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City University of New York PH.D. 1982

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GRAMMATICAL COMPLEXITY AS A PREDICTOR OF L2 PERFORMANCE

by

MARTIN R. GITTERMAN

A dissertation submitted to the Graduate Faculty in Linguistics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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May 11, 1982
date

Chairman of Examining Committee

11 May 1982
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Abstract

GRAMMATICAL COMPLEXITY AS A PREDICTOR OF L2 PERFORMANCE

by

Martin R. Gitterman

Adviser: Professor Donald Byrd

This study is concerned with the role of grammatical complexity in determining the relative difficulty of a series of related sentential structures among L2 learners of English. It is hypothesized that both children and adults learning a second language will demonstrate consistent orders of difficulty and that the relative difficulty of the target structures is predictable by a measure of grammatical complexity. Assessment of grammatical complexity includes analyses of transformational variants and variation from the basic form (S-V-O). The target structures include sentences containing passive and to-dative, both alone and in combination.

The results of the study reveal consistent difficulty orders for both children and adults in both comprehension and production. Furthermore, none of the predictions based on grammatical complexity were disconfirmed. The ability to comprehend is shown to exceed the ability to produce, with

some indication that the gap widens when more complex structures are involved. Adults show somewhat better performance in the production of passive sentences. No significant child-adult differences, however, are revealed in the comprehension of any of the target structures. In addition, no significant differences are found in the comprehension of reversible and nonreversible passives for either children or adults.

While it is argued that grammatical complexity seems to be the major determinant of the relative difficulty of the target structures, there seems to be support for a joint grammatical-cognitive model of second language difficulty.

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I am deeply grateful to the staff at the United Nations International School and at the International English Language Institute of Hunter College for allowing me to test subjects at their schools. Of course, a special expression of thanks goes to the subjects who participated in the study.

As I complete the requirements for the Ph.D. degree, I think back to three former professors of mine at Herbert H. Lehman College who encouraged me to pursue doctoral studies: Joseph DeVito, Norma Stegmaier and Cj Stevens. I am certainly pleased that I followed their advice and wish to express my thanks.

Finally, I want to thank Anna Veltfort who drew the pictures used in this study and Edna Ray who typed the final version of this thesis.

Prologue

A major area of investigation in second language learning has centered on the relative difficulty of various structures in the target language. Some have believed that the relative difficulty of various structures in L2 could be predicted by doing a contrastive analysis of L1 and L2. Areas of similarity, revealed by such an analysis, in L1 and L2, it is claimed, would pose less difficulty for the L2 learner. Numerous studies revealing similar difficulty orders of L2 structures (e.g., Dulay and Burt (1973, 1974), Bailey, Madden and Krashen (1974)) have caused many researchers to speculate that the majority of errors in the target language are intralingual and, consequently, not predictable by a contrastive analysis.

This study examines the relative difficulty of six target structures by L2 children and adults and includes an assessment of both comprehension and production. The target structures examined are:

1.	Active (simple)	The man is hitting the dog.
2.	Passive (simple)	The dog is being hit by the man.
3.	Active (to)	The teacher is giving the book to the student.
4.	Active (to-dative)	The teacher is giving the student the book.

5.	Passive (to)	The book is being given to the student by the teacher.
6.	Passive (to-dative)	The student is being given the book by the teacher.

It is predicted that both L2 children and adults will share a common difficulty order for the target structures in both comprehension and production and that those structures which are grammatically more complex will be more difficult. Since no claim can be made for the psychological reality of transformations, an assessment of grammatical complexity is supported independently based on the degree of departure from the basic form (S-V-0). Passives and to-datives alone count as one departure and to-dative passive sentences count as two departures. Thus, while a judgment of the grammatical complexity of the structures in this study in terms of a transformational analysis or, alternatively, based on variation from the basic form leads to the same conclusions, the validity of the assessment of complexity is not dependent on the psychological reality of transformations.

A confirmation of the expectations stated above regarding subject performance would provide strong support for the developmental nature of second language learning. The validity of such a conclusion would be that much stronger because the subjects in the study include speakers from a

broad range of native languages. Since an objective assessment of L2 performance requires one to examine numerous determinants (e.g., length, frequency of occurrence), a discussion of such factors is also included.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

1.1. Classification of L2 Literature

The body of literature dealing with second language acquisition is extremely broad. Not only is the quantity great, but the diversity of aims of published works, which is largely a reflection of readers with diverse interests, is quite apparent.

Much of the work in second language acquisition is concerned with pedagogy. The aim of such work is to improve teaching. Such work, in addition to including aspects that are related specifically to second language teaching, may very well contain principles of effective teaching in general. For example, Finocchiaro (1974) makes the following suggestion for maintaining student interest:

> Keep the pace of the lesson very brisk. Give the students the feeling that they're moving ahead all the time. When a student cannot answer a question, give the correct answer quickly or ask a more able student to give it. (Give a student reasonable time to answer; then move on to someone else and come back to the first student a little later in the lesson.) (p. 141)[1]

The applicability of this suggestion is, without doubt, not limited to the L2 classroom.

While much of the work dealing with pedagogy concentrates on very concrete guidelines for L2 teaching

(designing drills, testing, etc.), one may find, in addition, a discussion of the linguistic theory on which the suggested methodology is based. The quantity and degree of complexity of the discussion of linguistic theory will be based on whether the work is intended primarily for teachers (whose major concern would be how to present the material) or linguists (whose concern might be to judge the validity of a link between a particular theory and a proposed methodology).[2,3] The connection between theory and L2 methodology has been widely discussed. Anthony and Norris (1972) say that a method exists "only when pragmatically acceptable techniques are supported by theoretical assumptions" (p. 39). When our theoretical assumptions change so do our recommended methodologies.

> When language is seen as a closed system of contrasting patterns of phonology and syntax, a method which aims to teach aural-oral mastery of a finite set of sentence patterns enjoys theoretical support. But if we accept the view that language is a small set of basic relationships capable of infinite variation through expansion and variation, we will feel constrained to adjust our methods to fit these new "facts" of linguistic theory. (p. 40)[4]

Similarly, Finocchiaro (1974) provides a brief description of how various theoretical beliefs have resulted in methodological changes. It should be pointed out that while there has been much written about the possible relationship of linguistic theory to second language methodology, it is not my goal to discuss that relationship here in a critical manner. It is being discussed here solely

to illustrate an area that has been examined in the L2 literature.[5]

A great deal of work in L2 falls within the area of experimental applied linguistics research. The use of the term applied linguistics has been the subject of much discussion and debate. There is by no means a universally accepted definition of exactly what it encompasses. Kaplan (1980a), in a book devoted to presenting viewpoints of numerous individuals in the field on what applied linguistics is, states that the field of applied linguistics "remains somewhat fuzzy" (p. 12). Some of the presentations in his work help illustrate the complexity of the problem. Consider, for example, the following:

> It seems to me more appropriate to view applied linguistics as: That portion of the body of accumulated knowledge called linguistics which the practitioners of a different discipline find useful in doing their work. It is thus a part of linguistics, but one which varies, depending on the needs of the other disciplines to which it is applied. . . . But to say one studies applied linguistics in isolation, i.e. without considering what it is to be applied to, is merely to say that one is studying linguistics. (Anthony, pp. 4-5)

> Applied linguistics is a set of related activities or techniques mediating between the various theoretical accounts of human language on the one hand and the practical activities of language teaching on the other. (Corder, p. 8)

> Applied linguistics is the scientific-educational field dealing with the application of concepts, principles, findings, concrete results of linguistic description and/or research to the identification and solution of educational and sociocultural problems of a linguistic nature. (Gomes de Matos, p. 9)

> Part of 'applied linguistics' is the creation of materials and methods for second language teaching. Research in applied linguistics consists of comparisons of materials and methods, with student progress in L2 performance as the dependent variable (measure). (Krashen, p. 13)

Krashen says, in addition, that theoretical linguistics includes, but is not limited to, formal linguistics, historical linguistics, sociolinguistics, and psycholinguistics (which includes the study of L1, L2, and neurolinguistics). He points out that while theoretical linguistics may be of help to the applied linguist that the development of materials and methods does not have to be based on theory. The proper materials and methods are those which accomplish their aim.

Oller aims at a definition of applied linguistics by discussing those areas which are of interest to the applied linguist. In addition to areas related to L2 acquisition (such as the study of 'developmental' and 'transference errors'), Oller includes such things as "information retrieval, artificial intelligence systems, computer simulation of linguistic processes, voice typewriters, (and) automatic readers. . . ." (p. 15).

> No doubt there are many other applications of linguistics. Probably all of the various interests are tied together by the unifying interest of applied linguistics in how people contrast and modify grammatical systems that enable them to use language for all its varied purposes. (Oller, p. 15)

My reference to works in experimental applied linguistics should perhaps be discussed further in view of

the lack of a uniform understanding about what applied linguistics is. I am using the term to refer to experimental studies in L2 which do not necessarily have any automatic implications for teaching a second language. Perhaps, then, it may be better to classify such studies as theoretical. The use of such a classification might be more appropriate since one might feel less compelled to utilize the results to prescribe appropriate methods for presenting material to the L2 learner in the classroom.[6] Regardless of the appropriate terminology, many of these experimental works do not discuss practical implications.[7] In some studies possible applications are, in fact, considered. Bailey, Madden and Krashen (1974), who found a similar difficulty order for a set of morphemes among L2 adults, suggest that a syllabus for teaching L2 might order content for presentation to the students in the same order.[8] Dulay and Burt (1973) found a similar difficulty order of morphemes for L2 children. They suggest that teachers should, therefore, stimulate natural communication.

While a thorough overview of the L2 literature and an attempt to classify the works with appropriate terminology might be an interesting exercise, suffice it to say that the areas of investigation are extremely diversified and there is by no means agreement on the use of terminology used to represent these areas.

The work which is the subject of this thesis falls within the area that I have called experimental applied linguistics. I will present, therefore, no lengthy guidelines for second language teaching. I will, however, discuss possible implications of the findings for teaching a second language.

In the next section I will review the literature that is relevant to this study.

1.2. Review of the Literature

Error analysis has been a major area of investigation in many studies in applied linguistics. Many recent studies have demonstrated that errors made by L2 students are not predictable by a contrastive analysis of the target language and the native language of the student.[9] That is, many errors made by L2 students are developmental: L2 students, it is claimed, tend to acquire a second language in a similar pattern, regardless of their L1. It is this area that I would like to investigate.

Brown (1973), in a longitudinal study of three L1 subjects, found a similar order of acquisition of the fourteen morphemes he studied. deVilliers and deVilliers (1973), in a cross-sectional study, found results that were consistent with those found by Brown. Their study also examined L1 subjects. The similar findings in the two types of studies, longitudinal and cross-sectional, have caused

many to believe that the difficulty order resulting from a cross-sectional study is, in fact, also an acquisition order. This conclusion, however, is not universally accepted. Rosansky (1976) raises serious doubts about claiming that the results of cross-sectional studies represent a true order of acquisition. Her claim, however, is disputed by Krashen (1977a) who argues that when there exists a sufficiently large number of occasions for the use of particular structures that cross-sectional and longitudinal studies have reached very similar conclusions.[10] Nevertheless, the majority of L2 studies have been cross-sectional in nature. It should also be pointed out that there is not universal agreement on the appropriateness of studies which attempt to determine a rank ordering of structures. Huebner (1979), for example, claims that such studies may obscure interrelationships that exist in the interlanguage. We learn little from these studies about "the nature and paths of change in the interlanguage" (p. 25). It is argued that the conclusions one draws about the nature of second language learning are dependent largely on the framework within which it is examined. Before reviewing the L2 literature, it is important to consider certain other L1 studies which are crucial in setting the framework for analyzing the L2 data.

Chomsky (1969) tested children for comprehension of a number of grammatical structures. She found a similar order

of acquisition for the structures examined. She states her findings as follows:

> By tracing the child's orderly progress in the acquisition of a segment of his language, we are able to observe, for a set of related structures, considerable variation in rate of acquisition in different children together with a common, shared order of acquisition. (p. 121)

In another study of L1 children, Fraser, Bellugi and Brown (1963) analyzed both comprehension and production. They tested production in two ways. The first test of production was imitation. The second test of productive ability involved having each subject name a picture when the examiner pointed to it. The examiner had named the pictures before pointing to them so that the subjects were repeating structures that they had previously heard. In the comprehension test, the subjects had to point to a picture that illustrated the sentence provided by the examiner. Fraser, Bellugi and Brown found a similar difficulty order in all the tests. In addition, the subjects did best in the imitation test and found the comprehension test easier than the other test of production. The authors argue that the fact that subjects did best on the imitation test can be easily explained. Imitation is a "perceptual-motor skill" and subjects are, therefore, able to repeat things that they do not understand. Most researchers agree that language learners comprehend more than they produce and Fraser, Bellugi and Brown fully expected the subjects to do better on the comprehension test than on the second test of production,

which they did. It should be pointed out that since neither production task approached spontaneous speech that one must be cautious about drawing conclusions about the true productive ability of the subjects on the basis of these findings. The use of imitation tests to examine L1 or L2 language development has been widely discussed in the literature.

Slobin and Welsh (1967), for example, argue that imitation tests can provide useful insights into a language acquirer's productive ability. In their L1 study, many of the sentences provided for imitation were repeated in the grammar of the child. They found, however, certain inconsistencies. There were, for example, some sentences that the subject was able to produce in natural speech but was unable to imitate. Tarone (1974) refers to a number of studies which demonstrate that imitation can be a useful device for studying the productive ability of the language learner. Naiman (1974), for example, working with L2 subjects (learning French), found that in imitating the subjects demonstrated an understanding of the stimulus sentences but repeated them in a manner that was consistent with their spontaneous speech. Similarly, Labov (1969), working with speakers of Black English, found that subjects imitated sentences by rephrasing them to conform with the syntactic rules of Black English. Tarone provides the following illustration from Labov's data:

> E: I asked Alvin if he knows how to play basketball.
> S: I ax Alvin do he know how to play basketball. (p. 225)

Tarone reports on similar language behavior in L1 children (standard English):

> Ervin-Tripp (1970) and Menyuk (1969) found that children learning their first language who are given an elicited imitation task seem to be able to correctly perceive the meaning of a stimulus sentence which they cannot yet produce, and 'translate' such a sentence into their own production system in responding to the imitation task. (p. 225)

A review of these findings leads one to believe that imitation is a reasonable way to test productive ability. There are, however, certain limitations. If one were to make a judgment about differences in comprehension and production (tested solely by imitation) based solely on the conclusions of Fraser, Bellugi and Brown, one would have to conclude that production precedes comprehension, a highly unlikely occurrence. Ingram (1974), who claims that it is a linguistic universal that comprehension precedes production, argues that researchers who have arrived at a different conclusion have misunderstood exactly what it means to assert that comprehension precedes production. One misunderstanding is to assume that the claim that comprehension precedes production means that "the gap between comprehension and production is systematically long and predictable" (p. 329). It is perhaps best to conclude the discussion of the validity of imitation as an accurate means of measuring productive

ability with a reference to Ferguson and Slobin (1973), who state:

> Thus one cannot conclude with Fraser, Bellugi and Brown, that 'imitation is a perceptual-motor skill not dependent on comprehension.' This is true only of some imitations. Children may rote imitate sentences without understanding-but within clearly definable limits of length and complexity. (p. 464)[11]

I would agree that imitation is a valid means of investigating productive ability. However, because of its limitations, one should perhaps investigate other means in addition to, or instead of, imitation in studying oral production. All researchers agree that spontaneous speech is the best test of productive ability. This is really true by definition. Resorting to other means of testing, such as imitation, is sometimes necessitated by research considerations, such as trying to force subjects to use certain structures.[12]

In short, while L1 researchers have used different elicitation procedures in different types of studies (cross-sectional vs. longitudinal) to test different aspects of language development (comprehension vs. production), where the focus has been on various structures (morphemes or more expanded grammatical structures), one thing seems quite clear. Children seem to have a similar order of acquisition of the grammatical structures of their native language.[13] It was only natural for L2 researchers to determine how similar the process of acquiring a second language is to that of

acquiring one's native language. It is to that body of literature that I will now turn.

Shortly after Brown's findings for L1 children, Dulay and Burt (1973) conducted a cross-sectional study of L2 children in an attempt to determine whether there was a similar difficulty order for the morphemes studied. The subjects were all native speakers of Spanish. One group consisted of Chicano children, the second group was made up of Mexican children, and the last group consisted of Puerto Rican children. The groups were not similar in terms of amount of English exposure, nor did the groups have equal proficiency in English. The groups were very different from each other, in other words, except for the fact that they shared a common native language. The data were elicited by using the Bilingual Syntax Measure (BSM). The test consists of a series of cartoon type pictures about which the examiner asks a series of questions aimed at eliciting the morphemes being investigated.[14] Dulay and Burt found a common order of difficulty for the three groups tested. The order, however, was not the same as the L1 order. Dulay and Burt argue that "this pilot study supplies independent and additional evidence of the creative construction process in L2 acquisition" (p. 256).[15] Dulay and Burt (1974), in a similar study, analyzed both Spanish and Chinese native speakers and found a similar difficulty order for the two groups. The subjects, as in the previous study, were children. We have,

therefore, additional support for a common difficulty order for L2 children. Degree of exposure to English, level of English proficiency and native language do not seem to exert any significant influence on the L2 difficulty order. In an attempt to see if these findings could be extended to L2 adults, Bailey, Madden and Krashen (1974) studied adults, also using the BSM. The subjects in their study represented a very diversified group of native languages. They found that these adults had a similar order of difficulty of the morphemes studied.[16] The results also revealed that the adult order was similar to the order found by Dulay and Burt for L2 children. We have, therefore, additional support for the developmental nature of second language acquisition. According to Bailey, Madden and Krashen:

> While casual observation affirms that errors due to mother tongue interference do occur in second language learning in adults, our data imply that a major source of errors is intra- rather than inter-lingual, and are due to the use of universal language processing strategies. (p. 242)

Additional support for the developmental nature of second language acquisition is provided by Fathman (1975a). She tested children who were speakers of different native languages to determine the difficulty order of twenty grammatical structures. The test was one of productive ability and the structures examined included both morphemes and more complex syntactic structures. There were three occasions for the use of each structure. The advisability of using a testing instrument with such a limited number of

occasions (only three) for supplying each of the structures is, I believe, open to question. Nevertheless, Fathman found that the difficulty order for the younger children was similar to that found for older children. In a subsequent study, (Fathman, 1975b), in which she used the same testing instrument, it was found that L2 children whose native language was Korean shared a common difficulty order with L2 children who were native speakers of Spanish. Testing L2 adults, Krashen, Sferlazza, Feldman, and Fathman (1976), using the methodology developed by Fathman, found a common difficulty order for the various language groups tested. In addition, the results were similar to those found by Fathman in studying L2 children. Krashen et al. conclude as follows:

> The main findings of this study are that adult and child ESL learners obtain similar difficulty orderings in a spoken English language proficiency test, and that this order is similar for learners with different first languages and for learners exposed to different linguistic environments. (pp. 150-151)

While the findings of the studies discussed thus far have yielded quite consistent results, there have been others that have raised some doubts about these findings. Larsen-Freeman (1975), for example, is just such a case. Larsen-Freeman tested adult ESL students representing various native languages. The study was designed to determine the difficulty order of a set of morphemes. The test consisted of five language tasks. Data were elicited by means of the BSM and imitation. Another task consisted of a listening

test in which the subjects had to choose which of three sentences read to them correctly described a picture. In a reading task the subjects were presented with a story in which they had to determine which of three variants of each sentence was correct. In the final task the subjects were required to fill in a series of blank spaces with the appropriate morphemes. The same story was used in both the reading and writing tasks. Larsen-Freeman found that only on the BSM and imitation tasks did the subjects demonstrate a difficulty order of morphemes consistent with those of previous studies. While the results seem, at first, to provide significant counter-evidence to the findings of previous studies, an attempt has been made to explain the seemingly contradictory findings.

