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A Study of Young Children's Utterance Production

Alan Paul Kenworthy

A thesis presented for the degree of Doctor of Philosophy in the
University of Durham

1976

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Abstract

Unlike most studies of language development, this research is not primarily concerned with the discovery of grammars, but with utterance production. Not only is it concerned with what language young children produce, but also with how they produce it. And it is specifically concerned with the limitations to utterance production at the preschool age.

The main reason for taking this approach is the inadequacy of grammatical theories to account for language behaviour. It is argued that Chomsky's distinction between competence and performance is linguistically valuable but psychologically questionable. For instance, those aspects of language behaviour that are said to be linguistically irrelevant, are very relevant to a psychological theory of language behaviour. Therefore, this research is based on a comprehensive view of language as a system of communication.

The findings suggest that there is no limit to production at this age, other than that arising from learning, and the general discrepancy between receptive and expressive abilities. Furthermore, the variation in utterance production, and the systematic nature of the linkage between utterances and their linguistic and non-linguistic context, indicate that a probabilistic theory

of utterance production would best account for the behaviour observed. The research is exploratory, and the findings only give clues as to the nature of utterance production, but they confirm the value of the approach adopted.

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Chapter I

Introduction - The Study of Utterance Production

Language and Speech

This is a study of young children's utterance production, or to put it less technically, it is a study of their ability to talk. It might also be called a study of language development but these words were not used for reasons that have to do with the particular approach to language adopted in this research.

The main reason for not using the word language in the title is that it has come to have a meaning for some linguists which seems to exclude the essence of language, and that is its symbolism. Language has been defined as a set of grammatical sentences. This kind of definition emphasizes the structural or formal aspects of language while its functional and symbolic aspects are seemingly disregarded. The sentence is structurally defined using a system of abstract symbols and its function in the communication of ideas is not considered. Meaning has been a notoriously tricky phenomenon for both linguistics and psychology, therefore the attempts to describe language without involving meaning are quite understandable. This approach has resulted in the words language and sentence being used with more precise but also more abstract denotations than they ordinarily have.

Transformational grammar is an outstanding structural theory of language, and this grammar defines a language by generating all and only the grammatical sentences of that language. This grammar describes or defines a language by generating or making all the sentences that do or might belong to it. Since people know which word sequences are sentences in their language, the grammar is said to be a partial description of human linguistic knowledge. Nevertheless, it is very important to realise that the grammar is a linguistic device for generating sentences and not a model of human utterance production. The grammar may make sentences but the way in which it does this is not meant to represent how people make sentences in speaking a language. People produce utterances some of which are grammatical sentences and some of which are not, and when they speak they are usually expressing an idea or a feeling. This research is primarily concerned with actual language behaviour and how utterances are produced by young children, rather than with their knowledge of sentence structure. Therefore, the title is a study of utterance production and not a study of language development, even though the work is concerned with the development of language in its more general sense.

Most psycholinguistic studies of language development are based on transformational grammar so they tend to emphasize the structural aspects of child language

(Brown, Cazden and Bellugi 1968; McNeill 1970; Bloom 1970). These studies are more or less concerned with the child's knowledge of language, but this knowledge tends to be a rather abstract kind of knowledge in the sense that transformational grammar does not describe sentence production. From a psychological point of view it would be more helpful if the grammar was supposed to represent sentence production for then its validity as such could be investigated. Instead, the grammar is said to represent knowledge which is made use of in speaking with very little indication of just how the human speaker might use this knowledge. Since this research is concerned with utterance production and psychological theories to account for it, it must encompass the child's knowledge of language. However, the guiding principles for this research are that those aspects of language that have to do with its sentence structure are not likely to be psychologically distinct from other aspects of linguistic knowledge and, secondly, that a good account of the ability to talk will describe linguistic knowledge and its use in a dynamic theory of the organisation of language behaviour.

Linguistics and Psychology

The reader might suppose that the difference between the present work and most studies of language development reflects a difference between linguistic and psychological approaches to language. However, there is within both linguistics and psychology a great variety of

approaches to and theories about language so this contrast would be difficult to maintain. Moreover, as Bever (1968:478) points out, linguistic theory is psychological theory because it deals with a psychological phenomenon. On the other hand, linguists consider their science autonomous (Lyons 1970:8), which is interpreted to mean that they are more interested in languages than the psychological processes of understanding and speaking. In this regard languages are abstractions from human behaviour in much the same way that a person may describe a computer programming language without saying how the computer receives, processes and transmits it. Transformational grammar is largely based on the judgements of grammaticality and theoretical preferences of a few linguists, and in this way it is a description of language abstracted from behaviour. From a linguistic point of view this abstractive step is quite acceptable, but when the result is projected back into the organism as a partial account of the ability to understand and produce an indefinite variety of sentences, the abstraction and its associated projection seem to raise a number of questions about the psychology of language which could be avoided if the assumptions underlying the abstraction are changed.

The main problem is that transformational grammar has two roles which are not quite as compatible as they might at first appear. In the first role the grammar is presented as a partial account of the human ability to

understand and produce an indefinite variety of sentences (Chomsky and Miller 1963:271). In the second role it is presented as a system for differentiating grammatical and ungrammatical sequences (Chomsky 1957). It does very well in the second role but not so well in the first, probably because Chomsky's background is in linguistics and not psychology. It does well in the second role because it is the most simple, explicit and comprehensive system for defining a set of sentences. It does not do so well in the first role because it is not a model of speaking or understanding the indefinite variety of sentences which people can handle. The grammar's success in the second role depends on several assumptions, and it is these same assumptions which reduce the grammar's success in the first role.

Chomsky draws a distinction between knowledge of language and the use of this knowledge in language behaviour, and transformational grammar is said to represent this knowledge in part. It seems quite reasonable that the human speaker has some conception of what is well-formed in his language and the grammar attempts to make this conception explicit by specifying which sentences are well-formed or grammatical in a language. The problem comes in trying to relate this conception of well-formedness to actual speech. Chomsky suggests that a theory of language behaviour would incorporate the grammar but it is not easy to see how this could be done. The

problem would disappear if the strong distinction between knowledge and its use was not maintained.

Transformational grammar is primarily concerned with the structure of sentences and their grammaticality. In this case the term grammatical refers to an abstract idea of what some people think is proper or regular in a language. Grammaticality does not depend on context, which means that a grammatical sentence is grammatical regardless of who speaks it, or when, or where it is spoken. Furthermore, a sentence is defined as being grammatical if the grammar generates it. Now grammaticality is differentiated from acceptability by Chomsky, and the latter term is used to refer to all the other ways in which a sentence may or may not be acceptable to produce in a particular situation by a particular person. This differentiation of grammaticality from all other aspects of acceptability results in a situation in which the grammar generates sentences, some of which people cannot produce or understand, and in which people produce and understand a considerable number of utterances which are not sentences generated by the grammar. This differentiation makes it harder to fit the grammar into a theory of language behaviour, and without it there would seem to be a greater possibility of developing an integrated theory of the organisation of language behaviour.

Transformational grammar is also based on a strong distinction between structure and meaning, so that a

reasonable definition of language may be provided without having to rely on the meaning of sentences and words. The implication of this assumption is that there is a similar differentiation of structure and meaning in human linguistic knowledge. In pursuit of this idea, some people have looked into the possibility that in comprehension we analyse the structure of an utterance before we develop hypotheses about its meaning. However, the evidence shows that comprehension does not always follow this pattern, and it is hard to find the same clear separation of structure and meaning in actual language behaviour.

To sum up, the distinctions between knowledge and its use, grammaticality and acceptability, and structure and meaning all contribute to the effectiveness of transformational grammar as a definition of language. Yet these same distinctions seem to reduce the effectiveness of the grammar as an account of human linguistic ability. It is in this sense that transformational grammar has two roles that should perhaps be compatible but do not turn out to be so. Nevertheless, it would seem possible to increase the compatibility of these roles by closer observation of human knowledge of language and linguistic abilities. This means observation of more than sentence structure and more controlled experimental investigation of the hypotheses generated.

Bever (1968:478) has criticized modern linguistics in much the same vein. He questions the assumptions and

methods employed in linguistics, especially the use of intuitive judgements which most psychologists would be wary of placing so much weight on. He says that "Linguists have fragmented language into different kinds of descriptive problems and that each problem is differentiated intuitively from the others." He then criticizes the intuitive separation of facts pertinent to grammatical theory, that is the supposed knowledge of language, and facts pertinent to the use of language. He also queries the assumption that language may be characterised as a set of sentences, and finally he says that "There are, however, many arbitrary lines which have been drawn by linguists in order to partition off the kinds of facts about language which they felt prepared to describe." Most of the criticisms apply to Chomskyan linguistics, and it is noted that Chomsky has been criticized from within linguistics for taking assumptions as unequivocal truths (Matthews 1967).

The conclusion drawn from these introductory comments is that both psychologists and linguists need to be very careful to consider what they are studying when they investigate language, and how they investigate it. Firstly, it should be agreed that they are both dealing with a psychological phenomenon which may be researched in the accepted way by the experimental investigation of hypotheses derived from existing theory. Current linguistic theory suggests a great many hypotheses about human linguistic ability, and the investigation of these

hypotheses should contribute to the development of linguistic and psychological theory. It should contribute to both kinds of theory because they both deal with an aspect of human behaviour. Moreover, it follows that whatever regularities or relationships a linguist or psychologist detects in language, or between language and some non-linguistic factor, those regularities and relationships are a reflection of the organisation of behaviour. Therefore, for both linguistics and psychology the fundamental problem is understanding the organisation of behaviour.

Transformational grammar has proved to be an effective system for describing the formal aspects of language, but as it stands it is too abstract to adequately describe actual human language behaviour. However, it may be possible to modify and develop it so that it can account for the organisation of language behaviour or, at least, some of the insights it has yielded may help in the formulation of theories of language abilities.

This research is concerned with utterance production, and in particular, it is concerned with the ways in which preschool children might be limited in their capacity to produce utterances. It is easy enough to speculate about limitations to utterance production, such as constraints on utterance length and complexity, but it is much harder to specify exactly what these limitations might be, how they might operate, and how they can be investigated. One reason for this difficulty is the

almost complete lack of theories of utterance production. In the last decade psycholinguistics has increased our knowledge of the abstract formal structure of language in adult and child, but comparatively little has been learned about the organisation of language behaviour.

There are two reasons for this discrepancy in our knowledge. The first reason is that psycholinguistics has been dominated by transformational grammar and the assumptions that go with it. Chomsky (1965:4) makes a fundamental distinction between competence, the speaker-hearer's knowledge of language, and performance, the use of this knowledge in actual behaviour. Chomsky (1963:330) also asserts that competence is logically prior to performance, which means that you have to know what people know about language before you can say very much about how they speak and understand it. Hence, most researchers have concerned themselves with making descriptions of competence, but the assumption is thoroughly confounded by the fact that competence can only be studied by observation of performance. What people know about language can only be investigated by observing their behaviour. Transformational grammar is largely based on intuition, that is people's intuitive judgements of the grammaticality of selected sequences of words, but intuition is as much an aspect of performance as speaking. Therefore, it is quite reasonable to argue that the grammar is an account of one aspect of performance, the ability to discriminate

grammatical and ungrammatical sequences, and not of any abstract or underlying competence (Bever 1968:478).

Furthermore, psychologists do not normally draw a distinction between knowledge and use of knowledge in this way, although they do differentiate behaviour and the theoretical mechanisms thought to describe its organisation. Fodor and Garrett (1966:139) say that the latter distinction is to be defended on a priori grounds but not the former. Herriot (1970:57) also criticizes the competence-performance distinction, and Stemmer (1971) argues that the distinction is invalid because it is not justifiable to base two theoretical systems on the same behavioural data. Chomsky (1965:15) talks about competence underlying performance, and about theories of performance incorporating theories of competence. If a theory of performance did incorporate transformational grammar as a distinct component representing competence, it would be true to say that there would be one and not two theoretical systems based on, and accounting for, the behavioural data. Therefore Stemmer's criticism is debatable, but it does demonstrate how misleading this distinction can be. A more serious criticism is that the distinction has not been treated as a hypothesis to be tested experimentally, but as an intuitively acceptable premise.

The second reason for the lack of knowledge about the organisation of language behaviour is the lack of psychological theories of the organisation of complex

behaviour in general. The need for structural theories of behaviour has been accepted by some psychologists ever since Lashley (1966) demonstrated the inability of stimulus-response associations to account for the complexities of human behaviour. He used a linguistic example to illustrate his point because language is an aspect of human behaviour that more obviously demands a structural approach than others. Nine years later, Miller, Galanter and Pribram (1960) published the first major text on structural theories of behaviour, and for information about the structure of language they looked to Chomsky's developing theory of transformational grammar. One of the authors, Miller, was carrying out some now classic experiments into the psychological reality of the grammar around the same time. The appeal of transformational grammar was strong despite the fact that it was not presented as a theory of behaviour but as a description of knowledge underlying behaviour.

Psychology has continued to look to transformational grammar for ideas about theories of language behaviour without much success. It is argued that this lack of success stems from the basic nature of the grammar and the apparent incompatibility of its role as a description of the formal structure of all the sentences in a language and its role as a partial account of human linguistic creativity. This problem has to be discussed further because of the key position of transformational grammar

in psycholinguistics, but first it will help to describe the grammar in more detail.

