicate that all children found SVs significantly more difficult than PVs, and that the presence of a distractor clause at the end of the sentence had no effect on comprehension of either PVs or SVs. Results also indicate that the children found both PVs in which the particle immediately followed the verb and PVs in which the particle was separated from the verb by a noun phrase equally difficult. Lastly, the data show that the children did not consistently confuse SVs and PVs. The results of this study suggest that children as young as 3 years of age are capable of comprehending PVs, and that a developmental trend toward improved PV comprehension exists. Strategies for PV comprehension, regardless of particle position, may be learned prior to age 3. The fact that the children understood fewer SVs than PVs is surprising, but possibly due to test artifact. Because the children did not consistently confuse SVs and PVs, no dependent relationship between comprehension of PVs and SVs could be discerned. Future research regarding PVs should focus particularly on the processes by which they are learned and on the possible effects on learning of different semantic qualities of various PVs.

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CERTIFICATE OF APPROVAL

M.A. THESIS

This is to certify that the M.A. Thesis of

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has been approved by the Board of Examiners
for the thesis requirements for the degree of
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CHAPTER I

INTRODUCTION

Children face a considerable task when trying to acquire their first language. Students of child language acquisition have examined this task from several different vantage points, including that of acquisition of verbs and verb phrases (Fletcher, 1979). While many researchers have investigated the child's acquisition of the verb system (Berman, 1978; Clark and Garnica, 1974; Dollaghan, 1981; Gallivan, 1981; and others), virtually no research has been completed regarding children's production or comprehension of a frequently occurring English verb type, the phrasal verb (PV). Because of the unique characteristics of this verb type, research regarding children's acquisition of PVs could be most informative. The purpose of this study is to examine children's comprehension of PVs demonstrating certain of these unique characteristics.

<u>Phrasal Verb Defined</u>

The phrasal verb has been extensively studied as a linguistic phenomenon (Bolinger, 1971; Fraser, 1976; Kennedy, 1920; Live, 1965; Nilsen, 1972; Palmer, 1974; Quirk 1972; Strang, 1962; Taha, 1960; Van Dongen, 1919). There are as many definitions of "phrasal verb" and class-inclusion criteria as there are linguists who have studied the type. Bolinger (1971:6) notes that "no one has attempted to tabulate the response of phrasal verbs to (a) full set of criteria...". Linguistic analyses vary with the definitions proposed. A general definition of PVs has been put forth by Crystal (1980:270), and is as follows:

> A type of verb consisting of a sequence of a lexical element plus one or more particles, e.g., <u>come in</u>, <u>get up</u>, <u>look out for</u>. Sub-types may be distinguished on syntactic grounds (for instance, the particles may be classified into prepositional or adverbial types), and the definition of 'phrasal' varies somewhat within different descriptions. But the overall syntactic and semantic unity of these sequences is readily demonstrable...

For purposes of the present research, this definition will be somewhat refined later.

Virtually any dynamic (i.e., non-stative) [1] (terms followed by numbers within brackets are defined, in order of appearance, in Appendix A) simple verb (SV) can serve as the first "lexical element" in the verb-particle sequence which composes a PV. Particles function to accentuate or change the meaning of the SV. In isolation, the particles are usually defined as prepositions, but in PVs they represent a range of function, from prepositional to adverbial. Kennedy (1920) identified sixteen particles as the most frequently occurring in PVs. These include "about", "across", "around" (round), "at", "by", "down", "for", "in", "off", "on", "out", "over", "through", "to", "up", and "with". Of these, "about", "across", "around", "by", "through", and "with" are most likely to retain their prepositional value in combination (Kennedy, 1920).

In English, combining verbs and particles is a highly productive method of expanding the lexicon. This productivity stems from the ease and efficiency with which a relatively few, previously known, verbs and particles may be joined to create new meanings. Many "new words" may be created from only a few verbs and particles. Kennedy (1920) cited an incomplete list of over nine hundred PVs, which collectively held several thousand distinct meanings. Live (1965) cited <u>Webster's Third</u>

International dictionary as defining thirty-five separate meanings for "make up" alone, illustrating the fertility of the form.

Phrasal verbs exhibit semantic, syntactic, prosodic, and phonological qualities which are difficult to define. Bolinger (1971) states that "...a linguistic entity such as the phrasal verb can not be confined within clear bounds. Rather there are analogical extensions in all directions...". The semantic, syntactic, prosodic, and phonological qualities of PVs exist on a continuum. Because these qualities can be so ambiguous, the characteristics defined below will be those relevant to the following definition of PVs, which will be the working definition for this study. Phrasal verbs are defined here (after Crystal, 1980) as:

> A verb type consisting of a lexical element plus one particle, with the particle of a more adverbial, as opposed to prepositional nature. Though the verb and particle may occur together or be separated by numerous words within an utterance, the overall syntactic and semantic unity of the sequences may be demonstrated.

In the following section, those syntactic and semantic qualities of PVs most relevant to this study will be discussed.

Syntactic Qualities of Phrasal Verbs

The single most distinctive syntactic characteristic of PVs is that, in many cases, the SV and particle which form the PV do not need to appear adjacent to each other in an utterance. The particle is able to move from it's position immediately following the verb to a position one or several words away, yet the PV retains the same meaning (e.g., "Let's call up John and Mary" vs "Let's call John and Mary up"). The transitivity characteristics of a PV determine, in part, the movement restrictions on a particle. Both transitive and intransitive PVs allow the particle to separate from the verb, but with different restrictions. In transitive PVs, particles are able to move from a position immediately following the SV, but preceding the object noun phrase ("He showed off the car") to a position immediately following the object noun phrase ("He showed the car off"). This is not possible with intransitive PVs (e.g., "She spoke out about the injustice" vs "She spoke about the injustice out"). Intransitive PVs, however, allow a particle to be separated from the SV by one or more adverbs (e.g., "She spoke angrily yet cautiously out about the injustice"). Transitive PVs do not allow adverbs as the sole element intervening between SV and particle. (e.g., "He showed proudly off the car").

The SV and particle elements of many PVs may thus occur together (PV as continuous unit) or be separated by numerous other elements (PV becomes discontinuous unit) within an utterance. The separation of PV elements within an utterance may make it difficult for children to comprehend the meaning of a discontinuous PV. In reference to other discontinuous structures, several researchers have discussed the possible comprehension difficulties involved.

Based on a cross-linguistic review of child language acquisition studies, Slobin (1973) hypothesized a series of Operating Principles for Language Acquisition Strategies. His fourth principle states that "the greater the separation between related parts of a sentence, the greater the tendency that the sentence will not be adequately processed" (Slobin, 1973:201). Slobin noted, however, that this was "not a developmental universal, but a statement of general psycholinguistic performance constraint" (Slobin, 1973:201). Whether children's processing of discontinuous PVs conforms to this constraint remains to be empirically tested.

Clark and Clark (1977) proposed that, for processing ease, "words that reflect closely linked propositions" (such as the SV and particle in a PV) "belong together in a single surface constituent" (Clark and Clark, 1977:545). Though they did not define "single surface constituent", Clark and Clark suggested that noun phrases were "one constituent" (1977:546) and that 2 intervening words could "widely separate" (1977:546) 2 elements otherwise closely linked. When PVs are discontinuous, they are likely to span noun phrases of at least two, and frequently more, words. Clark and Clark's (1977) hypothesis suggests that discontinuous PVs would be difficult for children to comprehend.

The hypotheses of Slobin (1973) and Clark and Clark (1977) predict that discontinuous PVs would be more difficult for a child to comprehend than identical PVs presented as continuous units. This prediction needs to be empirically tested. Further, neither Slobin (1973) nor Clark and Clark (1977) speak specifically to developmental trends in the comprehension of discontinuous structures. These trends require greater analysis through empirical testing.

<u>Semantic Qualities of Phrasal Verbs</u>

The addition of a particle to a SV changes the meaning of that verb. The meaning of the resultant PV may or may not equal the sum of it's parts. Phrasal verb meanings exist on a continuum of "semantic opacity"-the degree to which the meaning of a PV is available through the inspection of it's parts. The most available meanings belong to those PVs which may be called "literal". The meaning of literal PVs is additive; if one knows the semantic values of the SV and the particle, then by adding their meanings, the meaning of the PV may be discerned. Examples of literal PVs include "to rub out" (a mistake with an eraser), "to cough up" (something caught in the throat), and "to burn up" (papers in a fireplace). The literal meaning of a PV may also be metaphorically extended, and used figuratively, as in "to rub out" one's adversary, "to cough up" some cash, and "to burn up" with anger. Without linguistic and non-linguistic context, these figurative meanings are less transparent than the literal meanings. The greatest degree of semantic opacity is exhibited by idiomatic PVs. The meaning of an idiomatic PV bears virtually no discernible relation to the meaning of the individual elements which comprise it (e.g., "bring about"="to cause").

The likelihood that PVs of various degrees of semantic opacity are learned and comprehended in the same manner is minimal. The focus of this study is children's comprehension of literal PVs. In learning the meanings of literal PVs, the challenge to the child is to learn that the particle affects the verb, frequently in a very systematic, though often subtle, fashion. The child must identify the features which characterize this systematicity, so that they can be used in the comprehension and production of numerous PVs. One question regarding this learning process which remains unknown is when (chronologically) children learn of the effect of the particle on the verb.

Literature Bearing on Children's Acquisition of Phrasal Verbs

Although PVs have been studied extensively by linguists, the form has been virtually neglected by researchers in child language acquisition. The information that is available on children's production, judgment, and comprehension of PV's must be viewed with caution, for two reasons. First, the qualitative, methodological problems in the collection and reporting of the available data make claims about children's acquisition of this verb type questionable. Second, the data available are so

limited in quantity that they do not provide enough evidence from which to draw conclusions. The following sections will examine the data available on children's production, judgment, and comprehension of PVs, and discuss the issues of the quality and quantity of those data.

Children's Production of Phrasal Verbs

The greatest source of information on children's production of PVs has been the re-examination, by one researcher, of utterance samples originally collected by a different researcher. Miller (1981:60) reported on the utterances cited by Klima and Bellugi (1966) and found "occasional use" of the verb-particle combination by children at a language development level of linguistic stage I [2] (Brown, 1973, cited in Miller, 1981). Fischer (1971) reported on an unpublished manuscript by Brown (no date cited), in which Brown noted that in the first appearance of PVs in children's language, the particle followed the direct object. Speech samples provided by Dale (1975) indicate that a child (or children) at approximately the two-word stage used only the SV when a PV was necessary to convey the appropriate meaning.

Several methodological concerns limit the interpretation of these data. First, all claims made were based on anecdotal evidence. None of the researchers cited above were primarily investigating children's production of PVs. The utterances provided by Klima and Bellugi (1966), and used by Miller (1981), were used in a study of the development of negation and interrogatives in children's language. The utterances from Dale (1975) were cited in a discussion of how mothers expand children's speech. Without systematic and focused observation of PVs, claims regarding children's production of this form can be only tentative at best. A second and related concern is that researchers have failed to define "PV" when reporting on children's production, thus obscuring the focus of their remarks. The possibility exists that researchers included in their analyses both PVs where the particle has a more prepositional role and PVs where it is more adverbial. They may also have inadvertently included SV-plus-preposition sequences. Without evidence to suggest otherwise, a further possibility is that "prepositional" PVs and "adverbial" PVs are learned and used differently by children (i.e., learning "prepositional" PVs may be a process of combining verb plus preposition, whereas learning "adverbial" PVs may involve learning when and how to use a PV as a single, albeit two-part, element of meaning). Without defining

the units for analysis, researchers may be contributing to a confusion of the issues. A third concern is that the existing data on children's production of PVs came from a limited number of both utterances and subjects. Brown's (no date) observation was based on a corpus of just four utterances, while Dale's (1975) data supplied only two utterances for analysis. Klima and Bellugi's (1966) study included just three children; because of omissions in reporting, the number of subjects (N) and the subject's ages for Brown's and Dale's data are unknown. With such limited data available for analysis, the question of just how representative these utterances are of children's production of PVs remains unanswered. Even given representativeness, the data can not be viewed developmentally, due to the lack of subject age information. Thus the interpretation of the data is limited by it's restricted quantity. A final concern is that the analyses of children's production of PVs have centered solely on syntax. Miller (1981) looked for production of syntactic forms only; Brown (no date) observed only particle placement within a given construction. No researcher has used PVs to study issues of semantic development. Studying syntax alone narrows the scope of our knowledge of children's language production in general, and PV production in particular.

Menyuk (1969) analyzed free speech samples she collected herself, under 3 different stimulus conditions, from children ages 3-7. She found that 88% of all children separated verb and particle in production of verb-particle combinations. She noted that preschool children omitted particles in production 27% of the time; kindergarteners omitted particles in production 6% of the time. First graders, instead of omitting particles, used them redundantly (e.g. "The barber cut off his hair off") 4% of the time. The first graders also frequently attached particles unnecessarily to SVs (e.g. He's biting it up). Menyuk hypothesized that particles were unnecessarily added or duplicated by the children in an effort to insure greater definition of the message. Further findings by Menyuk include the fact that "pick up", "put on", and "take off" were the most frequently used combinations, and that children made the frequent error of not moving a particle to post- pronoun object position, as required in English (e.g. they produced "He's putting on it" instead of "He's putting it on"). Menyuk hypothesized that this type of error indicated that verb-particle constructions "may be entered, initially, as a single entry" in the lexicon (1969:94).