Krashen (1977b) discusses the findings of Larsen-Freeman within the framework of his monitor model. Krashen makes a distinction between acquiring a language and learning a language. Language acquisition is that which takes place in situations where there is natural communication. It is the process by which children gain mastery of their native language. It is not a conscious process. Language learning, on the other hand, is a conscious process where learners develop a knowledge of the rules of the language. Krashen argues that the learned system can act as a monitor to correct the output generated by the acquired system in certain situations for the L2 subject. Thus, with respect to

the findings of Larsen-Freeman, Krashen says, "It is interesting to note that the Imitation test, which probably allowed the least monitoring time of all the supplementary tests, showed the most consistency in rank order across subjects, next to the BSM" (p. 155, fn. 1).[17]

While most of the early morpheme studies tended to reach consistent findings, researchers have been unable to determine the factor(s) that can predict a particular difficulty order. Why is it that subjects tend to perform much better on certain morphemes than they do on others? Larsen-Freeman (1978) addresses this issue in a fairly comprehensive fashion. She examines a number of possible determinants of the common L2 difficulty order. She argues that neither grammatical complexity nor semantic complexity (measured by means of a methodology developed by Brown (1973)) can account for the order since these measures of complexity were able to account for the order of Brown's L1 children, an order which is not the same as the L2 order.[18] Phonological complexity does not seem to be a significant factor "since morphemes with the same allomorphs are not clustered together, but possess diverse ranks in the morpheme sequence" (p. 374). Since Bailey, Madden and Krashen (1974) found that subjects from different classes and using different textbooks revealed a common difficulty order, an explanation for the order based on these factors seems to offer little hope. Perhaps, then, attitude or motivation

might be a factor. It is, however, considered unlikely since the subjects studied by deVilliers (1974), who were aphasics, had a difficulty order consistent with that found in other L2 studies. Larsen-Freeman argues, "While it is not impossible that aphasic adults and adult second language learners undergo a similar affective experience in speaking English, it is difficult to imagine that there is sufficient commonality between the two groups to account for almost identical morpheme orders" (p. 375). Perceptual saliency is also ruled out. The copula, for example, with low perceptual saliency, is one of the least difficult morphemes in the L2 order. Larsen-Freeman also rules out cognitive development and says there is insufficient information about the "operating principles" discussed in Slobin (1971) to offer a reasonable account for the L2 order. Larsen-Freeman did, however, find a significant correlation between the frequency of use of the various grammatical morphemes by the parents of the subjects in Brown (1973) and their difficulty in the L2 order. She speculates that frequency of use by native speakers might be the major factor in determining the L2 morpheme order.[19] She concludes that, "It would appear that second language researchers should pay more attention to the input to which the learner is exposed than has previously been afforded" (p. 379).

Dulay and Burt (1980) provide, however, counter-evidence of this claim. They refer, for example, to a study

conducted by Wagner-Gough and Hatch (1975) in which an L2 child was exposed to two types of questions equally and was able to produce only one of them. Dulay and Burt argue, in addition, that because frequency of occurrence correlates with a particular order is no reason to assume that there is a causal relationship. They believe that while frequency of input may be a factor in determining a particular order, "that its effects remain largely unspecified in the L2 research literature to date" (p. 82).

Thus, in these early studies, in which the focus has been largely on grammatical morphemes, there seems to be strong support for the developmental nature of second language acquisition. It appears, in addition, that both L2 children and adults seem to go through very similar stages in acquiring a second language. Researchers, however, have been unable to determine with any degree of certainty the determinant(s) of the very high degree of consistency that exists in the L2 orders revealed in the various studies. There is, it seems, a greater degree of certainty about what factors are not primarily responsible for the similarities. Even here, however, researchers have not been willing to eliminate these factors as having some role, however minimal.

Fortunately, in an attempt to get a greater understanding of the L2 acquisition process, some researchers have expanded their focus of investigation to areas beyond the

study of morphemes. Anderson (1978), for example, with this goal in mind, studied the productive ability of adults who were all native speakers of Spanish. The subjects had various degrees of exposure to English. The area that she chose to study was sentential complementation. Her reasons for studying this segment of grammar are stated as follows:

> In traditional grammar, sentential complements, which include gerunds, infinitives and that clauses, were viewed as being unrelated grammatically. Generative-transformational grammar, on the other hand, views sentential complementation as a uniform syntactic phenomenon whose various surface forms are all derived from the same underlying grammatical structure. The fact that deep structure can be held constant while surface forms are varied makes complementation a potentially revealing area for a syntax acquisition study. (p. 92)

The test consisted of a multiple-choice section as well as a translation exercise. The results demonstrated, as in the morpheme studies, a similar difficulty order. Anderson analyzed her results, following the analysis presented in Lakoff (1968), and found that derivational complexity was not a good predictor of difficulty order. The structures whose derivations required the greatest number of transformations were not, in fact, the most difficult for the subjects in this study. Using the principle of cumulative complexity, Anderson found that the two structures in her investigation that were analyzable by this method were ordered with respect to each other in a manner consistent with what was predicted by this measure of complexity. Thus, as Anderson reports, structures with the infinitive (e.g., I want him to go) were

found to be easier than structures requiring to-deletion (e.g., I made him go). The use of cumulative complexity (see Brown, 1973) was developed because a simple measure of derivational complexity assumes that all transformations are equally complex.[20] Anderson reports, however, that since only two structures in the study were analyzable in terms of cumulative complexity that its role as a determinant of the difficulty order is uncertain. Anderson also examined transfer from L1 and length as possible determinants of the L2 order.[21] While both of these factors were able to account for some of the data, neither one was able to fully explain the difficulty order of the subjects.

Gass (1980) examined the acquisition of relative clauses among L2 adults of various native languages. Three tests were administered: One test involved making judgments of grammaticality, the second required the subjects to write a composition, and, finally, there was a sentence-combining task. She argues that universal factors seem to play the major role in explaining the data generated by the tasks in her study. Her analysis in terms of universality is based on the accessibility hierarchy outlined in Keenan and Comrie (1977). She indicates, however, that characteristics of L1, as well as L2 (English in this study), can account for some of the data. She argues for a "multifactor approach" to explain L2 performance.

In a related article, Gass and Ard (1980) compare the results of a study done on relative clause acquisition by L1 children (Sheldon, 1974) to those found in testing L2 adults. The data were analyzed in terms of the predictions based on the accessibility hierarchy. The hierarchy is shown below in Table 1.

As stated by Gass and Ard, "the interpretation of the hierarchy is such that if a language allows relativization out of a position, it also allows relativization out of all positions higher on the hierarchy (listed to the left of that position)" (p. 446). Gass and Ard assume as true the proposal by Keenan (1975) that relativization becomes increasingly more difficult as one moves down the hierarchy. The predictions of relative difficulty were not confirmed by the acquisition order of the L1 subjects. The accessibility hierarchy was, however, a good predictor of the L2 difficulty order. The findings on relative clauses seem to be consistent with the findings of the various morpheme studies in the sense that there are differences in the L1 and L2 orderings which appear to require a search for different determinants to account for this variation.[22] There are, however, certain research findings which point to greater similarities in L1 and L2 orderings than reported thus far.

d'Anglejan and Tucker (1975), for example, replicated the study done by Chomsky (1969) using as subjects adult learners of ESL whose native language was French. The

Table 1

Accessibility Hierarchy

SU > DO > IO > OBL > GEN > OCOMP

Explanation of Symbols:

SU = subject

DO = direct object

IO = indirect object

OBL = oblique (in English, this is equivalent to object of preposition)

GEN = genitive

OCOMP = object of comparative

> = more accessible than

SOURCE: Gass and Ard (1980), p. 446.

subjects were tested for comprehension of contrasts such as John is eager to see and John is easy to see in one of the tasks. Sentences of the first type were shown to pose less difficulty for the subjects. After an analysis of all the tasks, d'Anglejan and Tucker conclude:

> We have studied the sequence of acquisition by our adult second language learners of a set of complex linguistic structures which are acquired by most native speakers of English between the ages of 5 and 10 in a stable, predictable sequence. We have found a similar developmental pattern for the acquisition of these structures in our second language learners. (p. 291)

The authors speculate that linguistic complexity might be a determinant of the relative difficulty of the structures.

Similar L1/L2 sequencing is reported, in addition, by Morsbach (1981). In a study of Japanese and German children learning English as a second language, it was discovered, first, that the two groups of subjects shared a common difficulty order for the 15 structures studied. The subjects were studied for skills in comprehension with a testing instrument that required them to point to the picture that they thought correctly described each of the sentences read by the examiner. The same test was administered to L1 children in order to compare the L1 and L2 orders. All three orders (L1, L2 (German children), and L2 (Japanese children)) were similar. With respect to the ranking of specific structures Morsbach reports, "For all three groups the following three grammatical structures were the easiest to understand: simply intransitive, comparative, and simple

negative. And the most difficult ones were: past tense, passive, future tense and harder prepositions" (p. 186).[23] In spite of some group differences, Morsbach concludes, "It seems that in both L1 and L2 learning children follow a common route from the acquisition of more simple to more complex structures" (p. 188).

A review of the experimental work related to the developmental nature of second language acquisition seems, therefore, to indicate that L2 children and adults seem to process the target language in ways that are quite similar to the process used by L1 children. This has been demonstrated by the results of numerous studies, dealing with both morphemes and more expanded syntactic structures, which show that the L2 subjects have a similar difficulty order for the structures examined. Interference, it appears, does not seem to be a major determinant of the L2 order since subjects representing very diverse native languages tend to reveal a common difficulty order. As has been shown, researchers have not found other factors (e.g., textbooks) to be good predictors of the L2 difficulty order. The problem is made somewhat more complicated by results indicating similar L1 and L2 difficulty orders in certain studies and others in which the orders are not common. Finally, many findings seem to indicate that there may be multiple determinants.

One thing, however, is certain. These studies, while they do provide some answers to important questions, raise

many questions that can only be answered by conducting additional research. Discussing the rationale for my study, which I hope will provide some of these answers, is the subject of the next chapter.

Footnotes: Chapter 1

[1]Student-student correction is a very effective teaching device. While a discussion of those situations in which the teacher might provide the correct response as an alternative is quite interesting, it will not be taken up here since it is not crucial to the issue at hand.

[2]See Ingram (1980) for an expanded discussion of this point.

[3]Obviously, both types of work are of concern to the linguist who is interested in teaching. In addition, Paulston and Bruder (1976), in a book which they state is primarily for teachers, argue that teachers should also acquire some knowledge about theory. Paulston and Bruder, incidentally, do not base their recommendations for effective teaching on any theory. They indicate that their recommendations for teaching ESL are based on the fact that they have worked effectively.

[4]The authors indicate that there are certain characteristics common to all methods. Whatever method we use "must include, as does all teaching, the selection of materials to be taught, the gradation of those materials, their presentation and pedagogical implementation to induce learning" (p. 41). Also included is a discussion of method as it relates to the possible goals of the language student: to develop facility in one or more of the four basic language skills (listening, speaking, reading, and writing); to develop an appreciation and understanding of artistic (literary) language; or to gain a knowledge of linguistics. Thus, it is asserted, it is important to analyze a particular method to determine whether its implementation will lead to the intended result.

[5]One might wish to refer to Lester (1970) for some interesting articles on this point.

[6]Perhaps, as is suggested in Krashen's discussion of the definition of applied linguistics, we should classify these studies as psycholinguistics (a branch of theoretical linguistics) and not feel bound to discuss pedagogical implications. See, in addition, Ritchie (1978), Kaplan (1980b) and Spolsky (1980).

[7]This does not mean, of course, that they either do, or do not, have practical implications.

[8]It would seem that the finding of a similar order of difficulty would be, according to Krashen, theoretical linguistics and the suggestion about a proposed order in a syllabus within the domain of applied linguistics. According to Krashen, "Theoretical linguistics may contribute to applied linguistics in this way. The construction of materials and methods may attempt to be consistent with theories and models of second language acquisition and performance developed by psycholinguistics" (p. 13).

[9]A thorough examination of interlanguage, within the framework of contrastive analysis, would examine the possibility of both positive and negative transfer from L1.

[10]At least ten obligatory occasions for each morpheme studied was used as a guideline.

[11]This would, undoubtedly, apply to L2 children and adults also.

[12]I do not use imitation as an elicitation device in this study. More will be said about what I consider to be a more appropriate measure of examining productive skills later.

[13]In the cross-sectional studies we would say <u>difficulty order</u> rather than <u>acquisition order</u>. Thus, the order revealed when subjects are tested at a single point in time (e.g., Bailey, Madden and Krashen, 1974) is called a difficulty order. The order revealed by a longitudinal study (e.g., Brown, 1973), on the other hand, is known as an order of acquisition.

[14]Rosansky (1976) and Porter (1977) express doubts about the validity of the Bilingual Syntax Measure as a testing instrument. See Krashen (1977a, 1978), however, for a defense of the BSM.

[15]The reason that Dulay and Burt claim "additional evidence" is that in a previous analysis of L2 errors of children (reported in the same article) they found that the overwhelming majority of errors were developmental, not based on interference from the native language.

[16]deVilliers (1974) studied adult non-fluent aphasics and found a difficulty order that was similar to the L2 order found in the studies discussed here.

[17]See, in addition, Krashen (1980) for further discussion of the conditions required for monitor use. It should be pointed out that the monitor model has been the

subject of some criticism. McLaughlin (1978) presents what he considers certain deficiencies in the model. For a response to McLaughlin, see Krashen (1979).

[18]This point will be discussed at greater length later in the thesis.

[19]Frequency of parental use was not considered a good predictor of the L1 order in Brown's study.

[20]A fuller discussion of cumulative complexity appears later.

[21]The reference to L2 order in second language research is intended to mean an ordering of a set of structures in the target language. It is not a reference to an ordering of rules.

[22]Gass and Ard consider cognitive differences in the children and adults to be a reasonable explanation for the differences.

[23]In her list of the 15 structures studied, along with sample sentences, one finds that she separates simple prepositions (e.g., <u>in</u>) from harder prepositions (e.g., <u>in front of</u>).

Chapter 2

RATIONALE FOR THE STUDY

The majority of studies on language learning have concentrated on either production or comprehension, but not both. This is not, in my opinion, a weakness of the studies but does, however, lead one to wonder how the results in comprehension would compare to those in production in any given study.

Corder (1973), in discussing comprehension and production, says that very little is known about "the qualitative or quantitative relations between them" (p. 262). Some of the researchers discussed in the first chapter have expressed an awareness of this limitation (not weakness) in the studies. For example, d'Anglejan and Tucker (1975) conclude their study on the comprehension of complex syntactic structures by stating, "However, our data do not permit us to extrapolate these findings to any prediction about the acquisition of productive skills in the second language" (p. 293). Morsbach (1981), whose study deals with comprehension, indicates that she studied comprehension because most of the earlier studies were based on productive skills. Thus, she is indicating, in my opinion, the need for researchers to broaden their area of investigation. It seems

to me that, if possible, a study should include an examination of both production and comprehension.

Furthermore, since the research studies reviewed in the previous chapter reveal a high degree of similarity between L2 children and L2 adults, it seems reasonable to me that future research should include subjects of both age groups to provide further confirmation of this apparent similarity or to reveal areas where the similarities might not be as striking as previously reported. If the area of investigation is one in which data from L1 children are also available, or can be readily examined, the significance of such research would be that much greater. For example, the results of d'Anglejan and Tucker (1975) contribute significantly more to our knowledge of the language learning process because of the similarities revealed in their results and those found by Chomsky (1969) with L1 children.[1]

One L2 study which deals with both comprehension and production and examines subjects of different age groups was conducted by Ramirez and Politzer (1978). While their purpose was to ascertain the ages at which subjects tend to be better learners of L2, their methodology is of direct relevance to the matter under investigation in this thesis. Ramirez and Politzer tested subjects from six different groups: kindergarten students, first graders, third graders, fifth graders, secondary school students in their first year of ESL study, and secondary school students in their second

year of ESL study. While many of their findings are quite interesting and add significantly to the body of knowledge about second language learning, it is difficult to make judgments about child-adult differences on the basis of their findings. The group of secondary school students ranged in age from 13 to 17. Certainly a judgment about adult language behavior should not be based on a sample of subjects where the oldest subject is 17 years old.[2] In addition, as in many of the studies previously examined, production was not measured by spontaneous speech or anything close to it. Ramirez and Politzer recognize this as a possible problem:

> We do not propose to have found a definite answer for the complex problem. The tests do not measure pronunciation or any kind of natural speech but are very specific types of Comprehension and Production (quasi imitation) tasks in which adolescents may have several advantages over smaller children. (p. 332)

The question of the best way to test subjects is obviously raised by the criticism of the methods used in some of the studies considered thus far in this thesis. While I believe that the BSM has some validity as a testing instrument, it is not, in my opinion, the ideal way to test productive ability. It is better than some of the other methods because it comes closer to spontaneous speech. The problem facing a researcher is that of finding an elicitation device that will encourage the subjects to produce data as close as possible to spontaneous speech in order to enable the researcher to conclude that the findings are truly

findings about productive ability and not simply an indication of performance on a particular test. As indicated in the first chapter, imitation tests have been widely used. I will, however, not use this method because it is not close enough to spontaneous speech. The comments of Fraser, Bellugi and Brown (1963), discussed in the first chapter, regarding imitation as a testing instrument, have some validity. At this point, an analysis of the literature seems to indicate that future studies on the developmental nature of second language learning should include, if possible, both comprehension and production, should examine both children and adults, and should use testing instruments that enable one to generalize the findings, with a reasonable degree of certainty, to valid conclusions about productive or receptive ability.[3]

Another area that has received great attention in the L2 studies has been the possible determinant(s) of an L2 difficulty order. It is an area, as we have seen, in which most of the questions remain unanswered. This seems to be due, in some measure, to the fact that there may be multiple determinants. The largely unresolved issue of accounting for a particular difficulty order merits, I believe, additional study. Larsen-Freeman (1978) eliminated a number of possible determinants of the L2 difficulty order for morphemes. There exists, however, the possibility that some of these factors might be determinants of the difficulty order for structures

other than morphemes. Larsen-Freeman also realizes that acquisition strategies for morphemes might differ somewhat from strategies operating when more complex structures are involved.

> Since grammatical morphemes have limited semantic weight, perhaps it is not in morpheme acquisition where the learner's cognitive involvement is evident in the second language learning task. Perhaps the creative talent of the second language learner is reserved for more complicated structures, while the learner concentrates on simply matching native-speaker input for structures at the morpheme level. (p. 379)

One area that has been considered a likely determinant of the L2 order is that of complexity. Morsbach (1981), as we have seen, concludes her study by stating, "It seems that in both L1 and L2 learning children follow a common route from the acquisition of more simple to more complex structures" (p. 188). A problem with this statement is that there is no indication of how one is to measure complexity. It could be argued, perhaps, that if one structure is acquired before a second structure then the first structure is, by definition, less complex.[4] Such an approach precludes one, however, from making predictions about the relative difficulty of structures which have not yet been tested.

d'Anglejan and Tucker (1975) argue that their results provide additional support for the role of linguistic complexity as a determinant of a particular order. They conclude:

> This suggests that the degree of linguistic complexity inherent in the sentence is indeed, as

> Brown (1973) speculated, a critical factor in determining the order of acquisition of certain grammatical features and that this factor operates in both native language and adult second language learning. (p. 292)

In this study, however, unlike the study by Morsbach, there is a clear analysis of different degrees of complexity. The analysis of the complexity of the structures tested is found in Chomsky (1969). Chomsky argues that sentences which vary from the S-V-O order are more complex than those which do not. Thus, it is assumed that John is eager to see is less complex than John is easy to see and will, according to Chomsky, be easier to interpret correctly. In analyzing other structures, additional analyses of complexity are proposed. Chomsky argues that sentences such as John wanted Bill to leave and John wanted to leave are less complex than sentences such as John promised Bill to leave because "the implicit subject of the complement verb is the NP most closely preceding it" (p. 10). Chomsky argues that the verb "promise is in a distinct semantic category" (p. 12). Those verbs which are found in the less complex sentences tend to be command-related verbs. The role of semantics is argued, therefore, to be of importance in analyzing the complexity, of certain structures. While additional examples of complexity, as proposed by Chomsky, could be presented, suffice it to say that a major strength of her study is that a concrete analysis of complexity is proposed, something which is lacking in many other studies. An additional

strength is that semantic factors are taken into consideration, thus providing greater insight into the complexity issue. It seems to me that a detailed analysis of complexity, as that proposed by Chomsky, is a crucial ingredient in a comprehensive study of the second language acquisition process. Certainly the other possible determinants considered by researchers merit additional study also.

I intend, in the study presented here, to add to the body of knowledge about L2 acquisition by following the guidelines implied by the discussion presented in this chapter. More specifically, the study has the following attributes:

1. It includes an analysis of both comprehension and production.
2. It includes both children and adults.
3. There are specific predictions about an expected difficulty order based on complexity.
4. Consideration of the role of semantics and syntax is included.[5]
5. A comparison of the data elicited from the L2 subjects in the study and available data on L1 is considered.