Transformational Grammar

A language is a system for communication, and it is very important in the human species. Language is used to express ideas and feelings and it forms the basis of the highly sophisticated social life of man (de Laguna 1963). The outstanding characteristic of language is its variability or creativity. People speak and understand an indefinite variety of utterances with an indefinite variety of meanings, whereas most other animals use a system of communication with a strictly limited degree of variation and meaning. The sophistication and complexity of human social interaction is directly related to the variability of human language. Although people do produce an indefinite number of different utterances, the structure of the utterances is not random and neither is their meaning. Languages show definite patterns of construction and the various patterns in a language tend to be associated with various functions or patterns of meaning. For example, most languages differentiate questions from statements and some, like English, do it syntactically. Inversion is a common device in English for making a question as in (1) and (2):

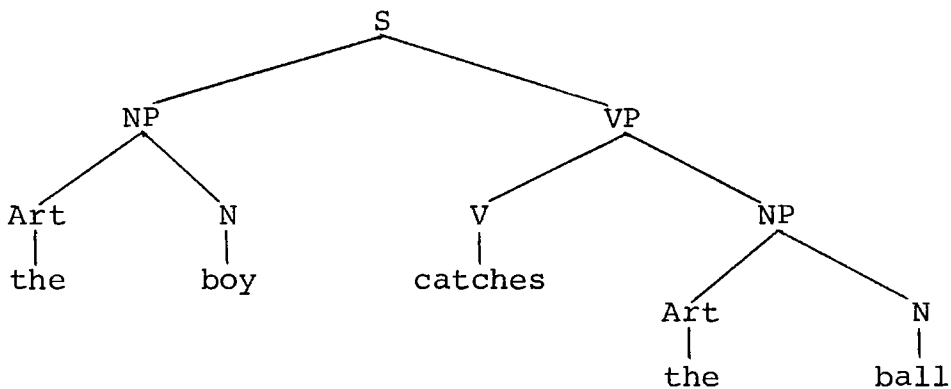
You have a pencil (1)

Have you a pencil? (2)

So for any language we can say that it consists of a complex set of relations that link the sounds of the language with its meanings, and that this set of relations is described in the grammar of the language. It is generally accepted that the most important, but not the only unit of language is the sentence. And it follows that any language may be described by defining the sentences that belong to it. Therefore, any grammar of a language should specify the set of sentences in that language and the connection between those sentences and their meanings.

If there were not an indefinite number of sentences in most human languages, a grammar could achieve both goals by listing all the sentences in the language and their meanings. One solution to this problem is to refer to classes of sentence and forms of meaning, and within sentences we can refer to classes of word or, to use a less specific term, lexical item. Noun, verb, adjective and pronoun are classes of words and these classes are the ones most frequently used in the structural description of sentences. For example, the sentence 'the boy catches the ball' consists of the sequence of classes, definite article (Art), noun (N), verb (V), definite article (Art), and noun (N). As well as classifying the lexical items of a sentence we can classify groups of items, for example 'the ball' is a noun phrase (NP) and 'catches the ball' is a verb phrase (VP). This kind of classification or distributional analysis can be

represented in a tree diagram or phrase marker, which shows the phrase structure of the sentence.



The phrase structure of this sentence may also be described by a set of rewrite or generative rules. The term rewrite refers to the fact that these rules specify which symbol or symbols may be replaced by, or rewritten as, which other symbol or symbols. For instance, the rule $S \rightarrow NP + VP$ specifies that the symbol S is to be rewritten as $NP + VP$. Here is a set of rewrite rules that generates 'the boy catches the ball'.

- Rules:
1. $S \rightarrow NP + VP$
 2. $VP \rightarrow V + NP$
 3. $NP \rightarrow Art + N$
 4. $Art \rightarrow the$
 5. $N \rightarrow boy, ball$
 6. $V \rightarrow catches$

This set of rules constitutes a simple generative grammar which actually generates three other sequences besides the sample one. Rules 4, 5 and 6 are lexical

substitution rules, and they specify which abstract categories may be rewritten as which lexical items. Rules 1, 2 and 3 are categorical rules and they specify which categories can be rewritten as which other categories. Lexical rule 5 is different from the others because it has two lexical items on the right-hand side, which means that N may be rewritten as 'boy' or 'ball'. It is this option that allows the grammar to generate a total of four sequences, as follows:

The boy catches the ball (3)
The boy catches the ~~ball~~ (4)
The ball catches the ball (5)
The ball catches the boy (6)

Sequences (3) and (4) are grammatical or well-formed, but sequences (5) and (6) are not. The grammar should only generate grammatical sequences, therefore the generative power of the grammar must be restricted in some way so that it no longer generates the second two sequences. In transformational grammar this kind of restriction is achieved with selection features that indicate which kinds of lexical items may be selected in combination with other items. Thus, the verb 'catch' can be assigned the feature (V(. . . NP), (+ animate . . . + animate) (+ animate . . . + abstract) which specifies that it is transitive, (. . . NP), and that it only takes an animate subject noun but the object noun may be animate or abstract. In transformational grammar the categories like noun and verb are

based on the analysis of sentence structure and not on meaning. Similarly, the features animate and abstract are used to describe structural restrictions without consideration of their meanings.

Chomsky (1965) makes a very important distinction between deep and surface structure. The surface structure of a sentence is the set of categories that its constituent lexical items belong to; for example, the surface structure of 'the boy catches the ball' is Art, N, V, Art, N. The deep structure of a sentence refers to its complete generative history, so that for example the above phrase marker and generative grammar represent the deep syntactic structure of this sentence.

The use of abstract categories and generative rules enables the grammar to describe a large number of sentences in a fairly simple and systematic way. Transformational grammar goes a step further by uniting all the rules for all the sentences in a language into one system. However, the grammar can still produce the variety of sentence structures in a language by the use of optional categories and alternative rules. For example, the optional category (Neg) can be included in the rule $S \rightarrow NP + VP$ to make $S \rightarrow (Neg) + NP + VP$ and this organisation allows for both affirmative and negative sentences. Alternative rules have the same category on the left-hand side but different categories on the right-hand side, for example, $NP \rightarrow Art + N$ and $NP \rightarrow that + S$.

There are certain sentences that have the same surface structure but their general pattern of meaning is different. The usual example is the difference between (7) and (8):

John is eager to please (7)
John is easy to please (8)

John is easily pleased (9)
John is eagerly pleased (10)

These two sentences may be transformed into (9) and (10), but of these only (9) is grammatical. The fact that (7) and (8) have the same surface structure means that they would be assigned the same deep structure in phrase structure grammar. It would be advantageous to be able to differentiate these sentences in some way from a structural rather than a meaning point of view. This transformational grammar is able to do by making use of the fact that 'John' is the immediate subject in both sentences, but only in (7) is it the deep structure subject. This is because (8) is derived from (11) in transformational grammar and (11) and (7) are generated differently so that they are assigned different structural descriptions by the grammar:

People please John easily (11)

In transformational grammar the categorical rules generate what are called base strings. Some of these base strings require the application of transformational rules and then they become terminal strings. Transformation rules are different from base rules in that they carry out

different kinds of operations. All base rules have only one symbol on the left-hand side, whereas a transformation rule usually has more than one. Furthermore, transformation rules tend to alter the left-hand set of symbols in some way instead of replacing them by another set. Transformation rules may add or delete a symbol, or they may simply change the order of the symbols on the left-hand side. Transformation rules add to the grammar's power and simplicity considerably. For example, they make it possible for one system of rules to generate both active and passive sentences. This is done by including an optional passive element that keys the transformation of active base strings into passive ones. Thus, the following set of rules can generate the two alternative base strings beneath it:

VP \rightarrow V + NP (+by + passive)

V \rightarrow hit

NP \rightarrow Art + N

Art \rightarrow the

N \rightarrow boy, ball

Active string: the + boy + hit + the + ball

Passive string: the + boy + hit + the + ball + by + passive

The active and passive strings are similar but with the application of the following passive transformation, the passive form 'the ball was hit by the boy' results:

Passive transformation: $NP_1 + Aux + V + NP_2 + by + passive$
 $\rightarrow NP_2 + Aux + be + en + V + by + NP_1$

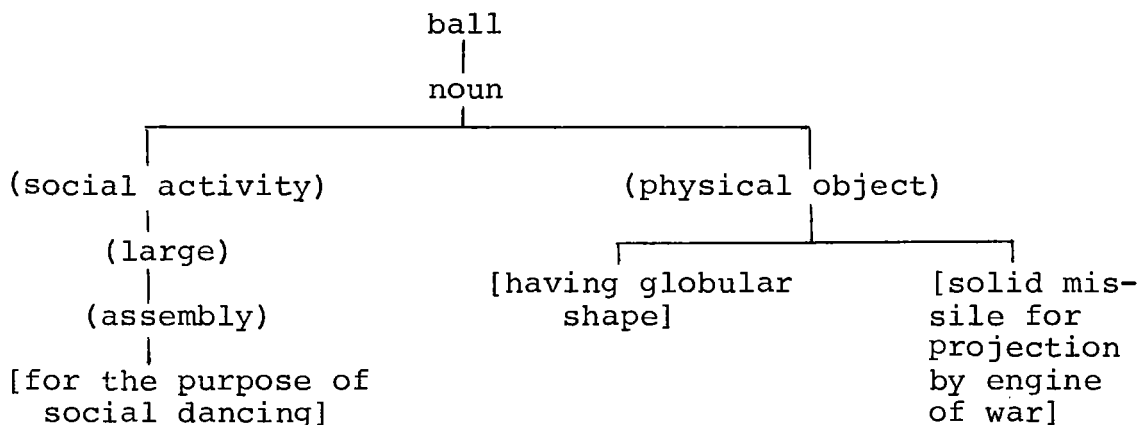
Transformational grammar has three components which are the syntactic, the phonological and the semantic components. The syntactic component contains the base and transformational rules just described and it is the central component in the grammar. The phonological component receives the terminal strings and converts them into sequences of symbols representing their sound form. The semantic component makes use of information about the deep and surface structure of sentences to construct semantic interpretations of them. Most attention has been paid to the syntactic and phonological components and the operation of the semantic component has been much less well defined. The reason for this is that meaning is much more difficult to describe and structural linguistics was initially concerned with the form of language rather than its meaning. Katz and Fodor (1964) proposed a theory of semantic interpretation that Chomsky (1965) acknowledged in his modified grammar. Their theory is intended to describe the ability to understand sentences in special circumstances when there is no linguistic or non-linguistic context. The reason for this is that it is impossible to specify the complete state of an individual's linguistic and non-linguistic knowledge at any one time, and it would be necessary to do this to provide a complete account of how an individual understands a particular sentence in context.

Their justification for dealing with sentences in isolation is expressed in the following quotations:

"Grammars seek to describe the structure of a sentence in isolation from its possible settings in linguistic discourse or in non-linguistic contexts. The justification which permits the grammarian to study sentences in abstraction from the settings in which they have occurred or might occur is simply that the fluent speaker is able to construct and recognise syntactically well-formed sentences without recourse to information about settings, and this ability is what a grammar undertakes to reconstruct" (1964:484). They say that they are looking for a semantic theory with the same general and abstract reference that specifies the various meanings that the fluent speaker can attribute to a sentence in isolation from linguistic and non-linguistic context. And, "then, the readings (meanings) that a speaker gives a sentence in setting are a selection from those the sentence has in isolation; a theory of semantic interpretation is logically prior to a theory of the selective effect of settings" (1964:488). This argument is reasonable enough except that these authors appear to be talking about the ability to understand as well as about grammatical theory. They assert that comprehension out-of-context is logically prior to comprehension in-context, but they present no evidence that this assertion is psychologically valid. For instance, it is possible that, developmentally, comprehension in-context is prior to comprehension out-of-context simply because the context provides so much

information in support of comprehension. This point will be mentioned later on in connection with the study of child language.

The semantic theory put forward by Katz and Fodor has two basic components, a set of projection rules and a dictionary. The dictionary contains all the lexical items in a language and a definition of the meanings of each item. The meanings of an item are represented in a tree diagram as a hierarchy of semantic markers and distinguishers. Semantic markers are labels like (male), (human), (physical object), and (social activity). Since these markers may have more than one meaning, distinguishers are used to identify the particular meaning required in each case. The following tree diagram represents the various meanings of 'ball'.



The projection rules use the structural information derived from the syntactic analysis of a sentence to integrate the lexical items in a sentence so as to generate its meaning. Items are integrated so that incompatible

meanings are eliminated, and when all the items of a sentence have been integrated there may be several possible semantic interpretations, or one, or none. If there are none the sentence is anomalous, and if there are several the sentence is ambiguous. This process of integration takes place in a well defined manner. First, the projection rules start with the items linked by the branches in the structural analysis at the lowest level, and then the process works upwards until all the items of a sentence have been accounted for. For example, in the sentence 'the boy found a hard ball', the adjective-noun pair, 'hard ball' would be processed before the subject noun phrase 'the boy' and before the verb phrase or predicate, 'found a hard ball'. The tree diagram above represents the meanings of 'ball', and we can imagine another one for 'hard'. The latter has many meanings but we will consider only two, rigid and difficult. Now 'hard ball' could refer to a difficult social activity (it was a hard ball to organise), or to a rigid physical object (the hard ball broke the window), or to a difficult physical object (it was a hard ball to catch). It could not refer to a rigid social activity. In this way the individual meanings of the two items are integrated and incompatible combinations eliminated. The next step is to integrate 'found' with 'hard ball' and the only reasonable combination of meanings is that referring to the recovery of a rigid physical object. This

example shows how the semantic markers are used in conjunction with the phrase structure to obtain meaning.

Katz and Fodor used semantic markers to describe meaning but it would be possible to achieve the same result using features like (+ animate), (+ human). If this was done the complete grammar would have two dictionaries, one in the syntactic component and one in the semantic component, and both dictionaries would make use of features. In the syntactic component these features would operate to restrict the combination of lexical items in the generation of sentences. In the semantic component these features would operate to restrict the combination of meanings of items in sentences. In the first case the features have a purely formal or syntactic function and in the second case they have a purely semantic function. Chomsky (1965:148) recognises this duality of function and it leads him to wonder if the selection rules of the syntactic component might be better placed in the semantic component, and if there is a clear boundary between syntax and semantics. He also poses the possibility of having the syntactic component take over the functions of the semantic component. This kind of integration would satisfy my own intuition about the distinction between linguistic form and content. In the beginning Chomsky (1957:15) discussed the difference between formal and semantic aspects of language as though formal only referred to abstract form. For instance, he said that the two sequences (12) and (13) are both meaningless

but only the first one is grammatical.