Though Menyuk's information on children's production of PVs comes from a larger data base and more focused analysis than that of others cited above, it suffers from some of the same disadvantages. Menyuk failed to provide descriptions of her subjects beyond the number and age range. The number of children at various ages who provided Menyuk's developmental data is unknown. Further, her study was descriptive, not experimental, and dealt solely with syntax, as did the research cited above.

A second source of data on children's production of PVs has been a word-association task. In this task the child's productions are elicited, rather than spontaneous. In 1966, Entwisle collected data from two hundred kindergarteners on their word-association responses to twenty-four verbs of high, medium, and low frequency of occurrence. Chapman, Dollaghan, Kenworthy, and Miller (in press) analyzed these data to find the three most common responses offered by children to each verb. Chapman et al. (in press) then classified the responses, and noted that 6% were "verb particles that made the action more specific". This finding indicates that young children conceive some unity between verbs and particles, at least with certain verbs. The exact nature of this conceived unity is unknown.

As with the free speech data discussed above, however, methodological concerns limit the use of data obtained through the word-association task to draw conclusions regarding children's production or conception of PVs. First, the evidence cited on verb-particle combinations by Chapman et al. (in press) was incidental to the focus of their research. Chapman et al. (in press) were developing microcomputer programs to test and teach motion verbs; to this end, they were interested in the shifts in children's semantic organization of the lexicon. Second, the definition of particles as a lexeme "that made the action more specific" (Chapman et al., in press) does not insure that the verb-particle sequence would be considered a PV. Sometimes, only the context provided by an utterance can define a verb-particle sequence as a PV. That is, a verb and particle in one utterance may be a PV, but the same verb and particle in another utterance may be strictly a verb-preposition sequence (compare "She ran up a bill", where "ran up" is a PV, with "She ran up a hill", where "ran up" is a verb-particle sequence). Whether this makes a difference in how a child processes the combination is unknown. However, the possibility exists that a response prepositional in nature may more realistically be considered a syntagmatic association to the stimulus word, and not a PV. There is thus difficulty in determining the nature of

the children's responses, and therefore, difficulty in determining just to what degree the findings of Chapman et al. (in press) speak to children's production of PVs. Lastly, the nature of the task allows for only a narrow interpretation of the data. Without sentential context, the syntactic and semantic aspects of children's production of PVs can not be studied.

The information presently available regarding children's production of PVs is lacking in focus, restricted in quantity, and limited in scope. This information is therefore inadequate, and needs to be supplanted by evidence obtained through careful and systematic research.

Children's Grammatical Judgment of Phrasal Verbs

Data on children's judgments of PVs comes from two experiments performed by Fischer (1971). She sought the judgments of children aged 3:9 to 4:3 on the relative grammaticality of sentences containing PVs, when the position of the particle and the nature of the direct object were varied. In one experiment, Fischer (1971) varied the position of the particle relative to 1) a full noun phrase which was the direct object of the sentence, or 2) an unstressed pronoun object. Particle position varied by either preceding or following the

unstressed pronoun (i.e., "The girl is calling him up" vs "The girl is calling up him"). Fischer (1971) reported that children accepted each sentence type as grammatical except those in which the particle preceded an unstressed pronoun (i.e., the ungrammatical "The girl is calling up him"). She concluded that the children were "sensitive to a restriction on the verb-particle construction" (1971:94). In a second experiment, children were confronted with the same judgment task, but the sentences were different. In the second set of sentences, the particle immediately followed the verb, and the object of the sentence was a pronoun. Sentence pairs were contrasted by varying the presence of stress on different pronoun objects. The children judged sentences such as the following all equally grammatical (underlined words indicate those words which were stressed):

1. The girl is calling <u>up</u> him.

2. The girl is picking <u>up</u> one.

3. The girl is calling up <u>him</u>.

Only sentences two (2) and three (3) are acceptable in adult grammar. From the results of these two experiments, Fischer tried to infer children's transformational rules, and concluded that, by age four, children have yet to "master the adult grammar for verb-particle constructions" (Fischer, 1971:94).

Though Fischer's experiments appear to be the most direct study of what children know about PVs, they actually provide very little concrete data. Fischer drew conclusions based on methodological assumptions and procedures of questionable merit. First, Fischer's procedures required children to repeat each sentence of a pair, then listen to the experimenter repeat the sentences (in reverse order), and then indicate which sentence "sounded better". In using this task, Fischer assumed that, if sufficiently developed, a child's sense of grammaticality would override any order-of-presentation effects, such as the recency effect. There is no evidence to suggest that this would necessarily occur with young children. Even if this assumption had adequate empirical or logical support, Fischer's conclusions would remain at issue, as the statistical analyses performed on the data were incomplete. If only those computations reported in

her manuscript were performed, then Fischer's interpretation of the data is questionable, even unfounded. In her first experiment, Fischer failed to eliminate the possibility of an interaction between particle position and order of sentence presentation. Further, she failed to test for significance in the difference between F ratios reported for the main effects of recency and particle position. Without this computation, no determination can be made as to whether the position of the particle did, in fact, override the recency effect. No statistical computations were reported at all for the second experiment. Fischer's problematic procedures, combined with her failure to insure that Ss were "normal", make it difficult to accept her conclusions regarding children's grammatical judgments of various PV constructions.

Children's Comprehension of Phrasal Verbs

Little research or anecdotal evidence regarding children's comprehension of PVs has been found in the literature. In one study, Payne (1982, cited in Dissertation Abstracts International, 1983) examined how deaf and normal hearing subjects, ages 8-19, understood verb-particle combinations. He used a written multiple-choice task and assessed children's

performance across 3 levels of semantic difficulty and 5 syntactic surface structures. Payne found that the hearing subjects scored significantly higher than the deaf subjects across all conditions, and that the order of difficulty of conditions were similar for each group. Idiomatic expressions were more difficult for each group than were other combination types. The deaf subjects had more difficulty with discontinuous combinations than with continuous combinations. Statements regarding the appropriateness of Payne's stimuli and methodology cannot be made here, because the details of his research were unavailable. Payne's findings, however, do not speak to the comprehension abilities of normal children younger than age 8.

Children's comprehension of PVs is obviously an area in need of further study. Information from such study would enhance our present knowledge of child language acquisition and could be useful in the diagnosis and treatment of child language disorders.

Research Questions

The research questions for this study were:

1. Is there a significant difference between 3 groups of children, at 3 different ages, in their comprehension of phrasal verbs in the following conditions?
    a) Subject-Verb-Noun Phrase
    b) Subject-Verb-Particle-Noun Phrase
    c) Subject-Verb-Noun Phrase-Particle
    d) Subject-Verb-Noun Phrase-Clause
    e) Subject-Verb-Particle-Noun Phrase-Clause
    f) Subject-Verb-Noun Phrase-Particle-Clause

2. Is there a pattern to the errors made by children within any of the 3 different age groups?

CHAPTER II

METHODS

Subjects

Subjects (Ss) were thirty-six normally developing children of both sexes, twelve each in 3 different age groups (mean ages: 3:1, 5:0, and 6:11). Subjects were selected from day-care centers, preschools, and churches in Missoula, Montana. To insure that Ss were developing normally, each S met the following criteria:

1. The S's chronologic age was within one of the following ranges: 2:9-3:2 (henceforth the '3 year-olds'); 4:9-5:2 (henceforth the '5 year-olds'); or 6:9-7:2 (henceforth the '7 year-olds').
2. The S's hearing acuity was within normal limits. Ss were determined to have normal hearing if they passed a hearing screening examination consisting of binaural testing, at 20 dB HL, of the following frequencies: 0.5, 1, 2, and 4 kHz (ASHA, 1975). In the presence of background noise, responses at 25dB HL were accepted at 0.5 kHz.

3. The S's receptive language was age-appropriate. Ss were determined to have age-appropriate receptive language if they scored within ± 1 standard deviation from the mean for their age group on the Test for Auditory Comprehension of Language (TACL) (Carrow, 1973). Scores for Ss in the 2:9-3:2 age group were compared to TACL norms for the children ages 3:0-3:5; scores for Ss in the 4:9-5:2 age group were compared to TACL norms for children 5:0-5:5; scores for children in the 6:9-7:2 age group were compared to TACL norms for children ages 6:6-6:11.

More information regarding Ss may be found in Appendix B.

Stimuli

Stimuli consisted of 10 SV plus particle combinations meeting the following criteria:

1. Each identified as a transitive PV on the basis of having passed the "definite-noun-phrase test" (Bolinger, 1971:61). The test determined that a given verb-particle combination was a transitive PV if the combination could stand as one unit in the position preceding "a simple definite noun phrase

consisting of...an anaphoric [3] ′the′ plus an unmodified common noun".

2. Each particle identified as adverbial on the basis of it′s ability to occur (grammatically) in both pre- and post- noun phrase position.
3. Each PV identified as semantically "literal" (i.e., not used figuratively or idiomatically) on the basis of the experimenter′s judgment, verified by two independent adults.
4. Each PV′s meaning had to differ enough from the meaning of the simple verb it encompassed so that the actions of both PV and SV could be clearly and differentially depicted.
5. Each PV and it′s component SV must have been able to take the same direct object.
6. Each SV component of each PV identified as a verb commonly used by children by age 5 (Wepman and Hass, 1969).

Each PV appeared in 6 different stimulus sentences; each sentence was a separate experimental condition. Conditions varied according to presence or absence of the particle, particle position within the sentence, and presence or absence of a distractor clause. The six conditions (identified by sentence structure) and rationale for each were:

1. Subject-Verb-Noun Phrase (S-V-NP). The verb tested in this condition was the SV component of the given PV. This condition was tested so that, by comparing Ss comprehension of the SV with their comprehension of the corresponding PV, possible relationships between the way Ss comprehend the two might be discerned.

2. Subject-Verb-Particle-Noun Phrase (S-V-Part.-NP), and
3. Subject-Verb-Noun Phrase-Particle (S-V-NP-Part.). These conditions were tested to determine whether separation of the verb and particle was a factor in Ss comprehension of the PV.

4. Subject-Verb-Noun Phrase-Clause (S-V-NP-C), and
5. Subject-Verb-Part.-Noun Phrase-Clause (S-V-Part.-NP-C), and
6. Subject-Verb-Noun Phrase-Part.-Clause (S-V-NP-Part.-C). Clauses were added to the original stimulus sentences (conditions 1-3) to shift the focus of the sentence from the end of the first clause to the end of the second. Several possible reasons exist as to why a listener's attention may focus on the final word (or words) of an utterance more than on the preceding words. First, research indicates that, in English, utterance-final position is typically highlighted by speakers through various prosodic means (Currie, 1980). This prosodic highlighting directs a listener's attention toward the word(s) in final position. Second, utterance-final position is frequently occupied by the word(s) which have the

greatest information value in an utterance (Clark and Clark, 1977). When this is the case, those words are typically highlighted prosodically. The possibility exists, however, that even without prosodic marking, a listener may tend to focus on the word(s) in utterance-final position, strictly from the expectation of finding new information there. Lastly, the recency effect will likely cause listeners to remember the utterance-final word(s) better than preceding words. Because the particle in condition 3 appears in sentence-final position, it may receive more attention than the particle in condition 2. By adding clauses to the sentences in conditions 1-3, the listener's focus and the sentence complexity may be held constant across conditions, and the Ss comprehension of PVs under equal conditions analyzed.

Stimulus sentences were designed to be as similar as possible, both within and between stimulus sets (the PV and it's corresponding SV, under all 6 conditions). Sentences were designed such that, within a given set, the action of the verb (simple or phrasal) was the only semantic variable across conditions (discounting the added clauses in conditions 4-6).

For any given stimulus set, both the subject and noun phrase (NP) were identical across each condition. Across all ten stimulus sets, the NPs, though different in content, each consisted of 3 words, in the following pattern: determiner- adjective-noun. Further, for any given stimulus set, the clause added in conditions 4-6 was identical across conditions. Across stimulus sets clauses were composed of 4 words; each began with "because" and each identified the inner state of the sentence's subject (e.g., The boy is picking the new truck because he is happy.). This type of clause was chosen because it increases the complexity of the sentence, without increasing the complexity of the stimulus pictures by adding information that would need to be pictured. Across all conditions and all stimulus sets, the present progressive verb form was used in stimulus sentences. This form was used because it is learned early (stage II) [4] (Brown, 1973), and is relatively easy to depict. A complete list of the stimulus sentences appears in Appendix C.

<u>Stimulus Materials used in Testing</u>

To test comprehension of the verbs within each stimulus set under each condition, sixty test plates (10 stimulus sets by 6 conditions each) were created. These plates, each 8.5 by 11 inches, consisted of 4, quarter-page, colored drawings, one each designed to depict the following:

1. The action expressed by the SV only. This picture was the target for stimulus sentences under conditions 1) and 4).
2. The action expressed by the PV. This picture was the target for stimulus sentences under conditions 2), 3), 5), and 6).
3. The subject of the sentence acting on the direct object in a manner different from that expressed by the SV or PV.
4. The subject of the sentence located near, but not interacting with, the direct object.

The drawings for each stimulus set consisted of the same background scene, same person or persons, and same objects; only the subject's action on the objects varied.