Footnotes: Chapter 2

[1]Again, I would like to stress that failure to include a broad range of age groups in a study is not a fault but merely a limitation. If, for example, one limits one's study to L2 children, another study could replicate the procedure with subjects of a different age group.

[2]This, of course, does not mean that studies comparing children and adolescents are not valid. Such studies are not, however, the primary concern of this thesis.

[3]One major advantage of a very comprehensive study, other than the fact that we naturally learn more about language behavior from such a study, is that the same researcher is conducting all segments of the test and, therefore, one can be more certain that all subjects are tested in a similar manner and under similar test conditions. When replicated studies are conducted, I do not feel that the same degree of certainty necessarily exists.

[4]Chomsky (1969) indicates, "The natural assumption is that children acquire later those structures which are more complex" (p. 6). This assumption would, in my opinion, also apply to L2 children and adults.

[5]Semantics, as discussed in chapter 3, is limited in this study to a consideration of reversible and nonreversible passives.

Chapter 3

THE STUDY

3.1. Discussion of the Hypothesis

While many of the studies on the nature of second language acquisition have centered on the acquisition of grammatical morphemes, the more recent studies have aimed at increasing our knowledge of the L2 process by examining more expanded structures. Such an examination can be, I believe, most fruitful and I will continue to follow such a course in this study. Rather than selecting a set of structures that are difficult to relate to each other in terms of some reasonable measure of complexity, I will focus on a set of clearly related structures. The structures that will be considered in the study are indicated below in Table 2.

In an effort to relate these structures to each other, one might wish to consider transformational complexity. A measure of transformational complexity would simply involve comparing various structures based on the total number of transformations involved in their derivations. The structure requiring the greatest number of transformations would be considered the most complex. Brown (1973) argues, however, that a measure of complexity based solely on the number of transformations is not valid. He states:

Table 2

Structures to be Studied

Structure	Sample Sentence
1. Active (simple)	The man is hitting the dog.
2. Passive (simple)	The dog is being hit by the man.
3. Active (to)	The teacher is giving the book to the student.
4. Active (to-dative)	The teacher is giving the student the book.
5. Passive (to)	The book is being given to the student by the teacher.
6. Passive (to-dative)	The student is being given the book by the teacher.

> Assessing transformational complexity in terms simply of the number of transformations in each derivation is a somewhat dubious procedure. In general it is probably the case that a construction involving more transformations involves more grammatical knowledge than one involving fewer transformations, but it need not always be so. Transformation rules vary in internal complexity, in terms, for instance, of the number of elementary transformations involved. It is certainly not safe to assume that all transformations involve a constant increment of complexity. . . . a better rationalized index of complexity would be the cumulative number of transformations. In these terms a construction y is more complex transformationally than a construction x only if y involves all the transformations involved in x plus one or more others. Cumulative transformational complexity does not assume that transformations all add a constant increment of complexity. (p. 377)

An analysis of structures in terms of transformational complexity should, it would seem, be conducted in conformity with the principles of cumulative complexity. Since the structures listed in Table 2 are closely related, such an analysis is quite simple. The structures focus on the passive and to-dative transformations, both individually and in combination. The formalization of these transformations, within the framework of standard theory, is shown in Table 3. If one considers the application of these transformations to the structures listed in Table 2, one arrives at the results indicated in Table 4.

Working within the framework of cumulative complexity one arrives at the predictions indicated in Table 5. In short, a judgment is being made about grammatical complexity as a first step. This judgment about complexity is being

Table 3

Formalization of Applicable Transformations

Dative

SD: X - V - NP - {to / for} - NP - Y

1 2 3 4 5 6

SC: 1 2 5 Ø 3 6

Passive

SD: X - NP - Y - V - NP - Z

1 2 3 4 5 6

SC: 1 5 3 be+en 4 Ø 6 by 2

Table 4

Application of Transformations to Target Structures

Structure	Dative	Passive
1	DNA	DNA
2	DNA	✓
3	DNA	DNA
4	✓	DNA
5	DNA	✓
6	✓	✓

NOTES: Structure # corresponds to # in Table 2.

DNA = Does not apply.

✓ = Does apply.

Table 5

Predictions Based on Cumulative Complexity

1 > 2	
3 > 4	NOTE: > Is used to mean will be acquired before or will be supplied accurately more often than.[1]
3 > 5	
3 > 6	
4 > 6	
5 > 6	

used in the next step to make a set of predictions about subject performance.

It can be observed that these predictions contrast only structures which are derived from a common deep structure.[2] One might wish to analyze, however, structures without a common deep structure and make predictions which are still in conformity with the cumulative complexity approach. For example, one might predict 1 > 4 since both are actives, but in 4 the dative transformation has applied. Similarly, the prediction 2 > 6 could be made since the passive in 6, unlike the passive in 2, has undergone the dative transformation.[3] While the predictions in Table 5 might be considered primary predictions since there is a control for deep structure, I will add the two transformations just discussed and arrive, therefore, at a revised set of predictions (see Table 6).[4]

At this point one might question whether it is correct to make any predictions of difficulty based on a theory which can describe linguistic competence, but does not necessarily describe what people actually do when they produce and understand utterances. In other words, might it be that we are falsely attributing psychological reality to the transformations in question? Bresnan (1978) points out that evidence from psycholinguistic experiments does not show transformations to be psychologically real. She argues that "new developments in transformational linguistics, together with independent developments in computational linguistics

Table 6

Predictions Based on Cumulative Complexity: Revised

Prediction No.	Prediction
1	1 > 2
2	3 > 4
3	3 > 5
4	3 > 6
5	4 > 6
6	5 > 6
7	1 > 4
8	2 > 6

and the psychology of language, make it feasible to begin to construct realistic grammars" (pp. 2-3).[5] Related to this point is the fact that new theories are constantly being proposed. Some structures, such as passive, are no longer believed by many to be handled by a passive transformation. The fact that formal theories change and that there are many divergent opinions on the best grammar, even at a given point in time, does not seem to pose a major problem for the framework within which this study is being conducted. Whether or not there is a passive transformation or a dative transformation in a proposed theory, there is no denying that there are both passive voice and dative case in sentences. Furthermore, these sentences represent a variation from the basic form (which corresponds to the word order in deep structure). All will agree that a sentence of the form John gave a book to Bill is the most explicit of its alleged transformational variants. John and a book are in their normal positions as both grammatical and logical subjects and objects, and Bill is marked explicitly by to as the indirect object. Grammatical complexity will be defined in terms of departure from this ideal. Passive structures count as one departure, to-dative as one departure, and to-dative passives as two departures. The predictions listed in Table 6 are, in other words, still applicable.

While the discussion above has centered on syntactic complexity, one might also reasonably expect that semantics

has a role in determining relative difficulty.[6] While it is difficult to determine an ideal way of measuring semantic complexity, an experimental technique used by Slobin (1966) provides an interesting possibility. In testing the comprehension of passives by L1 children and adults Slobin found that reversible passives (where subject and object can be interchanged) were more difficult to comprehend than nonreversible passives (where an interchange of subject and object do not produce a semantically acceptable sentence).[7] In an effort to determine the role of semantics in L2 children and adults, a sub-test examining the influence of reversibility on passive comprehension is included in this study. The general hypothesis of the study is, however, the following:

> Statement of General Hypothesis: There is a unique difficulty order for both comprehension and production of various grammatical structures in L2 children and adults, and the difficulty order is determined by "grammatical complexity" (as defined above).

3.2. Subjects

The subjects in the study consist of 36 speakers of English as a second language, all tested in New York City. They range in age from 6½ years old to 47 years old and represent a wide variety of native languages. The age

distribution is indicated in Table 7. Table 8 provides a breakdown of the native languages. Finally, Appendix A provides a complete picture, age and native language, of each subject in the study.

The 12 children in this study were tested at the United Nations International School. The age of the oldest such subject was 11 years old. The 24 adult subjects were tested at the International English Language Institute of Hunter College of the City University of New York.[8] The children were enrolled in an ESL class which was quite heterogeneous in terms of English proficiency. Some were clearly very advanced in English and others were barely able to speak or understand any English. The subjects chosen for the test were those deemed to be intermediate level students. In a few cases subjects initially selected for testing were not given the test since it became obvious that the entire test was well beyond their level of competence. These subjects revealed their unsuitability for inclusion by being unable to answer the background data questions and/or their inability to comprehend the test directions. The adults, on the other hand, were all selected from more homogeneous classes (intermediate level) and the selection problem did not, therefore, exist.

Table 7

Age Distribution of Subjects

Age	Number of Subjects
6½	1
8	5
9	3
10	2
11	1
16	1
17	2
18	1
19	4
20	1
22	1
24	1
25	1
26	3
27	1
28	1
29	1
31	1
32	1
37	1
38	1
42	1
47	1

Table 8

Native Language Distribution of Subjects

Native Language	Number of Subjects
Arabic	4 + ½*
Chinese	6
Fijian	1
French	4 + ½ + ½
Hebrew	1
Italian	2
Japanese	2
Korean	2
Portuguese	3
Spanish	8 + ½
Urdu	1

*The use of "½" means that a subject indicated the language in question as one of two native languages. In this study one subject indicated Arabic and French and another indicated both Spanish and French.

3.3. The Testing Instrument

The testing instrument consisted of two parts: production and comprehension (see Appendices B and C). The comprehension part of the test was divided into two sub-parts. Each of these tests will be described in this section.

The test of production required the subjects to form a sentence using a series of noun cues in the order presented. The sentence formed had to accurately describe a picture shown to the subjects as the noun cues were read. For example, the subjects were shown a picture of a man hitting a dog with a newspaper as the noun cues the man . . . the dog were read. The subjects were also given the verb to use in the sentence.[9] The verb was presented in the infinitive. The following was the sequence followed:

> Cue (read orally to subject): The verb is to hit . . . the man . . . the dog
>
> Shown to Subject: Picture of a man hitting a dog
>
> Target Response: "The man is hitting the dog."

The noun cues were presented in various orders in an attempt to elicit each of the target sentence-types indicated in Table 2. The example above is an attempt to elicit sentence-type #1 (active (simple)). An example of each of the other structures is listed below.

#2--Passive (simple)

Cue: The verb is to hit . . . the dog . . . the man

Shown to Subject: Picture of a man hitting a dog

Target Response: "The dog is being hit by the man."

#3--Active (to)

Cue: The verb is to give . . . the teacher . . . the book . . . the student

Shown to Subject: Picture of a teacher giving a book to a student

Target Response: "The teacher is giving the book to the student."

#4--Active (to-dative)

Cue: The verb is to give . . . the teacher . . . the student . . . the book

Shown to Subject: Picture of a teacher giving a book to a student

Target Response: "The teacher is giving the student the book."

#5--Passive (to)

Cue: The verb is to give . . . the book . . . the student . . . the teacher

Shown to Subject: Picture of a teacher giving a book to a student

Target Response: "The book is being given to the student by the teacher."

#6--Passive (to-dative)

Cue: The verb is to give . . . the student . . . the book . . . the teacher

Shown to Subject: Picture of a teacher giving a book to a student

Target Response: "The student is being given the book by the teacher."

If a subject produced a sentence in which the nouns were not in the order required, the noun cues were repeated. All the subjects' responses were given orally and tape recorded for later transcription. The production portion of the test consisted of sixty series of noun cues and thus sixty target responses from each of the subjects. There were 10 target responses for each of the 6 structures being examined.

The next part of the test (Comprehension I) was aimed at determining receptive ability. The subjects were shown two pictures and had to indicate which of the two pictures illustrated a sentence which was read. For example:

Sentence Read to Subject: The girl is hitting the boy.

Shown to Subject: Two pictures:
A. A girl hitting a boy
B. A boy hitting a girl

The subjects wrote down the letter of their choice on an answer sheet provided. They did not have to speak at all during this portion of the test. There were a total of sixty sentences read to the subjects and, as in the production section, there were 10 instances of each of the structures listed in Table 2.

The final part of the test (Comprehension II) was included to determine the role of reversibility and nonreversibility in comprehension. In this section the subjects were shown 20 pictures. As they looked at a given picture a sentence was read to them. The subjects had to

write true or false on an answer sheet to indicate whether a sentence accurately described a particular picture. For example:

Sentence Read to Subject: The pipe is being smoked by the man.

Shown to Subject: Picture of a man smoking a pipe.

The above is an example of a nonreversible passive and comprehension would be indicated by a true response.

In all three tests described above, a type of randomization was used to avoid enabling the subjects to determine appropriate responses because of a uniform pattern of responses. More specifically, in the production test the ordering of the target structures to be elicited was varied from picture to picture. In the first test of comprehension, where subjects had to respond either A or B, there was no clear pattern of responses. A sequence of responses such as A-B-A-B-A at the beginning of the test might have caused some subjects to continue following the uniform sequence rather than basing responses on their ability to comprehend the sentences. Finally, in the second test of comprehension, where true or false had to be supplied for each item, there was no clear sequence of responses. In addition, there were five true and five false correct responses for both reversible and nonreversible passives. Again, as stated earlier, Appendix B contains the verbal component of the test and Appendix C includes the associated pictures.

3.4. Scoring

I begin this section by discussing the guidelines used for scoring the production part of the test. I will discuss the target structures in the order they appear in Table 2.

For structure #1 (active (simple)), a score of 1 is given for a correct response. The use of a correct verb form merits ½ and the other ½ is given for an appropriate S-V-O sentence. Thus hypothetical responses (1), (2), (3), and (4) would be scored 1, ½, ½, and 0, respectively.

(1) The man is hitting (hit(s)) the dog.

(2) The man the dog hits.

(3) The man hitting (hitted) the dog.

(4) The man the dog hitting (hitted).

The responses above are, of course, only a small sample of possible responses provided solely to illustrate examples of the application of the scoring guidelines. It should also be pointed out that a grammatical sentence that does not accurately describe a given picture is scored 0. These comments apply, obviously, to the examples given below, in addition.

For structure #2 (passive (simple)), a score of 1 is given for a correct response. The use of a correct verb is scored ½ and ½ is given for the remaining component of the passive structure, namely, the introduction of by.

Therefore, hypothetical responses (5), (6), (7), and (8) are given scores of 1, ½, ½, and 0, respectively.

(5) The dog is being hit by the man.

(6) The dog is being hit from the man.

(7) The dog hitted by the man.

(8) The dog hitted from the man.

For structure #3 (active (to)), a score of 1 is given for a correct response, ½ is given for a correct verb form and another ½ for the use of to and the S-V-O order. Responses (9), (10), (11), and (12) are, therefore, given scores, respectively, of 1, ½, ½, and 0.

(9) The teacher is giving the book to the student.

(10) The teacher is giving the book from the student.

(11) The teacher giving the book to the student.

(12) The teacher giving the book from the student.

For structure #4 (active (to-dative)), a correct response, again, receives 1. The verb, if correctly produced, is rated ½ and ½ is given for the appropriate to-dative movement (placement). Scores of 1, ½, ½, and 0 are given, therefore, for the following types of sentences.

(13) The teacher is giving the student the book.

(14) The teacher is giving to the student the book.

(15) The teacher giving the student the book.

(16) The teacher giving to the student the book.

For structure #5 (passive (to)), as in the other cases, 1 is given for a correct response. A correctly formed verb

is ½ and the correct production of by and to are given ½. Responses (17), (18), (19), and (20) represent hypothetical responses granted scores, respectively, of 1, ½, ½, and 0.

(17) The book is being given to the student by the teacher.

(18) The book is being given to the student from the teacher.

(19) The book giving to the student by the teacher.

(20) The book giving to the student from the teacher.

For structure #6 (passive (to-dative)), a correct sentence receives 1. A correct verb form is given ½ and ½ is given for the remaining components of this structure: the use of by and the appropriate to-dative movement (placement). The scores of 1, ½, ½, and 0 are assigned, therefore, to (21), (22), (23), and (24), respectively.[10]

(21) The student is being given the book by the teacher.

(22) To the student is being given the book from the teacher.

(23) The student giving the book by the teacher.

(24) To the student giving the book from the teacher.[11]

In summary, each response is given a score of 0, ½ or 1 on the production test. The use of partial credit makes it possible to determine productive ability more accurately. To give each response 0 or 1, without any allowance for partially correct responses, might obscure very significant differences in productive ability.

In a limited number of cases responses are not included in the results. No score is assigned to such sentences. This applies, for example, to inaudible responses. Similarly, no score is assigned to a response which accurately describes a given picture in a grammatical utterance but does not make use of the target structure.

Finally, it should be pointed out that grammatical errors unrelated to the target structures (e.g., omission of the definite or indefinite article) are not considered a factor in scoring.

The scoring of both parts of the comprehension section presents no scoring difficulties. All of the responses are short answers and, therefore, each response is marked either correct or incorrect.

In the next chapter the results are presented and discussed.

Footnotes: Chapter 3

[1]The word supplied is used broadly to mean either produced or understood.

[2]Thus, structures 1 and 2 form a group and structures 3, 4, 5, and 6 form a second group since the structures in each group share a common deep structure.

[3]The passive in 2 could not have undergone the dative transformation since, because of its deep structure, it could never have met the structural description for the dative transformation.

[4]If one were to analyze these predictions in terms of simple transformational complexity, rather than cumulative complexity, one would see that these predictions also meet the criteria for the simple measure. This does not pose a problem, however, in my opinion. As long as the predictions are in conformity with the cumulative complexity criteria, one is avoiding basing one's conclusions on the unproven assumption that all transformations are of equal complexity.

[5]Fiengo (1980) says, "Had transformational grammars passed the test set by the derivational theory of complexity experiments, we would have been witness to a miracle--the one-to-one correspondence of inferred mental processes to the statements of a formal theory constructed on totally independent data. Though miracles happen, we resist basing theories on the assumption that they have" (p. 31). While it is not within the scope of this thesis to discuss whether grammatical theories should be constructed in accordance with principles of psychological reality, it does seem clear, however, that one must not falsely assume that existing theories do possess this characteristic. See also Brown (1973, p. 187) for additional comments on psychological reality.

[6]Brown (1973), it should be pointed out, analyzed the semantic complexity of the grammatical morphemes in addition to syntactic complexity.

[7]Thus, The lady is being washed by the man is a reversible passive, and The pipe is being smoked by the man is an example of a nonreversible passive.

[8]The addresses of the schools are as follows:

(1) United Nations International School
24-50 East River Drive
New York, New York

(2) Hunter College of the City University of New York
International English Language Institute
440 East 26 Street
New York, New York

Some of the students were tested at the address below, which is used as an annex by the International English Language Institute of Hunter College.

(3) Julia Richman High School
317 East 67 Street
New York, New York

[9]It became obvious during a pre-test that it would be necessary to present the verb in addition to the noun cues. Failure to provide the verb made it much less likely that the subjects would try to produce the target lexicon and structures.

[10]The scoring procedure for all structures is based, therefore, on a uniformity where the verb form is separated for scoring purposes from the remaining relevant components of the target structures.

[11]It should be pointed out again that responses which accurately describe pictures and make use of the target structures are, of course, considered acceptable. For example, the structures below would all be given a score of 1. The numbers correspond to the structures in Table 2.

(1) The man hits the dog.
(2) The dog is hit by the man.
(3) The teacher gives the book to the student.
(4) The teacher gives the student the book.
(5) The book is given to the student by the teacher.
(6) The student is given the book by the teacher.

Chapter 4

RESULTS AND DISCUSSION

4.1. Results

A presentation of the raw data for all subjects in both comprehension and production can be found in Appendix D. A breakdown of group performances in terms of means and standard deviations is shown in Table 9. The predictions were evaluated within each group using the Wilcoxon matched-pairs signed-ranks test and these findings are presented in Table 10.[1] As can be seen, there are no cases which go against the direction of any of the predictions. In fact, the results are significant in almost every case. In those few cases where the results do not reach a level of significance or do not indicate a clear trend ($p < .10$), it was due largely to multiple tie scores in the data. In view of these findings, it can be claimed that to the extent that a relative order of difficulty is specified by the eight predictions, there is no evidence with either children or adults in either production or comprehension against a consistent order of difficulty.