Colourless green ideas sleep furiously (12)

Furiously sleep ideas green colourless (13)

According to their abstract form the first sequence is potentially meaningful, but not the second. However, the modified theory of transformational grammar went further and specified the structure of grammatical sentences right down to the selection of lexical items. This step makes both sequences ungrammatical. But according to my own intuition, meaning is involved in the selection of items rather than just form. For example, the abstract form of (14) does not correspond with normal English whereas that of (15) does. And although (15) is anomalous, a similar sequence (16) is not. The reason people do not say (14) is because its abstract form is not normal, but the reason they do not say (15) is because it is unlikely that anybody could eat a chair unless it was a cake decoration made of confectionery.

The I ate chair (14)

I ate the chair (15)

I bought the chair (16)

The point being made is that perhaps it is not possible to specify all the grammatical sentences in a language down to the level of lexical selection because this is only partly determined by sentence structure. It is also partly determined by meaning and since it is not possible to specify exactly which lexical combinations have been or will be used meaningfully, it is not possible to specify grammaticality so finely. Moreover, lexical

selection is not the only aspect of utterances that is partly determined by meaning. People speak questions when they seek information and give answers when information is requested from them. This does not affect transformational grammar because it deals with sentences out-of-context. Yet, it is just because this grammar does not relate sentence structure to context that it is not a very meaningful account of human linguistic abilities. The essence of human linguistic creativity seems to be a system of symbols so flexible that it can be adapted to express an indefinite variety of perceptions, ideas, and feelings. Transformational grammar describes the patterns of symbols that occur in a language, but it does not describe how their patterning is related to what the symbols are used to represent as well as is necessary for it to be a satisfactory account of human linguistic abilities.

Competence and Performance

Transformational grammar relates sentences to their semantic interpretations indirectly through the syntactic component. Not only does the grammar generate sentences, but in the manner of analysis-by-synthesis it can assign them structural descriptions. Chomsky (1963:323) discusses various grammars and the kinds of machines they are equivalent to and he talks about such machines accepting and generating sentences. Thus, a machine that is equivalent to a grammar is capable of

accepting and generating all and only the sentences of the language described by the grammar. Accepting a sentence means that the machine is able to assign a structural description to it on the basis of the rules of the grammar it is equivalent to. The potency of machines to act like grammars depends a great deal on their memory capacity. Chomsky finds that any machine that is capable of generating the grammatical sentences of English as defined by transformational grammar must be an infinite state device. In effect, this means that it cannot have limited memory capacity or it is likely that it will fail to generate some English sentences.

Assuming that the operation of the semantic component is reversible in the same way that accepting sentences is the reverse of generating them, the complete system is capable of receiving sentences and generating structural descriptions and semantic interpretations for them, and it is also capable of receiving semantic interpretations and generating sentences for them. If there was a machine that could do these two operations, an observer could make a study of the relationship between its input and output and describe this in terms of a grammar. It could be argued that this grammar describes the competence of the machine. In abstract terms it would describe how sentences are related to semantic interpretations. However, Sutherland (1966:157) argues that such a grammar does not describe the mechanism whereby one is converted to the other, although he does not make

it entirely clear what he means by mechanism. According to Chomsky, there are some fairly clear connections between machines and the grammars they are equivalent to. Therefore, to some extent, the grammar would describe the capacities of the machine even if it did not specify in physical terms how the conversion takes place.

It is assumed that transformational grammar does not represent the physiological structures and processes involved in speaking and understanding, but as an account of certain linguistic abilities it must to some extent represent the psychological structures and processes involved. At least, it is reasonable to treat the grammar as a hypothetical description of these structures and processes. Therefore, the grammar may be considered to be a partial account of performance. It is a partial account for several reasons: (1) It does not include aspects of mental functioning like memory, attention, perception and motor control, for these are said to be grammatically irrelevant; (2) it deals with a limited set of utterances that have a high degree of structural regularity (Lyons 1968:152); (3) it deals with a limited amount of semantic knowledge that is common to the users of a particular language; (4) it does not deal with the relationships between utterances in linguistic discourse; and (5) it does not deal with the relationships between utterances and their non-linguistic context because this is also held to be grammatically irrelevant. The reason that the grammar is limited as an account of linguistic

ability in so many ways is because it is only intended to provide a formal definition of all the sentences in a language. But if a broader view of the nature of language is adopted and the distinction between competence and performance revised, there is nothing to stop the development and modification of the theory to include other aspects of linguistic abilities. Campbell and Wales (1970:246) give a brief discussion of the distinction between competence and performance in which they suggest that transformational grammar is a limited description of linguistic competence. They recognise the right of the linguist to concern himself with facts directly pertaining to language and to disregard linguistically irrelevant facts like memory limitations. However, they strongly argue that any reasonable account of linguistic ability must include the ability to produce and understand utterances that are appropriate to the context in which they occur.

It is understandable that a linguist should consider memory limitations irrelevant to the study of language, yet these same limitations are very relevant to the psychological study of linguistic abilities. Memory is considered an important aspect of intelligence and there is no obvious reason why it should not play as important a role in linguistic abilities as in any other abilities. Grammar describes the structure of the sentences of a language, but memory limitations have a great deal to do with the structure of language as it is used,

too. This is demonstrated by the recursive organisation of language. Transformational grammar contains recursive rules which allow the grammar to generate sentences of indefinite length. Self-embedded sentences like (17) and (18) are examples of recursion, and in theory the structure of English permits sentences with infinite degrees of embedding:

The woman the boy saw was running (17)

The woman the boy the dog followed saw was running (18)

The problem is that people do not usually produce utterances with more than one degree of embedding because they are very difficult to understand. For example, (18) is much harder to understand than (17). In fact it is difficult to produce utterances with more than a few degrees of embedding without pencil and paper. Moreover, it is much easier to understand such sentences when they are written down than when they are heard. Therefore, on the one hand there is the fact that the structure of English allows for an apparently indefinite degree of self-embedding. And on the other hand there is the fact that we are quite limited in our use of this form of sentence structure by our perceptual and memory capacities. In Chomsky's conception of language, the rules of English grammar are assigned to competence, the knowledge of language, while memory limitations are assigned to performance as aspects of the use of the rules in language behaviour. A comprehensive account of linguistic abilities will describe how, in these terms, knowledge of

language interacts with memory limitations and other aspects of language use in the comprehension and production of real utterances. But then there is no need to have a competence-performance distinction for all the linguists have done is to isolate those aspects of linguistic abilities which they consider relevant to the study of language.

The distinction between competence and performance suggests that in some way the speaker-hearer is more linguistically able than he appears. It suggests that our underlying competence is somehow able to generate infinitely embedded sentences whereas in performance our memory limitations prevent us producing and understanding such sentences. This is not meaningful because the human brain is entirely restricted so that there can be no underlying ability to generate such sentences. It would seem more sensible to discard the competence-performance distinction and instead try to describe linguistic abilities in an integrated way. An integrated description would be a model of the speaker-hearer and it would specify the relationship between his perceptual and memory capacities and the utterances that he can produce and understand. In essence, the model would place equal weight on linguistically relevant and linguistically irrelevant aspects of linguistic abilities.

The meaningfulness of the competence-performance distinction depends on the distinction between knowledge of rules and use of rules. The latter distinction is

intuitively acceptable but the value of the distinction must not rest on its intuitive acceptability but on its psychological validity. It is argued that its validity is questionable, especially in the case of the child who is learning language. Transformational grammar is said to be a partial account of the ideal speaker-hearer's linguistic abilities. Chomsky (1963:326) says that "the grammar represents the information concerning sentence structure that is available in principle to one who has acquired the language." He goes on to say that the grammar indicates how the speaker-hearer would understand a sentence under ideal conditions. In making the point that performance does not consistently reflect competence under normal conditions, there seems to be an implicit assertion that under normal conditions man's knowledge of language remains ideal and it is only the interference of performance factors like memory limitations that prevents the full and accurate manifestation of this knowledge. Two points arise from this. Firstly, if the difference between ideal and real performance amounts to a difference between unlimited perceptual and memory capacities, and strictly limited capacities of this kind, this difference is too great to be scientifically valuable. This difference is hardly comparable with the difference between, say, the behaviour of gases as predicted by Boyle's Law and the actual behaviour of gases. Therefore, although it may be helpful to begin the study

of linguistic abilities with certain aspects of these abilities set aside, a complete account of them cannot be very realistic without them.

The second point concerns the implication that man's knowledge is normally ideal. This is like saying that, but for lapses of attention and memory we could all be perfectly law-abiding citizens or that we could perform arithmetic calculations like the calculators we are becoming increasingly dependent on. So it seems that the distinction between rules and human knowledge of them has been forgotten. For instance, the rules of arithmetic appear to stand independently of man's existence as characteristics of this universe, but unfortunately that does not make it any easier for man to learn and remember them. In this line of thought transformational grammar does not so much represent man's knowledge but what an ideal man might know. To this extent the grammar constitutes an attempt to equate the regularities of human behaviour with absolute scientific principles like the rules of arithmetic.

Now that a distinction between real and ideal knowledge has been drawn it can be argued that the distinction between knowledge and use of knowledge has less meaning. Chomsky's own analogy for demonstrating the distinction between knowledge and its use may also be used to demonstrate the limited value of this distinction. He suggests that the fact that people cannot multiply two large numbers together in their heads does not mean that

they do not know the rules of arithmetic required. It merely means that they lack the memory capacity and attention span to use the rules successfully. It is true that the limitations of memory and attention do restrict our arithmetic abilities in this way, but this is not the only way in which our abilities can be restricted. Most adults know the rules of arithmetic so well that they have no difficulty in recalling all the rules for single digits without error. But they do make mistakes in recalling the sums and products of larger numbers, and in the same way children make mistakes with single digit arithmetic relations. For both adult and child, the quality of recall of the rules of arithmetic depends on the extent of learning and practice so that some errors will reflect insufficient learning of the rules rather than improper use of the rules. For example, if a child makes a mistake with the rule for the product of two digits about 50 per cent of the time it is by no means so obvious that his errors are defects of use and not defects of knowledge. Once it is recognised that people learn rules and it is not simply a matter of knowing a rule and using it more or less correctly, the distinction between knowledge and its use loses its meaningfulness. To put it another way, since knowledge is intimately related to use in the ability to learn it is unreasonable to maintain a strong distinction between knowing rules and using them.

This argument raises the issue of probability in linguistic abilities since a probabilistic theory of behaviour would seem to describe the changes in the frequency of manifestation of rules of grammar during language development rather well. And Osgood (1963) has proposed a probabilistic theory of comprehension and production. The point is that rules of grammar cannot be probabilistic; a rule either exists or it does not. This would seem to mean that either grammars cannot be models of behaviour or that the structure of language cannot be described in terms of rules. However, this problem disappears with the recognition of the difference between knowledge of linguistic structure and the conception of this structure in terms of rules. In other words, it is quite in order for our knowledge of language to be probabilistic and at the same time for us to conceive of language as a system of rules. Knowing that the addition relationship between two numbers constitutes a rule is related to but not exactly the same as learning and knowing the relationship. It follows that transformational grammar is more a description of some linguists' conception of language than of their abilities to speak and understand.

There is another way in which transformational grammar is more like an abstract description of language than an account of linguistic abilities. The proponents of the grammar assume that there is one system of linguistic knowledge that is used in the various linguistic

abilities, including comprehension and production. Furthermore, it is sometimes suggested that comprehension is the reverse of production. Now it is reasonable that the linguist, who wishes to describe language as an abstraction from human behaviour, should attempt to do this in one general theory. However, it is quite a different matter to project this general theory back into the human being without evidence to support its validity as a description of linguistic abilities as well as of language. For example, there is a critical difference between comprehension and production in that a thorough knowledge of linguistic structure is only needed for production. Comprehension can and has been shown to take place on the basis of the meaning of constituent words without complete structural analysis (Herriot 1970:70). It is likely that there are similarities and close connections between comprehension and production, but a thorough account of these linguistic abilities cannot afford to disregard the unique aspects of each ability because they do not seem to be relevant to a particular linguistic theory.

This point is particularly relevant to language development because there do appear to be discrepancies between comprehension and production in development, and there is some question as to how these should be accommodated in transformational grammar. For example, Braine (1971:58) discusses the equivalence of comprehension and production and he says that the differences between

them in development are usually minimal. Sometimes it appears that a child can understand a word fairly well but he produces it irregularly or not at all when it is appropriate to do so. This kind of finding has led to the idea of there being different grammars for comprehension and production (Miller and Ervin 1964), but this is not meaningful in the theory of language enveloping transformational grammar (Chomsky 1964). Braine argues that it is not necessary to have separate grammars for comprehension and production because those parts of the grammar that are involved in the generation of language that is comprehended but not produced can be put as optional rather than obligatory in one general grammar.

There is another more common solution to this problem which is to base the description of the child's competence on his comprehension and to explain the absence of certain structures in production in terms of performance factors. Yet there is no reason why such factors should not be operating in comprehension, in which case it may be impossible to pin down the exact nature of competence. And more importantly, there is no a priori reason why the ability to understand should develop in the same way and at the same rate as the ability to produce. The competence-performance distinction has been criticized for its implications concerning the quality of human knowledge, and from this point of view, Braine's proposal of optionality is more acceptable because it

seems to make provision for imperfect knowledge. However, making a rule optional is not enough to account for the variations in frequency in the structures produced, and the use of optionality seems to place the grammar half way between an abstract description of child language and a psychological description of the child's abilities to understand and speak.

The work of Lois Bloom (1970) also shows the difficulties that arise in the application of transformational grammar to child language. To begin with, her method of studying child language demonstrates the limitations of the grammar as an account of linguistic abilities. Since child language is different to adult language the meaning and structure of it is not always immediately known to the adult observer. Bloom was interested in the function as well as the form of child language and she used her knowledge of function, or meaning, to determine the structure of the children's utterances. And she depended on her knowledge of the children studied and of the linguistic and non-linguistic contexts of their utterances to determine the function of these utterances. Thus, she used her knowledge of function to establish form which is quite the opposite of the accepted pattern of behaviour based on transformational grammar in which a structural analysis of utterances is necessary for the extraction of meaning.