To determine whether a given stimulus picture depicted the action of it's stimulus sentence well enough to be correctly identified from hearing the sentence, 1 adult was given the comprehension test. The adult correctly matched all stimulus sentences with their target pictures, except that the first presentation of "brush off" was missed. Though the stimulus sentence presentation was deemed somewhat ambiguous, it was retained in the comprehension test because it was determined to be a presentation not atypical of normal English language ambiguity. The adult recognized the target picture after the first presentation, indicating that she had resolved the ambiguity upon closer inspection of the stimulus pictures.

Six separate plates containing the 4 drawings were used to test the 6 conditions in each stimulus set. The 4 drawings on each plate were randomly arranged, and all sixty plates were randomized prior to testing. Order of presentation of the plates was held constant across Ss.

Procedure

Subjects were individually tested for comprehension of the PVs by the experimenter, who was experienced in test administration and familiar with the test items. All testing occurred at the S′s day-care surroundings, with distractions kept to a minimum. The comprehension test was not administered on the same day the screening tests had been administered. Before testing, each S was given the following instructions by the experimenter:

> I′m going to show you some pictures. Look at each picture (experimenter points to each of 4 pictures on a demonstration page). Then you will hear something from the tape recorder. Point to the picture that shows what it said. Sometimes the tape recorder says things that sound kind of like what it already said. But its not the same. Each time its a little bit different. So you have to listen hard. Then point to the picture you think it said. Do you understand? Let′s try it (S attempts the demonstration pages).

Before beginning the experimental condition, each S was required to correctly identify 3 consecutive pictures named by the experimenter. Once a S demonstrated understanding of the task, the experimenter said "Good! You know exactly how to do this. Let′s do the rest. Ready?"

All stimulus sentences were tape recorded on TDK cassette audiotapes, using a General Electric tape recorder, model number 3-5195A, to insure consistent presentation across Ss. Stimulus sentences for conditions 4, 5, and 6 were recorded without a pause before the distractor clause. During recording, the experimenter monitored the volume unit (VU) meter on the tape recorder to insure that each sentence was recorded at approximately equal voice levels. Only those sentences in which the recording level remained in the middle one-third of the VU meter range were acceptable as stimuli. Sentences were recorded at 7 second intervals.

During comprehension testing, the pre-recorded cassette was played on the same General Electric tape recorder. Tape Recorder loudness levels varied between Ss, but were always kept at a comfortable level appropriate to the testing environment. The tape was run continuously during each test session, unless the subject required more than 7 seconds to respond. If more response time was necessary, the experimenter stopped the tape between sentences. All but 7 of the children received the stimuli through tape-recorded presentation. The remaining 7, all in the 3 year- old group, received live voice presentations. In these presentations, care was taken to present the stimuli as it

had been presented on the tape recording.

During testing, the Ss were periodically praised for their cooperation, and reminded to look at all pictures in an array, and to listen carefully.

Subject's responses were recorded, and the number of correct responses for each stimulus condition was totaled. The direction of an S's error was also noted (i.e., if the S identified the picture of the SV when the stimulus sentence had contained a PV). See Appendix D for an example of the response scoring form.

Research Design and Measurements

The research design was a 3 by 3, split-plot factorial design with repeated measures on the last factor. The first factor was age, including the following 3 groups:

1. 2:9-3:2 year-olds
2. 4:9-5:2 year-olds
3. 6:9-7:2 year-olds

The second factor was particle changes, including the following 3 groups:

1.
    a) S-V-NP
    b) S-V-NP-C
2.
    a) S-V-Part.-NP
    b) S-V-Part.-NP-C
3.
    a) S-V-NP-Part.
    b) S-V-NP-Part.-C

The possible number of correct responses for each condition was 10. All raw scores (the total number of correct responses by each group of Ss, for each condition) were subjected to an arc-sine transform to meet the necessary assumptions for an analysis of variance (ANOVA). Following transformation, an

Ullrich-Pitz ANOVA (1981) was performed. The alpha level of significance for the ANOVA was set at $p=.05$. Post-hoc data analyses, when appropriate, consisted of a Tukey HSD test (Kirk 1968).

CHAPTER III

RESULTS

The purpose of this study was two-fold: 1), to determine whether there were significant differences between 3 groups of children, at 3 different ages, in their comprehension of phrasal verbs under 6 different conditions (see Figure 1 for a display of the research design, including descriptions of conditions), and 2), to determine whether there was a pattern to the errors made by children within any of the 3 age groups. The first concern was addressed through statistical analysis of the data, the second through descriptive analysis.

Groups by Conditions ANOVA

Figures 2 and 3 show the mean scores for each age group under each of the 6 conditions. A Groups by Conditions analysis of variance (ANOVA) was performed on these data to determine whether any of the obtained performance score differences were significant. A computer program (Ullrich and Pitz, 1981) was used to perform the analysis. Results of the ANOVA (summarized in Table 1) indicated significant main effects for Groups ($p<.00001$) and Conditions ($p<.00001$). Tukey Multiple Comparisons

FIGURE 1

Research Design. Group 1 = 7 year-olds, Group 2 = 5 year-olds, Group 3 = 3 year-olds. Conditions are as follows:

Condition 1 = Subject-Verb-Noun Phrase

Condition 2 = Subject-Verb-Particle-Noun Phrase

Condition 3 = Subject-Verb-Noun Phrase-Particle

Condition 4 = Subject-Verb-Noun Phrase-Clause

Condition 5 = Subject-Verb-Particle-Noun Phrase-Clause

Condition 6 = Subject-Verb-Noun Phrase-Particle-Clause

RESEARCH DESIGN

	Clause Absent			Clause Present		
	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Condition 6
Group 1						
Group 2						
Group 3						

Figure 1

FIGURE 2

Mean performance scores as a function of conditions by age group. Conditions are as follow:

Condition 1=Subject-Verb-Noun Phrase

Condition 2=Subject-Verb-Particle-Noun Phrase

Condition 3=Subject-Verb-Noun Phrase-Particle

Condition 4=Subject-Verb-Particle-Noun Phrase-Clause

Condition 5=Subject-Verb-Particle-Noun Phrase-Clause

Condition 6=Subject-Verb-Noun Phrase-Particle-Clause

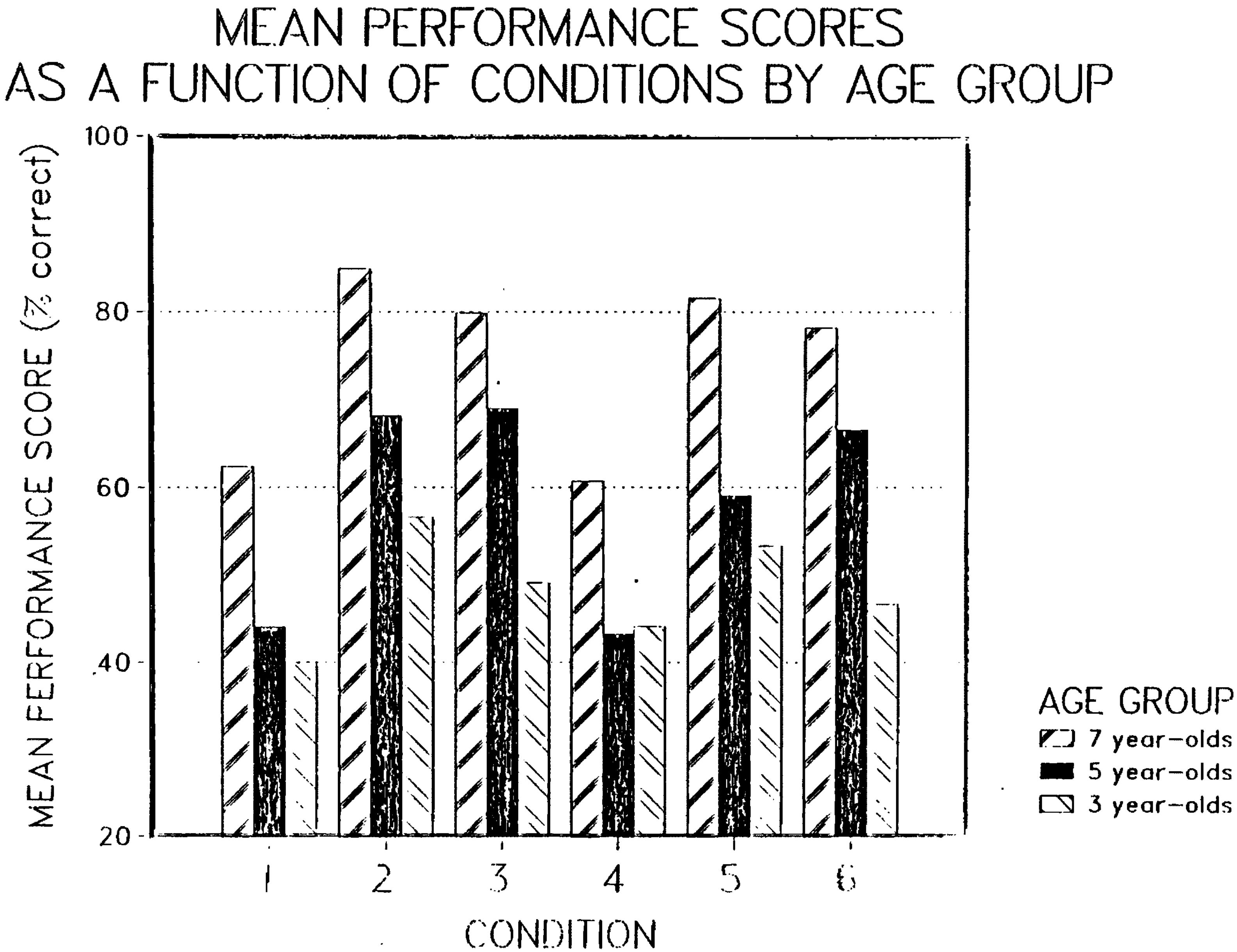
MEAN PERFORMANCE SCORES
AS A FUNCTION OF CONDITIONS BY AGE GROUP
MEAN PERFORMANCE SCORE (% correct)
100
80
60
40
20
1
2
3
4
5
6
CONDITION
AGE GROUP
7 year-olds
5 year-olds
3 year-olds

Figure 2

FIGURE 3

Mean performance scores as a function of age groups by condition. Age groups: 7 = 7 year-olds; 5 = 5 year-olds; 3 = 3 year-olds.

MEAN PERFORMANCE SCORES
AS A FUNCTION OF AGE GROUPS BY CONDITION

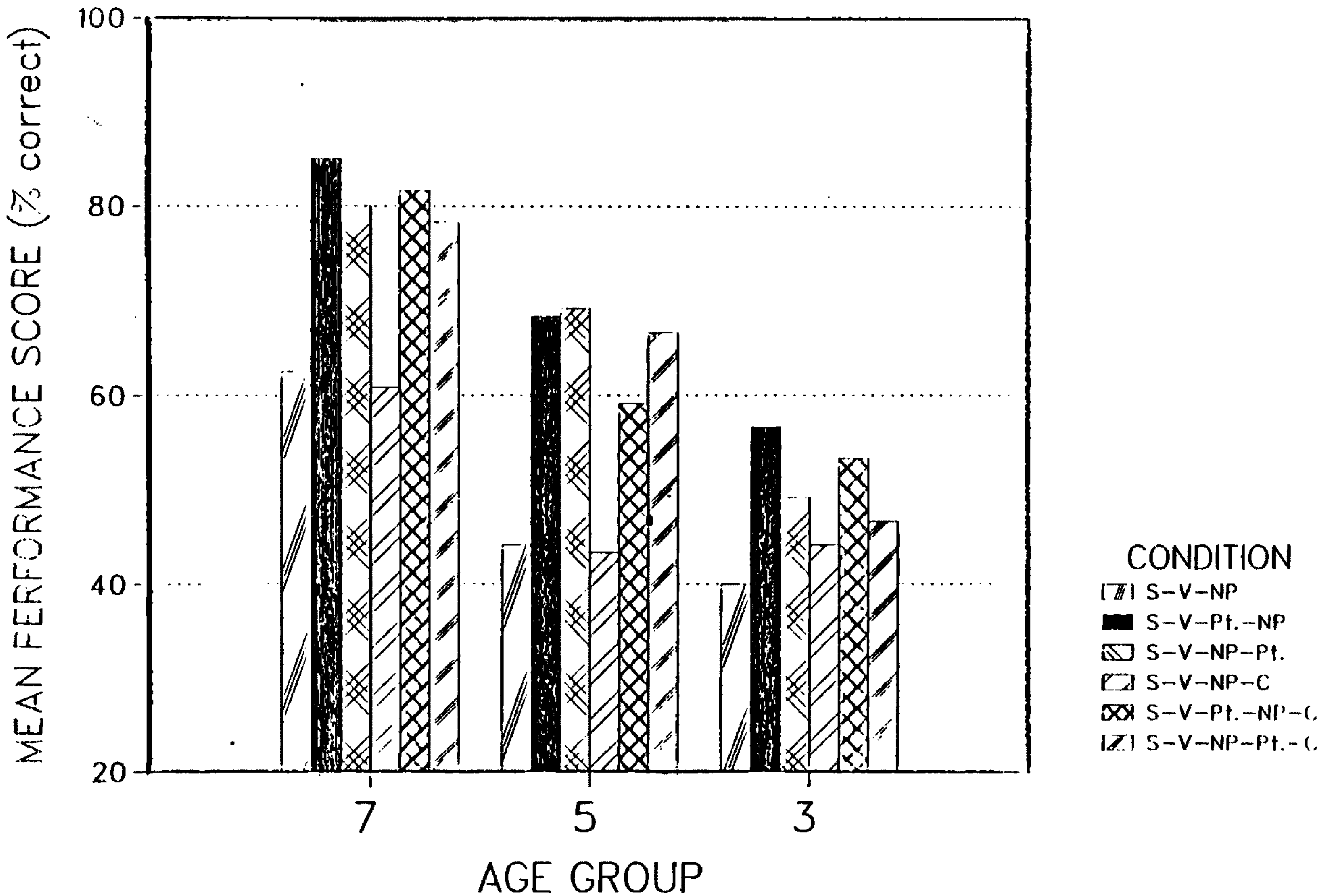

Figure 3

TABLE 1

TWO-WAY ANOVA FOR GROUPS AND SIX CONDITIONS

Conditions (C ['subject-verb-noun phrase' versus 'subject-verb-particle-noun phrase' versus 'subject-verb-noun phrase-particle' versus 'subject-verb-noun phrase-clause' versus 'subject-verb-particle-noun phrase-clause' versus 'subject-verb-noun phrase-particle-clause']) by group (G ['three year old' versus 'five year old' versus 'seven year old']) analyses of variance for arc-sine transformed performance scores.