An analysis of the data comparing comprehension with production shows quite clearly that the ability to comprehend clearly exceeds the ability to produce the target language. These findings are illustrated in Table 11. In reading the

Table 9

Correct Performance on the Six Structures by Children and Adults

In Production and Comprehension

Structure	Production				Comprehension			
	12 Children		24 Adults		12 Children		24 Adults	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
1. Active (simple)	81.7	17.6	81.6	11.2	93.3	8.9	89.6	11.2
2. Passive (simple)	29.2	37.7	54.8	33.1	70.8	22.7	84.6	15.9
3. Active (to)	70.4	33.1	74.5	20.2	93.3	6.5	95.8	7.2
4. Active (to-dative)	49.6	29.3	50.5	22.2	85.0	16.2	84.6	15.3
5. Passive (to)	24.8	37.2	47.0	30.2	75.8	29.7	88.3	18.1
6. Passive (to-dative)	5.2	14.3	27.4	32.1	68.3	36.1	82.5	25.8

Table 10

Tests of Experimental Specific Hypotheses by Within Group Comparisons

Hypothesis		Production				Comprehension			
		12 Children		24 Adults		12 Children		24 Adults	
		Z_T[1]	p	Z_T[1]	p	Z_T[1]	p	Z_T[1]	p
1.	1 > 2	3.06	***	3.04	***	2.34	**	1.07	
2.	3 > 4	1.73	*	4.06	***	2.03	*	3.05	***
3.	3 > 5	3.06	***	3.42	***	1.96	*	2.36	**
4.	3 > 6	3.06	***	4.11	***	2.10	*	2.64	**
5.	4 > 6	2.80	**	3.30	***	1.82	*	0.53	
6.	5 > 6	1.57	∿	3.01	**	1.37	∿	1.87	*
7.	1 > 4	2.60	**	4.20	***	1.35	∿	1.18	
8.	2 > 6	2.20	*	3.64	***	0.37		0.36	

[1]Wilcoxon matched-pairs signed-ranks test, corrected for ties and assessed by the Z distribution.

∿p < .10, *p < .05, **p < .01, ***p < .001, one tailed

Table 11

Contrasts Between Production and Comprehension for the Six Structures in Children and Adults

Structure	12 Children		24 Adults	
	z_T[1]	p	z_T[1]	p
1	2.75	**	1.65	∿
2	4.75	***	2.98	***
3	4.18	***	2.07	*
4	4.91	***	2.63	**
5	5.20	***	3.06	**
6	5.14	***	2.93	**

[1]Wilcoxon matched-pairs signed-ranks test, corrected for ties and assessed by the z distribution.

∿$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$, two tailed

table, a level of significance is to be interpreted as meaning comprehension exceeds production. It can be seen that the gap between comprehension and production varies depending on the structure in question. There is some indication that the gap becomes wider when more complex sentences are involved.

The final analysis of the data in terms of overall group performance involved comparing the performance of adults to that of children. The Mann-Whitney U-test revealed the findings shown in Table 12. There were no significant differences in the performances of children and adults in comprehension. In production, however, adults performed somewhat better ($p < .05$) on structures 2, 5, and 6. Interestingly, these are the three target structures requiring the formation of the passive.

Since it is not necessarily true that group findings reveal a true picture of individual performances, it is important to examine individual performances when one is involved with hypothesis testing. Tables 13 and 14 reveal the role of each subject as a contributor to the group data reported in Table 10. An examination of Tables 13 and 14 reveals a clear picture of the degree to which each of the specific hypotheses was supported by individual performances in either production (Table 13) or comprehension (Table 14). The performance of each subject is recorded in one of five categories. Any subject falling within the first three

Table 12

Contrasts Between Children and Adults for the Six Structures in Production and Comprehension

Structure	Production		Comprehension	
	Z_U[1]	p	Z_U[1]	p
1	-0.67		-0.95	
2	1.97	*	1.82	
3	0.05		1.35	
4	0.16		-0.21	
5	2.22	*	1.15	
6	2.50	*	0.83	

[1]Mann-Whitney U-Test, corrected for ties and assessed by the Z distribution. Negative Z values indicate higher scores for children.

*$p < .05$.

Table 13

Assessment of Specific Hypotheses in Individual Production

Hypothesis	12 Children						24 Adults					
	C[1]	F[2]	=	>	<	<%	C[1]	F[2]	=	>	<	<%
1. 1 > 2	0	0	0	12	0	0.0	1	0	0	19	4	16.7
2. 3 > 4	0	0	0	9	3	25.0	1	0	1	21	1	4.2
3. 3 > 5	0	0	0	12	0	0.0	2	0	0	18	4	16.7
4. 3 > 6	0	0	0	12	0	0.0	1	0	0	22	1	4.2
5. 4 > 6	0	1	0	10	1	8.3	1	0	2	18	3	12.5
6. 5 > 6	0	8	0	4	0	0.0	2	1	1	18	2	8.3
7. 1 > 4	0	0	2	9	1	8.3	1	0	0	23	0	0.0
8. 2 > 6	0	6	0	6	0	0.0	0	2	0	19	3	12.5

[1]C: Both scores were 90% or greater (ceiling).

[2]F: Both scores were 10% or less (floor).

Table 14

Assessment of Specific Hypotheses in Individual Comprehension

Hypothesis	12 Children						24 Adults					
	C[1]	F[2]	=	>	<	<%	C[1]	F[2]	=	>	<	<%
1. 1 > 2	2	0	0	9	1	8.3	6	0	2	12	4	16.7
2. 3 > 4	6	0	0	6	0	0.0	8	0	0	14	2	8.3
3. 3 > 5	6	0	0	6	0	0.0	13	0	0	10	1	4.2
4. 3 > 6	6	0	0	6	0	0.0	11	0	0	12	1	4.2
5. 4 > 6	5	0	0	6	1	8.3	10	0	1	7	6	25.0
6. 5 > 6	5	0	3	3	1	8.3	12	0	1	9	2	8.3
7. 1 > 4	5	0	0	6	1	8.3	8	0	1	10	5	20.8
8. 2 > 6	4	0	1	5	2	16.7	9	0	1	9	5	20.8

[1]C: Both scores were 90% or better (ceiling).

[2]F: Both scores were 10% or less (floor).

categories was considered to have neither conformed to nor to have falsified a particular hypothesis. This was possible for three reasons: both scores at ceiling (90% or greater); both scores on the floor (10% or less); or scores between floor and ceiling, but equal. The last two categories include those subjects who conformed to a hypothesis (>) and those who falsified it (<), respectively. The percentage of subjects who failed to conform to a particular hypothesis is reported in the final column (< %). As can be seen, an assessment of individual performances provides very strong support for the predictions. In fact, falsification rates average less than 10%.

The high rate of consistency in the performance of the subjects is further revealed by examining the specific hypotheses when one compresses those structures not discriminated in the set of eight predictions. Four steps are clearly discriminated after a compression of the eight hypotheses. Put simply, the eight specific hypotheses imply that a subject would do best on structure 1, next best on 2 and 3 (compressed), next best on 4 and 5 (also compressed) and the subject would do the worst on structure 6. To determine how well each subject fit this compressed model, tied responses (including floor and ceiling responses) were not considered to have falsified a particular hypothesis. In other words, a hypothesis was considered falsified only in those cases where performance was better on a more difficult

structure than on a simpler structure. In order to determine individual scores on the compressed structures (that is, (2,3) and (4,5)), average performances were computed. Tables 15 and 16 illustrate the performance of each subject with regard to the overall compressed hypothesis ($1 \geq (2,3) \geq (4,5) \geq 6$) as well as each of the implied sub-parts of the hypothesis. The results are very revealing. As can be seen, 75% or more of all subjects confirm the overall compressed hypothesis. In addition, the results in each of the sub-parts approach 100% in varying degrees. It should be noted that the results support this model somewhat better in production than in comprehension. This is likely a result of the greater ranges in subject performance in production.

In short, an analysis of individual performances provides support for this proposed ranking of relative difficulty. To help illustrate these findings, Figure 1 presents the combined results for both children and adults for each of the sub-parts of the overall compressed hypothesis.

Finally, an analysis of the data on the sub-test comparing reversible passives to nonreversible passives does not reveal any significant differences. If one eliminates from consideration all cases that are at ceiling or on the floor as well as cases where scores are equal, one finds that in the remaining cases 4 of 9 adults qualifying for

Table 15

Confirmation of Compressed Specific Hypotheses in Production

Hypothesis	12 Children		24 Adults[1]	
	N	%	N	%
1 ≥ 23 ≥ 45 ≥ 6	10	83.3	18	75.0
1 ≥ 23	12	100.0	20	83.3
23 ≥ 45	10	83.3	22	91.7
45 ≥ 6	12	100.0	21	87.5
1 ≥ 45	12	100.0	24	100.0
23 ≥ 6	12	100.0	24	100.0
1 ≥ 6	12	100.0	24	100.0

[1]Including 1 ceiling case.

Table 16

Confirmation of Compressed Specific Hypotheses in Comprehension

Hypothesis	12 Children[1]		24 Adults[2]	
	N	%	N	%
1 ≥ 23 ≥ 45 ≥ 6	9	75.0	18	75.0
1 ≥ 23	12	100.0	20	83.3
23 ≥ 45	10	83.3	22	91.7
45 ≥ 6	11	91.7	23	95.8
1 ≥ 45	12	100.0	20	83.3
23 ≥ 6	10	83.3	22	91.7
1 ≥ 6	12	100.0	23	95.8

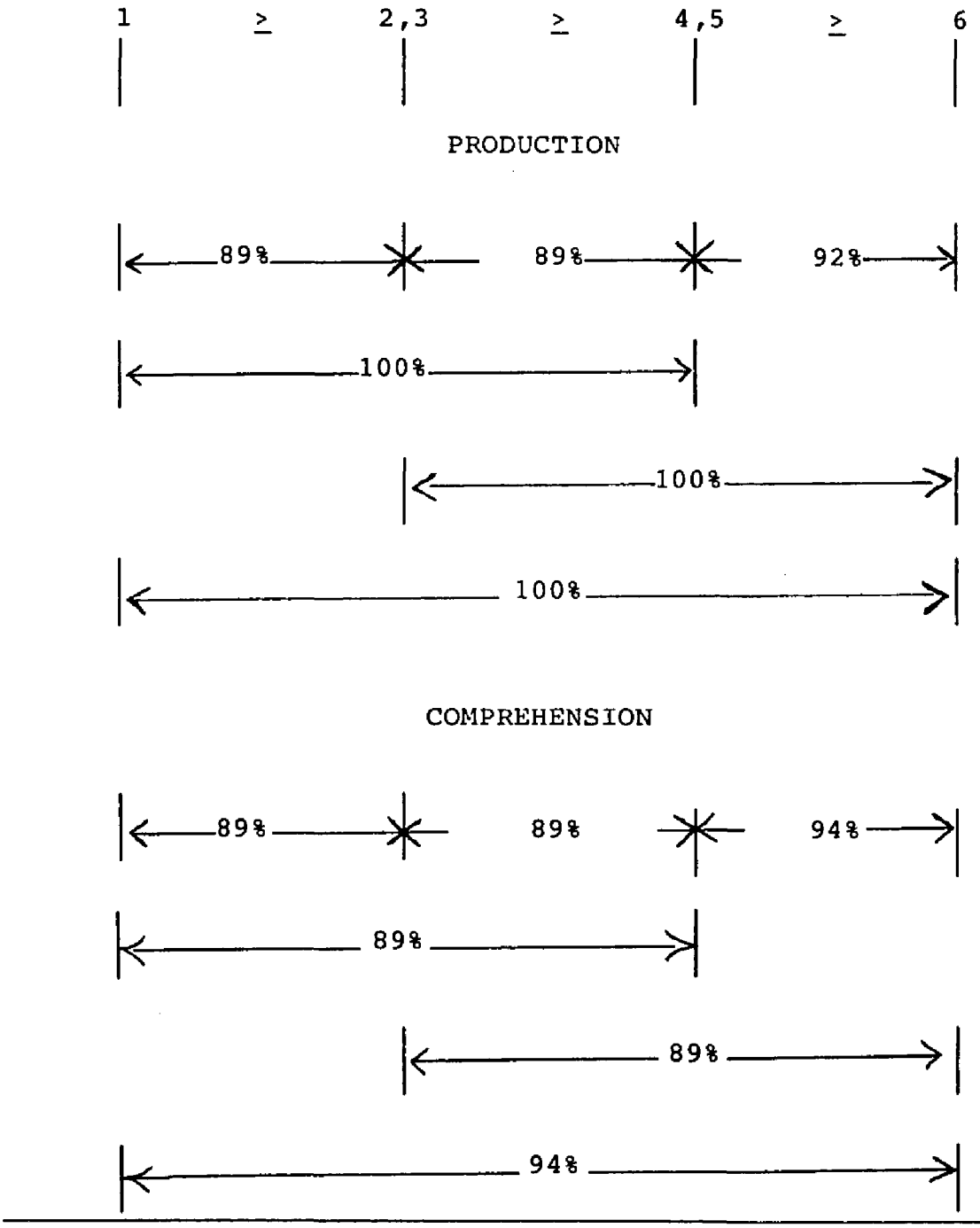
[1]Including 5 ceiling cases.

[2]Including 14 ceiling cases.

Figure 1

Overall Confirmation of Compressed Specific Hypotheses:

Combined Results (Children and Adults)



inclusion did better on nonreversible passives. All five of the children not eliminated under the criteria stated above did better on nonreversible passives. One might be tempted at first to conclude that nonreversible passives might be less difficult for children, while the two types of passives are of roughly equal difficulty for adults. An analysis, however, of the children qualifying for inclusion reveals that in three of the five cases the scores differed by only one response. It would seem, therefore, that there is little evidence to support a claim that nonreversible passives are less difficult than reversible passives whether one is speaking of children or adults.

With the results stated, it is now necessary to discuss in detail these findings as they relate to the hypothesis of this study and, in addition, to consider the implications of this study for future research. It is to these areas that the following section is devoted.

4.2. Discussion of Results

The results above demonstrate quite clearly that the predictions based on grammatical complexity are confirmed by both children and adults in both comprehension and production. This study provides, therefore, further support for the claim that the relative difficulty of target structures is similar for all L2 learners. It is important to point out that this conclusion is reached as a result of

an analysis of the data which is not limited to an assessment of group means. In many of the studies done previously, conclusions were based on overall group performance, a procedure in which wide variations in individual scores may not be revealed in the conclusions. It is within the realm of possibility that an analysis of group means might yield results that are somewhat misleading because one does not know the number of subjects who either conformed to or falsified a particular hypothesis. This problem in data analysis has not gone unrecognized in the literature. Rosansky (1976), for example, accurately, I believe, asserts that dealing with individual variations "is a serious methodological question for L2 researchers to resolve" (p. 418). In a related discussion, Madden, Bailey, Eisenstein and Anderson (1978) argue for a consideration of individual variation in data analysis. They point out, however, that group scores have a purpose in experimental work. Such scores can, for example, indicate a trend and provide a useful starting point for further investigation.

An analysis of the results of this study limited to group scores would certainly not be as valid as an analysis involving individual performances. If one considers the group scores reported in Table 9, one arrives at the rank orderings listed in Table 17. The similarity in the difficulty orders is apparent. Furthermore, none of the eight specific hypotheses are disconfirmed in any of the four

Table 17

Rank Orderings Based on Mean Scores

Production				Comprehension			
12 Children		24 Adults		12 Children		24 Adults	
Structure	$\bar{X}$	Structure	$\bar{X}$	Structure	$\bar{X}$	Structure	$\bar{X}$
1	81.7	1	81.6	1	93.3	3	95.8
3	70.4	3	74.5	3	93.3	1	89.6
4	49.6	2	54.8	4	85.0	5	88.3
2	29.2	4	50.5	5	75.8	2	84.6
5	24.8	5	47.0	2	70.8	4	84.6
6	5.2	6	27.4	6	68.3	6	82.5

orders of difficulty. In sum, an analysis of the data limited to a consideration of group means leads one to the conclusion that the expectations stated in the general hypothesis are confirmed by the data. Stating, however, that the general hypothesis has been confirmed on the basis of the analysis above would be somewhat speculative since it would leave open the question of the degree of conformity of each of the subjects in the study. It might be stated that these findings do, however, suggest a conclusion in the area of investigation in this study. Put another way, while it would be wrong to consider group findings definitive, it would be equally unreasonable to minimize the role of group data. For example, it would be very unwise to dismiss the very revealing findings regarding the specific hypotheses (see Table 10) because they are based on overall group performances. Fortunately, in this study one can feel much more confident about these findings since they stand up quite well under the scrutiny of an examination of individual performances (see Tables 13 and 14). In short, it can be said that the results of this study are quite revealing whether the conclusions are based on group data analysis or on an analysis of individual performances. The specific hypotheses as seen above, are not falsified under either approach. Regarding a unique difficulty order for all subjects in both comprehension and production, Table 17 shows a very high degree of consistency for the four orders involved. In terms of an examination of

individual variability, it may be said that since none of the specific hypotheses of relative difficulty were falsified that both children and adults conformed to a relative order of difficulty specified by these predictions. Again, it is the results involving an analysis of individual variation that enables one to claim that the findings are consistent with the expectations outlined in the general hypothesis.

It is interesting to consider these findings in terms of what they tell us about the relationship between L1 and L2 acquisition. While this study provides evidence that L2 acquirers follow a similar pattern in their development of skills in the target language, it is important to investigate how similar the L2 pattern is to that found in L1. In a study of first language acquisition, Roeper, Lapointe, Bing and Tavokolian (1981) investigated the acquisition of sentences with dative movement and others which contained passivized datives.[2] In their study of the ability to comprehend these structures, only subjects who had demonstrated the ability to comprehend unmoved datives and passives in a pre-test were included. The study required the subjects to move toys to demonstrate their understanding of the target sentences. The results reveal some similarities to those found for the L2 subjects in this study. As reported by Roeper et al.:

> In sum there was exactly one of 30 children whose responses countered the hypothesis that Passive and Dative must be mastered separately before dative passive can be learned. This is strong evidence in

> favor of our hypothesis that rules must be learned individually before they can interact. (p. 54)

The significance of their results cannot be minimized since their analysis involved a breakdown of individual performances (see p. 52 in their study). While there are major differences in their study and this one, the similarities in the findings lead one to consider the possibility that L1 and L2 difficulty orders might exhibit higher degrees of consistency than many researchers have previously believed. Many of the morpheme studies discussed in Chapter 1 of this study have led researchers to believe that there are two difficulty orders, one for L1 subjects and another for both L2 children and adults. That is, while L1 children follow a similar pattern and L2 subjects follow a similar pattern, the two patterns are different. Perhaps the degree of consistency in L1 and L2 orderings is dependent to some extent on the complexity of the structures being examined. It might be the case, as suggested by Larsen-Freeman (1978), that an assessment of L2 behavior might not be accurately revealed in studies limited to morpheme acquisition. As seen earlier, there are some studies (e.g., d'Anglejan and Tucker (1975) and Morsbach (1981) which lead one to believe that there is perhaps a greater degree of similarity in L1 and L2 orderings than one might have expected.[3] It would seem that to the extent that these findings and those found by Roeper et al. (1981) are

comparable, additional evidence is provided for the claim that L1 and L2 development display many consistencies.

While the confirmation of the general hypothesis in this study might lead one to the belief that grammatical complexity is the determinant of the L2 difficulty order, it would be unwise to assert that it stands alone as the predictor of relative difficulty. It might be more prudent to claim that grammatical complexity seems to be a major determinant of the difficulty order for L2 subjects.

There are, however, other areas that remain to be investigated. If, for example, one examines the structures investigated in the study, one can discriminate structures 1 and 2 as a group from structures 3, 4, 5, and 6 as a second group in terms of their underlying informational complexity. More specifically, in the second group the information carried by the prepositional phrase in structure 3 is included in some form in structures 4 through 6 and it is because of this additional cognitive load that one can discriminate the two groups. It might be argued that the group 1 structures (i.e., structures 1 and 2) carry a cognitive load of 1. Because of the additional information in the group 2 structures (i.e., structures 3, 4, 5, and 6), they can be said to carry a cognitive load of 2.[4] Obviously, cognitive load alone cannot account for the relative difficulty of the structures examined since structures 3 through 6 all have a cognitive load of 2 and differ greatly

in relative difficulty. If, however, one examines cognitive load concurrently with grammatical complexity, the results are very interesting. Arriving at an overall measure of difficulty for a particular sentence by adding the number of transformations involved in its derivation (the number of variations from its basic form) to the cognitive load, one determines what can be called a total load for each sentence (see Table 18),[5] where the total loads range from 1 to 4. If one proposes a model in which difficulty is determined by both grammatical complexity and cognitive load, one would expect the following difficulty order: structure 1 should be the easiest; structures 2 and 3 (compressed) should be somewhat more difficult; structures 4 and 5 (also compressed) should be more difficult; and structure 6 should be the most difficult. Interestingly, this is the exact order predicted by the overall compressed hypothesis discussed in the previous section. Since the subjects exhibited a high degree of conformity to the compressed hypothesis (see Tables 15 and 16), it seems reasonable to assume that cognitive load plays an important role in determining the relative difficulty of target structures for L2 subjects. In an effort to determine whether cognitive load is as important as grammatical complexity in determining relative difficulty, it is revealing to compare structures 2 and 3. Both structures have a total load of 2 but structure 3 has a greater cognitive load and structure 2 is more complex grammatically.