Bloom studied the language development of three children at the initial ages of nineteen and twenty-one

months. She constructed generative grammars for the language of each child at intervals of six weeks, and these grammars described the structure of the utterances produced by the children rather than the utterances judged by her on the children to be grammatical. In this case, then, language is defined as the set of utterances occurring at a certain time in development and not as a set of sentences judged to be grammatical. Chomsky (1964) points out that grammars of this kind are not theories of competence but theories of performance. However, it is arguable that no theory of language can be more than a theory of performance because competence is only accessible through performance. Furthermore, grammars based on language as it occurs have the advantage that they do not presuppose a strong distinction between grammatical and ungrammatical, or a sense of grammaticality in the mind of the child.

Bloom's method of investigation of language development led her to the conclusion that the three children knew more about the structure of language than the surface structure of their utterances often indicated. For example, one girl said mummy sock on two different occasions, once when the girl picked up her mother's sock and once when her mother was putting a sock on the girl's foot. In one case, the girl appeared to be expressing possession, and in the other case she appeared to be expressing predication. Although these two functions were expressed in the same utterance form Bloom argues

that their deep structure is different to correspond with their difference in meaning. She found many instances where utterance surface structure did not reflect the complete deep structure as this was reckoned to be on the basis of utterance function. And she found that the relationship between deep and surface structure was systematic: the expression of deep structure in surface structure followed definite patterns, patterns that she effectively described in transformation rules which deleted certain elements of deep structure so that they were not manifested in surface structure. For instance, if the child used a negated predicate it would say 'no sock' rather than 'no mummy sock' or 'mummy no sock', as though there was a limit on the number of deep structure elements that could be expressed in surface structure. Bloom (1970:165) suggests that there seems to be some kind of cognitive constraint on the form of young children's utterances, and this constraint affects the handling of the structural complexity of utterances rather than their length per se. At the end of her chapter on constraints on form she presents an analogy between the limitations on processing utterance structure and the young child's inability to carry a whole train at one go. The implication is that a kind of sampling process is occurring in both.

If transformational grammar is only supposed to describe competence, as what the child knows about

language, rather than the use of this knowledge, Bloom has overstepped the mark in using deletion transformations to describe processes which she clearly believes reflect the interaction of linguistic structure and cognitive constraints. If there are cognitive constraints these are aspects of performance and not competence according to Chomsky's original definition. On the other hand transformation rules describe the reduction between deep and surface structure very effectively, and this reduction is certainly an important aspect of the young child's linguistic abilities from a psychological point of view. It is interesting to note that Bloom does not refer to any distinction between knowledge and use, and her description of child language seems to be quite effective without one. Nevertheless, her grammars are abstract descriptions of language as it is produced, and the reduction or deletion transformations describe general patterns of behaviour that have only been observed to occur in production. To this extent her grammars appear to be descriptions of the linguistic ability of production rather than abstract descriptions of language.

Transformational grammar was not meant to be a model of speaking or understanding yet it comes near to this in Bloom's work for two reasons. Firstly, she uses the grammar to describe the structure of the utterances produced by the children and not the structure of

sentences judged to be grammatical by the children or her. Secondly, she uses transformation rules to describe what happens to the structure of utterances during production. If the grammar was used in the way originally intended, it would describe the language known to the child. But this discussion shows that it is not easy to determine the nature of the language known to any child. Young children do not give judgements of grammaticality so most studies have focussed on the language produced by the child. Now the language produced by young children is not entirely the same as the language understood by them so some researchers have suggested that the description of competence must be based on comprehension. This kind of reasoning is based on the assumption that the child has one system of linguistic knowledge that is used in comprehension and production. Since comprehension seems to be more advanced than production descriptions of the child's linguistic knowledge are to be based on comprehension. And it follows that the discrepancies between comprehension and production are to be entirely accounted for by limitations in the use of linguistic knowledge.

However, there are weaknesses in this reasoning. Firstly, the child's knowledge of language can only be investigated by studying his use of language. Secondly, the distinction between knowledge and its use does not seem to be the only or the best way to interpret human abilities, especially when the role of learning is

considered. Thirdly, there is evidence that comprehension and production are not entirely the same, and the differences between them have a great deal to do with linguistic knowledge as well as memory limitations, etc. Therefore it is suggested that there are very important differences between the description of language as an abstraction from human behaviour and the description of human linguistic abilities. Transformational grammar is a remarkable description of language, the abstraction, but a rather incomplete and psychologically dubious description of human linguistic abilities because of these differences. Essentially, it is more a conception of language than an account of these abilities. This opinion is supported by the outstanding lack of evidence for the assumptions made about the nature of human linguistic abilities in contrast to the intellectual sophistication of the grammar. In a very abstract way transformational grammar does describe human linguistic abilities because it describes the relationships between sound and meaning in language, and these abilities are also concerned with these relationships. But it is argued that rather than trying to project the grammar back into the human being as his system of linguistic knowledge, the description of actual human linguistic abilities should be based on a more comprehensive study of these abilities. This study would beget a theory of comprehension describing how utterances are understood in context and not how sentences are understood out of

context. And there would be a theory of production describing how utterances are constructed in context and not how sentences are generated out of context. These theories would probably be closely related and this relationship would be of the utmost relevance to a theory of language development.

Chomsky never presented transformational grammar as a model of comprehension or production yet he suggested that it does describe human linguistic knowledge. This has led to some confusion as to just what the grammar does represent, and this confusion stems from the basic inconsistency in this description of the roles of the grammar. This inconsistency is that an account of human linguistic knowledge does not make much sense if it is not also a theory of comprehension and production. Therefore, since the grammar is not a theory of linguistic behaviour it would seem to have little value for psychology. Yet the grammar clearly has a great deal to say about the structure of language, and rather than rejecting it entirely it would be wiser to see how it can be developed into a theory of behaviour, or how its insights into the structure of language can aid in the development of such a theory. Bloom's use of transformational grammar is an example of how it can be developed to be a more complete account of utterance production.

Social Aspects of Utterance Production

The main body of this introduction has dealt with the distinction between competence and performance and the relationship between grammars and psychological theories of linguistic abilities. It was concluded that linguistic theories of language are not necessarily the same as psychological theories of linguistic abilities although they may be valuable in developing these.

Utterance production is a linguistic ability and it is now appropriate to examine this ability and the theories about it in more detail. There are very few theories of utterance production and, not surprisingly, some of these involve phrase structure grammar. Before these theories are discussed it will be helpful to make a few points about the social aspects of utterance production and language generally.

Earlier in this chapter attention was drawn to the distinction made by some linguists between grammaticality and acceptability. Chomsky's use of this distinction rests on the assumption of a distinction between competence and performance, with grammaticality relating to competence and acceptability to performance. In line with the present rejection of the competence-performance distinction, grammaticality is not considered to be a distinct characteristic. Instead, grammaticality is considered to be an aspect of acceptability as Lyons (1968:137) has suggested. Lyons gives four types of

acceptability and he distinguishes social acceptability from acceptability based on grammaticality and meaningfulness. He says that an utterance can be grammatical and meaningful but not socially acceptable. An example of this is provided in the following question and answer sequence:

Question: Do you have the right time?

Answer: No, it isn't raining now.

The problem with this analysis of acceptability is the way in which it deals with the role of context. Thus, social acceptability seems to be the only kind of acceptability that involves the relationship between an utterance and its context because meaningfulness seems to refer to the meaning of utterances abstracted from context, and grammaticality to their well-formedness out of context. However, meaningfulness does involve context as a simple example will show. The sequence (19) does not seem to be meaningful in any context whereas sequence (20) could be meaningful in some contexts:

John is a girl (19)

John is a paraplegic (20)

The important point is that although (20) is potentially meaningful unlike (19), it is not always meaningful. There are probably some people called John who are also paraplegic, but saying that (20) is meaningful out of context implies that any person who is called John is also paraplegic. In other words, the meaningfulness of

sequences like (20) depends on which person called John the statement refers to.

Grammaticality as the well-formedness of language also involves context in the sense that language has structure beyond the sentence. There is a definite pattern to conversation as Pease (1972) has shown in his study of the ability to judge the well-formedness of conversations. The well-formedness of conversations is most evident in what is called discourse agreement. When answers are formulated to fit in with the structure of the questions preceding them, for example:

Question: Where is Michael going?

Answer: He's going to the library.

Question: Is Michael going to the bank?

Answer: No! He's-going to the library.

Question: Is Michael going to the library?

Answer: Yes, he is.

Therefore, grammaticality and meaningfulness are not really distinct from social acceptability because they are both to some extent dependent on context. Even the out-of-context well-formedness of utterances is socially variable in that what is well-formed in one dialect of English is not always well-formed in another. Transformational grammar is said to describe the knowledge of language of the ideal speaker-hearer in a homogeneous speech community, but in reality most speech communities are heterogeneous. There is no one English language even though all the dialects of English are similar enough to be collectively assigned one name. Abstract meaningfulness

varies in the same way as abstract grammaticality, for instance, the sentence 'the soldiers used rubber bullets' would have been considered nonsense twenty years ago but today in Ireland its meaning is quite clear.

There are many different languages in the world. Though some linguists think that these are all basically the same it is important not to forget this variation. Not only do languages vary from social group to social group, they also vary in time. Languages change because people change them just as languages exist because people speak them. There seems to be an implicit agreement between the members of a social group to speak approximately the same language so that they can understand each other. Sometimes this agreement is explicit as when a group agrees to use a secret code. The point to be made is that people make language and their linguistic creativity is not to be confined to the ability to speak and understand an indefinite number of grammatical sentences. The usual use of linguistic creativity suggests that there is something creative about language whereas the real creativity lies in the human mind. Furthermore, the usual interpretation of the competence-performance distinction implies that people would necessarily speak grammatical sentences but for limitations in their use of linguistic knowledge. On the contrary, it is here argued that people can and do decide and agree, implicitly or explicitly, to speak grammatically and meaningfully. Normally, people

do speak meaningful and fairly grammatical utterances in order to communicate successfully, and from this point of view languages act as social restrictions on man's linguistic creativity so that successful communication is possible.

Human linguistic creativity is as evident in children as it is in adults. Children are imaginative and playful and they sometimes make up their own words for things. Jespersen (1922:131) noted this inventiveness, which can be of three kinds. Sometimes a child will construct a new word in the basis of certain words in the parent language. Jespersen cites one child who said breakolate from breakfast and chocolate. Children also use adult words in new ways. Lois Bloom (1970:228) describes how one of the children studied by her used last night to refer to an event that had taken place six weeks before. This child appeared to have learned the form of adverbs of time before her differentiation of the concept of time was fully developed. In these two examples the children's utterances have been relatively similar to the parent language in form and function, but children can be more extremely creative and produce their own names for things and their own secret languages.

The child's learning of language is a kind of social learning because language is a form of social communication. The child is able to be linguistically creative but his creativity tends to be limited in the sense that his

language is not entirely novel because it reflects the structure of the parent language to an increasing degree. And as the child grows his language reflects his expanding social environment in the form of peer group, school, and job (Labov 1971:215). Imitation is a form of social learning and the influence of the social environment on language acquisition shows that imitation is important.

However, language acquisition does not take place by the straightforward imitation of the language experienced. There seems to be a continual interaction between the child's developing linguistic systems and his linguistic environment which cannot be explained as simple imitation. In other words the child does not just imitate utterances but he develops linguistic systems which show an increasing capacity to produce utterances like those that he hears. The child's learning of the plural inflection is a good example of this process. As Susan Ervin (1964) describes it the development of the plural inflection passes through three stages. At first the child produces an array of forms, and irregular forms like 'feet' are often reproduced correctly. Then there is a period of overgeneralisation in which the child applies the regular inflection '____s' to both regular and irregular nouns, so 'foots' is more likely to occur than 'feet'. Then gradually there is an increasing match with adult English as both regular and irregular forms are correctly inflected more and more often. Ervin says that the study of the development of plural inflections

shows that analogy may outweigh the imitation of familiar forms in the production of utterances. This is true, but overall the child is learning to reproduce the language he hears around him and this is imitation in a more abstract sense.

The fact that language learning is not a matter of straightforward imitation is also shown by the studies of children's linguistic creativity. Ervin (1964) describes an experiment to investigate the young child's ability to form plurals. She found that children could readily form plurals with ordinary English words and with novel words like 'bik'. Jean Berko (1958) studied the creative use of several forms in children between four and eight years. She also used novel words like 'wug' and found that preschoolers did better than chance on her tests. If language learning was limited to the imitation of familiar forms the children could not have succeeded with the new words as well as they did. It would seem, instead, that children develop abstract linguistic principles that allow them to generalise familiar forms to new words, and it would seem that meaning plays an important role in this creative ability. This is because the tests were presented to the children as though the new words had reference to things or actions, and the children certainly behaved as though they appreciated this reference.

There is another kind of evidence that imitation does not play a straightforward role in language learning and this also shows that meaning is important. Brown and

Bellugi (1964) noted that children tend to imitate their parents and vice versa. When parents imitate their children's utterances they tend to correct what they consider to be grammatical errors. This correction often amounts to adding certain items that the child appears to have omitted. For example, if a child says 'that man' his mother may repeat this as 'that's a man'. These parental expansions appear to be excellent material for children to develop their language by imitation. However, the early observations showed that children tend to repeat what they say rather than the parental expansions of their utterances. Furthermore, Ervin (1964) found that children's imitations were not grammatically more advanced than their spontaneous utterances. Finally, Courtney Cazden (1965) found that language development was encouraged more when parents talked about what the child said than when they simply expanded the child's utterances. It could be argued that this discussion of the content of utterances is more helpful to the child than expansion because it helps him understand more. This evidence suggests that children do not learn language by imitating individual utterances but by the development of linguistic systems, relating meaning and sound, which become increasingly but gradually like the systems possessed by adults.

Robert Scholes' (1970) experiment which makes use of imitation, also shows that meaning important in connection with the telegraphic utterances of young children.