SOURCE	SUM OF SQUARES	MEAN SQUARE	DF	F-RATIO	PROB.
G	3.4611	1.7306	2	35.818	0.0000
Error	1.5944	0.0483	33		
C	1.7989	0.3598	5	13.921	0.0000
Error	4.2645	0.0258	165		
GxC	0.3070	0.0307	10	1.188	0.3018
Error	4.2645	0.0258	165		

Tests (Bruning and Kintz, 1977) were performed to identify pairs of means which differed significantly. For Groups, the Tukey analyses indicated a significant difference between Group 1 (the 7 year-olds) and Group 3 (the 3 year-olds), with the older children correctly identifying significantly more stimulus items than the younger children. No significant differences on performance scores between Groups 1 and 2 (the 7 year-olds and the 5 year-olds) or between Groups 2 and 3 (the 5 year-olds and the 3 year-olds) existed. Table 2 summarizes results of the Tukey analyses for group comparisons.

Tukey analyses for significant differences between conditions (summarized in Table 3) revealed that children correctly identified significantly more stimulus items under conditions 2,3,5, and 6 (the PV conditions) than under conditions 1 and 4 (the SV conditions). These results indicate that the children correctly identified the PV stimuli significantly more often than they correctly identified the SV stimuli. No significant differences were found between children's performances under conditions 1 and 4, nor between performances under conditions 2,3,5, and 6. These results indicate that the

TABLE 2

TUKEY TABLE FOR GROUP EFFECTS

Differences between Group I (7 year-olds) and Group II (5 year-olds) and Group III (3 year-olds). The scores were expressed as proportion correct and were arc-sine transformed before analysis.

	GROUP I (1.07255)	GROUP II (0.87432)	GROUP III (0.76695)
GROUP II	0.19823*		0.10737
GROUP III	0.30560*	0.10737	

*Mean differences which exceed the Honestly Significant Difference of 0.2214496.

TABLE 3

TUKEY TABLE FOR CONDITION EFFECTS

Differences between conditions 1 (subject-verb-noun phrase), 2 (subject-verb-particle-noun phrase), 3 (subject-verb-noun phrase-particle), 4 (subject-verb-noun phrase-clause), 5 (subject-verb-particle-noun phrase-clause), and 6 (subject-verb-noun phrase-particle-clause). The scores were expressed as proportion correct and were arc-sine transformed before analysis.

	COND. 1	COND. 2	COND. 3	COND. 4	COND. 5
COND. 1 (0.778538)		0.236082*	0.181375*	0.002339	0.172682*
COND. 2 (1.014620)			0.054707	0.233743*	0.0634
COND. 3 (0.959913)				0.179036*	0.008693
COND. 4 (0.780877)					0.170450*
COND. 6 (0.942463)	0.163925*	0.072157	0.017450	0.161586*	0.008757

*Mean differences which exceed the Honestly Significant Difference of 0.109856.

children found both SV conditions (1 and 4) equally difficult, and all PV conditions (2,3,5, and 6) equally difficult. No significant interaction between Groups and Conditions was found, indicating that the order of difficulty of each condition was equal for children in all 3 age groups. Analysis of individual children's responses indicated that only a few children were responsible for the significant differences obtained.

<u>Clause by Subconditions ANOVA</u>

An ANOVA for 2 conditions (presence or absence of a clause) and 3 subconditions (particle placement variations) was performed to determine whether significant differences existed between the clause conditions and/or the subconditions. The ANOVA indicated significant differences (see Table 4). Tukey analyses (summarized in Table 5) indicated significant differences between subconditions: the children's performance under subcondition 1 (grouped conditions 1 and 4, the SV conditions) was significantly poorer than their performance on subcondition 2 (grouped conditions 3 and 5, PV conditions in which the particle immediately followed the verb). The children's performance under subcondition 1 was also significantly poorer than their

TABLE 4

THREE-WAY ANOVA FOR GROUPS, CLAUSE, AND SUBCONDITIONS

Groups (G['3 year old' vs. '7 year old']) by clause (C[presence vs. absence]) by subconditions (S[collapsed scores for 'subject-verb-noun phrase' and 'subject-verb-noun phrase-clause' conditions vs. collapsed scores for 'subject-verb-particle-noun phrase' and 'subject-verb-particle-noun phrase-clause' conditions vs. collapsed scores for 'subject-verb-noun phrase-particle' and 'subject-verb-noun phrase-particle-clause' conditions]) analysis of variance for arc-sine transformed performance scores.

SOURCE	SUM OF SQUARES	MEAN SQUARE	DF	F-RATIO	PROB.
G	3.4611	1.7306	2	35.818	0.0000
Error	1.5944	0.0483	33		
C	0.0370	0.0370	1	1.890	0.1754
Error	0.6460	0.0196	33		
GxC	0.01460	0.0073	2	0.374	0.6957
Error	0.6460	0.0196	33		
S	1.7210	0.8605	2	22.443	0.0000
Error	2.5306	0.0383	66		
GxS	0.2698	0.0674	4	1.759	0.1466
Error	2.5306	0.0383	66		
CxS	0.0409	0.0202	2	1.242	0.2950
Error	1.0879	0.0258	66		
GxCxS	0.0225	0.0056	10	0.342	0.8495
Error	1.0879	0.066	66		

TABLE 5

TUKEY TABLE FOR SUBCONDITION EFFECTS

Differences between subcondition 1 (collapsed scores for ´subject-verb-noun phrase´ and ´subject-verb-noun phrase-clause´ conditions) and subcondition 2 (collapsed scores for ´subject-verb-particle-noun phrase´ and ´subject-verb-particle-noun phrase-clause´ conditions) and subcondition 3 (collapsed scores for ´subject-verb-noun phrase-particle´ and ´subject-verb-noun phrase-particle-clause´ conditions). The scores were expressed as proportion correct and were arc-sine transformed before analysis.

	SBCON I (0.77971)	SBCON II (0.98292)	SBCON III (0.95119)
SBCON II	0.20326*		0.03173
SBCON III	0.17148*		

*Mean differences which exceed the Honestly Significant Difference of 0.1710095.

performance under subcondition 3 (grouped conditions 4 and 6, PV conditions in which the particle was separated from the verb by a noun phrase).

Figures 4 and 5 display the mean number of correct responses for each age group in each of the 3 subconditions. The ANOVA indicated no clause condition effect, and no interactions. Figure 6 displays the mean number of correct responses for each age group in the 2 clause conditions. The ANOVA and Tukey results indicate that neither presence of a clause nor particle position affected children's responses. The results also indicate that PVs were correctly identified significantly more often than were SVs.

Direction of Errors Analysis

Descriptive analysis of the direction of children's errors indicates no major trends in the responses of children in any group toward making errors misidentifying PVs as their SV cognates any more often than SVs were misidentified as PVs. When misidentifications were viewed as a percentage of the total number of errors possible in a given direction, the percentage of

FIGURE 4

Mean performance scores as a function of age group by common condition. "Common condition" is referred to in the text as "subcondition". Age groups: 7 = 7 year-olds; 5 = 5 year olds; 3 = 3 year-olds. Common conditions are:

1) S-V-NP=collapsed conditions 1 and 4

2) S-V-Pt-NP=collapsed conditions 2 and 5

3) S-V-NP-Pt=collapsed conditions 3 and 6

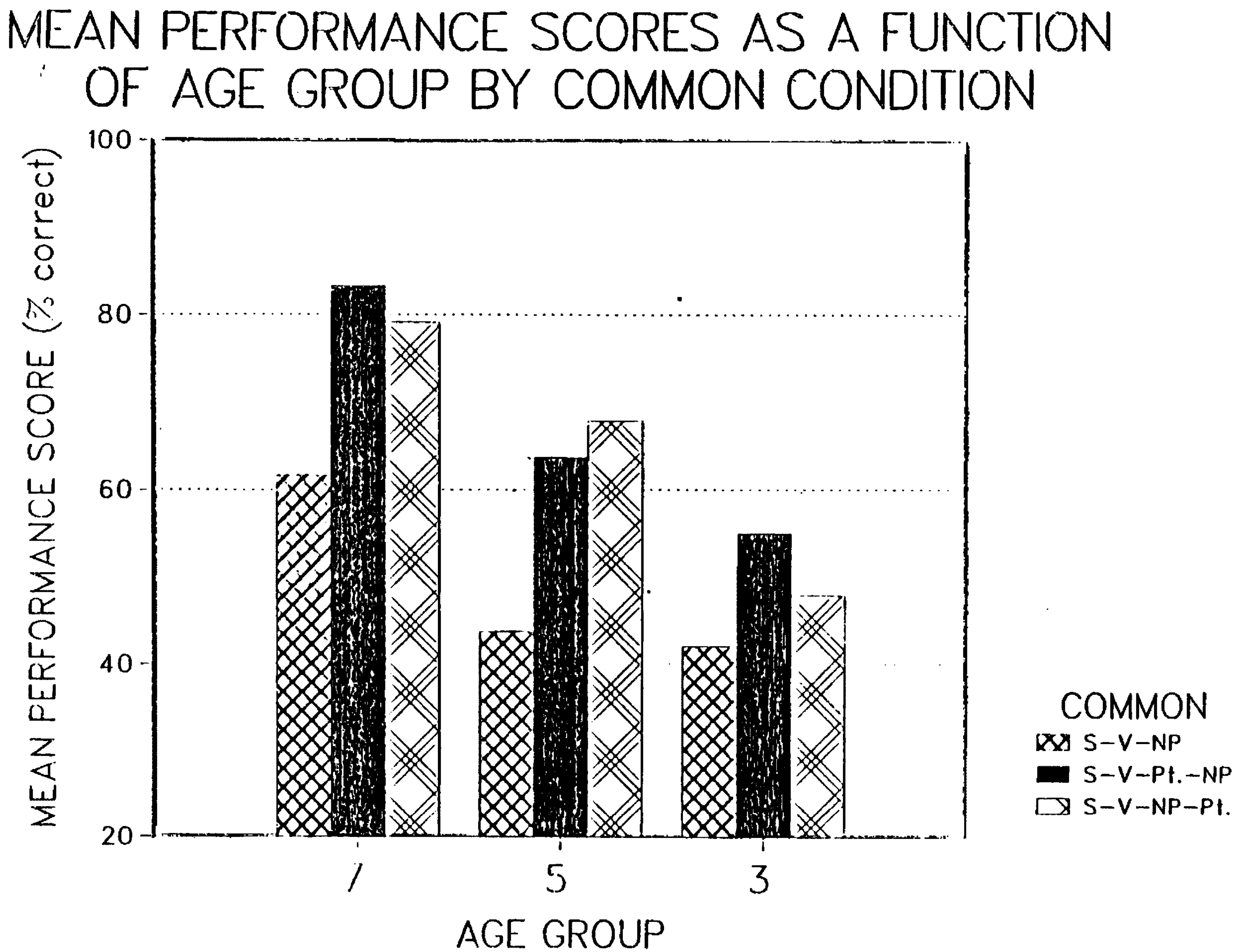
MEAN PERFORMANCE SCORES AS A FUNCTION OF AGE GROUP BY COMMON CONDITION
MEAN PERFORMANCE SCORE (% correct)
100
80
60
40
20
7
5
3
AGE GROUP
COMMON
S-V-NP
S-V-Pt.-NP
S-V-NP-Pt.