Table 18

Assessment of the Six Structures Based on Grammatical Complexity and Cognitive Load

Structure	Number of Transformations	Cognitive Load	Total Load
1. Active (simple)	0	1	1
2. Passive (simple)	1	1	2
3. Active (to)	0	2	2
4. Active (to-dative)	1	2	3
5. Passive (to)	1	2	3
6. Passive (to-dative)	2	2	4

An analysis of group means (see Table 9) shows that structure 3 is easier for both children and adults in all four tasks and this finding (i.e., 3 > 2) is supported by very low falsification rates when one examines individual performances (see Appendix D). Thus, it appears that grammatical complexity is the more important determinant. Nevertheless, it can be asserted with some degree of certainty that cognitive load plays a role in determining the relative difficulty of the L2 target structures, although its role appears to be secondary.

Other possible determinants of L2 difficulty include reversibility vs. nonreversibility of passives, interference from L1, frequency of occurrence, phonological complexity, textbooks and teaching methods, attitudes, and length.

First, the examination of reversibility vs. nonreversibility of passives did not provide any convincing evidence that L2 subjects perform significantly better on either type of passive.[6]

Interference from L1 seems to be an unlikely candidate for the role of major determinant since the diversity of native languages involved did not alter the consistency of the findings even under an analysis of individual variability. This should not be interpreted to mean that interference from L1 plays no role in determining second language performance. There is convincing evidence against such a claim. Schachter (1974), for example, found that

Chinese and Japanese ESL students produced fewer relative clauses in free composition than did Arab and Persian students. Interestingly, the Chinese and Japanese students also made fewer errors. Since relative clause formation in English resembles that found in Persian and Arabic more than it does that found in Chinese and Japanese, Schachter concludes that L1 interference resulted in avoidance of the use of relative clauses by the Chinese and Japanese subjects. The fact that Chinese and Japanese subjects made fewer errors is explained by saying that these subjects used relative clauses only when they were reasonably certain about their accuracy. It is difficult to argue with Schachter's conclusions. Finally, it should be pointed out that even the most extreme proponents of the intralinguistic nature of L2 learning would agree that some errors in L2 can be attributed to interference from L1. These findings, however, are not inconsistent with my claim that in this study interference from L1 does not appear to play a significant role in determining L2 performance.

Frequency of occurrence might at first appear to play a major role since one could argue that subjects performed better on active sentences than on passive sentences because they are exposed to more sentences of that type. The assertion that frequency of occurrence is a major determinant runs into problems, however, when one tries to explain the better performance on structure 3 (active (to)) than on structure 4 (active (to-dative)). It seems unlikely that one

hears structure 3 with much greater frequency than structure 4. It might even be the case that structure 4 occurs with greater frequency. Similarly, it is hard to imagine that the consistently poorer performance on structure 6 (passive (to-dative)) than on structure 5 (passive (to)) can be attributed to a difference in frequency of occurrence.

A measurement of phonological complexity does not seem to be applicable in a study of expanded structures as it is in a study of morphemes and can thus be ruled out.

An attempt to explain the results in terms of textbooks and teaching methods provides little hope for an answer because the consistency in the findings occurred in spite of the fact that the subjects were from different schools and were certainly exposed to very different learning materials, not to mention different teaching approaches.[7]

An attempt to explain the findings in terms of the subjects' attitudes presupposes that even if one could accurately measure their attitudes, one could establish a reasonable means of relating these attitudes to their performances. This seems to be an impossible task in a study of this nature but is, perhaps, an area requiring additional study.

Finally, an attempt to explain the results in terms of length does not prove successful. For example, active (to-dative) sentences (structure 4) were shown to be more difficult for the subjects than active sentences where the

prepositional phrase remains (structure 3), yet sentences of the first type are not longer.

The results of this study provide some other interesting insights into L2 behavior. While the finding that comprehension exceeds production is to be expected, the degree to which comprehension exceeds production in performance involving different structures is an area with more unanswered questions. This study provides evidence that as complexity increases, so does the gap between comprehension and production (see Table 11). So, for both children and adults the gap is narrowest in the performance of simple active sentences. Also of interest is the finding that there were no significant differences in the performance of children and adults in the comprehension of any structures. On the three structures involving the passive (i.e., structures 2, 5, and 6), however, adults performed somewhat better in production ($p < .05$). Thus, overall the findings provide rather strong support for child-adult similarities in L2 performance.

As seen in the first chapter of this study, researchers have proposed different suggestions for teaching a second language based on their research findings. Dulay and Burt (1973) propose that it is important to stimulate natural communication in the classroom. Bailey et al. (1974), on the other hand, suggest that the relative order of difficulty revealed in research findings might also be an appropriate

order for presentation of structures to L2 students in the classroom. More recently Krashen (1980) argues against a rigid syllabus for teaching L2. He assumes that subjects acquire L2 in a natural order, an assumption that is strengthened by the findings of this study. Krashen presents the following four reasons against a rigid syllabus as the best means of enabling a student to go from his current stage of L2 development (i) to the next stage (i + 1):

> (1) All students may not be at the same stage. The 'structure of the day' may not be the i + 1 for many of the students. With natural, communicative input, i + 1 will be provided for everyone.
> (2) With a grammatical syllabus, each structure is presented only once. If the student misses it, is absent, is not paying attention, or if there simply has not been enough 'practice,' the student may have to wait until next year! On the other hand, roughly tuned comprehensible input allows for natural review.
> (3) A grammatical syllabus assumes we know the order of acquisition. No such assumption is necessary when we rely on comprehensible input.
> (4) Finally, a grammatical syllabus, and the resulting grammatical focus, place serious constraints on what can be discussed. Too often it is difficult if not impossible to discuss or read anything of real interest if our underlying motive is to practice relative clauses. In other words, a grammatical focus will usually prevent real communication using the second language. (pp. 173-174)

I find these reasons quite valid. In support of the first two reasons, it can be argued that even in classes that are called homogeneous there are great differences in the students, both in terms of their level of language development and the rate at which they are able to acquire

new structures. Adherence to a rigid syllabus falsely assumes almost complete homogeneity. Since it is true that only a tiny segment of the grammar has been studied to determine whether L2 subjects acquire structures in a similar order the third reason is, in my opinion, appropriate. I might point out again that in many of the studies where consistent orders of difficulty were found, the results are not as conclusive as they would be if the researchers had taken individual variability into account (again, see Rosansky (1976)). Regarding the fourth reason proposed by Krashen, it can be argued that rigid constraints may decrease motivation and inhibit creativity, not exactly ideal conditions if one hopes to maximize L2 performance.[8]

In short, Krashen's remarks on pedagogy are consistent not only with the findings of this study but have much merit, in addition, on independent grounds. It is, therefore, fair to assert that even if one knew the order of acquisition of structures across a broad segment of the grammar, there would still be many reasons against adhering rigidly to a syllabus structured on the basis of that order.[9]

Having discussed the results of this study, I would like to express the hope that additional research will be done to determine how well grammatical complexity can predict the ordering of other structures. It would also add significantly to our knowledge of L2 behavior to see if the joint grammatical-cognitive model proposed earlier (Table 18)

stands up when other structures are studied. It is hoped that researchers conducting these studies will not base their conclusions on an analysis limited to a review of group means.

In conclusion, the general hypothesis of this study--that L2 children and adults share a common difficulty order for both comprehension and production and that grammatical complexity is a good predictor of that order was confirmed. A number of additional possible determinants were considered and there seemed to be some support for a joint grammatical-cognitive model to explain the order revealed by the subjects. In addition, there were similarities in the findings of this study and those found by Roeper et al. (1981) for L1 subjects. The method of data analysis was argued to be crucial in enabling one to feel confident that the results represented a true picture of L2 performance.

Footnotes: Chapter 4

[1]Siegel (1956) was used as a source in the preparation of this section of the dissertation.

[2]Their study involved agentless passives.

[3]Of course, as reported earlier, not all studies involving more expanded structures reveal similar L1 and L2 sequencing (see, for example, Gass and Ard (1980)).

[4]Cognitive load is used here, in other words, to refer to the amount of information contained in a sentence. While it is difficult to quantify the amount of information, it is clear that structures 3, 4, 5 and 6 contain more information than structures 1 and 2. The quantification of cognitive load in this study seems, therefore, quite appropriate. It should also be clear that cognitive load is a measure that is independent of grammatical complexity. Cognitive load is a measure of what is said (informational content), and grammatical complexity is a measure of how it is said (number of transformations or variations from the basic form).

[5]While it cannot be assumed that transformations are of equal difficulty, it is impossible to quantify their relative difficulties. Even if such quantification were possible, one could argue that the results of such an analysis would not differ significantly from the results reported in Table 18. The analysis undertaken here seems to be a very reasonable way of determining the possible role of cognitive load.

[6]This might be an area in which L1 children and L2 subjects differ (refer to discussion of Slobin (1966) earlier in this dissertation).

[7]Byrd and Dumicich (1975) assert, however, that teachers of ESL tend to agree on when target language structures should be presented to students, an order of presentation that is not always consistent with the order found in many textbooks.

[8]Krashen also discusses the role of conscious learning in the classroom, a role which he considers to be much less important than was previously thought. According to Krashen, it "is no longer the star performer" (p. 178).

[9]This does not mean, of course, that a knowledge of such an order would have no value for the L2 teacher. One might, for example, make use of the order in structuring that part of the course that does involve conscious learning.

Appendices

Appendix A

SUBJECTS IN THE STUDY

Subject	Age	Native Language
MR	18	Spanish
KS	19	Chinese
HA	20	Arabic
CS	16	Spanish
MB	37	Arabic and French
VV	24	Portuguese
CA	26	Spanish
VS	19	Spanish and French
SS	19	French
PT	17	Spanish
OC	17	Spanish
ES	47	Hebrew
HG	25	French
DL	22	Chinese
YW	29	Japanese
JH	42	Chinese
CK	38	Korean
GM	28	Portuguese
PL	19	Chinese
SB	32	Chinese
LA	26	Spanish

Subject	Age	Native Language
PT	27	French
IK	31	Urdu
YC	26	Chinese
RS	9	Spanish
MB	8	Italian
MA	10	Italian
VB	6½	Spanish
SN	10	Japanese
WA	9	Arabic
HS	8	Arabic
WL	9	Korean
PM	8	Fijian
PN	8	Arabic
LR	11	Portuguese
SM	8	French

Appendix B

THE TESTING INSTRUMENT: VERBAL COMPONENT

Production

The sentences listed below are target responses. For each of the sentences listed below the subject was given the verb (in the infinitive) and the noun cues. The numbers in parentheses refer to the target structures in Table 2. The numbers after P refer to the pictures (see Appendix C).

The man is hitting the dog. (1)-P1

The dog is being hit by the man. (2)-P1

The teacher is giving the book to the student. (3)-P2

The teacher is giving the student the book. (4)-P2

The book is being given to the student by the teacher. (5)-P2

The student is being given the book by the teacher. (6)-P2

The packages are being carried by the girl. (2)-P3

The girl is carrying the packages. (1)-P3

The lady is handing the doctor the cat. (4)-P4

The lady is handing the cat to the doctor. (3)-P4

The doctor is being handed the cat by the lady. (6)-P4

The cat is being handed to the doctor by the lady. (5)-P4

The man is opening the window. (1)-P5

The window is being opened by the man. (2)-P5

The ball is being thrown to the dog by the girl. (5)-P6

The girl is throwing the dog the ball. (4)-P6

The dog is being thrown the ball by the girl. (6)-P6

The girl is throwing the ball to the dog. (3)-P6

The policeman is stopping the cars. (1)-P7

The cars are being stopped by the policeman. (2)-P7

The man is being given a pillow by the nurse. (6)-P8

A pillow is being given to the man by the nurse. (5)-P8

The nurse is giving the man a pillow. (4)-P8

The nurse is giving a pillow to the man. (3)-P8

The baby is being kissed by the woman. (2)-P9

The woman is kissing the baby. (1)-P9

The man is giving a puppy to the girl. (3)-P10

A puppy is being given to the girl by the man. (5)-P10

The man is giving the girl a puppy. (4)-P10

The girl is being given a puppy by the man. (6)-P10

The dog is eating the food. (1)-P11

The food is being eaten by the dog. (2)-P11

The lady is being given the letter by the mailman. (6)-P12

The letter is being given to the lady by the mailman. (5)-P12

The mailman is giving the lady the letter. (4)-P12

The mailman is giving the letter to the lady. (3)-P12

The girl is being hit by the boy. (2)-P13

The boy is hitting the girl. (1)-P13

The boy is showing the girl the picture. (4)-P14

The picture is being shown to the girl by the boy. (5)-P14

The boy is showing the picture to the girl. (3)-P14

The girl is being shown the picture by the boy. (6)-P14

The girl is pushing the boy. (1)-P15

The boy is being pushed by the girl. (2)-P15

The student is giving the paper to the teacher. (3)-P16

The paper is being given to the teacher by the student. (5)-P16

The teacher is being given the paper by the student. (6)-P16

The student is giving the teacher the paper. (4)-P16

The girl is being kissed by the boy. (2)-P17

The boy is kissing the girl. (1)-P17

The doctor is giving the man the medicine. (4)-P18

The doctor is giving the medicine to the man. (3)-P18

The medicine is being given to the man by the doctor. (5)-P18

The man is being given the medicine by the doctor. (6)-P18

The boy is being watched by the girl. (2)-P19

The girl is watching the boy. (1)-P19

A bone is being given to the dog by the man. (5)-P20

The man is giving the dog a bone. (4)-P20

The man is giving a bone to the dog. (3)-P20

The dog is being given a bone by the man. (6)-P20

Comprehension I

The sentences listed below were read to the subjects. For each sentence the subjects had to indicate which of two pictures correctly illustrated the sentence read. The numbers after P refer to the pictures shown. The numbers in parentheses refer to the target structures in Table 2.

The girl is hitting the boy. (1)-P1a,b

The girl is being hit by the boy. (2)-P1a,b

The teacher is giving the chalk to the student. (3)-P2a,b

The student is giving the teacher the chalk. (4)-P2a,b

The chalk is being given to the student by the teacher. (5)-P2a,b

The teacher is being given the chalk by the student. (6)-P2a,b

The man is kissing the lady. (1)-P3a,b

The lady is being kissed by the man. (2)-P3a,b

The mother is giving a toy to the baby. (3)-P4a,b

The mother is giving the baby a toy. (4)-P4a,b

A toy is being given to the mother by the baby. (5)-P4a,b

The mother is being given a toy by the baby. (6)-P4a,b

The girl is pushing the boy. (1)-P5a,b

The girl is being pushed by the boy. (2)-P5a,b

The man is giving the letter to the lady. (3)-P6a,b

The man is giving the lady the letter. (4)-P6a,b

The letter is being given to the man by the lady. (5)-P6a,b

The lady is being given the letter by the man. (6)-P6a,b

The boy is watching the girl. (1)-P7a,b

The girl is being watched by the boy. (2)-P7a,b

The lady is giving the picture to the man. (3)-P8a,b

The man is giving the lady the picture. (4)-P8a,b

The picture is being given to the man by the lady. (5)-P8a,b

The lady is being given the picture by the man. (6)-P8a,b

The boy is carrying the girl. (1)-P9a,b

The boy is being carried by the girl. (2)-P9a,b

The boy is showing the toy to the girl. (3)-P10a,b

The girl is showing the boy the toy. (4)-P10a,b

The toy is being shown to the girl by the boy. (5)-P10a,b

The boy is being shown the toy by the girl. (6)-P10a,b

The big dog is barking at the little dog. (1)-P11a,b

The little dog is being barked at by the big dog. (2)-P11a,b

The man is handing the notebook to the lady. (3)-P12a,b

The man is handing the lady the notebook. (4)-P12a,b

The notebook is being handed to the man by the lady. (5)-P12a,b

The lady is being handed the notebook by the man. (6)-P12a,b

The boy is feeding the lady. (1)-P13a,b

The boy is being fed by the lady. (2)-P13a,b

The man is throwing the ball to the girl. (3)-P14a,b

The girl is throwing the man the ball. (4)-P14a,b

The ball is being thrown to the man by the girl. (5)-P14a,b

The girl is being thrown the ball by the man. (6)-P14a,b

The girl is admiring the boy. (1)-P15a,b

The boy is being admired by the girl. (2)-P15a,b

The man is reading the book to the lady. (3)-P16a,b

The man is reading the lady the book. (4)-P16a,b

The book is being read to the man by the lady. (5)-P16a,b

The lady is being read the book by the man. (6)-P16a,b

The lady is hugging the man. (1)-P17a,b

The lady is being hugged by the man. (2)-P17a,b

The lady is showing the magazine to the child. (3)-P18a,b

The child is showing the lady the magazine. (4)-P18a,b

The magazine is being shown to the child by the lady. (5)-P18a,b

The lady is being shown the magazine by the child. (6)-P18a,b

The little boy is kicking the big boy. (1)-P19a,b

The big boy is being kicked by the little boy. (2)-P19a,b

The boy is bringing the packages to the lady. (3)-P20a,b

The boy is bringing the lady the packages. (4)-P20a,b

The packages are being brought to the lady by the boy. (5)-P20a,b

The boy is being brought the packages by the lady. (6)-P20a,b

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Comprehension II

The sentences listed below were read to the subjects. For each sentence the subjects had to indicate whether the sentence accurately described a picture shown to the subjects by writing true or false. The numbers after P refer to the pictures shown. The letters in parentheses indicate whether the passives are reversible (R) or nonreversible (N).