The utterances of young children have been described as telegraphic because of their similarity with the way in which adults write telegrams. It is usual to omit certain words in writing telegrams, words that are not essential to the comprehension of the message. The omitted words usually belong to the class of function words, whereas the words put in usually belong to the class of content words. Content words are nouns, adjectives and verbs, whereas function words are articles, prepositions, and the like. 'That man' is telegraphic in the sense that the child appears to be saying 'that's a man'. Various explanations for the telegraphic nature of early utterances have been proposed (Brown and Bellugi 1964), including the greater information content of, and possibly greater stress in adult language on content words. In his experiment, Scholes presented various kinds of word strings to children of mean age three years and eleven months in order to find out something about the omission of function words by studying their imitations of these strings.

Some strings were well-formed and meaningful (my cat liked his milk), some were well-formed but anomalous (my cat drove his milk), and some were ill-formed (cat milk his my liked). Furthermore, in some strings the content words were replaced by nonsense syllables, and in some the function words were replaced by nonsense syllables. The results of imitation showed that content words were preferentially handled, and that function words

were not omitted purely because of limited memory capacity or differential stress. To begin with, function words were omitted in imitation more often from the well-formed and meaningful strings than from the other two. In other words the meaningfulness of these strings appeared to enhance the omission of function words. Since content words were omitted with the same frequency from all three strings, meaningfulness appeared to selectively enhance the omission of function words beyond the level determined by the children's memory capacity. The results for the strings for nonsense syllables support this interpretation. For when these strings contained function words these and the nonsense syllables were omitted about equally frequently. However, when these strings contained content words the nonsense words were omitted more often than the content words. The results of this experiment suggest that young children are more likely to repeat those parts of adult utterances which have meaning for them.

Theories of Utterance Production

Utterance production is communication. It is putting ideas into words, and the ideas are formed before the utterances that represent them. The fundamental aim of any theory of utterance production must be to account for the human ability to express an indefinite variety of ideas in a systematic way such that another person from the same speech community can understand what idea is

being communicated. In the 1965 version of transformational grammar the semantic component appears to have less status than the syntactic component in the sense that it is the syntactic component that is presented as the source of linguistic creativity. From a communicative and psychological point of view this is not altogether correct. People produce an indefinite variety of utterances because they have an indefinite variety of ideas to express, and not because they like being creative with sentence structure without regard to meaning. Osgood (1968) makes the same point with respect to Johnson's (1968) ideas about the role of phrase structure in memory for sentences. His point is more conveniently demonstrated in what Brown and Bellugi (1964) said about generative grammars of child language.

In the early stages of language development children produce a great many two-word utterances like that man. These utterances may be described by a simple generative grammar containing the categorical rule $S \rightarrow M + N$, where M means modifier and N means noun. The grammar has two lexical substitution rules, $M \rightarrow \text{that, this, a, the, more}$; and $N \rightarrow \text{man, boy, flower . . .}$. In the original paper Brown and Bellugi presented this grammar as a model of the mental mechanism by which the two children studied generated their two-word utterances. In later papers Brown took up the now standard practice of using grammars to describe competence, in which case they no longer

constitute models of the mental mechanisms underlying utterance production. However, in the context of the present enquiry his original proposal will be pursued. As a model of utterance production the grammar lacks a semantic component. There is nothing to decide which lexical item is to be selected in the production of any one utterance. Some kind of selective process is necessary because the child certainly does not speak as though his words were randomly selected. This is just the point Osgood makes, and he also says that the semantic component will be central in any model of the speaker.

Utterance production involves two basic processes. One is the selection of items for a particular utterance, and the other is the ordering of these items. In most utterances these two processes probably interact but their separate effects can be observed in the following contrasting examples:

We have a book vs. Have we a book?

We have a book vs. They have a book.

These examples express different ideas and these ideas must to a large extent determine the forms in which they are expressed. Transformational grammar generates the deep structure of sentences which is then interpreted by the semantic component, but the reverse process would appear to be possible. It would seem that the semantic structure of a sentence could, through the projection rules, determine the generation of the deep and then the

surface structure of that sentence. The grammar would then be more like a model of utterance production in which the semantic input determines the selection of lexical items and their ordering with assistance from the syntactic component.

An alternative model of utterance production is proposed by Schlesinger (1971) in which the relationship between meaning and utterance is more direct than in the grammatical model just discussed. Schlesinger takes as his starting point the speaker's intention so that any model of utterance production has to account for how these intentions become utterances. He says that intention is used loosely and he goes on to propose a more definitive term, the input or I marker. The I marker represents those parts of the speaker's intentions which are converted into the output utterance. It contains semantic structures and it specifies the relationships that exist between a set of concepts. For example, if someone is intending to describe another person, John, who is catching a ball, the I marker for this would include the concepts 'John', 'catch', and 'ball'. It would also include the relations that exist between these concepts, for instance, that 'John' is the agent of 'catch'.

Schlesinger discusses the processes whereby I markers might be converted into utterances. The first possibility is that each I marker is transformed into its corresponding P marker in the way just described, but he rejects this

approach. Instead he suggests that I markers be directly converted into utterances through a special kind of transformation rule called a realisation rule. And conversely he suggests that in comprehension the same realisation rules transform utterances into I markers. He makes it clear that these proposals are only tentative.

Realisation rules are of two kinds, position rules and category rules. Position rules govern the order of representation of the I marker concepts in the utterance. Category rules govern the grammatical category of a concept as it is to be expressed in a particular utterance. Position rules govern the order of representation of any two concepts according to the semantic relationship between them. Where the relationship is that between agent and action the appropriate position rule results in 'agent + action'. Where the relationship is that between action and object the appropriate position rule results in 'action + object'. Where the relationship is that between agent and object the appropriate position rule results in 'agent + object'. This set of position rules accounts for the two-word utterances of young children involving any two of agent, action and object. By application of the first two position rules it is possible to produce an utterance containing an agent, an action and a direct object.

Schlesinger mentions several other position rules including one for negation, 'negation + X'. In this case

there is no relationship between two elements like in the rules just described. Instead, he suggests that negation operates on one element to produce utterances like 'no wash' and 'no mama'. There is also a rule 'modifier + head' that specifies the positions of elements where a modification relationship exists as in utterances like 'pretty boat', 'more nut' and 'baby car'. There are different kinds of modification and this is where the category rules come in. Category rules specify the classes of word that may occur in a 'modifier + head' construction, and they would operate alongside the position rules as follows:

modifier	+	head
adjective		noun

Schlesinger emphasizes the value of his approach to utterance production in regard to learning theories of language development. Essentially, his argument is that this approach obviates the need for deep syntactic structure so that the main reason for supporting a strong nativist interpretation of language development is done away with. At the same time he notes that his theory of utterance production is of a nature that makes it amenable to standard learning theory principles. Whether or not this is true, the absence of deep syntactic structure from his theory of utterance production means that the reduced form of young children's utterances may have an interpretation other than that given by Bloom.

If Bloom's grammars are taken to be theories of production, the reduced form of young children's utterances is accounted for by reduction transformations which delete certain elements of deep structure so that these are not represented in surface structure. In a typical case the information available to the linguist indicates that an utterance like 'mummy sock' has been reduced from a complete sentence consisting of a subject noun phrase and a verb phrase that includes an object noun phrase. The reduction transformation is thought to reflect some cognitive constraint which restricts the expression of deep structure in surface structure.

In Schlesinger's theory there is no deep syntactic structure and no reduction transformations. Therefore, according to his theory an utterance like 'mummy sock' is an incomplete representation of an idea which consists of an agent, an action and an object. The simplest explanation of this partial representation is partial realisation. According to the theory two realisation rules are required to transform the idea into the complete utterance. If only one rule is applied the resulting utterance will be one of 'agent + object', 'agent + action' and 'action + object'. The theory seems to provide a satisfactory account of reduction without involving deep syntactic structure.

Schlesinger's theory and transformational grammar are equivalent systems in the sense that they relate

sentences to meaning. Bloom does not describe the semantic components of her grammars but it may be assumed that these would use projection rules to relate deep syntactic structure to semantic structure. Bloom accounts for reduction as the incomplete representation of deep structure in surface structure but perhaps it could also be explained by incomplete application of the projection rules. Bearing in mind that the projection rules deal with two elements at a time like Schlesinger's realisation rules, the application of one projection rule where two are appropriate seems to be equivalent to the application of one realisation rule where two are appropriate.

Schlesinger also makes the point that the utterance structure 'noun phrase + verb phrase' or subject and predicate covers a wide range of utterances that differ in the semantic relations they express. We could postulate sets of realisation rules that would transform these semantic relations into utterance forms. These sets of rules would be separate just as each rule has a separate identity even though they produce similar forms of utterance. A theory of utterance production like this does not explicitly describe the structural similarities of utterances that originate from different semantic constructs. In contrast, transformational grammar places emphasis on the structural similarities of utterances rather than the specific relationships between utterances and their semantic structure. Schlesinger's theory is

presented as a theory of utterance production whereas transformational grammar is not, and since Schlesinger's theory focusses on the determination of utterance structure by semantic structure rather than on the abstract syntactic structure of language, his theory appears to have greater potential value as a theory of utterance production.

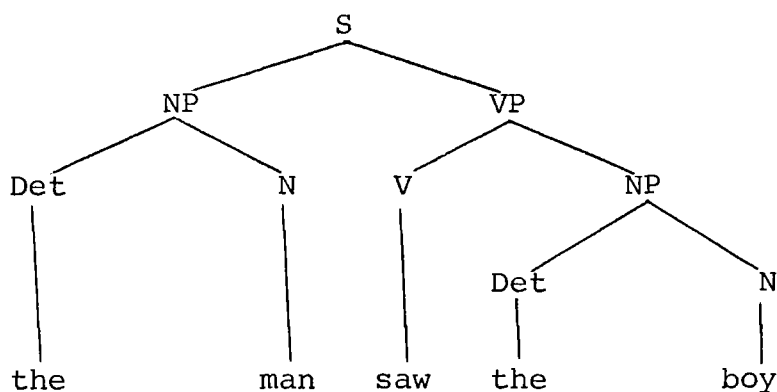
It is important to bring out the relationship between Schlesinger's theory and transformational grammar because the difference between them is perhaps not quite as great as Schlesinger implies. In his discussion of the 'modifier + head' rule Schlesinger notes that his list of examples includes attributes and possessives. Big boat is an attributive construction and baby car is possibly a possessive construction. His list also includes more nut which is neither possessive nor attributive. According to Bloom's (1970) observations 'more . . .' is usually used to express the desired or observed recurrence of an object or an event, as in 'more rabbit' and 'more ride'. Therefore, there is one position rule covering three kinds of semantic relationship which makes sense in that the three kinds of utterance produced are structurally similar. Yet it is the description of structural similarity that seemed to differentiate Schlesinger's theory from transformational grammar. Schlesinger says that "ultimately, of course, the child must learn to distinguish between (attributives and possessives) and learn the appropriate realisation rules" (1971:75). Bloom's work suggests that the functions of

young children's utterances are well defined in which case this statement underestimates the child's level of semantic development. Therefore, it would be psychologically more accurate to have separate realisation rules for expressing attribution, possession and recurrence than to amalgamate all three in the 'modifier + head' rule. The point to come out of this is that a theory of utterance production can be workable without descriptions of the abstract structural similarities between utterances. In other words, it seems that the creative use of language by young children can be accounted for by realisation rules that can express an indefinite variety of instances of particular semantic relationships. For example, recurrence is one kind of semantic relationship and in the early stages of development one realisation rule is adequate to transform any instance of this relationship into the appropriate utterance.

There are two other theories of utterance production which are alike in their use of phrase structure grammar. Yngve's (1960) model and hypothesis was an important attempt to describe sentence production and certain possible limitations to it. The model is the result of the application of computer data processing to a kind of phrase structure grammar. In a sense it is an activated grammar that converts phrase markers into sentences. Although the model is mechanically sound it cannot be a complete account of sentence production because the origin of phrase markers

is not explained. Miller and Chomsky (1963) reject the model for several reasons, most of them valid, but they are wrong to say that it implies that phrase markers are constructed in a top-to-bottom manner. This is because the model describes how phrase markers are used to make sentences, and not how phrase markers are constructed.

Despite its inadequacies the model and its related hypothesis about sentence depth are interesting. The model produces sentences by the sequential application of the sets of generative rules that describe the structure of those sentences. The model is strictly concerned with phrase structure grammar, meaning that there are no transformational rules involved. All the rules used in the model either describe a division or a branching in the phrase marker, or they specify a lexical substitution. The branchings are always binary as in $S \rightarrow NP + VP$ and $VP \rightarrow V + NP$, and this is very important for the model's operation.



1. S → NP₁ + VP
2. NP₁ → Det₁ + N₁
3. Det₁ → the
4. N₁ → man
5. VP → V + NP₂
6. V → saw
7. NP₂ → Det₂ + N₂
8. Det₂ → the
9. N₂ → boy

The operation of the model is best explained with the aid of the sample phrase marker and set of rules for the sentence 'the man saw the boy'. The rules relate to the phrase marker either by specifying a branching in it or a lexical substitution. The rules are listed in the exact order in which the model must use them in order to produce the sample sentence. Since sentences are produced in real time the order in which lexical items are produced is critical, therefore the model is designed to process those parts of the phrase marker that relate to the first item first. In other words, the model must process the left-most branchings first and work through the branchings in a strictly left-to-right manner. The question which Yngve poses is: What happens to the right-hand branchings while the model is processing the left-hand ones? His answer is to store them in a short-term memory until the model is ready to process them. Thus, to produce the first lexical item of the sample sentence the model

processes $S \rightarrow NP_1 + VP$. It then takes up NP_1 for immediate processing and puts VP in short-term memory. Next the model processes $NP_1 \rightarrow Det_1 + N_1$, taking up Det_1 and putting N_1 in the short-term memory. Then $Det_1 \rightarrow$ the is processed and the first lexical item produced. Now the model returns to the last branching, that is the last symbol put in short-term memory, and processes it. In this case the last symbol put in was N_1 so this is processed to man and the next lexical item produced. Now the model goes back to the previous branching and takes VP out of short-term memory. This symbol is processed in the same way until all the lexical items have been produced and there are no symbols left in the memory.