Figure 4

FIGURE 5

Mean performance scores as a function of condition by age group. Condition is referred to in the text as "subcondition" and in Figure 4 as "common condition". Age groups: 7 = 7 year-olds; 5 = 5 year-olds; 3 = 3 year-olds. Conditions are:

1) Condition 1=collapsed conditions 1 and 4

2) Condition 2=collapsed conditions 2 and 5

3) Condition 3=collapsed conditions 3 and 6

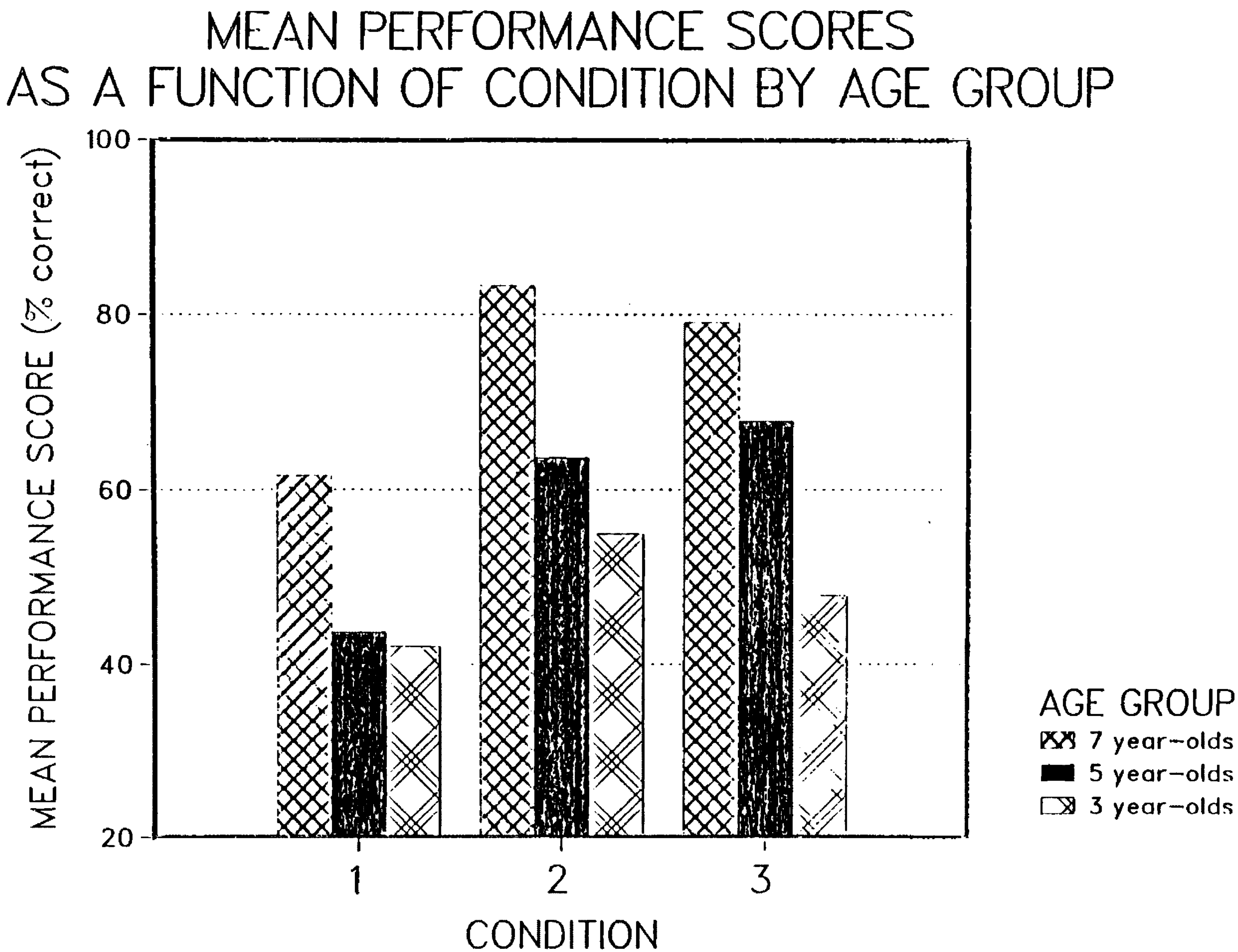
MEAN PERFORMANCE SCORES
AS A FUNCTION OF CONDITION BY AGE GROUP
MEAN PERFORMANCE SCORE (% correct)
100
80
60
40
20
1
2
3
CONDITION
AGE GROUP
7 year-olds
5 year-olds
3 year-olds

Figure 5

FIGURE 6

Mean performance scores as a function of age groups by presence of clause. Age groups: 7 = 7 year-olds; 5 = 5 year-olds; 3 = 3 year-olds.

MEAN PERFORMANCE SCORES AS A FUNCTION OF AGE GROUP BY PRESENCE OF CLAUSE

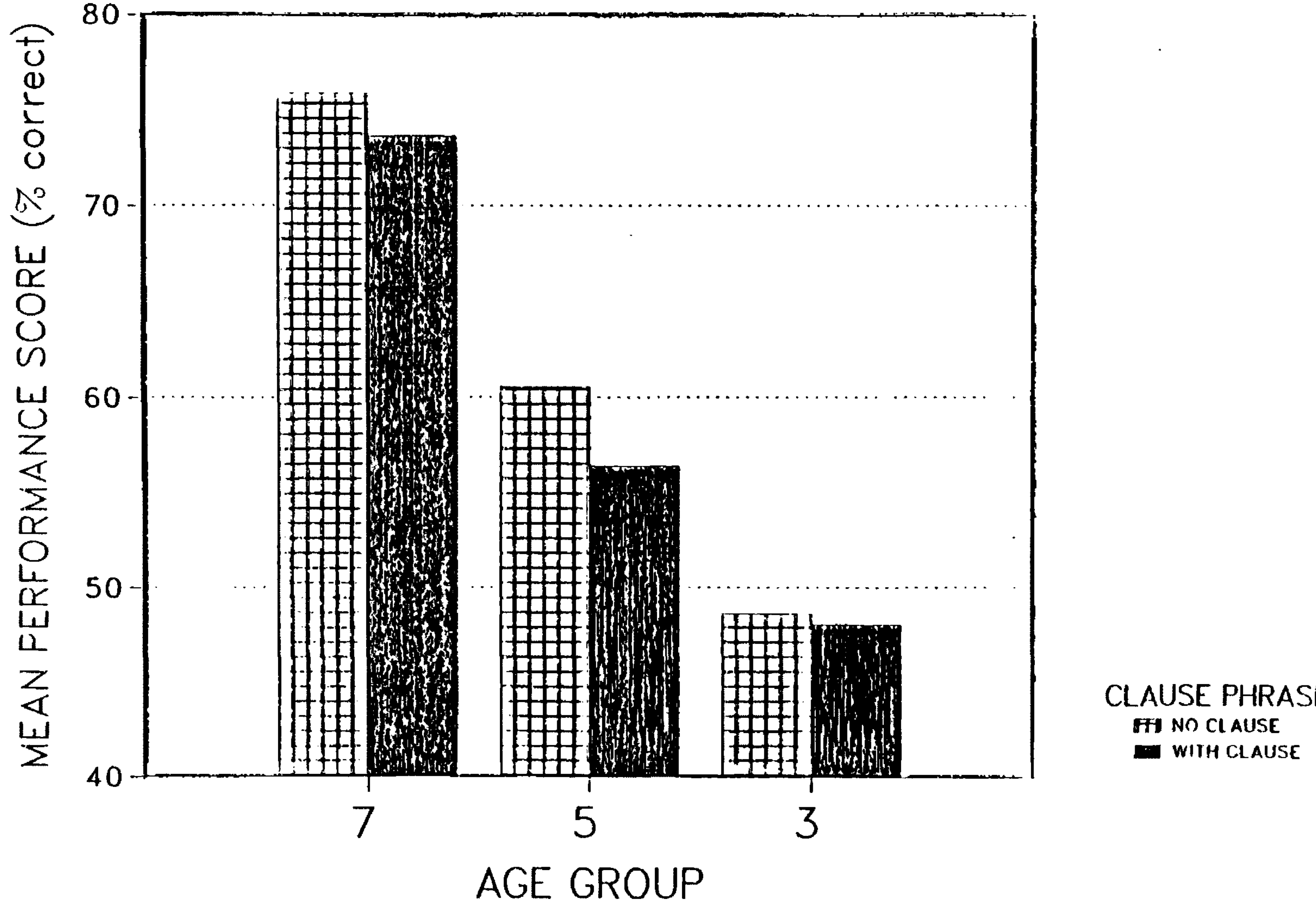

Figure 6

incorrectly identified PVs was approximately equal to the percentage of incorrectly identified SVs in the 3 year-old group (36% incorrect PVs chosen, 31% incorrect SVs chosen). For the 5 year-old group, somewhat more incorrect PVs were chosen (53%) than incorrect SVs (31%). The same trend was evident for the 7 year-olds, with the children misidentifying SVs as PVs 36% of the time, while misidentifying PVs as SVs only 17% of the time. A developmental trend in the choice of foils was evidenced, with the younger children choosing foils more often than older children. Out of all opportunities to choose foils, 3 year-olds chose a foil 20% of the time; 5 year-olds chose foils approximately 3% of the time, and 7 year-olds, 2% of the time. Except for the 7 year-olds, foils were chosen approximately twice as often when a PV was the stimulus than when a SV was the stimulus. Seven year-olds chose foils slightly more often under SV stimulus conditions than under PV stimulus conditions.

Summary

The results of this study indicate that there is a developmental trend in the comprehension of PVs, with older children evidencing greater comprehension than younger children. The results also demonstrate that children of all ages had more difficulty with SV stimuli than with PV stimuli, and that the children found all PV conditions equally difficult. Lastly, descriptive analysis of the errors suggests that the children do not confuse PVs with their SV cognates.

CHAPTER IV

DISCUSSION

The purpose of this research was to study some developmental aspects of young children's comprehension of PVs, and to examine some factors which might affect PV comprehension. The results of this study suggest that children's comprehension of PVs increases with age, and that variation of particle placement within a sentence does not affect comprehension. The results also suggest that, generally, children 3 and older do not confuse PVs with their SV cognates, indicating that even very young children recognize the value of a particle and the difference between PVs and their SV cognates.

Group Effects

The fact that the 7 year-old children correctly identified significantly more stimuli than did the 3 year-olds is indicative of the universal developmental trend of language skill improvement, and indeed of improvement in the performance of any task. The superior performance of the 7 year-olds can be attributed to both better comprehension of PVs and to more sophisticated test-taking skills. Because of their age, the

older children brought to the task longer attention spans (Flavell, 1977), an increased ability to focus on the salient aspects of the task (Flavell, 1977), and a knowledge of the world which may have increased their awareness of contextual factors (linguistic and non-linguistic), which may have facilitated appropriate stimulus identification. The younger children, conversely, were less able to focus their attention as needed (Flavell, 1977) to complete the task successfully, and had fewer skills and less world knowledge upon which to call when confronted with ambiguous stimuli. These less sophisticated test-taking skills combine with poorer general comprehension of PVs to produce the younger children's poorer performance score. The 5 year-old children, whose group mean performance score did not differ significantly from the group means for either the 7 or 3 year-old children, may typify a transition stage in both PV comprehension and test-taking skills.

Condition Effects: PV Conditions

Analysis of the children's comprehension of PVs under the 6 different conditions of particle absence and particle placement variation provided somewhat unexpected findings. Results indicate that all PV conditions (conditions 2, 3, 5, and 6) were equally difficult for children. This indicates that position of the particle - whether immediately following the verb or separated from the verb by a noun phrase - had no effect on children's ability to comprehend the PVs. Since no Groups by Conditions interaction was found, children, even by age 3, appear able to comprehend PVs regardless of particle position. The improvement in comprehension scores with increased age indicates, however, that the ability to comprehend PVs is not completely intact by age 3. This is at least the case for comprehension of PVs in the stimulus sentences tested here, which are believed to be representative examples of how verbs and particles are typically separated in English. This finding does not support the hypotheses of Clark and Clark (1977) or Slobin (1973). As previously stated, these researchers hypothesize that discontinuous elements within a sentence are more difficult to process than continuous elements. Though they also hypothesized a developmental trend toward greater processing ease with

increased age, neither Clark and Clark (1977) nor Slobin (1973) specified an age or ages at which one might expect to find children comprehending discontinuous structures. Slobin, noting that his hypothesis was "a statement of general psycholinguistic performance constraint" (1973:201) further noted that the severity of the performance constraint depended on a child's developmental level. The most severe performance constraints are placed on younger children, and ease as a child grows older. The results obtained in the present study indicate that the processing constraints supplied by a PV in which the verb and particle are separated by a 3-word noun phrase are not severe enough to inhibit comprehension of the PV by a child as young as 3 years-old. There are several possible explanations of why the children comprehended discontinuous PVs with such relative ease. One explanation involves test artifact. By repeating the same noun phrase across all conditions for a given verb set, the children may have heard numerous repetitions of the noun phrase by the time they were asked to identify a discontinuous PV structure. The children's opportunity for increased familiarization with a given noun phrase may have made the phrase less salient, and therefore less of an obstacle for processing. By diminishing the intermediate obstacle between verb and particle in a discontinuous PV, comprehension would be

facilitated, according to Watt (1970). Even if discontinuous PV conditions occurred early in the child's exposure to a given word set, the 'noun phrase familiarity' effect might operate, though perhaps to a lesser degree, because of the pattern of using 3-word noun phrases across all stimulus sentences in the experimental task. Once the children recognized that knowledge of the noun phrase was not crucial to completion of the task, their attention to all noun phrases may have been diminished. This test artifact may have influenced children's performance. Other explanations for the obtained results involve possible linguistic skills possessed by the child. The ease with which even young children comprehended discontinuous PVs may be due to either their ability to anticipate the possible appearance of a particle, based on their knowledge of the combinatorial properties of verbs, or to their ability to repair original misinterpretations of the verb (assigning SV meaning) when confronted with the particle. Because young children have been found unable to recognize many of the surface structure combinatorial requirements or propositional schema of verbs in general (Dollaghan, 1981) and PVs in particular (Menyuk, 1969), the former hypothesis is unlikely. The greater possibility is that children as young as 3 years of age have developed effective strategies for recovering the meaning of the verb in

discontinuous PV structures.