The pipe is being smoked by the man. (N)-P1

The lady is being washed by the man. (R)-P2

The man is being helped by the lady. (R)-P3

The lady is being washed by the dress. (N)-P4

The skinny man is being hit by the fat man. (R)-P5

The hat is being worn by the girl. (N)-P6

The man is being read by the book. (N)-P7

The letter is being written by the woman. (N)-P8

The old man is being kissed by the little girl. (R)-P9

The lady is being carried by the man. (R)-P10

The man is being yelled at by the lady. (R)-P11

The girl is being eaten by the food. (N)-P12

The girl is being watched by the man. (R)-P13

The pencil is being held by the woman. (N)-P14

The girl is being held by the boy. (R)-P15

The lady is being followed by the man. (R)-P16

The man is being watched by the television. (N)-P17

The car is being driven by the man. (N)-P18

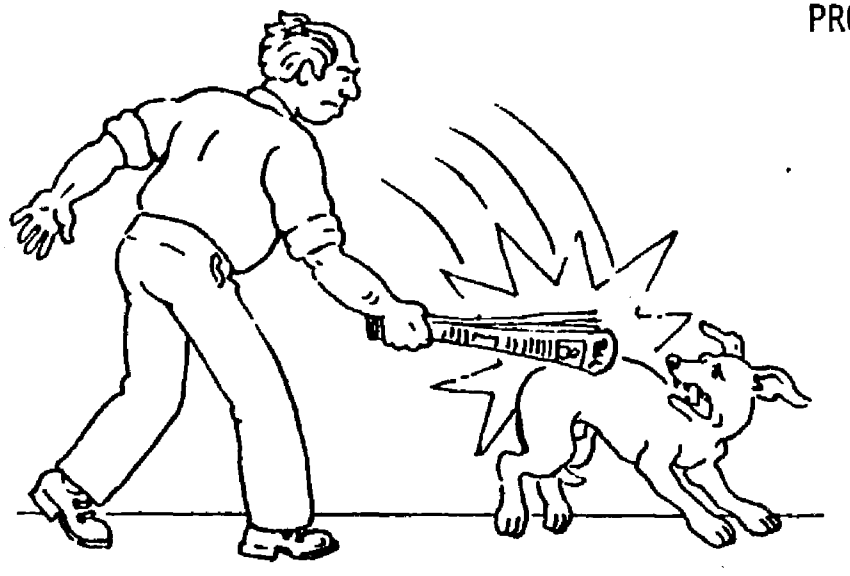
The lady is being cleaned by the table. (N)-P19

The boy is being slapped by the girl. (R)-P20

Appendix C

THE TESTING INSTRUMENT: PICTORIAL COMPONENT

PRODUCTION



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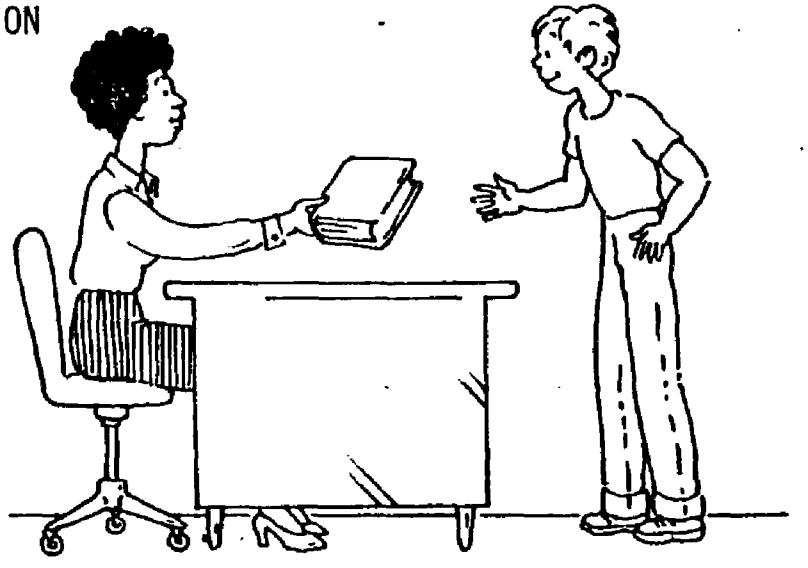

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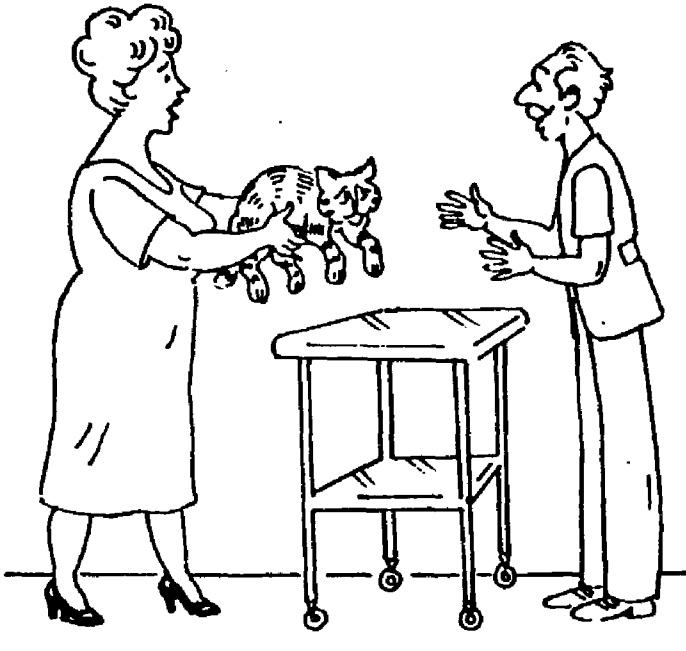

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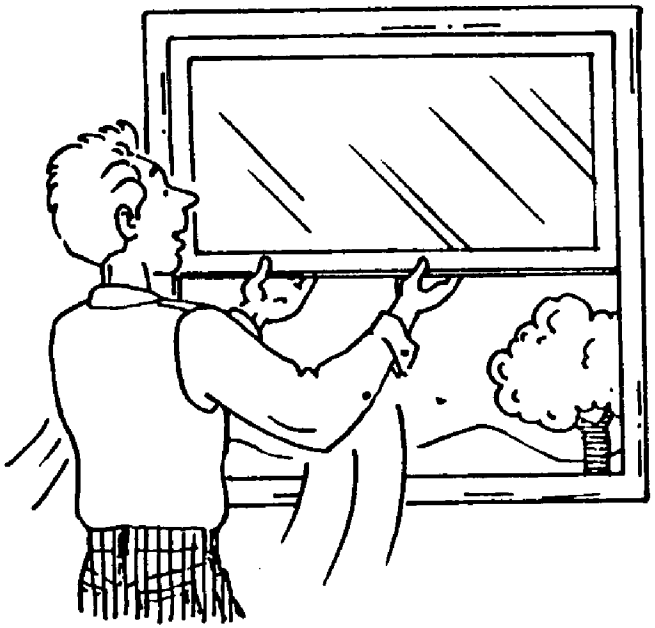

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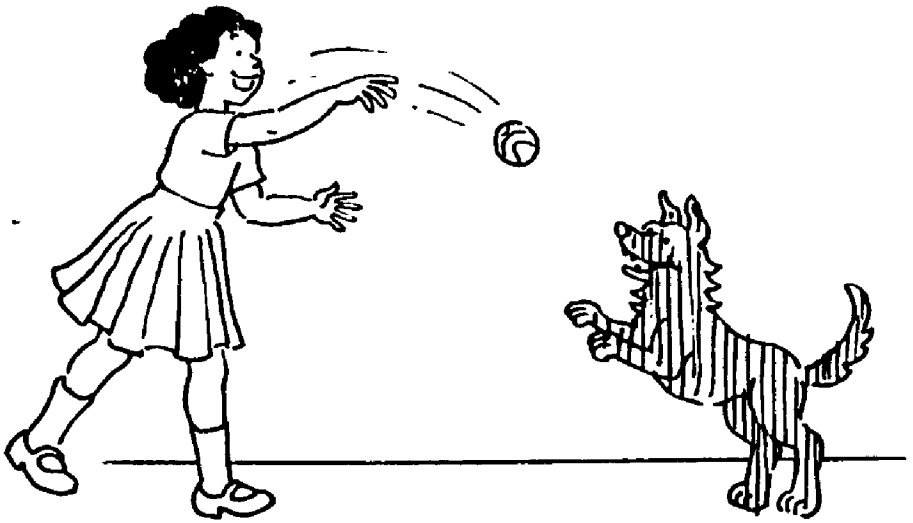

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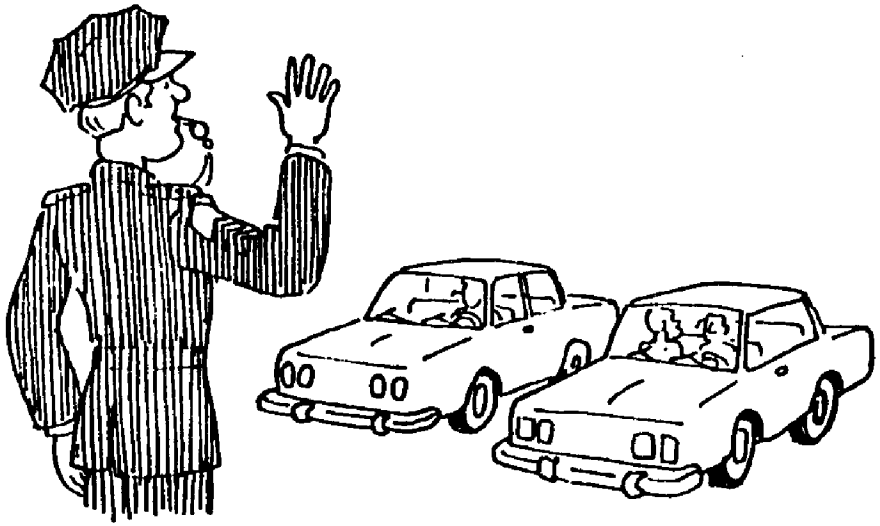

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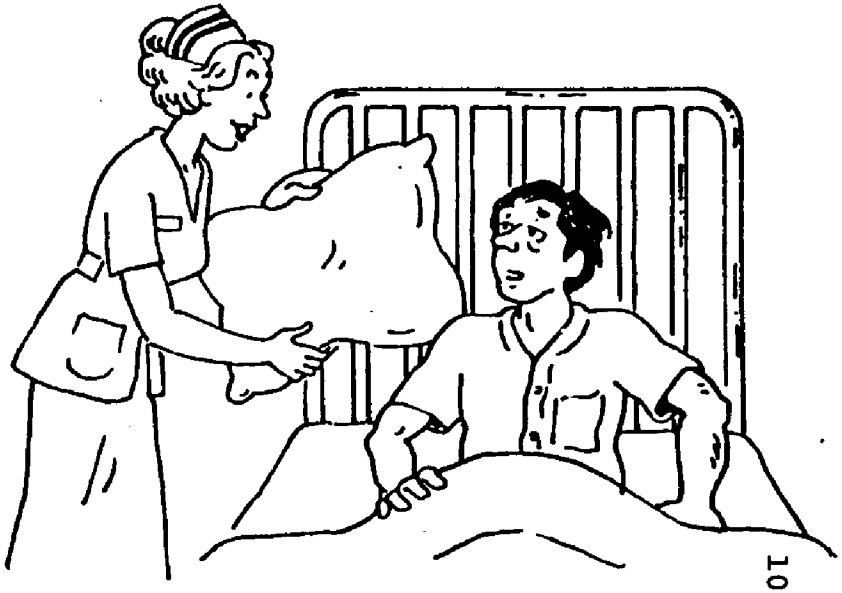

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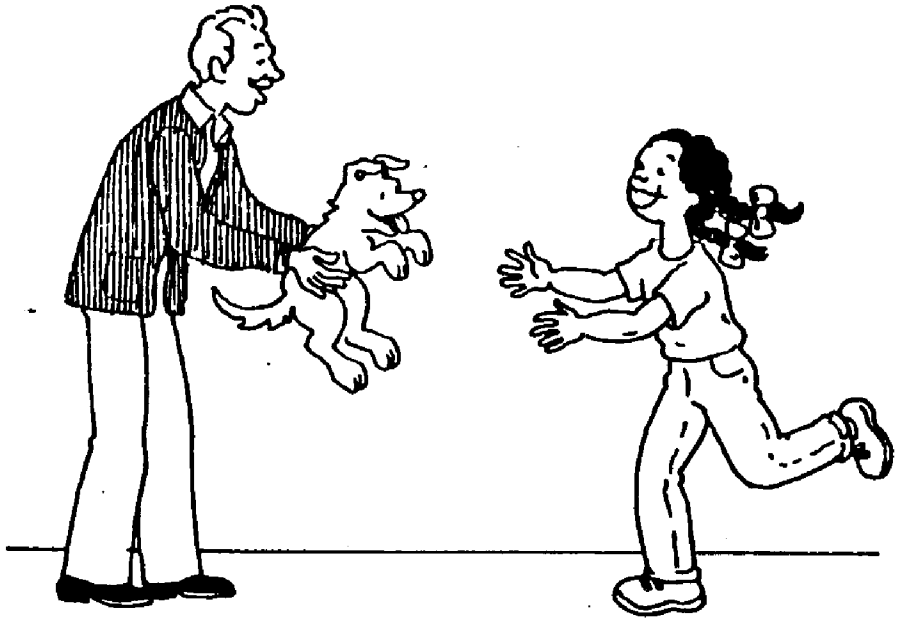

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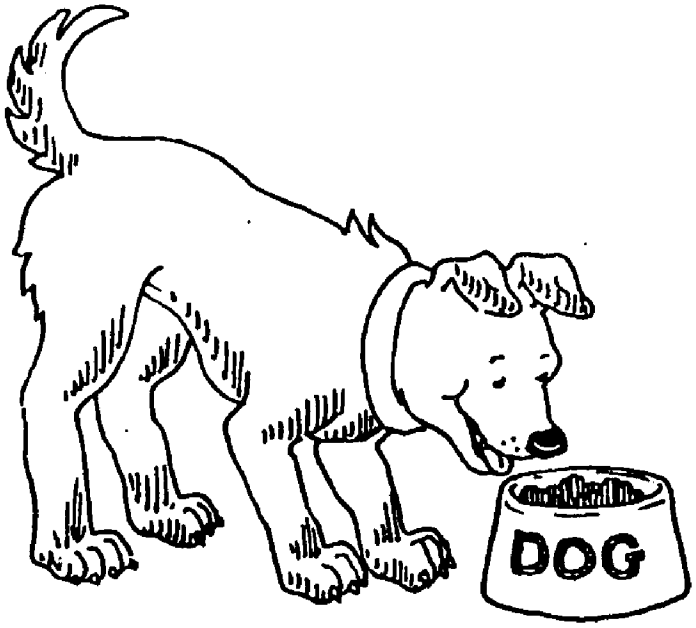

11.

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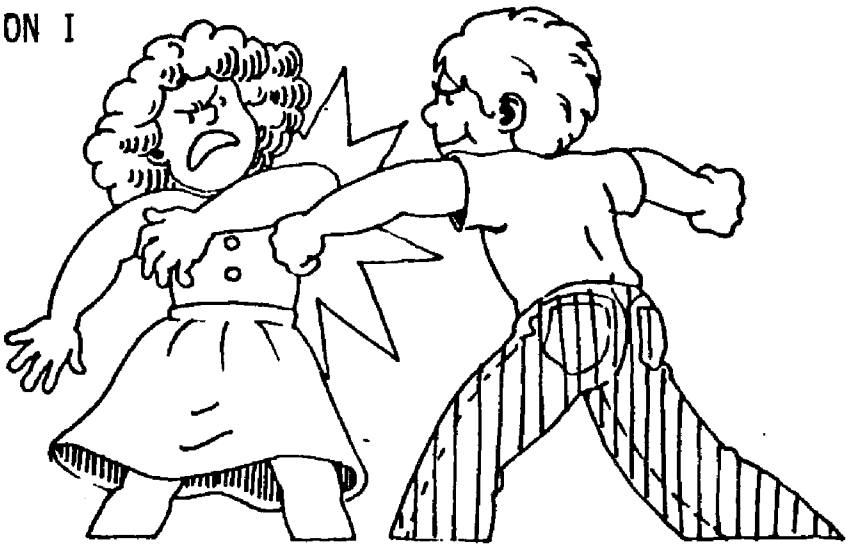
20.

COMPREHENSION I

1 (A)

(B)



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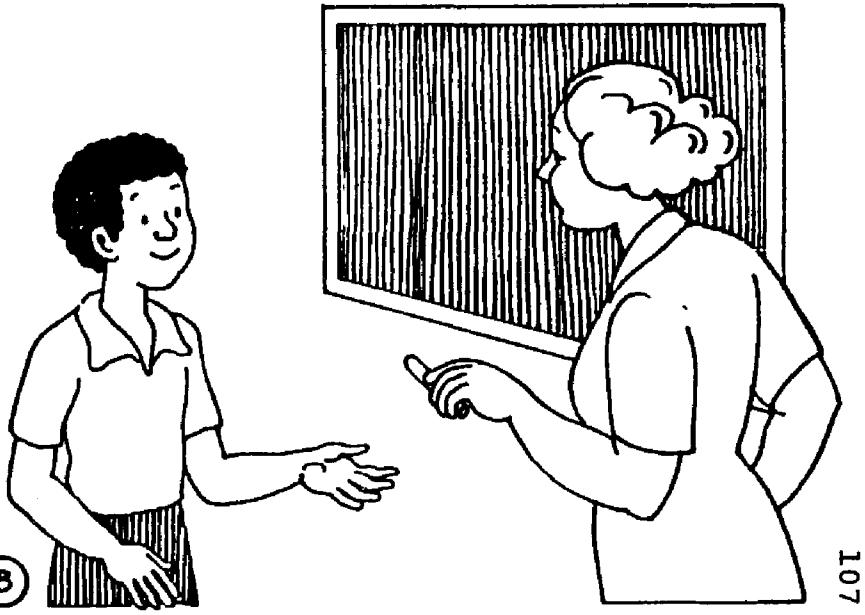

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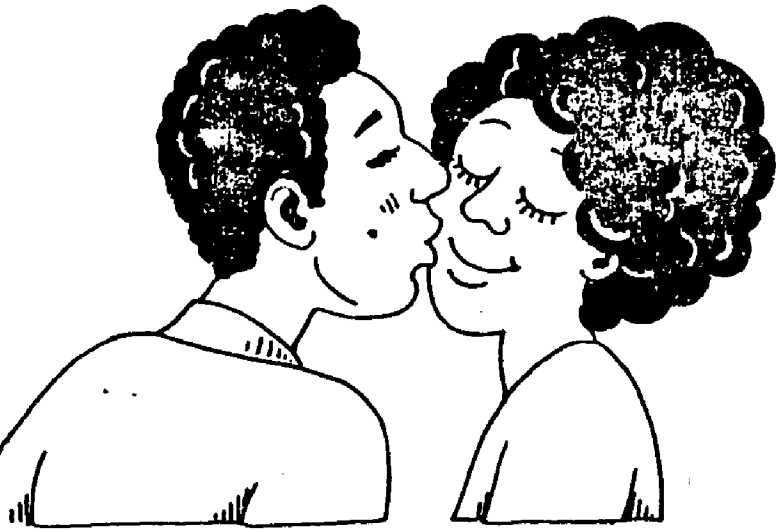

(B)

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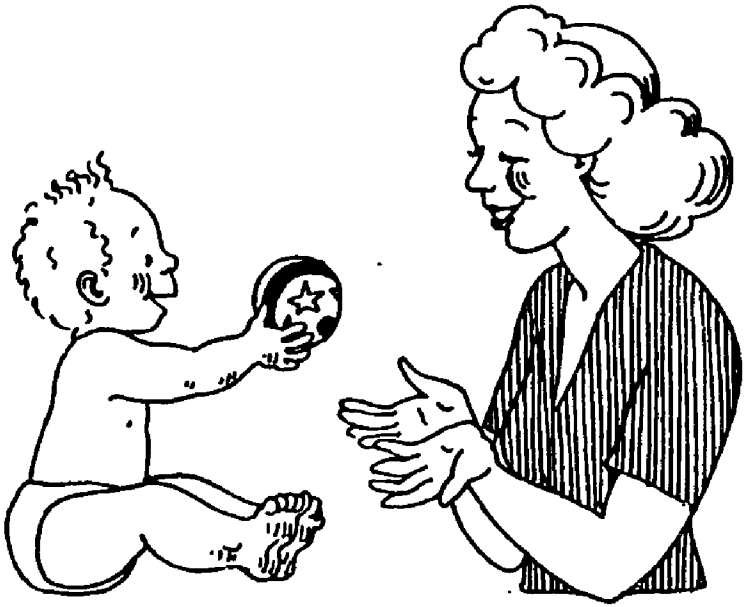

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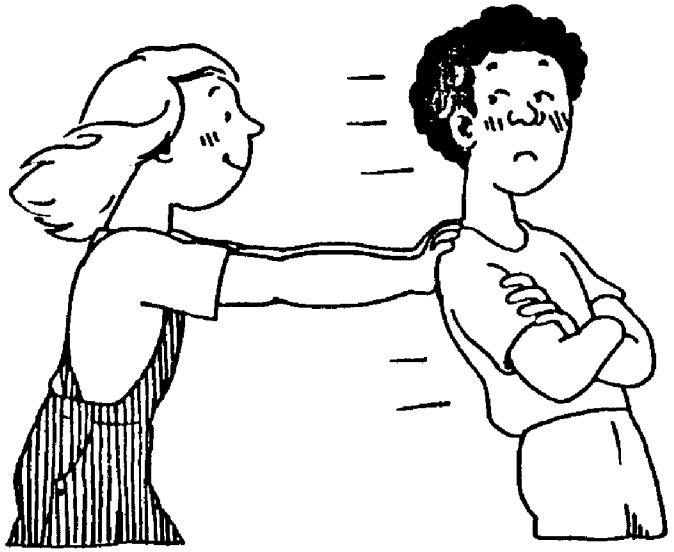

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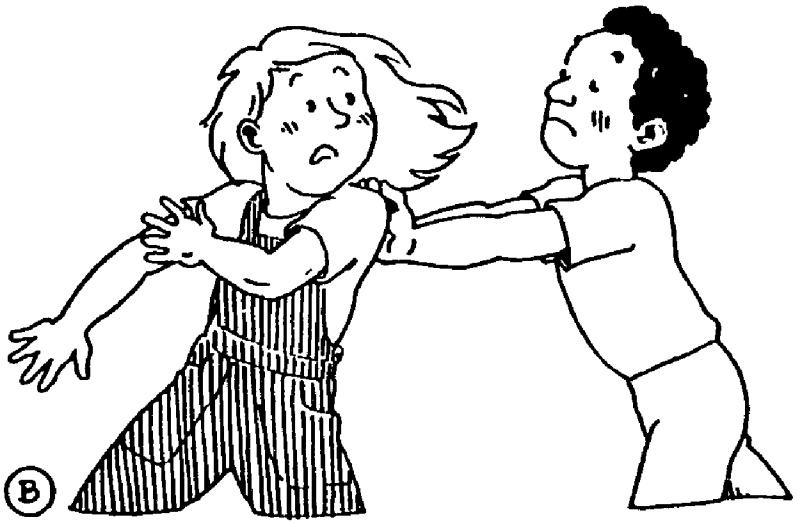