When a symbol is put into the short-term memory Yngve says it is like storing a commitment to continue the processing along another branch. Thus, after $S \rightarrow NP + VP$ is used and VP is stored it is like storing a commitment to process and produce a predicate. Sentences vary in the number of commitments or symbols that have to be stored during their production. The sample sentence requires the storage of two symbols at most, and this maximum occurs during the processing of the first lexical item. In fact, the number of commitments that have to be stored at any one time is precisely related to the number of left-hand branching nodes in the phrase marker. In the sample phrase marker there are two left-branching nodes, equivalent to the rules $S \rightarrow NP_1 + VP$ and $NP_1 \rightarrow Det_1 + N_1$. The rest of the branchings are right branching because in these the

subsequent branchings all occur on the right-hand branch. It follows that the amount of short-term memory capacity required to produce a sentence depends on the number of left-branching nodes in its phrase marker. This means that left-branching sentences are more complicated to produce than right-branching ones. So if the model does represent human utterance production it is predicted that natural languages would avoid left-branching structures. Some natural languages have more left-branching structures than others, but Yngve finds that in English there is such a tendency to avoid left-branching structures. For example, instead of saying this is the malt that the rat that the cat that the dog worried killed ate, we say this is the dog that worried the cat that killed the rat that ate the malt.

Yngve refers to the number of commitments that have to be stored during the production of a lexical item as the depth of that item. The more commitments involved the greater the depth. Expressed in terms of depth it is predicted that natural languages avoid sentences with high degrees of depth involved, and Yngve says that this is true of English. The research connected with this theory is discussed in the second chapter which concerns the application of the model to children's utterance production. The model has been discussed enough for present purposes and now it is the turn of the ideas of Neal Johnson.

Johnson (1965, 1966a, 1966b, 1968) has investigated the role of grammatical structure in the imitation of

sentences by adults. He has found that the structures that people make use of to learn sentences show a strong resemblance to phrase structure grammar. He says that his interpretation of phrase structure grammar is similar to Yngve's except he talks about decoding steps rather than commitments. Whereas Yngve would say that the production of the first lexical item in the sample sentence involves the storage of two commitments, Johnson would say that it involves two decoding operations. His evidence that phrase structure grammar is involved in sentence learning and recall comes from the analysis of errors made in recall. His analysis involves the computation of transitional error probabilities, which may be forward and backward. The forward transitional error probability is based on the frequency (in a large sample of people) with which a word is recalled incorrectly given that the preceding word is recalled correctly. The backward transitional error probability is based on the frequency with which a word is recalled incorrectly given that the following word is recalled correctly.

If sentences are learned as transitions between words or as a sequence of associations between words the transitional error probabilities, forward and backward, should be roughly the same. This assumes that the associations or transitions between any pair of consecutive words in a sentence is as easy to learn as any other. If, however, phrase structure is used in learning sentences the transitional error probabilities will not be equal.

Instead, their size should correlate with the pattern of the phrase marker for a particular sentence. This is because some words are more closely related in phrase structure than others. For example, in the phrase marker for 'the man saw the boy', 'the' and 'man' are more closely related than 'man' and 'saw' because the first pair are linked by one node or branching whereas the second pair are linked by two. One would predict a higher transitional error probability for 'man' and 'saw' than for 'the' and 'man' and this is the kind of result Johnson has found. There is one qualification: the correlation between phrase structure and transitional error probabilities only occurs for forward probabilities. This finding is consistent with the temporal sequence of sentence constituents.

Yngve's model makes explicit use of rules to produce sentences. It is a kind of activated grammar. It has been argued that rules represent idealised knowledge and that real knowledge is perhaps better thought of as associations with varying degrees of probability. Thus the equivalent model of human utterance production would have probabilistic rather than obligatory connections, as Osgood (1963) suggested. Nevertheless, the use of probability is not meant to suggest that utterance production is merely a reflection of the statistical structure of language. On the contrary, it is meant to suggest that the whole system of connections between meaning and utterances is probabilistic.

Yngve's model also brings out another difference between grammars and models of utterance production. Osgood (1968:489) says that grammars are abstract from time whereas utterance production occurs in time. The grammars printed in textbooks are certainly abstract from time but a grammar in this form does not generate sentences. Generative grammars are really just lists of rules which cannot generate anything without some device, be it man or machine. Therefore, the capacities of the device using a grammar will to some extent determine the language produced by that device and grammar. Osgood says that transformational grammar can generate a sentence with an indefinite degree of self-embedding. Now it is true that we can imagine the grammar generating such a sentence but whether or not it actually does so will depend on the capacities of the real device using it.

It is important to note that Johnson's observations apply to verbal learning and a theory of verbal learning is not synonymous with a theory of utterance production. It is easier to study verbal learning than utterance production since it is easier to control the input into the speaker when he is learning than when he is speaking spontaneously. This is because the input for spontaneous speech is partly meaning and as an aspect of cognition this is not readily observed and controlled. However, many studies of verbal learning have shown that meaning is an important factor in this, too. Marks and Miller (1964)

found that well-formed and meaningful strings were learned most well, while well-formed but anomalous strings were learned a little more readily than ill-formed strings. Their findings suggest that adults have some knowledge of the structure of language which they can make use of in verbal learning whether or not the material is meaningful. With children the evidence is less clear, partly because of the small amount of published research on children's imitations of well and ill-formed sequences.

There is evidence that both six year old and twelve year old children can learn meaningful strings more readily than strings that are meaningful but improbable (Vanevery and Rosenberg 1970). There is also evidence that, within the age range of three to five years, children make an increasing use of well-formedness in learning word strings (Scholes 1969). David McNeill (1970:118) did an experiment with children aged five, six, seven, and eight years. According to his results the younger children learned meaningful strings better than anomalous strings, and anomalous strings better than ill-formed strings. This order was the same for all ages except that the older children learned the meaningful strings much better than the other two types. It is hard to know what to make of his results because the level of learning on the anomalous and ill-formed strings was very low, and because there was no increase in learning for these with age. Some increase would be expected over four years as a reflection of the general development of short-term memory.

Perhaps the most helpful experiment is that of Gamblin (1971) in which he investigated the influence of age, short-term memory, meaningfulness and phrase structure on sentence retention. His subjects were in the ninth, tenth, eleventh, and twelfth grades (fourteen through seventeen years). He used a probe latency technique to evaluate the influence of phrase structure: the longer it took subjects to recall the word following the probe word given to them, the more complex and distant the syntactic relationship between the words was assumed to be. As expected, sentence retention varied with age, short-term memory, and meaningfulness. However, Gamblin found that the results from the high short-term memory group reflected phrase structure whereas those from the low short-term memory group did not. He also found that the low short-term memory group was more influenced by the meaningfulness of the material, whereas the high group was more influenced by its grammaticality.

Johnson (1968) describes some research by Matthews (1965) using the transitional error probability technique. Matthews examined the linguistic abilities of children aged six through nine years, and he found a positive correlation between children's and adult's transitional error probability patterns that increased with age. The correlation at nine years was 0.94 which suggests that, if the learning task is easy enough, children of this age can learn sentences in the same way that adults do. At six the correlation was 0.71. In contrast to the findings of

Vanevery and Rosenberg with the analysis of transitional error probabilities at this age this level of correlation suggests that the learning behaviour of six year olds does approximate that of adults. Bearing in mind Gamblin's findings it seems quite possible that the learning of verbal material by children of any age will reflect phrase structure if the task is easy enough. Furthermore, if the material is well-formed but anomalous there seems to be less chance that learning will reflect phrase structure than if it is well-formed and meaningful, at any age.

This means that the knowledge of linguistic structure represented in realisation rules and in phrase structure or transformational grammar is required to account for verbal learning in adults and children. Realisation rules can account for the learning of structure and meaning together, but when structure is learned without meaning some kind of abstract structural knowledge is necessary. However, remembering sentences is not the same as producing utterances and the linguistic knowledge represented in realisation rules may be adequate to account for production since people usually intend to produce meaningful utterances. The linguist who produces utterances like 'colourless green ideas sleep furiously' behaves in a way that requires more than realisation rules. So we should not forget that adults and perhaps children as well can produce anomalous but otherwise well-formed utterances if they want to.

The latter part of the introduction has been concerned with utterance production and the kinds of linguistic ability required to account for it and verbal learning. At the present time there are only two published models of utterance production that are more than just ideas about it. These two models differ considerably. Yngve's model is a phrase structure or grammatical model which is by no means a complete account of production. On the other hand Schlesinger's model emphasizes the expression of meaning in words. His model provides a simpler explanation of the production of the two-word utterances of young children than does transformational grammar, but his ideas have yet to be fully developed or experimentally validated. Yngve's hypothesis about sentence depth has been researched with some success and it provides a strong hypothesis regarding the utterance production of young children who have strictly limited short-term memory. If children produce utterances according to Yngve's model the complexity of their utterances will be severely limited by their short-term memory capacity. The next chapter deals with this hypothesis.

Chapter 2

Experiment 1 - Children's Repetition of Sentences and the Depth Hypothesis

Introduction

In the first chapter Yngve's (1960) model of sentence production was described as a device for converting phrase markers into sentences. It was noted that the model does not explain the origin of phrase markers, only their conversion into sentences, which means that the model is interesting but incomplete. Miller and Chomsky (1963:474) criticize the model on several counts, one of which is that the model implies that phrase markers are produced in a top-to-bottom fashion, with major categories like NP and VP being selected before minor ones like N and V. However, it is argued that the model says nothing about the formation of phrase markers although it clearly converts these into sentences in a top-to-bottom fashion.

Miller and Chomsky also say that the model is a better description of speaking than of hearing because of the kind of grammar it involves. This is not surprising because the model is presented as an account of production and not of comprehension. Miller and Chomsky make this comment because it is their assumption that the human speaker-hearer may be described as having one system of knowledge of linguistic structure that is applied in the

various linguistic abilities, including comprehension and production. This assumption has been criticized for its confusion of linguistic and psychological theory. From an abstract linguistic point of view it is reasonable to describe language as a system that relates utterances to their meanings. However, it does not follow that the psychological relationship between utterances and their meanings is the same as what is said to be the most simple, explicit and systematic linguistic description of the relationship between the sentences of a language and their meanings. For example, it does not follow that the psychological process whereby people understand utterances is exactly the reverse of the psychological process whereby they produce them. In fact, there is evidence to suggest that comprehension is not simply production in reverse. Therefore, from a psychological point of view, Yngve seems to be quite justified in proposing a model for only production.

There has also been criticism of the way certain sentences are described in the grammar used by the model. For instance, co-ordinate constructions are arbitrarily assigned a right-branching structure. A more serious problem for the model is the fact that some natural languages have much more left-branching than English, for example Turkish. According to the depth hypothesis natural languages should tend to avoid left-branching, but this is clearly not true of all of them. There has been less criticism of the way in which the model produces

sentences from a mechanical rather than a grammatical point of view.

Yngve's hypothesis about the depth of sentences and the number of commitments involved in sentence production was described in the first chapter. According to the hypothesis the production of every lexical item in a sentence, except the last one, entails the storage in a short-term memory of one or more commitments to process the rest of the phrase marker for that sentence. The number of commitments that have to be stored during the production of an item is called the depth of that item. And the depth of an item depends on the structure, in Yngve's kind of phrase structure grammar, of the sentence it belongs to.

The capacity of the model to produce sentences depends on their phrase structure and the model's short-term memory capacity. If the model is able to store no more than, say, three commitments at any one time it cannot properly produce sentences containing items with a depth greater than three. Thus, the capacity of the model to produce a sentence is determined by the highest degree of depth in it: even if only one item has a degree of depth that exceeds the model's short-term memory capacity, the sentence it belongs to cannot be properly produced. The highest degree of depth in a sentence is here referred to as its maximum depth. An alternative measure of the productive complexity of sentences is their mean depth.

To compute the mean depth of a sentence the depth of each constituent item is worked out from examination of the sentence phrase marker. Then these depths are summed and the sum is divided by the number of constituent items to yield the mean depth. Most of the research connected with the depth hypothesis has used mean depth rather than maximum depth as a measure of sentence productive complexity. The term productive complexity is used rather loosely in the thesis to refer to any factor or variable that affects the complexity of production. It is generally assumed that utterances of greater productive complexity will be harder to produce.

Yngve's model produces sentences in a hierarchical manner. Evidence that people process verbal material in a hierarchical manner is considered to be weak evidence of the model's applicability to human utterance production. Strong evidence of the model's applicability to human utterance production can only come from the study of the influence of depth on utterance production. There is plenty of evidence of hierarchical processing in verbal behaviour, for example, Mandler (1969) found that the patterns of recall of lists of words were adequately described by hierarchical schemes. Furthermore, studies of verbal learning have shown that this is strongly influenced by grammatical structure (Miller and Selfridge 1950; Marks and Miller 1964; Mandler and Mandler 1964; Epstein 1961). Grammatical structure is usually organised

hierarchically, and there is evidence that the structures people use in learning sentences are typically equivalent to phrase structure grammar (Johnson 1965, 1966a, 1966b; Herriot 1967; Levelt 1970).

There have been several studies of the depth hypothesis, and these have generally shown that sentence repetition does vary with mean depth (Martin and Roberts 1966; Herriot 1968; Wearing 1970). However, the effect of depth has been found to interact with other aspects of sentence structure, for example voice (Martin, Roberts, and Collins 1968). The effect of depth has not been outstanding and this is possibly because most researchers have used sentences with a maximum depth of not more than three or four. In other words, a short-term memory capacity of three or four units was usually sufficient and this is well within the limit of about seven units for human short-term memory (Miller 1956). Moreover, subjects may have repeated some sentences better because their structure was preferred in some way, or just used more often. Clark and Clark (1968) found such a structural preference in their study of sentence learning. These authors found that subjects recalled pairs of clauses better when the order of the clauses corresponded with the temporal order of the events being described.

Perfetti (1969) found that the depth of sentences was not as good a predictor of sentence retention as lexical density. His concept of lexical density refers

to the proportion of nouns, verbs, adjectives, and adverbs in a sentence. Perfetti found that sentences with a higher proportion of these content words were retained less well than those with a lower proportion.