Proposals discussed by Watt (1970) may help explain the relative ease with which children were able to recover meaning in a discontinuous PV. Watt states that:

> Psycholinguistic parsing complexity increases with the amount of deep structure whose correct assignment is postponed; with the length of sentence over which the postponement must be carried; and with the complexity of misassignments whose rescission returns the processor to an earlier point in the sentence. (1970:151)

The discontinuous PV postpones only 1 word, the particle, in the transition from the (hypothesized) PV deep structure. Since 1 word is obviously the smallest amount of deep structure capable of being displaced, the relative ease of comprehending a discontinuous PV is apparent. Further, as structured in the stimulus sentences used here, the postponement of the particle in discontinuous PVs occurs over only 3 words (and, arguably, over only 2, if content words alone are counted). This does not appear to be enough to tax the limits of a 3 year-old's memory so severely that processing breakdowns occur. Miller (1973) found that 5 year-old children could accurately imitate (and thus carry in immediate memory) 5-word sentences in 90% of all trials. Data on 3 year-old children's memory span for connected speech have

not been found, but it is presumably somewhat less than 5 words. The present data indicate, however, that the 3 year-olds are capable of holding at least four words in memory (simple verb plus 3 words in the noun phrase) while processing a fifth (the particle), at least when the utterance is accompanied by visual cues. Clark and Clark (1977) suggested that two intervening elements in an utterance could "widely separate" two words otherwise closely linked. In the case of young children and discontinuous PVs, even three intervening elements do not appear to separate words widely enough to cause a disruption in processing. Watt's third factor influencing sentence parsing complexity may also explain the results obtained here. The possibility of complex misassignments of the particle, before correct assignment to the verb, is perhaps less for PVs under the stimulus conditions here than for PVs in other linguistic contexts (Hunter and Prideaux, in submission) or for other discontinuous elements, such as relative clauses, that have been discussed in the literature (Clark and Clark, 1977; Sheldon, 1977; Slobin and Welsh, 1973). Kimball (1973, reported in Clark and Clark, 1977) proposed that in processing a sentence for comprehension, the listener tries "to attach each new word to the constituent that came just before" (Clark and Clark, 1977:65). After analysis of each new attachment, the listener decides

whether to accept or reject the "fit" of the mating. If a reasonable interpretation of the meaning is not obtained on the first attempt, the listener moves back to the next previous word. Using this strategy under the present stimulus conditions, a child would have only 3 false matches (the words in the noun phrase) before finding the verb and a correct match. Further, the intervening noun phrase is itself "clean", free of deleted and/or implied elements, embeddings, and other trappings with which a listener must contend before reaching the verb and a correct interpretation of the sentence. One may also speculate that certain semantic qualities of particles could facilitate recovery of meaning in discontinuous PV structures. Bolinger (1971) noted that the two main semantic features of a PV were motion and result. The motion feature links the particle closely to the verb, but the result feature tends to link the particle to the object of the verb. For instance, once a garment has been taken off, it is off; once a wagon has been pushed over, it is over. This link to the object of the verb may cause some children to stop the search for the particle's "mate" when they find the noun which immediately proceeds the particle. The children can identify the resultant condition of the noun with the particle, and their search for a mate to the particle is terminated. This may be the case only with certain particles

and/or PVs, however; a more complete semantic analysis of PVs is necessary before any validity can be assigned this idea.

The children in the present study, then, may have been aided in their comprehension of discontinuous PVs by test artifact, but they may also have been demonstrating language skills superior to those than would have been predicted for normal children on the basis of the hypotheses of Clark and Clark (1977) and Slobin (1973). The discrepancy between the children's actual performance and their hypothesized performance may be due to the fact that the hypotheses of both Clark and Clark (1977) and Slobin (1973) were based on data regarding children's ability to process discontinuous elements such as embedded and relative clauses, which are more complex than the discontinuous PV structures used here.

Condition Effects: SV vs. PV Conditions

Analysis of the children's comprehension of stimuli under the 6 different conditions also indicated that all children, regardless of age, correctly identified significantly fewer SVs than phrasal verbs. This result was somewhat unexpected, due to the supposed increased complexity a particle adds to a SV. One

possible interpretation of these results is that the SVs were more difficult to comprehend than the PVs, perhaps even unknown to the children. This is unlikely, as each was chosen, in part, because of its inclusion in the Wepman and Hass (1969) list of verbs used most frequently by 5 year-olds. Further, many of the children were observed to use the SVs which appeared on the test in conversation with the experimenter or when describing stimulus pictures. A second and more likely explanation for the results is test artifact. There were only half as many SV stimuli as PV stimuli in the comprehension test. Children, when tiring of the task or not listening closely to stimulus sentences, may have identified the PV picture in an array, instead of the SV picture, simply because the PV had been indicated so many more times in previous stimulus presentations. The data indicating that the 5 and 7 year-old children misidentified more SVs as PVs than vice versa tend to support this hypothesis. Further, children may have found some of the SV stimulus pictures more ambiguous than many of the PV pictures. This may be due to some of the drawings and/or stimulus sentences used in the comprehension test, and/or it may result because particles impart varying effects on their SVs. Verb effects and the ambiguity in stimuli are discussed in more detail in Appendix D.

Clause vs. No Clause Conditions

The analysis of clause conditions by subconditions indicated again that particle position had no effect on children's comprehension of PVs, and that PVs were correctly identified significantly more often than SVs. The analysis also indicated that the presence of a distractor clause had no effect on children's performance. This finding suggests that the clause did not provide enough memory overload to cause a child to forget the stimulus verb, nor did it divert attention from post-noun phrase position particles enough to disrupt children's processing to the point of non-comprehension. Even the youngest children appear able to retain and use the information provided in the sentence-medial position. The function of the distractor clause, as stated in Chapter II, was to provide for equal sentence complexity across conditions. The fact that the distractor clause had no effect indicates that either children as young as 3 are capable of comprehending PVs in complex sentences, or that some other force or forces may be operating to produce the obtained results. Due to possible test artifact, this latter explanation may be the most viable. The children may have essentially ignored clauses after hearing an initial few, since

they heard very similar clauses in half the stimuli used. By design, the clause added no information useful to the child in performing the comprehension task. Once the children understood the nature of the task, they may have ignored extraneous input and focused on the verbal element in each sentence. Again, observations of children's behavior during the comprehension testing provide support for this hypothesis. In spite of repeated admonitions not to point until they had heard the entire stimulus sentence, some children identified pictures before the sentence was completed. Children, including those who were stopped from pointing early, also tended to poise their finger above a picture, or to visually focus on one picture at which they would later point, after hearing only part of the stimulus sentence.

Direction of Children's Errors

Descriptive analysis of the direction of children's errors indicated no trends toward making errors misidentifying PVs as their SV cognates any more frequently than SVs were misidentified as their PV cognates. Thus, no dependent relationship between comprehension of PVs and comprehension of a PV's SV cognate was discerned. PVs and SVs appear to be comprehended as entities

distinct from each other, with comprehension of one not dependent upon comprehension of the other. Whether they are originally learned as distinct entities or whether the child learns to apply particle meanings in the comprehension of the 2 types remains unknown. Patterns of learning may differ from child to child and from verb to verb; this remains an area in need of investigation.

Children in the 5 and 7 year-old groups incorrectly chose PVs somewhat more often than they incorrectly chose SVs, but this can be attributed to the fact that the test contained twice as many PV stimuli as SV stimuli. When unsure of the appropriate response, or perhaps out of boredom, these children responded to the stimulus most frequently heard, the PV stimulus. The fact that these children tended to stay within the appropriate verb set (the PV or it's SV cognate) when responding, rather than pointing to foils, attests to their linguistic and cognitive maturity. The 3 year-old children chose considerably more foils than the older children (20% of all opportunities vs. 2% and 3% of all opportunities). This likely is because these children had neither the linguistic maturity to stay within the appropriate verb set nor the cognitive maturity to maintain attention to the task. The fact that 3 and 5 year-olds chose foils twice as often

when a PV was the stimulus is probably due, again, to the fact that twice as many PV stimuli occurred in the test than SV stimuli. The 7 year-olds chose slightly more foils under SV conditions than PV conditions, possibly because they found the SV pictures more ambiguous. Their performance across conditions indicates that they were better able to identify PVs and SVs than the younger children; perhaps, when unsure of how to respond to a SV stimuli because of picture ambiguity, they were more likely to be sure that the PV picture was not correct, and to respond to an unknown, the foil.

Summary

The present study provides evidence that children as young as 3 years-old are capable of comprehending PVs, and that a developmental trend toward improved ability to comprehend PVs exists. The finding that variations in particle placement had no effect on children's comprehension of PVs fails to support the hypotheses of Clark and Clark (1977) or Slobin (1973). This failure may be due to the fact that the hypotheses of Clark and Clark (1977) and Slobin (1973) were based on children's performance on tasks involving linguistic constructions other than PVs. PVs may not be as complex as these other

constructions, and strategies for PV comprehension, regardless of particle position, may be learned prior to age 3. The finding that children understood significantly fewer PVs than SVs was somewhat surprising, but may be due to test artifact. Test artifact probably also accounts for the finding that the presence of a distractor clause had no effect on the children's comprehension of either PV or SV stimuli. Lastly, because the children identified PVs as SVs approximately as often as they made the opposite error, no dependent relationship between comprehension of a PV and it's SV cognate could be discerned. One must remember that PVs are complex entities, and many different semantic types may exist, even within the "literal PV" category. The complexities of different PV types likely influence a child's comprehension. As the findings and conclusions reported here are based upon only a small sample of PVs, the results should not be viewed as necessarily applicable to all PVs.

Directions for Future Research

Because of the dearth of information available on children's production, judgment, and comprehension of PVs, any and all research in these areas would be a welcome addition to the literature on children's acquisition of language. Particularly, research is needed regarding the processes by which children acquire competency with PVs. Is there any relationship between learning a PV and learning it's SV cognate? How is it exactly that children recognize PVs in a discontinuous state? What are the developmental trends in these processes for obtaining linguistic competency with PVs? Do strategies for learning and using PVs differ from child to child? If so, how much individual variation is there? These questions, particularly, may best be addressed through longitudinal, time-series research designs, replicated across subjects. Further questions concern language-disordered children's acquisition of, and competency with, PVs. Do language-disordered children learn and use PVs as other children do? If not, how do they differ? In future research, attention should be paid to the type of PV being studied (literal, figurative, or idiomatic). If literal PVs are studied, particular attention must be directed toward determining whether the PVs may be differentiated semantically (see Appendix

D), and, if so, whether semantic differences affect the child's learning of, or competence with, PVs. Lastly, methodologies for studying these and other questions will need to be chosen with care. Innovative techniques will be necessary to study what children know about the complexities of PVs, and how they learn it.

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APPENDIX A

DEFINITION OF TERMS

1) non-stative: any verb that does not meet the distinguishing syntactic criteria for ´stativity´, those being 1) ability to occur in the progressive form, and 2) ability to occur in the imperative form. Semantically, non-statives are usually said to express actions rather than states of affairs. (Definition after Crystal, 1980:330).

2) linguistic stage I: a stage in language development identified by Brown, 1973, in which the child´s mean length of utterance (MLU) equals 1.01-1.49. The predicted age range, ±1 standard deviation, for this stage is 16.4-27.5 months. (from Miller, 1981)

3) anaphoric: "the process or result of a linguistic unit referring back to some previously expressed unit or meaning." (Crystal, 1980:25).

4) linguistic stage II: a stage in language development identified by Brown, 1973, in which the child´s mean length of utterance (MLU) equals 1.50-1.99. The predicted age range, ±1 standard deviation, for this stage is 19.3-32.3 months. (from Miller, 1981)

APPENDIX B

SUBJECT DATA

Table B1 contains detailed information regarding the subjects who participated in the complete protocol for this study. Table B2 contains information on those potential subjects who participated during the initial screening but who failed to meet the screening criteria detailed in Chapter II. Potential subjects (according to the age criterion) deemed by parents or preschool teachers to be delayed in any way were not tested. Six children (1-7 year old, 2-5 year olds, and 3-3 year olds) were thus automatically eliminated from participation.

Table B 1

SUBJECT DATA

Group	Mean Age	Sex	Mean TACL Score	Range of TACL Scores	Acceptable Range of TACL Scores
1 7 year-olds	6:11	7M,5F	93.50	87-97*	83.34-96.76
2 5 year-olds	5:0	7M,5F	75.75	65-83	62.36-83.46
3 3 year-olds	3:1	7M,5F	54.33	49-60	45.53-63.07

*Deemed acceptable because child was older than the oldest age used to derive normative scores.