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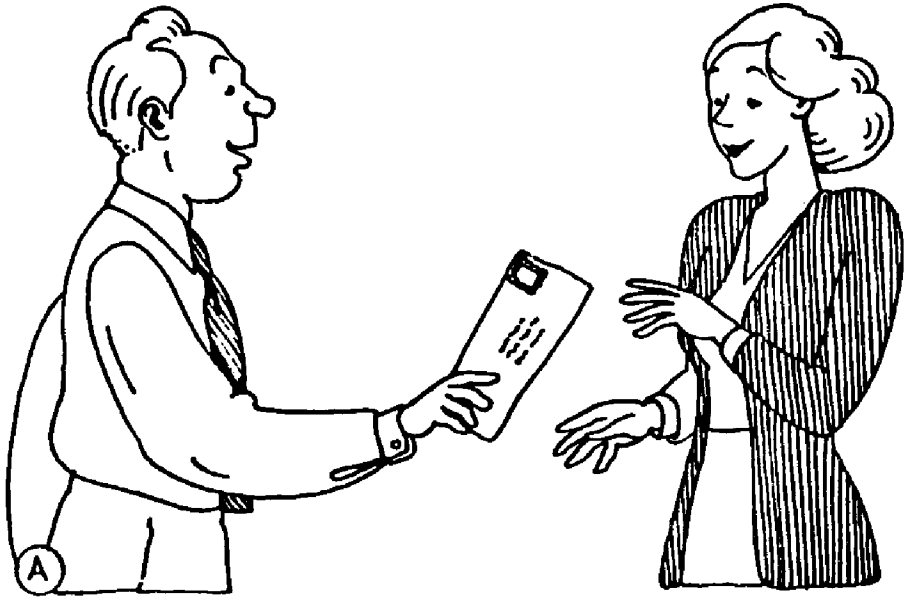

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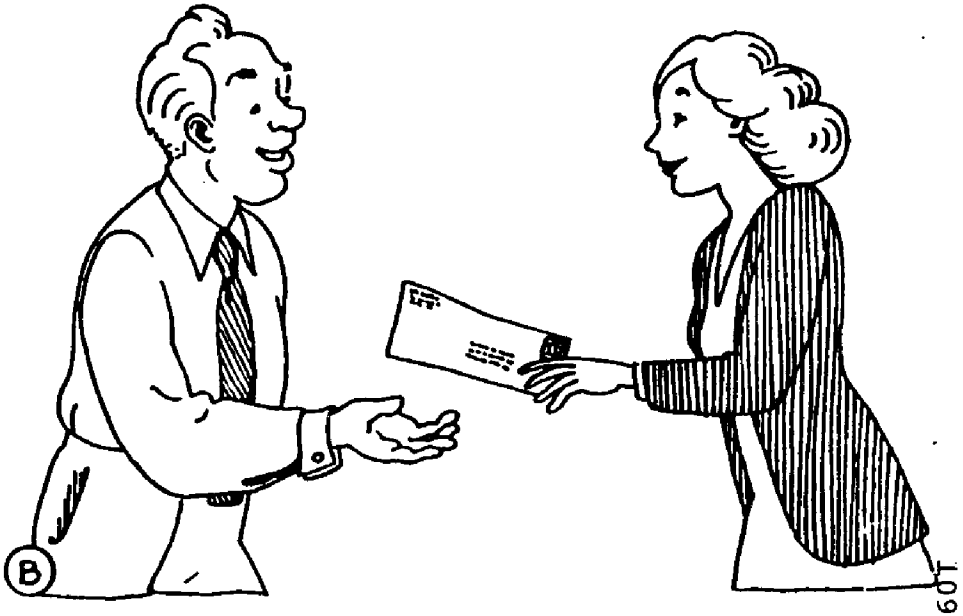
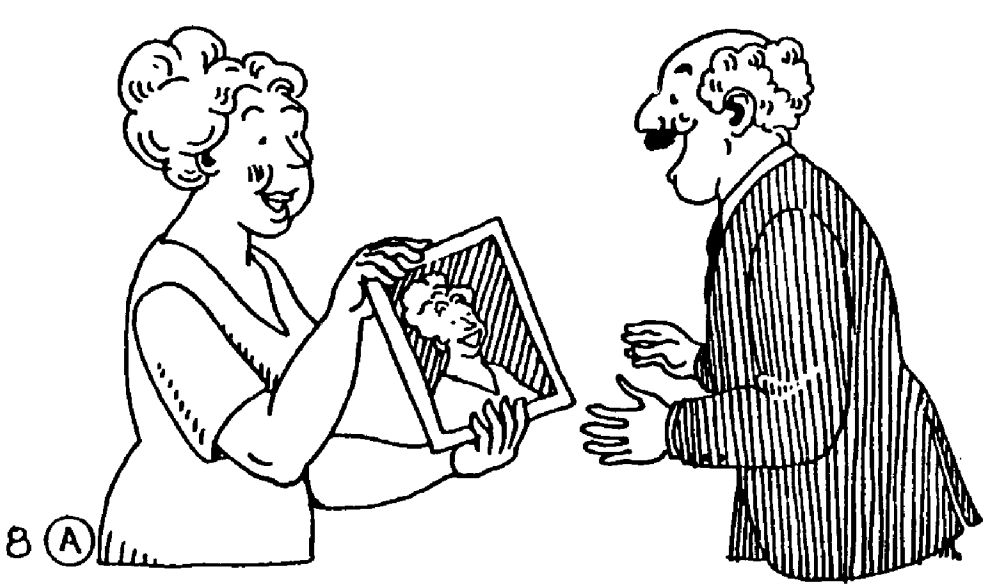


7 (A)

(B)



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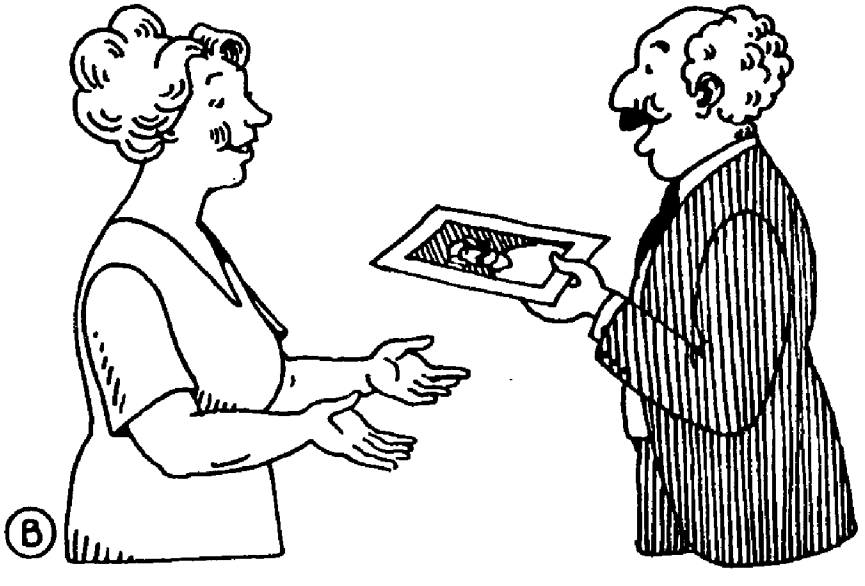

(B)

9 (A)

(B)

10 (A)

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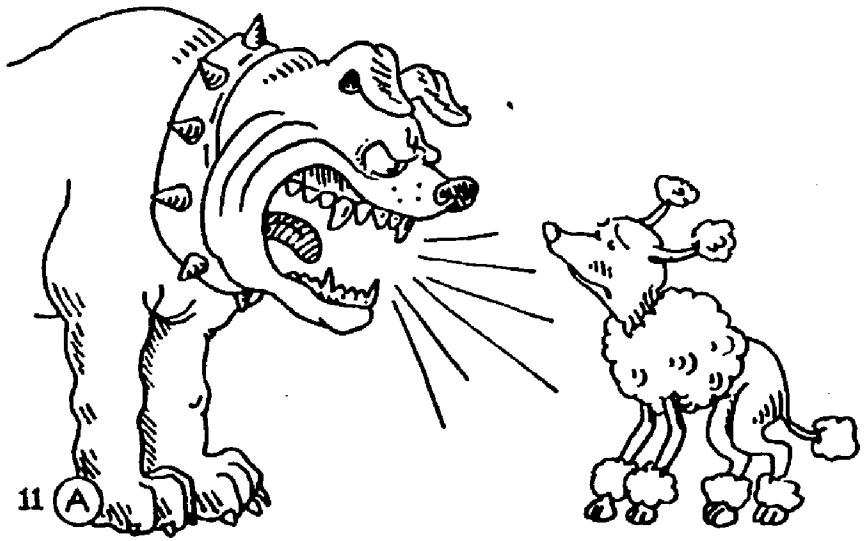

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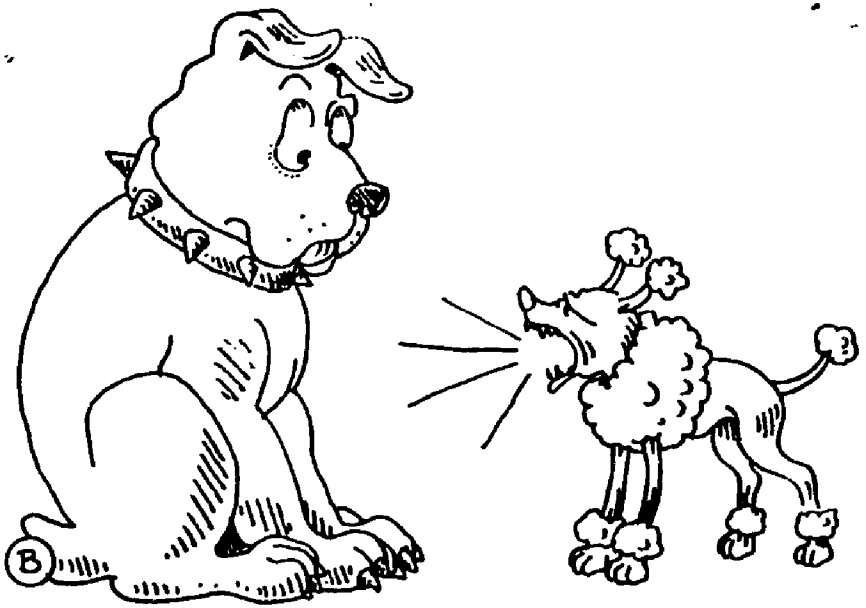

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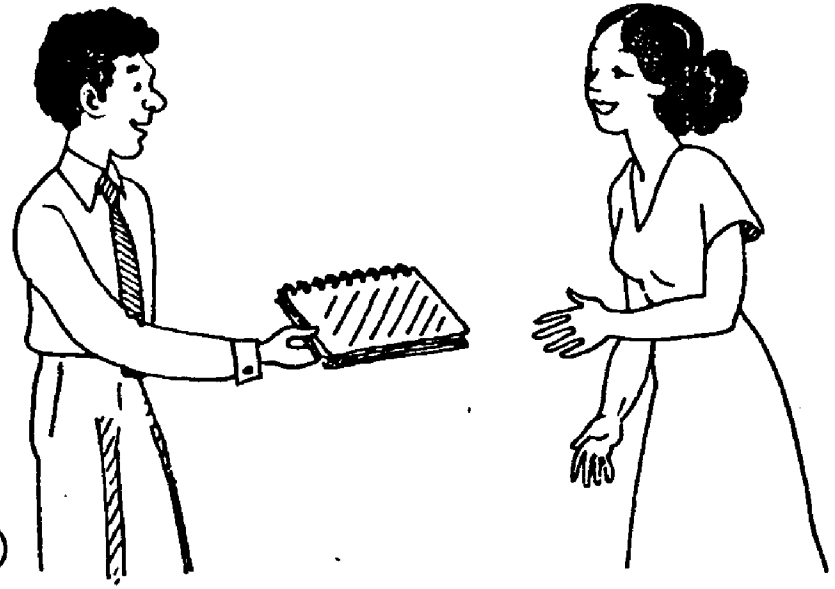

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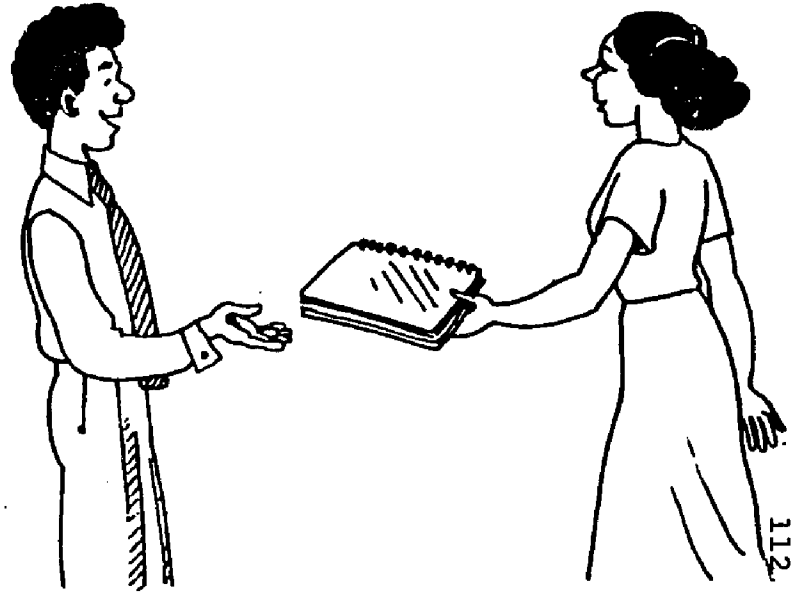
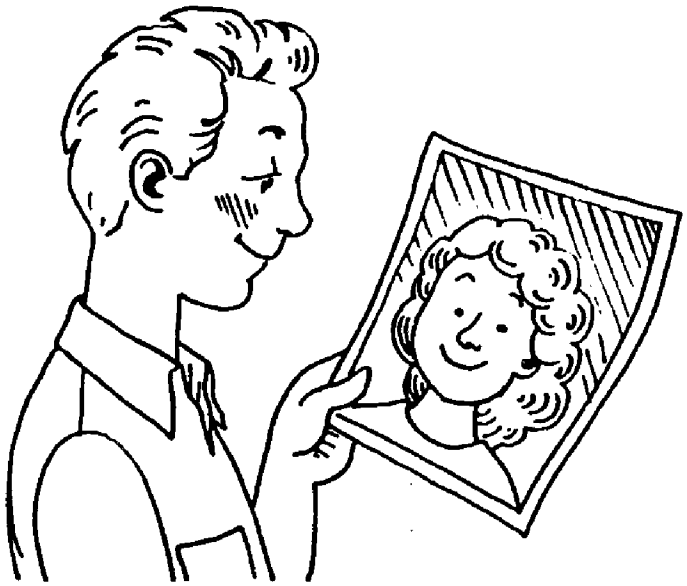


(B)


13
A
B


14
A
B

15 (A)



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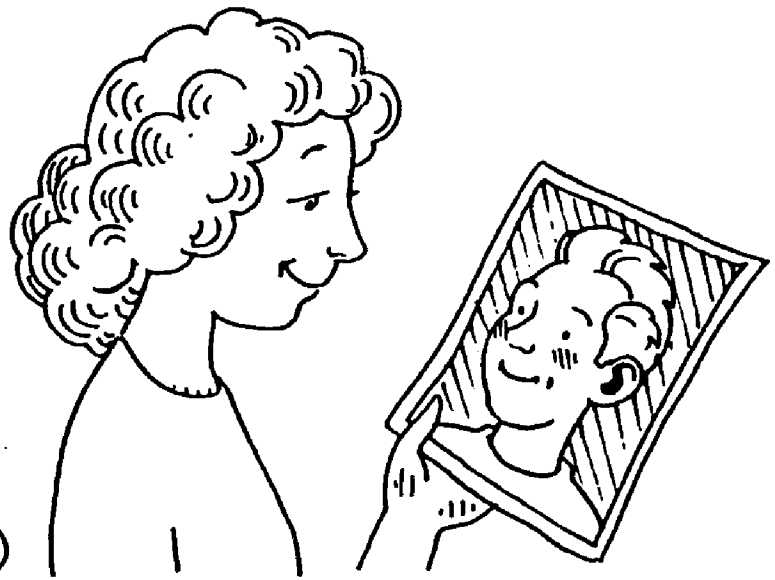

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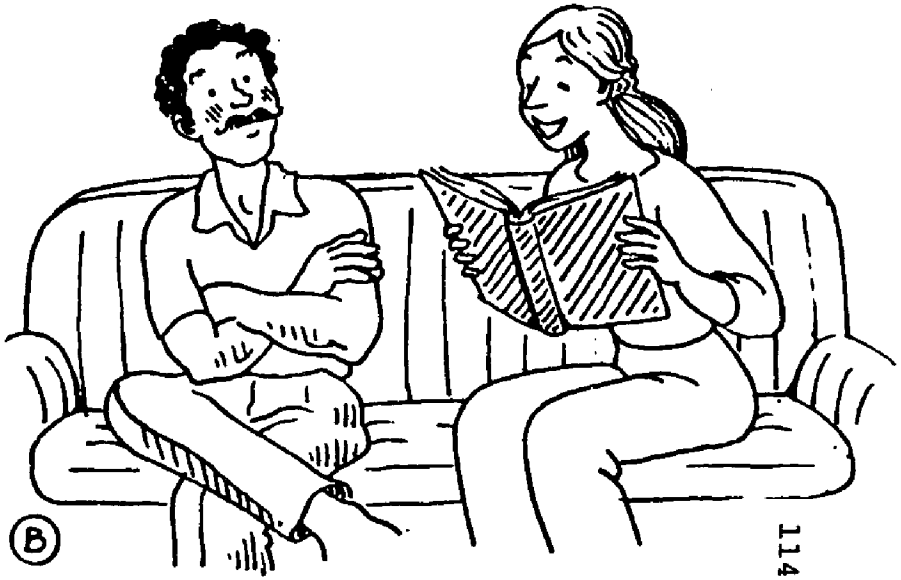

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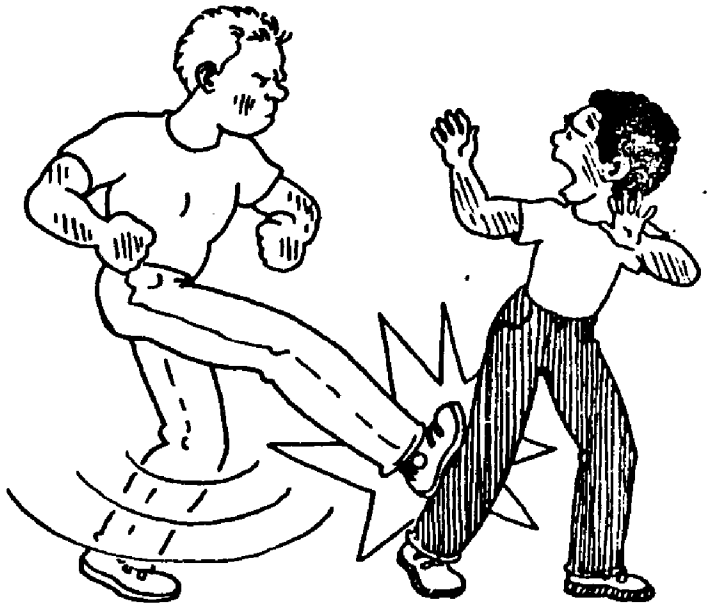