Turning to the research done with children, it was shown by Freedle, Keeney, and Smith (1970) that the tendency of young children to leave out function words when imitating sentences did not relate to mean depth, although it did relate to grammaticality. Graham (1968) found that the sentence recall of educationally subnormal children correlated with their short-term memory capacity. Since both variables are concerned with memory this finding is to be expected regardless of Yngve's hypothesis. Carlota Smith (1970) also studied sentence repetition, though not with regard to depth, and she found that this was affected by the distribution of content words in the sentences. When content words occurred close together in a sentence repetition was reduced. Smith refers to this concentration of content words as their degree of compression. Though compression and lexical density do not refer to the same characteristic they are both concerned with content words.

There is one characteristic of the research of the depth hypothesis that complicates its interpretation, and this is that all the studies have investigated sentence repetition rather than spontaneous utterance production. This is important because the load on short-term memory will generally be much greater in sentence repetition than

in spontaneous utterance production. In sentence repetition subjects will not only have to store commitments, they will also have to remember the whole phrase marker for a sentence and probably its meaning as well. In spontaneous utterance production there should only be a need to store commitments because the phrase marker for a particular utterance is, presumably, created or stimulated by the meaning or content to be expressed in the utterance. Moreover, the meaning or content of an utterance is probably linked to and, to some extent, stimulated by the linguistic and non-linguistic context. This difference between repetition and production in load on memory could account for the influence of lexical density and compression on repetition. Since content words carry more content or information, their load on memory will be greater. Therefore it would be expected that the proportion and distribution of content words in a sentence would have much to do with how well that sentence could be learned and recalled. In spontaneous utterance production, however, there should be nowhere near the same load on memory since this behaviour will be more directly and immediately related to the ongoing thought and context.

Although there is plenty of weak evidence for the applicability of the model to human utterance production, the strong evidence is less easy to find. But the fact that short-term memory capacity has a crucial role in the model, and young children have a much smaller short-term

memory capacity than adults, means that the depth hypothesis is still worth exploring as an explanation of the limited length and complexity of young children's utterances. The first experiment investigates the sentence repetition and spontaneous utterance production of some preschool children to see if they do repeat and speak as the model predicts.

According to the depth hypothesis, children whose short-term memory capacity is less than the maximum depth of a sentence should be unable to repeat or utter that sentence completely. Assuming that Yngve's model applies to human utterance production, it is predicted that those parts of a sentence most likely to be omitted in repetition and spontaneous utterance will be those with commitments stored first or last, when more commitments are to be stored than there is capacity for. According to the theory of memory proposed by Norman (1968), new items entering short-term buffer storage knock out the oldest ones, so it is further predicted that commitments stored first will be lost first when the storage capacity is overloaded.

In this experiment some preschool children are given sentences to repeat that vary in mean and maximum depth. Their spontaneous utterances are also recorded. Their short-term memory capacity is measured and this is used to interpret the spontaneous utterances and the repetitions, to find out if the children behaved according to the model and the depth hypothesis. The literature

contains reports on sentence repetition, sentence recall, and sentence imitation, all referring to similar experimental procedures. In this experiment the term sentence repetition is used, and it means that a sentence is spoken to the child and he is asked to say it back straightaway.

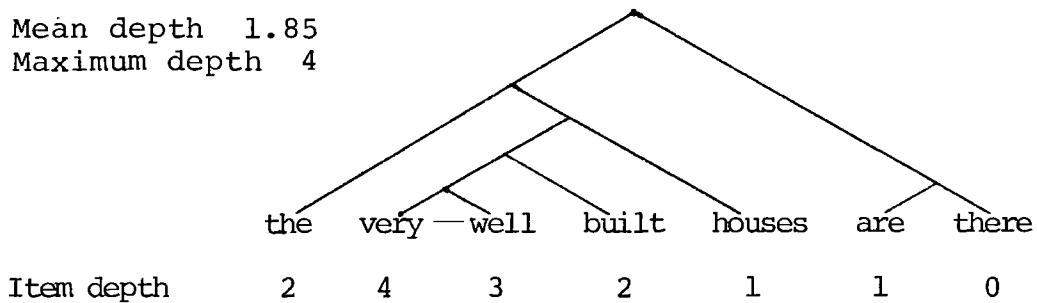
Method

Subjects: The subjects were twelve preschool children of mean age four years (S.D. 6 mos.), who were attending playgroup sessions at the Department of Psychology in the University of Durham. These children came to the playgroup regularly and they were quite familiar with the experimenters and their equipment before research was begun.

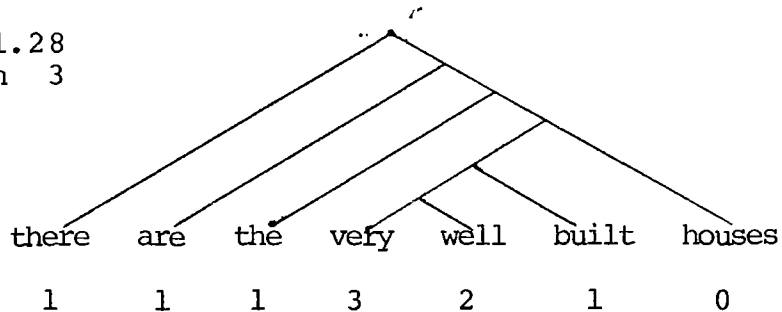
Sentence Repetition Test: Three forms of sentence with mean depths 1.85, 1.28, and 0.85, and maximum depths 4, 3, and 1, respectively, were used. These three forms were represented in a variety of word sequences to control for word content and meaning as much as possible. The two forms of greater depth included an adverbial noun phrase, and the other form included a sequence of three adjectives. Three sample sentences are shown below, one for each form, and these three are matched in word content. The phrase marker for each sentence is drawn in and the number below each word indicates the depth of that word. The first word in the first sentence is 'the' and it has a depth of two, which means that two commitments have to be stored

in its production. It has a depth of two because there are two branchings or nodes between the top of the phrase marker and it. The next word 'very' has a depth of four. There are five nodes between the top of the tree and 'very' but only four of these entail commitments or branchings to parts of the tree not yet produced. The next word 'well' also has five nodes between it and the top of the tree, but only three of these entail commitments or branchings to parts of the tree not yet produced. Therefore, 'well' has a depth of three.

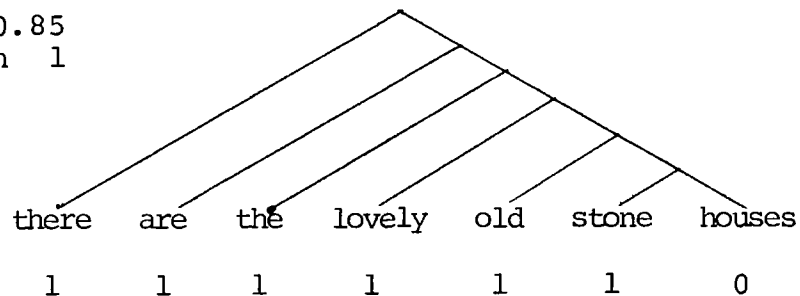
Mean depth 1.85
Maximum depth 4



Mean depth 1.28
Maximum depth 3



Mean depth 0.85
Maximum depth 1



The sentences were recorded on a tape recorder by the author who spoke at a rate allowing clear pronunciation of every word. The sentences were spoken with normal intonation so that they sounded like normal language. Although intonation could affect repetition because the words will not have the same stress it was considered essential to include it because Scholes (1969) found that young children handled sentences without intonation as strings of unrelated words.

These particular forms of sentence were used because they all have the same number of content words, and because these content words occur together in all three forms. This means that the three forms are equivalent in their lexical density and their degree of compression.

The sentences were presented according to a balanced design that controlled for order of presentation of the different forms and sentence content. Each child attempted to repeat one sentence of each form, that is three sentences altogether. The three sentences for each child were different or non-matching in their word content. There were six different sentences for each word form and the whole eighteen sentences are given in Appendix 1. The twelve subjects were divided into six pairs and each pair attempted to repeat three of these eighteen sentences. Each pair were assigned to a different set of three sentences so that a total of eighteen sentences was required for the six pairs.

To ensure the children's attention for the main task a short dummy sentence was presented before the first

test sentence. The children were used to repeating material from a tape recorder, and before the experiment they were simply instructed to listen carefully and repeat what they were about to hear.

Short-term Memory Test: After the sentence repetition test, but not at the same session, each child attempted a test of short-term memory. For this test twenty-eight verbs were taken from the Thorndike-Lorge (1944) lists of most frequent words in juvenile literature, and arranged in seven sets of four words. Only one type of word was used in order to minimise facilitation of recall by grammatical structure (Stanners 1969; Epstein 1961), and verbs were used rather than nouns because there is some evidence that nouns are recalled better than other kinds of words. The words were randomly assorted into groups of four since it was unlikely that children of this age would be able to fully repeat groups larger than this. Then this random assortment was adjusted so that no group contained acoustically similar words because such similarity could facilitate repetition. The groups of words were then recorded on a tape recorder by the author, speaking at a rate of approximately one word per second with each word receiving the same amount of stress. The seven groups of four words are shown in Appendix 1.

The children were instructed to listen carefully and to repeat all the words they could remember. A dummy group of words was presented before the test groups to attract the children's attention, as was done with the sentence

repetition test.

The children were encouraged to talk during the experimental sessions to help them accept the situation and to build up samples of their spontaneous speech. This speech and their test responses were recorded together on a cassette tape recorder and transcribed afterwards. This method was used throughout the research whenever the children's speech was to be observed. The utterances collected during this particular experiment were examined to determine their mean and maximum depths for comparison with test results.

Results

Sentence Repetition and Short-Term Memory: Sentence repetition was scored as the number of correct words repeated in the correct order, and the mean scores for the group of twelve children on the three forms are shown in Table 1.

Table 1: Sentence repetition scores for sentences of three different depths (N=12).

Sentence Form		
Mean Depth	Maximum Depth	Mean Score
1.85	4	4.2
1.28	3	4.0
0.85	1	5.1

A two-way analysis of variance, depth by individuals, was applied to the results. According to this analysis the

effect of depth was significant ($F=5.44$, $n_1=2$, $n_2=22$: for $p=0.05$, $F=3.44$). Then an analysis of selected contrasts was made in the manner described by McNemar (1962:345). According to this the repetition of sentences of maximum depth four was significantly different from the repetition of sentences of maximum depth one ($t=2.99$, 22 d.f.; p less than 0.01). Repetition of sentences of maximum depth three was significantly different from repetition of sentences of maximum depth one ($t=3.54$, 22 d.f.; p less than 0.01). However, the repetitions of the sentences of maximum depths three and four were not significantly different ($t=0.54$, 22 d.f.).

The mean scores in Table 1 do not correlate with degrees of depth very much: although sentences of least depth were repeated most well sentences with maximum depths three and four were repeated almost equally well. Since these two forms of sentence differed from the other one in the type of phrase included, it looks as though phrase type was more influential than depth.

The next step is to examine the patterns of transitional error probabilities in the three forms of sentence. This will show whether the children were handling the sentences as strings of unrelated words or as structured sequences of words. When adults repeat strings of unrelated words the results typically show a serial order effect, with words at the ends of the strings being repeated more often than those in the middle. When the word strings have grammatical structure there is no simple serial order effect

and the pattern of repetition tends to reflect this structure according to the analysis of transitional error probabilities.

If the children's repetition of strings of unrelated words reflects a serial order effect this may be observed in the short-term memory test. Therefore, the results of this test are presented next, before the discussion of sentence repetition patterns. The short-term memory test was scored as the number of words correctly repeated regardless of order, although it should be noted that the order of presentation was closely followed. The mean number of words correctly repeated for the group of twelve children was 2.01 words (S.D. 0.78). The pattern of repetition of these words does show a serial order effect, with the end words being repeated more often than the second word, and the last word being repeated more often than the first. This difference between the end words is expected and it reflects the fact that four children, whose mean scores were less than two words, never repeated the first two words of any group of four.