Table B 2

SUBJECTS FAILING TO MEET CRITERIA

Group	Reason for Failure to Meet Criteria	Number failing for Specified Reason	Mean Age	Sex	Mean TACL Score	Range of Acceptable TACL Scores
1 7 year-olds	Score on TACL too High	5	7:1	2M,3F	98.2	83.34-96.76
	Score on TACL too Low	1	7:1	M	78.0	
2 5 year-olds	Score on TACL too High	7	5:0	3M,4F	86.9	62.36-83.46
	Failed Hearing screening	1	4:10	M	73.0	
3 3 year-olds	Score on TACL too High	5	3:1	4M,1F	65.8	45.53-63.07
	Failed to condition to hearing screening task	3	3:0	1M,2F	51.0*	

*Based on scores for 2 of the 3 children.

APPENDIX C

STIMULUS SENTENCES

Verb Set	Stimulus Sentence under Each Condition
Blow/up	1) The girl is blowing the yellow balloon.
	2) The girl is blowing up the yellow balloon.
	3) The girl is blowing the yellow balloon up.
	4) The girl is blowing the yellow balloon because it is fun.
	5) The girl is blowing up the yellow balloon because it is fun.
	6) The girl is blowing the yellow balloon up because it is fun.
Brush/off	1) The man is brushing the dog's hair.
	2) The man is brushing off the dog's hair.
	3) The man is brushing the dog's hair off.
	4) The man is brushing the dog's hair because he needs to.
	5) The man is brushing off the dog's hair because he needs to.
	6) The man is brushing the dog's hair off because he needs to.
Kick/over	1) The boy is kicking the garbage can.
	2) The boy is kicking over the garbage can.
	3) The boy is kicking the garbage can over.
	4) The boy is kicking the garbage can because he is mad.
	5) The boy is kicking over the garbage can because he is mad.
	6) The boy is kicking the garbage can over because he is mad.
Pick/up	1) The girl is picking the red truck.
	2) The girl is picking up the red truck.
	3) The girl is picking the red truck up.
	4) The girl is picking the red truck because she likes it.
	5) The girl is picking up the red truck because she likes it.
	6) The girl is picking the red truck up because she likes it.

Pull/out
1) The boy is pulling the horse toy.
2) The boy is pulling out the horse toy.
3) The boy is pulling the horse toy out.
4) The boy is pulling the horse toy because he wants to.
5) The boy is pulling out the horse toy because he wants to.
6) The boy is pulling the horse toy out because he wants to.

Push/over
1) The girl is pushing the old wagon.
2) The girl is pushing over the old wagon.
3) The girl is pushing the old wagon over.
4) The girl is pushing the old wagon because whe is mad.
5) The girl is pushing over the old wagon because she is mad.
6) The girl is pushing the old wagon over because she is mad.

Take/off
1) The mom is taking the warm coat.
2) The mom is taking off the warm coat.
3) The mom is taking the warm coat off.
4) The mom is taking the warm coat because she wants to.
5) The mom is taking off the warm coat because she wants to.
6) The mom is taking the warm coat off because she wants to.

Throw/away
1) The boy is throwing the orange ball.
2) The boy is throwing away the orange ball.
3) The boy is throwing the orange ball away.
4) The boy is throwing the orange ball because he likes to.
5) The boy is throwing away the orange ball because he likes to.
6) The boy is throwing the orange ball away because he likes to.

Turn/on
1) The man is turning the new light.
2) The man is turning on the new light.
3) The man is turning the new light on.
4) The man is turning the new light because he needs to.
5) The man is turning on the new light because he needs to.
6) The man is turning the new light on because he needs to.

Wash/off

1) The mom is washing the dirty bib.
2) The mom is washing off the dirty bib.
3) The mom is washing the dirty bib off.
4) The mom is washing the dirty bib because she needs to.
5) The mom is washing off the dirty bib because she needs to.
6) The mom is washing the dirty bib off because she needs to.

APPENDIX D

RESPONSE SCORE FORM

NAME BIRTHDATE AGE SCHOOL

TARGET VERB	CORRECT RESPONSE	Cond. #1 -V-NP	Cond. #2 V-PT.-NP	Cond. #3 V-NP-PT.	Cond. #4 V-NP-C	Cond. #5 V-PT-NP-C	Cond. #6 V-NP-PT-C	CORRECT	INCORRECT: Chose FOIL	INCORRECT: Chose PV	INCORRECT: Chose S.V.	CHILD'S DESCRIPTION OF VERB(S) MISSED
1) brush	4	1 2 3 4								(1)		BLOW
2) push over	1					1 2 3 4					(4)	BLOW UP
3) blow	4	1 2 3 4								(1)		BRUSH
4) turn	3	1 2 3 4								(2)		BRUSH OFF
5) kick over	4					1 2 3 4					(2)	KICK
6) blow	1				1 2 3 4					(4)		KICK OVER
7) wash off	2			1 2 3 4							(3)	PICK
8) take off	1						1 2 3 4				(4)	PICK UP
9) push over	3			1 2 3 4							(1)	PULL
10) pick up	2						1 2 3 4				(1)	PULL OUT
11) blow up	1						1 2 3 4				(2)	PUSH
12) push over	2						1 2 3 4				(4)	PUSH OVER
13) wash	4	1 2 3 4								(1)		TAKE
14) blow up	2		1 2 3 4								(4)	TAKE OFF
15) kick over	2			1 2 3 4							(1)	THROW
16) brush off	1			1 2 3 4							(3)	THROW AWAY
17) wash off	1					1 2 3 4					(3)	TURN
18) push	1	1 2 3 4								(4)		TURN ON
19) throw away	2		1 2 3 4								(3)	WASH
20) brush	1				1 2 3 4					(4)		WASH OFF
21) throw away	2					1 2 3 4					(4)	
22) pick	3				1 2 3 4					(4)		
23) turn on	1					1 2 3 4					(4)	
24) pull out	1			1 2 3 4							(4)	
25) pick up	3			1 2 3 4							(4)	
26) blow up	2					1 2 3 4					(4)	
27) pull	2	1 2 3 4								(3)		
28) kick over	4						1 2 3 4				(3)	
29) wash	1				1 2 3 4					(4)		
30) kick	2				1 2 3 4					(4)		
31) take	2	1 2 3 4								(1)		
32) throw away	1			1 2 3 4							(2)	
33) kick	2	1 2 3 4								(2)		
34) pull out	4		1 2 3 4								(1)	
35) turn on	3						1 2 3 4				(1)	
36) brush off	2					1 2 3 4					(3)	
37) kick over	3		1 2 3 4								(1)	
38) pull out	4					1 2 3 4					(2)	
39) blow up	3			1 2 3 4							(2)	
40) pick up	1		1 2 3 4								(3)	
41) throw away	3						1 2 3 4				(4)	
42) pull	1				1 2 3 4					(4)		
43) turn	3				1 2 3 4					(4)		
44) take	3				1 2 3 4					(4)		
45) brush off	4		1 2 3 4								(3)	
46) turn on	3		1 2 3 4								(2)	
47) pick up	2					1 2 3 4					(1)	
48) throw	1	1 2 3 4								(3)		
49) take off	1			1 2 3 4							(3)	
50) pick	2	1 2 3 4								(4)		
51) turn on	3			1 2 3 4							(1)	
52) brush off	2						1 2 3 4				(4)	
53) take off	3					1 2 3 4					(4)	
54) push over	3		1 2 3 4								(2)	
55) pull out	1						1 2 3 4				(2)	
56) take off	4		1 2 3 4								(3)	
57) wash off	2						1 2 3 4				(1)	
58) throw	4				1 2 3 4					(2)		
59) wash off	3		1 2 3 4								(2)	
60) push	2				1 2 3 4					(3)		

ACROSS VERBS: TOTAL CHOSEN INCORRECTLY: V | PV | FOIL

TOTAL # CORRECT BY VERB, ACROSS ALL CONDITIONS: WASH / WASH OFF | TAKE / TAKE OFF | THROW / THROW AWAY | TURN / TURN ON | PICK / PICK UP | PULL / PULL OUT | PUSH / PUSH OVER | BLOW / BLOW UP | BRUSH / BRUSH OFF | KICK / KICK OVER

Total # correct

Condit. #: 1 2 3 4 5 6

APPENDIX E

VERB EFFECTS

Results of an ANOVA for Group and Verb effects indicated a significant Group main effect ($p<.0075$). These results are summarized in Table E1. A Tukey test was performed to identify pairs of Group means which differed significantly, but the test did not have the power to make such an identification. Because at least one pair of means differ significantly, one may hypothesize that it is the pair with the greatest difference, in this case Group 1 (the 7 year-olds) and Group 3 (the 3 year-olds). This would indicate that the 7 year-olds performed significantly better than the 3 year-olds. Other significant differences between Groups may exist as well, but these can not be determined at this time.

Tukey tests were also performed to identify those pairs of verb means which differed significantly. Results are summarized in Figure 7. Because the comprehension test for the present study was not counterbalanced for order of presentation of verbs, and because it did not present an opportunity for all verbs to be presented an equal number of times, the implications of the verb

effects (or of the Group by Verb interaction) found here cannot reasonably be discussed. The findings are presented solely to note the possibility that not all PVs or SVs are equal, relative to ease of comprehension. Ambiguous oral or visual presentation of stimuli might be responsible for results such as these, but these findings could also be indicative of inherent differences, most likely semantic, between verbs. Future research will need to address this possibility.

TABLE E1

TWO-WAY ANOVA FOR GROUPS AND VERBS

Groups (G['3 year old' vs. '5 year old' vs. '7 year old']) by Verbs (V[the complete 20 different stimulus verbs]) analyses of variance for arc-sine transformed performance scores.

SOURCE	SUM OF SQUARES	MEAN SQUARE	DF	F-RATIO	PROB.
G	16.868	8.4340	2	26.110	0.0000
Error	10.660	0.3230	33		
V	109.1192	19.7448	19	22.063	0.0000
Error	163.26	0.2604	627		
GxV	0.43730	0.0307	38	1.679	0.0075
Error	163.26	0.2604	627		

FIGURE E1.

Matrix comparing comprehension of individual PVs and SVs across all subjects, indicating superior vs. inferior performance. The X indicates that performance on the comprehension task for the verb on the vertical axis was significantly better than for the verb on the horizontal axis corresponding to the same X. Verbs corresponding to numbers on the axis are:

1. Blow
2. Blow up
3. Brush
4. Brush off
5. Kick
6. Kick over
7. Pick
8. Pick up
9. Pull
10. Pull over
11. Push
12. Push over
13. Take
14. Take off
15. Throw
16. Throw away
17. Turn
18. Turn on
19. Wash
20. Wash off

COMPARISON OF COMPREHENSION OF INDIVIDUAL VERBS INDICATING SUPERIOR VS. INFERIOR PERFORMANCE, ACROSS ALL SUBJECTS

VERB NUMBER

VERB NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL
1				X																	1
2	X			X	X		X			X	X		X		X		X			X	10
3	X			X	X		X		X	X	X		X		X		X		X	X	12
4																					
5																					
6	X			X	X		X		X	X	X		X		X		X			X	11
7				X																	1
8	X			X	X		X				X						X			X	7
9				X	X		X				X										4
10				X	X		X				X										4
11																					
12	X			X	X		X				X		X		X		X			X	9
13				X	X						X										3
14	X			X	X		X				X				X		X	X		X	9
15				X	X																2
16	X			X	X		X				X				X		X			X	8
17				X																	1
18	X			X	X		X				X						X			X	7
19	X			X	X		X				X						X			X	7
20				X																	1
TOTAL	9			17	13		11		2	3	12		4		6		9	1		9	

Figure E1

APPENDIX F

RAW DATA AND COMPUTER PROGRAMS

TABLE F1

VERB-EFFECTS DATA AND ANALYSIS PROGRAM

The following table contains the computer program using the Ullrich-Pitz Analysis of Variance for verb effects immediately followed by the data. There were 20 verbs analyzed and performance scores are expressed in proportion correct with every other score being a three-digit number (including decimal point) and the remainder scores being expressed with a four-digit number (including decimal point). The scores for the verbs are entered in relation to the alphabetical ordering of the verbs used. See Appendix C for details.

```
DATA ANALYSIS FOR VERB EFFECTS
  3   1   1   1  20   1   1   1  12   0   0  00   0   8   2
  G                V   T
(10(F3.1,F4.2))
0.51.001.00.751.01.001.01.000.51.001.01.001.01.001.00.751.00.750.51.00
0.01.001.00.000.01.000.01.000.50.250.01.001.01.000.51.000.51.000.01.00
0.51.001.00.750.01.001.01.000.51.000.51.001.01.001.01.000.50.751.01.00
```