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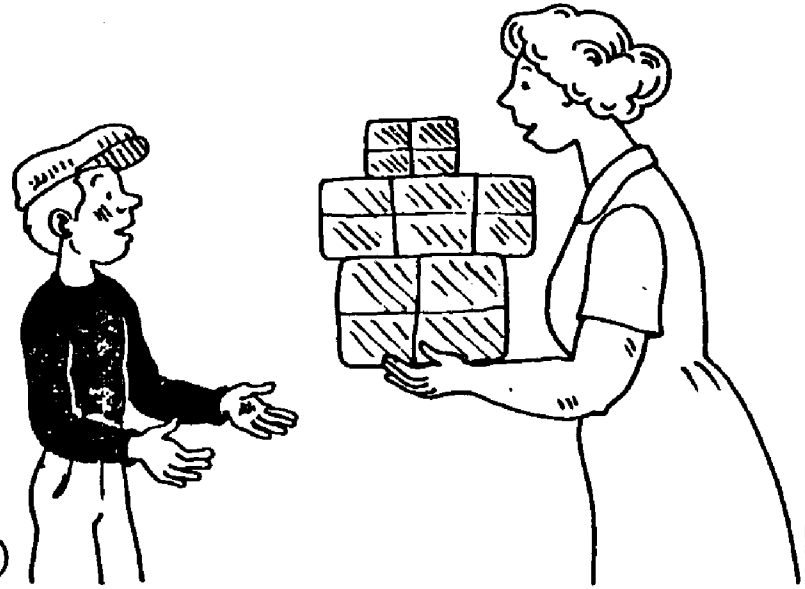
20 (A)

(B)



COMPREHENSION II

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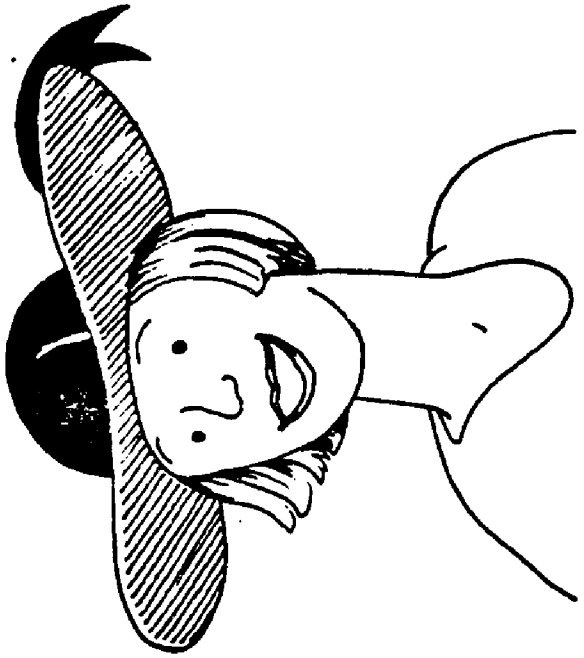

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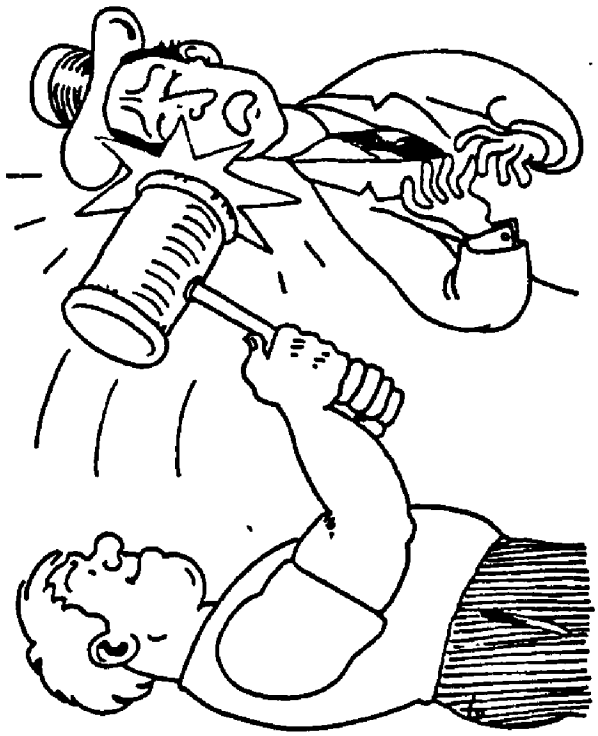

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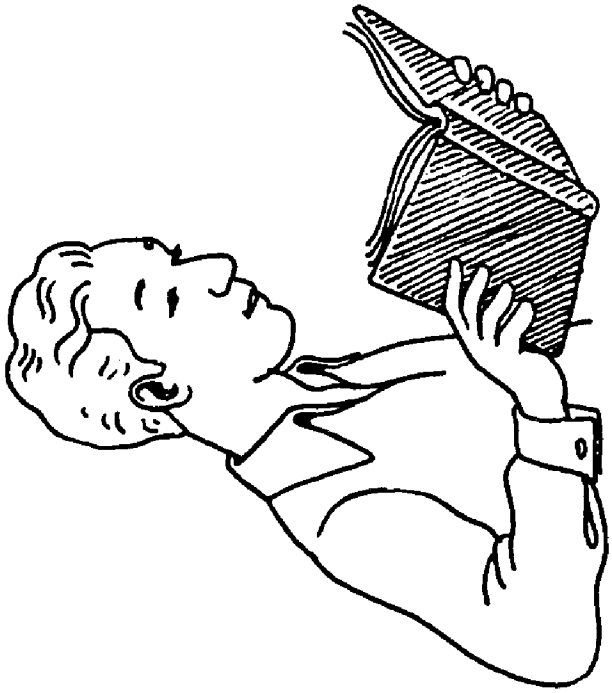

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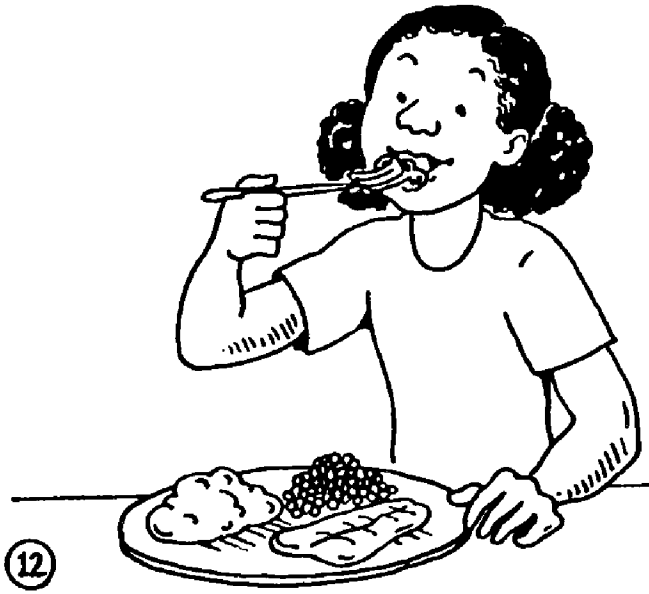
(9)

(10)

(11)



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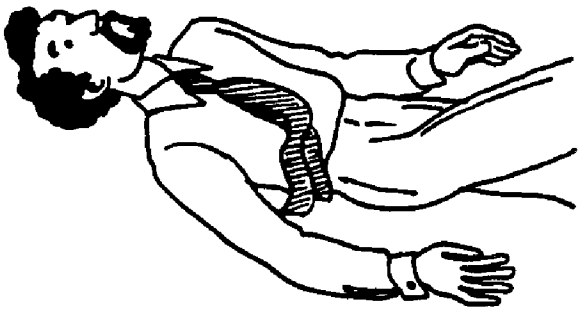

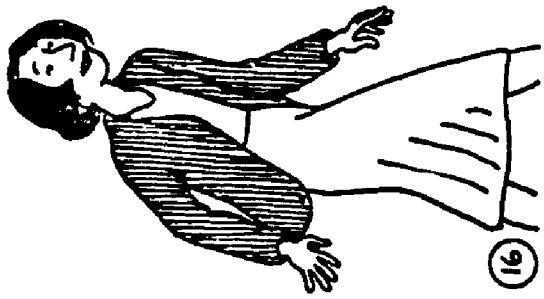

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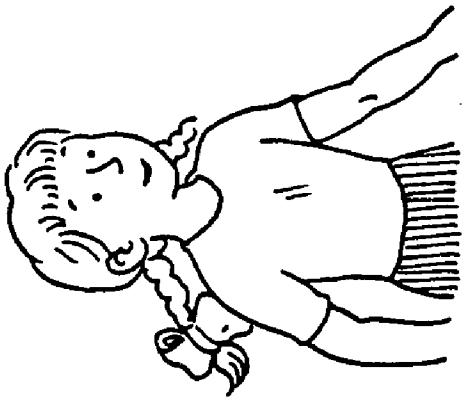

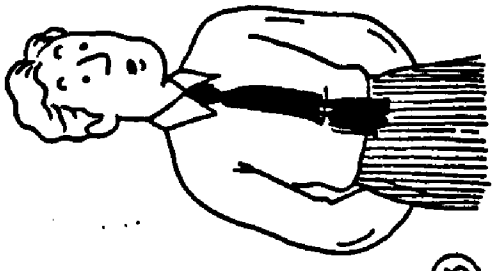

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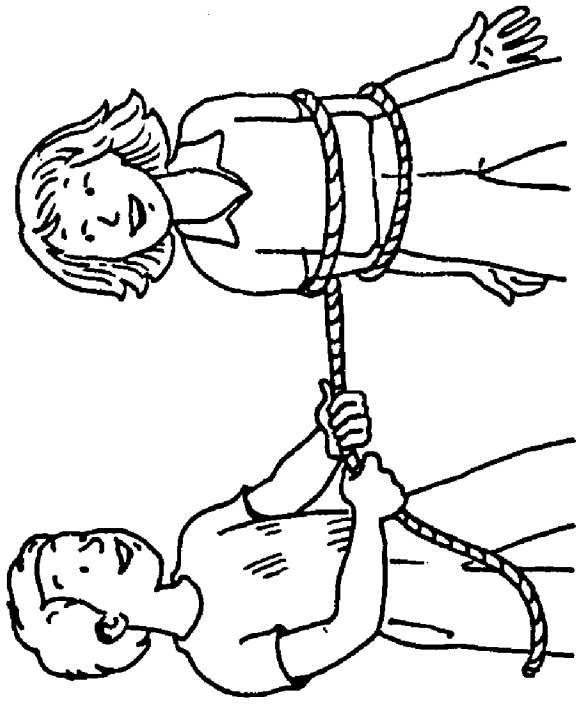

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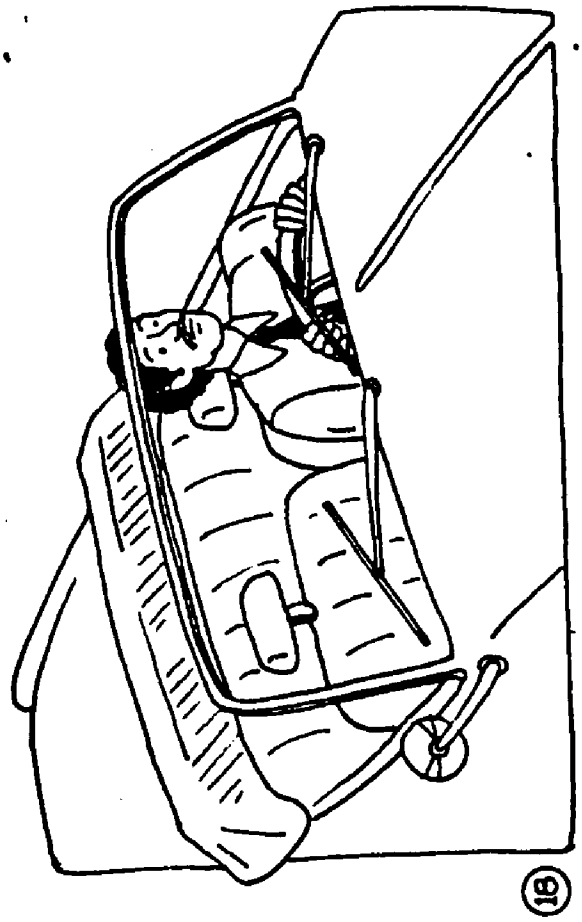

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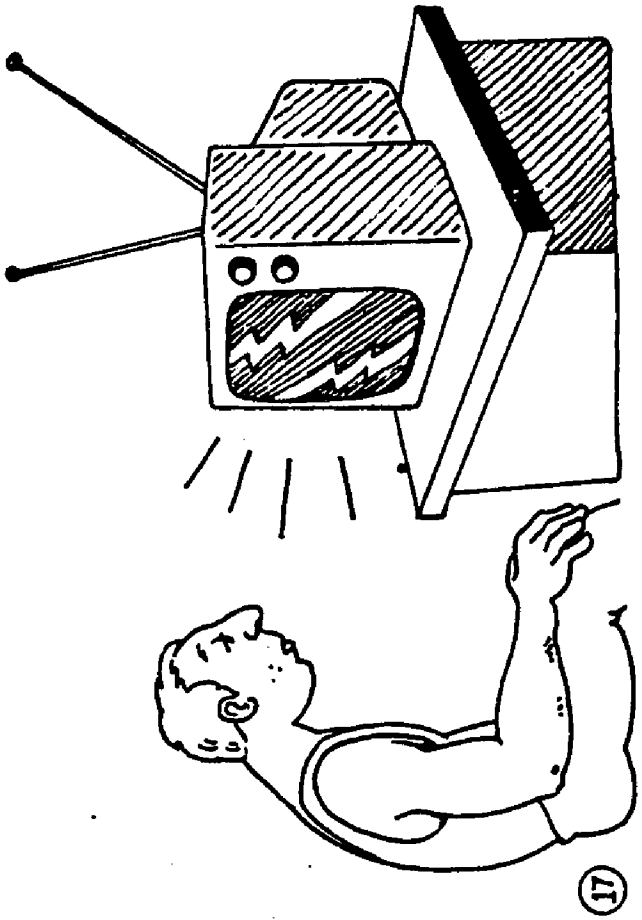

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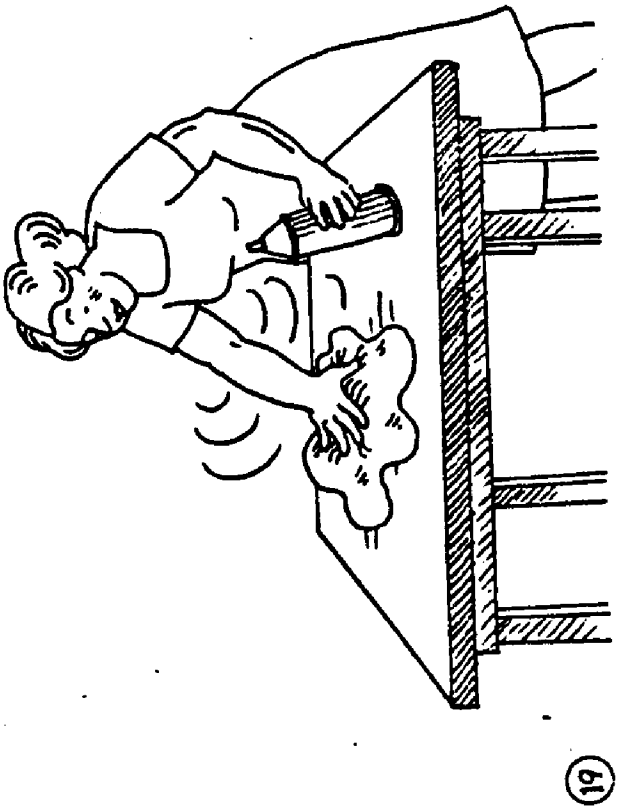

19

Appendix D

RAW DATA FOR ALL SUBJECTS: PERCENT CORRECT PERFORMANCE

	ADULTS													
	Production						Comprehension							
Structure	1	2	3	4	5	6	1	2	3	4	5	6	R[1]	N[2]
1. MR	85.0	25.0	95.0	83.3	85.0	5.0	100	100	100	100	100	100	100	100
2. KS	90.0	90.0	100	85.0	20.0	61.1	70.0	100	100	100	100	100	90.0	80.0
3. HA	85.0	83.3	100	83.3	95.0	95.0	90.0	100	100	90.0	90.0	90.0	50.0	80.0
4. CS	100	16.6	70.0	40.0	27.7	00.0	90.0	90.0	100	90.0	100	100	90.0	90.0
5. MB	95.0	20.0	75.0	35.0	55.0	00.0	90.0	100	100	70.0	100	100	100	100
6. VV	85.0	28.5	60.0	16.6	11.1	00.0	100	50.0	100	80.0	80.0	30.0	40.0	70.0
7. CA	80.0	00.0	70.0	44.4	25.0	10.0	80.0	70.0	80.0	50.0	50.0	20.0	50.0	40.0
8. VS	95.0	90.0	90.0	60.0	55.0	00.0	100	80.0	100	100	100	100	100	100
9. SS	95.0	88.8	100	35.0	50.0	10.0	90.0	100	100	100	100	100	100	100
10. PT	70.0	85.0	70.0	40.0	95.0	77.7	80.0	100	100	70.0	100	100	100	90.0
11. OC	65.0	72.2	55.0	38.8	40.0	00.0	100	90.0	100	80.0	100	100	90.0	100
12. ES	80.0	44.4	90.0	55.5	45.0	00.0	80.0	70.0	100	100	100	90.0	90.0	100

	ADULTS													
	Production						Comprehension							
Structure	1	2	3	4	5	6	1	2	3	4	5	6	R	N
13. HG	85.0	5.0	100	55.0	5.0	00.0	80.0	90.0	90.0	90.0	80.0	80.0	90.0	100
14. DL	88.8	100	90.0	75.0	95.0	75.0	90.0	70.0	100	90.0	100	90.0	90.0	90.0
15. YW	60.0	40.0	45.0	25.0	5.5	30.0	80.0	80.0	100	80.0	90.0	80.0	90.0	90.0
16. JH	90.0	50.0	95.0	45.0	20.0	5.0	100	90.0	100	100	90.0	60.0	80.0	100
17. CK	60.0	00.0	42.8	5.0	00.0	00.0	100	50.0	90.0	50.0	30.0	20.0	50.0	40.0
18. GM	65.0	55.5	60.0	40.0	35.0	30.0	100	60.0	100	90.0	100	90.0	70.0	60.0
19. PL	80.0	100	55.0	35.0	70.0	35.0	90.0	80.0	100	100	100	100	100	100
20. SB	81.2	75.0	60.0	60.0	50.0	50.0	100	90.0	100	60.0	70.0	80.0	60.0	100
21. LA	75.0	27.7	35.0	40.0	40.0	30.0	60.0	100	80.0	90.0	90.0	90.0	100	100
22. PT	83.3	77.7	75.0	70.0	45.0	10.0	80.0	80.0	80.0	90.0	70.0	60.0	90.0	80.0
23. IK	75.0	60.0	65.0	55.0	70.0	40.0	100	100	90.0	80.0	80.0	100	90.0	100
24. YC	90.0	80.0	90.0	90.0	90.0	95.0	100	90.0	90.0	80.0	100	100	100	100

	CHILDREN													
	Production						Comprehension							
Structure	1	2	3	4	5	6	1	2	3	4	5	6	R[1]	N[2]
1. RS	85.0	00.0	100	85.0	00.0	00.0	100	80.0	100	100	100	100	90.0	100
2. MB	95.0	93.7	95.0	40.0	70.0	50.0	70.0	90.0	100	100	100	100	90.0	100
3. MA	95.0	20.0	80.0	40.0	60.0	00.0	100	100	100	90.0	80.0	80.0	100	100
4. VB	81.2	00.0	90.0	80.0	00.0	00.0	100	90.0	90.0	100	100	100	80.0	90.0
5. SN	100	85.0	100	70.0	77.7	00.0	90.0	90.0	90.0	90.0	100	100	100	100
6. WA	60.0	33.3	55.0	60.0	00.0	00.0	100	50.0	90.0	80.0	90.0	50.0	10.0	00.0
7. HS	85.0	00.0	55.0	90.0	00.0	00.0	90.0	50.0	90.0	70.0	80.0	30.0	40.0	50.0
8. WL	95.0	85.0	100	10.0	90.0	00.0	100	90.0	100	100	100	100	80.0	90.0
9. PM	95.0	00.0	90.0	20.0	00.0	5.0	90.0	40.0	80.0	60.0	30.0	30.0	40.0	80.0
10. PN	85.0	33.3	60.0	55.0	00.0	7.1	90.0	80.0	90.0	70.0	70.0	90.0	100	90.0
11. LR	44.4	00.0	15.0	00.0	00.0	00.0	100	40.0	100	100	20.0	00.0	00.0	20.0
12. SM	60.0	00.0	5.0	45.0	00.0	00.0	90.0	50.0	90.0	60.0	40.0	40.0	40.0	40.0

[1]R = reversible passives. [2]N = nonreversible passives.

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