0.51.001.00.000.51.000.01.001.01.000.51.000.50.751.01.000.01.001.00.50

0.01.001.00.000.01.001.00.001.00.750.01.001.01.000.01.000.01.000.50.75

0.01.001.00.000.01.000.51.001.00.251.01.001.01.001.01.000.51.001.00.00

0.50.751.00.000.01.001.01.001.00.751.01.001.01.001.01.001.00.751.00.00

0.51.001.00.000.51.001.00.751.01.000.51.001.01.001.01.001.01.001.00.25

0.50.751.00.000.01.000.51.001.01.000.01.001.01.001.01.000.51.000.50.00

0.51.001.00.000.01.000.00.750.01.000.01.000.50.750.01.000.01.001.00.25

0.01.001.00.000.01.000.00.750.01.000.01.000.50.750.01.000.01.001.00.00

0.51.001.00.000.01.000.01.001.00.000.51.001.01.001.01.000.01.000.50.75

0.01.001.00.000.01.000.00.750.01.000.01.000.01.000.01.000.01.001.00.00

0.51.001.00.000.01.000.01.000.50.750.01.000.01.000.01.000.01.001.00.00

0.51.001.00.000.00.750.01.001.00.000.01.000.01.000.01.000.01.001.00.00

1.00.001.00.000.00.750.01.001.00.000.00.750.00.250.01.001.00.000.51.00

1.00.751.00.000.01.000.50.501.00.750.00.750.01.001.00.750.01.001.00.00

0.51.001.00.000.01.000.01.000.00.750.01.001.01.000.01.000.51.001.00.25

1.00.751.00.000.01.000.01.000.01.000.01.001.00.750.51.000.01.001.00.00

0.51.001.00.000.50.750.51.001.00.001.00.000.50.500.01.000.01.001.00.00

0.01.001.00.000.01.000.50.750.01.000.50.750.51.001.00.001.00.501.00.00

0.01.001.00.000.01.000.50.000.01.001.01.000.50.751.00.751.00.001.00.00

1.00.501.00.000.01.000.00.751.00.000.01.000.01.000.00.750.00.750.50.50

0.01.001.00.000.00.750.01.001.00.250.01.001.00.000.01.000.00.750.01.00

0.51.001.00.000.51.000.00.251.00.250.50.750.00.000.00.250.00.750.50.50

0.01.001.00.000.01.000.00.500.01.000.01.000.51.000.01.000.00.500.00.75

0.00.750.50.000.00.751.00.000.01.000.00.750.50.750.50.250.50.500.00.50

0.00.501.00.000.01.000.01.001.00.000.00.750.51.000.50.501.00.751.00.25

1.00.500.50.000.50.500.50.750.51.000.50.250.50.500.50.001.00.000.00.75

0.01.001.00.001.00.750.00.750.50.000.00.000.50.500.50.000.01.000.50.00

0.01.001.00.000.51.000.50.751.00.000.00.750.00.000.00.750.50.250.50.25

0.01.001.00.000.01.001.00.000.50.750.51.001.01.000.50.250.00.750.00.75

0.00.251.00.001.01.000.00.250.50.000.00.500.00.751.00.751.00.750.50.50

0.51.001.00.000.01.000.01.000.00.000.50.750.01.000.50.001.00.250.50.00

0.50.750.50.000.00.500.50.250.50.500.00.751.00.000.50.750.01.000.00.00

0.50.751.00.000.50.500.00.251.00.500.00.750.00.750.50.750.00.001.00.25

TABLE F2

SPSS PROGRAM USED TO GENERATE BAR CHARTS

The following computer program is a sample of programs used to generate Figures 2 through 6. The program uses the Statistical Package for the Social Sciences software.

```
RUN NAME     THESIS DATA ANALYSIS
FILE NAME    BAR CHARTS
PAGESIZE     60
VARIABLE LIST        GROUP,SCORE,COND
INPUT MEDIUM         TRAW.DAT
N OF CASES   UNKNOWN
INPUT FORMAT         FIXED(I1,F7.3,I1)
VALUE LABELS         GROUP(1)7 YEAR-OLDS (2)5 YEAR-OLDS (3)3
YEAR-OLDS/
RAW OUTPUT UNIT      PLOT.OUT
BARCHART     PLOT=MEAN(SCORE) WITH GROUP BY COND(LT 4)/
    FORMAT   FANCY,FRAME,GRID/
    TITLE='MEAN PERFORMANCE SCORES AS A FUNCTION'
          'OF AGE GROUP BY COMMON CONDITION'/
    BASE AXIS='AGE GROUP' LABELED '7' '5' '3'/
    SIDE AXIS='MEAN PERFORMANCE SCORE (correct)'/
```

```
    LEGEND TITLE='COMMON'/
    LEGEND LABELS='S-V-NP' 'S-V-Pt.-NP' 'S-V-NP-Pt.'/
    ORDER=7,1,13/
BARCHART    PLOT=MEAN(SCORE) WITH COND(LT 4) BY GROUP/
    FORMAT  FANCY,FRAME,GRID/
    TITLE='MEAN PERFORMANCE SCORES'
          'AS A FUNCTION OF CONDITION BY AGE GROUP'/
    BASE AXIS='CONDITION' LABELED '1' '2' '3'/
    SIDE AXIS='MEAN PERFORMANCE SCORE (correct)'/
    LEGEND TITLE='AGE GROUP'/
    LEGEND LABELS='7 year-olds' '5 year-olds' '3 year-olds'/
    ORDER=7,1,13/
BARCHART    PLOT=MEAN(SCORE) WITH GROUP BY COND(LT 4)/
    FORMAT  FANCY,FRAME,GRID/
    TITLE='MEAN PERFORMANCE SCORES'
          'AS A FUNCTION OF AGE GROUP BY CONDITION'/
    BASE AXIS='AGE GROUP' LABELED '7' '5' '3'/
    SIDE AXIS='MEAN PERFORMANCE SCORE (correct)'/
    LEGEND TITLE='COMMON CONDITION'/
    LEGEND LABELS='S-V-NP' 'S-V-Pt.-NP' 'S-V-NP-Pt.'/
    ORDER=7,1,13/
    COLORS=4/
FINISH
```

TABLE F3

RAW DATA FOR SPSS ANALYSES AND PLOTTING

The following represents the raw data base of the subjects. The data are formatted as follows: group number (one-digit number from 1 to 3); percent-correct score (6 three-digit numbers) for each of the six conditions entered sequentially in the order described in the text. A different subject's data is entered on each line.

1080100080090090100

1050080080020080090

1060100090080100090

1060080090060090070

1040080070050080070

1070070070070070080

1080080070090080060

1100090080070070080

1060080080060080070

1050090080080090090

1030080090020080060

1070090080040070080

2020080080020070080

204008007002008008 0

2040070070030060070

2050050050040040050

2060070070050060060

2040080080060080080

2040080080060070070

2050050060070050060

2060070070050050050

2060050060060050060

2040070080030040060

2030070060030060080

3060050020020070030

3010080090020070070

3010070040050060050

3040070060060040060

3040040060070040030

3030040030060050030

3060060060050050040

3060060060030070070

3060070050040030040

3050050050030050050

3020040040050050050

3040050030050060040

TABLE F4

RAW DATA USED FOR BAR CHARTS

The following is the raw data obtained in the present study formatted for the computer programs listed in Table F2. The data are entered as follows: Group number (a one-digit number from 1 to 3); condition number (a one-digit number from 1 to 6 [see Figure Legend for Figure 2]); percent correct score (a three-digit number). When the data are completed in sequenced input for subject #1, the data then are entered for subject #2, etc...

11 80

12100

13 80

14 90

15 90

16100

11 50

12 80

13 80

14 20

15 80

16 90

11 60

12100

13 90

14 80

15100

16 90

11 60

12 80

13 90

14 60

15 90

16 70

11 40

12 80

13 70

14 50

15 80

16 70

11 70

12 70

13 70

14 70

15 70

16 80

11 80

12 80

13 70

14 90

15 80

16 60

11100

12 90

13 80

14 70

15 70

16 80

11 60

12 80

13 80

14 60

15 80

16 70

11 50

12 90

13 80

14 80

15 90

16 90

11 30

12 80

13 90

14 20

15 80

16 60

11 70

12 90

13 80

14 40

15 70

16 80

21 20

22 80

23 80

24 20

25 70

26 80

21 40

22 80

23 70

24 20

25 80

26 80

21 40

22 70

23 70

24 30

25 60

26 70

21 50

22 50

23 50

24 40

25 40

26 50

21 60

22 70

23 70

24 50

25 60

26 60

21 40

22 80

23 80

24 60

25 80

26 80

21 40

22 80

23 80

24 60

25 70

26 70

21 50

22 50

23 60

24 70

25 50

26 60

21 60

22 70

23 70

24 50

25 50

26 50

21	60
22	50
23	60
24	60
25	50
26	60
21	40
22	70
23	80
24	30
25	40
26	60
21	30
22	70
23	60
24	30
25	60
26	80
31	60
32	50
33	20
34	20
35	70

36 30

31 10

32 80

33 90

34 20

35 70

36 70

31 10

32 70

33 40

34 50

35 60

36 50

31 40

32 70

33 60

34 60

35 40

36 60

31 40

32 40

33 60

34 70

35	40
36	30
31	30
32	40
33	30
34	60
35	50
36	30
31	60
32	60
33	60
34	50
35	50
36	40
31	60
32	60
33	60
34	30
35	70
36	70
31	60
32	70
33	50

34 40

35 30

36 40

31 50

32 50

33 50

34 30

35 50

36 50

31 20

32 40

33 40

34 50

35 50

36 50

31 40

32 50

33 30

34 50

35 60

36 40

TABLE F5

COMPUTER PROGRAM USED TO TRANSFORM DATA

The following is a computer program written in FORTRAN and used in the course of the present study to transform the format of the raw data listed in Table F3 into the format shown in Table F5. The transformation was necessitated by the different software packages used in the course of the analysis (Ullrich-Pitz versus SPSS).

```
      OPEN(UNIT=1,FILE='RAW.DAT',ACCESS='SEQIN')
      OPEN(UNIT=3,FILE='TRAW.DAT',ACCESS='SEQOUT')
2     FORMAT(I1,6F3.0)
3     FORMAT(I1,F7.3,'1')
4     FORMAT(I1,F7.3,'2')
5     FORMAT(I1,F7.3,'3')
6     FORMAT(I1,F7.3,'4')
7     FORMAT(I1,F7.3,'5')
      DO 1 I=1,36
      READ(1,2)G,S1,S2,S3,S4,S5,S6
      AV1=(S1+S4)/2.
      AV2=(S2+S5)/2.
      AV3=(S3+S6)/2.
```

```
      AV4=(S1+S2+S3)/3.
      AV5=(S4+S5+S6)/3.
      WRITE(3,3)G,AV1
      WRITE(3,4)G,AV2
      WRITE(3,5)G,AV3
      WRITE(3,6)G,AV4
      WRITE(3,7)G,AV5
    1 CONTINUE
      STOP
      END
```

TABLE F6

TRANSFORMED RAW DATA

1 85.0001
1 95.0002
1 90.0003
1 86.6674
1 93.3335
1 35.0001
1 80.0002
1 85.0003
1 70.0004
1 63.3335
1 70.0001
1100.0002
1 90.0003
1 83.3334
1 90.0005
1 60.0001
1 85.0002
1 80.0003
1 76.6674
1 73.3335

1 45.0001

1 80.0002

1 70.0003

1 63.3334

1 66.6675

1 70.0001

1 70.0002

1 75.0003

1 70.0004

1 73.3335

1 85.0001

1 80.0002

1 65.0003

1 76.6674

1 76.6675

1 85.0001

1 80.0002

1 80.0003

1 90.0004

1 73.3335

1 60.0001

1 80.0002

1 75.0003

1 73.3334

1 70.0005

1 65.0001

1 90.0002

1 85.0003

1 73.3334

1 86.6675

1 25.0001

1 80.0002

1 75.0003

1 66.6674

1 53.3335

1 55.0001

1 80.0002

1 80.0003

1 80.0004

1 63.3335

2 20.0001

2 75.0002

2 80.0003

2 60.0004

2 56.6675

2 30.0001

2 80.0002

2 75.0003

2 63.3334

2 60.0005

2 35.0001

2 65.0002

2 70.0003

2 60.0004

2 53.3335

2 45.0001

2 45.0002

2 50.0003

2 50.0004

2 43.3335

2 55.0001

2 65.0002

2 65.0003

2 66.6674

2 56.6675

2 50.0001

2 80.0002

2 80.0003

2 66.6674

2 73.3335

2 50.0001

2 75.0002

2 75.0003

2 66.6674

2 66.6675

2 60.0001

2 50.0002

2 60.0003

2 53.3334

2 60.0005

2 55.0001

2 60.0002

2 60.0003

2 66.6674

2 50.0005

2 60.0001

2 50.0002

2 60.0003

2 56.6674

2 56.6675

2 35.0001

2 55.0002

2 70.0003

2 63.3334

2 43.3335

2 30.0001

2 65.0002

2 70.0003

2 53.3334

2 56.6675

3 40.0001

3 60.0002

3 25.0003

3 43.3334

3 40.0005

3 15.0001

3 75.0002

3 80.0003

3 60.0004

3 53.3335

3 30.0001

3 65.0002

3 45.0003

3 40.0004

3 53.3335

3 50.0001

3 55.0002

3 60.0003

3 56.6674

3 53.3335

3 55.0001

3 40.0002

3 45.0003

3 46.6674

3 46.6675

3 45.0001

3 45.0002

3 30.0003

3 33.3334

3 46.6675

3 55.0001

3 55.0002

3 50.0003

3 60.0004

3 46.6675

3 45.0001

3 65.0002

3 65.0003

3 60.0004

3 56.6675

3 50.0001

3 50.0002

3 45.0003

3 60.0004

3 36.6675

3 40.0001

3 50.0002

3 50.0003

3 50.0004

3 43.3335

3 35.0001

3 45.0002

3 45.0003

3 33.3334

3 50.0005

3 45.0001

3 55.0002

3 35.0003

3 40.0004

3 50.0005