Some correlations were calculated and there was found to be a rank correlation of +0.18 between short-term memory test score and age, and one of +0.52 between sentence repetition score and age. These correlations were not significant but then the age range and sample size are both small. There was a correlation of +0.77 between scores on two tests, and this was significant (t test: $t=3.5$, 10 d.f.; p less than 0.01). A significant correlation between the

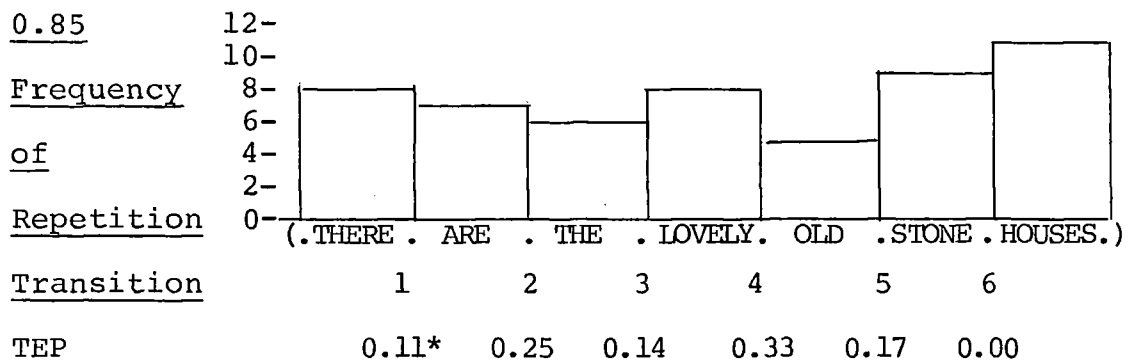
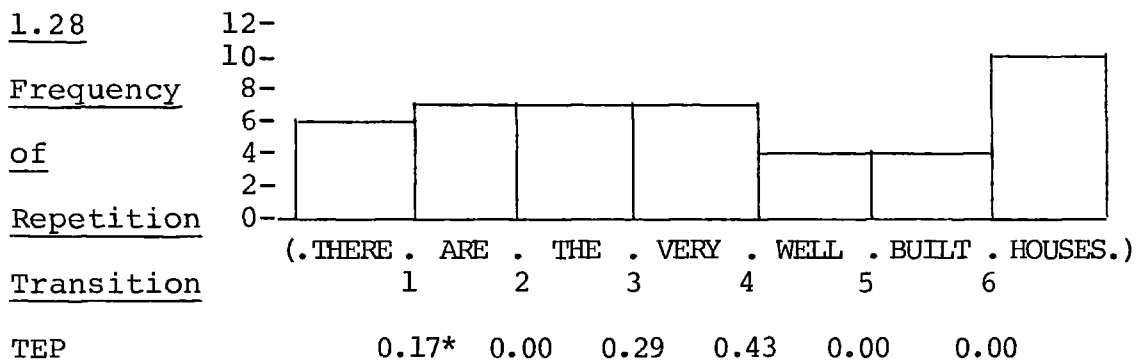
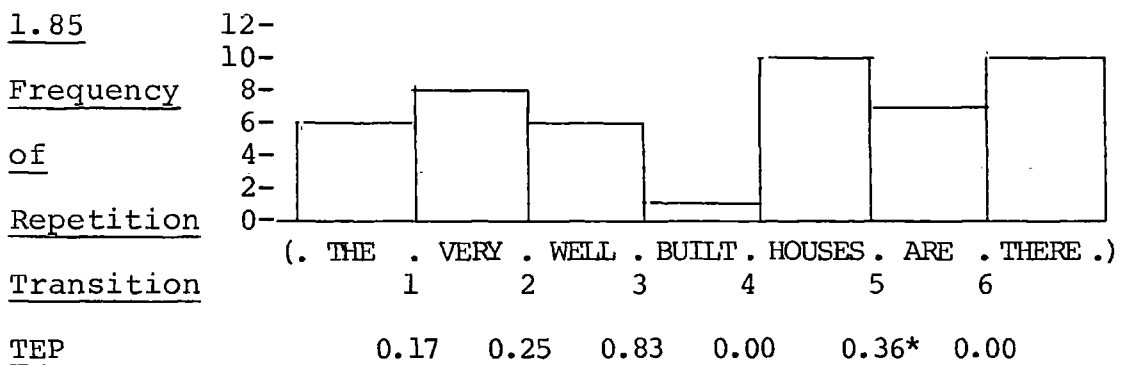
tests was expected since they both measure aspects of short-term memory.

Returning to sentence repetition the first point to note is that the mean scores for this are greater than the mean score on the memory test. The sentences contained seven words whereas the groups only had four, but this should make little difference because the limit to short-term memory for strings of unrelated words is not a proportion of the number of items presented. In fact, one would expect a string of seven unrelated words to overwhelm some children so that, if anything, the mean score for seven unrelated words might be less than that for four. Therefore, the fact that the mean scores for sentence repetition are greater indicates that the children were making use of structure to some extent.

Table 2 shows the frequencies of repetition of constituent words and the forward transitional error probabilities between adjacent words, for each of the three forms of sentence used in the sentence repetition test. In this instance the forward transitional error probability is defined as the frequency with which a word is incorrectly repeated given that the preceding word was correctly repeated. Johnson (1965) found that these probabilities vary in the results of sentence repetition by adults in a way that reflects sentence phrase structure. For example, the greatest transitional error probability (TEP) usually occurs at the subject-predicate boundary which is the major boundary in phrase structure grammar. Furthermore, Johnson

found that the forward TEP varied with the level of the node or branching relating consecutive words so that the higher the branching in the phrase structure the greater the forward TEP was.

Table 2: Histograms for frequency of word repetition, and forward transitional error probabilities (TEP) for sentences of mean depths 1.85, 1.28, and 0.85 (N=12).



In Table 2 the transitions are numbered from one to six, and below each transition is given the forward TEP for that transition (there are seven words in each sentence and therefore six transitions). The transition that marks the highest level of branching in the sentence phrase marker is labelled with an asterisk. In none of the sentence forms is the TEP at this transition greater than the others. Each sentence form has six transitions varying in the level of structural relationship they reflect. For each form it is possible to draw up a mean TEP for the three transitions corresponding to the three highest levels of structural relationship, and a mean TEP for the three transitions corresponding to the three lowest levels of structural relationship. If the forward TEP's reflect phrase structure the mean TEP's for the three higher level transitions should be consistently greater than the mean TEP's for the three lower level transitions. Table 3 shows the high and low mean TEP's for the three forms of sentence, and the high level TEP's are not consistently greater than the low level TEP's. Therefore, the TEP analysis does not demonstrate the use of phrase structure.

Table 3: Mean transitional probabilities for the three higher level and the three lower level transitions in sentences of mean depth 1.85, 1.28, and 0.85.

<u>Sentence Mean Depth</u>	<u>High Level Transitions</u>	<u>Low Level Transitions</u>
1.85	0.17	0.17
1.28	0.15	0.15
0.85	0.17	0.36

The histograms in Table 2 do not show any consistent serial order effect, except that the last word in all three forms was repeated most often. However, in the forms of mean depth 1.28 and 0.85 the last word was a noun. In the form of mean depth 1.85 the fifth word, a noun, is repeated as well as the last word which is not a noun. The superior repetition of the nouns in this case suggests that the superior repetition of the last words in the other two forms was partly a consequence of their being nouns.

To investigate the pattern of repetition of the three forms a three-way analysis of variance was carried out with the variables being depth, serial position, and individuals. The results of the analysis are given in statistical Appendix 1. According to the analysis depth had a significant influence on repetition and so did serial position. There was also a significant degree of interaction between depth and serial position. These results show that repetition varied with sentence form and therefore with depth as it did according to the first analysis. The serial position effect means that the words in the seven sentence positions were not repeated equally frequently. The highly significant interaction effect means that the pattern of repetition was influenced by sentence form, and therefore depth presumably. An interaction effect would be expected if depth was influencing repetition since the three sentence forms have different distributions or patterns of depth.

The three sentence forms all have a five-word phrase. Two have an adverbial phrase (e.g. the very well built houses) and the other has an adjectival phrase (e.g. the lovely old stone houses). Observation of the histograms in Table 2 suggests that these five-word phrases were repeated in a similar way. The nouns at the beginnings and ends of the phrases were repeated very frequently in all three forms, and the second words in the phrases tended to be repeated more frequently than the other remaining words. To evaluate this similarity a further three-way analysis of variance was carried out using the five-word phrases only. Once again depth showed a significant effect and so did serial position, and there was a significant interaction between these main effects. The results of this analysis are given in statistical Appendix 2. The fact that there is a significant interaction effect again indicates that the similarity of repetition of the three forms was not that great. Yet the effect of serial position is much more significant in the second analysis which suggests that there was greater similarity in the patterns of repetition of the five-word phrases than in those of the whole sentences. The difference in effect of serial position can be assessed using the F ratio of the two variance estimates, one from each analysis. This F ratio is not significant so the difference in the effect of serial position could have occurred by chance. Therefore, there is no conclusive evidence that the five-word phrases were repeated in a similar fashion. Indeed, there

is evidence that the children did not repeat the adjectival phrase in the same way as the adverbial phrases. The adverbial phrases have an adverb of degree (e.g. very), then an adverb of manner (e.g. well), and then a past participle (e.g. built). The adjectival phrases have three adjectives in these positions. If the middle adjectives are omitted from the adjectival phrases, the grammaticality of the phrases is not affected (e.g. lovely - stone houses). If the words in the middle position in the adverbial phrases are omitted, the results are ungrammatical (e.g. very - built houses). Now three children omitted the middle adjective but repeated the other two, but no child omitted the second adverb but repeated the first adverb and the participle. Since the children had twice as many adverbial phrases as adjectival phrases to repeat, this difference in pattern of repetition is perhaps great enough to suggest that their repetition was influenced by grammatical structure to some extent.

To sum up, there is definite evidence that the children did not repeat the sentences as strings of unrelated words, so conversely, they appear to have made use of grammatical structure. On the other hand the TEP patterns did not reflect phrase structure which suggests that repetition was not aided by grammatical structure. However, it only suggests this and does not prove it. Indeed, the research into the influence of grammatical structure on children's verbal learning, mentioned in the first chapter, would confirm that grammatical structure can

influence learning without this influence being apparent in TEP patterns. Overall it appears likely that the children did make use of grammatical structure in their repetition of sentences.

The next step is to find out if the patterns of errors in sentence repetition are as predicted by the depth hypothesis. It was predicted that when the number of commitments to be stored is greater than the short-term memory capacity available, those parts of the sentences with commitments stored first would be omitted as their commitments would be the first ones to be lost from short-term memory. In the sentences of maximum depth four the critical part of the sentence is the last two words, and in the sentences of maximum depth three the critical part of the sentence is the last word. In neither sentence form do these critical parts appear to have been omitted in the way predicted.

Another way of exploring the depth hypothesis is to compare the repetitions of the last three words in the sentences of mean depths 1.28 and 0.85. In the sentences of mean depth 1.28 three commitments have to be stored while the fourth word (e.g. very) is being produced. In comparison, in the sentences of mean depth 0.85 only one commitment has to be stored during the production of the fourth word (e.g. lovely). If depth does affect repetition the last three words of the 1.28 sentences should be omitted more frequently than the same three words in the 0.85 sentences. Once again it is predicted that those

words with commitments stored first will be more likely to be omitted, and this prediction is not confirmed because the last words in these two forms were repeated almost equally frequently. The fifth words were also almost equally frequently omitted, and the sixth words are the only ones that are likely to yield a significant difference in the predicted direction. Given the general lack of support for the depth hypothesis it is considered unlikely that this one difference results from depth and not from the fact that one form is adverbial and the other adjectival.

Spontaneous Speech: The children's spontaneous speech was examined to see if the effects of depth were apparent in this. If children are restricted by short-term memory in the depth of utterance they can produce there should be some correspondence between utterance depth and short-term memory score. Since most of the utterances collected were of minimal depth without any such correspondence this investigation yields no evidence to support the hypothesis.

However, it was noticed that many of the utterances collected were not complete sentences, which means that other factors besides depth and short-term memory capacity were affecting the form of utterances. In most cases the way in which the utterances were incomplete constituted the ordinary ellipsis that is common in everyday conversation.

One child whose speech could be described as telegraphic had a mean score of 1.7 words on the short-term memory test, but the words lacking from his utterances were

not systematically related to depth. This finding corresponds with the experiment of Freedle et al. (1970) which showed that children's omission of some function words in sentence repetition was not a function of mean depth. From the opposite point of view, there were a few clear cases of children producing utterances the maximum depths of which were greater than their short-term memory capacity, as measured by the test. An example of this is the child who had a mean score of 2.14 words and who said one of those little boys who is very naughty ate all. Even if 'one of' is taken to be one lexical item, this utterance still entails the storage of three commitments three times according to the depth hypothesis.

Discussion and Conclusion

The correlation between short-term memory and sentence repetition matches Graham's findings with educationally subnormal children. As both tasks involve memory a significant correlation was to be expected. Yngve's model of utterance production would predict a very high correlation between short-term memory and sentence repetition, but the correlation between them found in this research does not appear to be a consequence of depth.

Although the sentence form with least mean and maximum depth was repeated best, the lack of difference between the other two forms suggests that the experimental effect was a result of the difference between the adverbial and adjectival constructions used and not depth. The adverbial

forms were repeated less well than the adjectival form. In connection with this it is noted that the adverbs of quality were often changed into their corresponding adjectives, for example, 'nicely' was often changed to 'nice'. The participles in the adverbial forms were also changed, usually into similar sounding words and frequently into adjectives. For example, 'built' was sometimes repeated as 'big'. 'Built' was also one word that was moved in repetition to produce '. . . houses were built there'. This behaviour confirms that the adverbial construction was more difficult for the children to handle than the adjectival one.

If the sentences had been repeated as strings of unrelated words it would have been unlikely that the pattern of errors would reflect depth. Although the forward transitional error probabilities did not form a pattern corresponding with sentence phrase structure, there was adequate evidence that the sentences were not handled as strings of unrelated words. But the patterns of error and omission in repetition did not generally support the depth hypothesis. However, there is some evidence to support the hypothesis: only one child with a mean short-term memory score of 3.28 words repeated correctly and completely the sentence form with a maximum depth of four; and the three children who repeated the sentence form with a maximum depth of three correctly and completely were the only ones with mean memory test scores greater than three words.

Yet this evidence loses weight because only four children were able to repeat the sentence form with a maximum depth of one correctly and completely, but no child had a mean memory test score of less than one word. Therefore, it is concluded that the correlation between short-term memory and sentence repetition merely represents the correlation to be expected between two tests of memory, and that the way in which grammatical structure was involved in repetition was not like the way grammatical structure is processed in Yngve's model.

The spontaneous speech data were less valuable than had been anticipated in the sense that most of the utterances were of minimal depth. This pattern of behaviour could and presumably does reflect choice of utterance structure, for there is no apparent obligation that children should produce utterances of the greatest degree of depth allowed by their short-term memory capacity. Some telegraphic utterances were collected but depth was not able to account for their telegraphic structure. Furthermore, some children produced utterances of greater depth than was to be expected from their short-term memory capacity. Therefore, on balance, the spontaneous speech data did not support the depth hypothesis.

The general conclusion that Yngve's model of sentence production is not applicable to human speech confirms a similar conclusion by Perfetti and Goodman (1971). They performed an experiment similar to the present one in which they tested the ability of adults to repeat sentences with

a maximum depth great enough to overload adult short-term memory capacity. They found that repetition was not limited in the way predicted by the model and its related depth hypothesis.

Although short-term memory probably limits the child's perception of language and therefore its understanding and learning of language, it is not clear how else short-term memory might be involved in and influence the production of utterances. Wootton, Masland and Case (1968) found evidence that delayed language development is associated with reduced immediate memory for digits, and if short-term memory is directly involved in production, utterance length and complexity should advance with short-term memory. In this research there was a significant correlation between short-term memory for words and sentence repetition, but some children who only repeated one or two words from the sentences were quite able to utter full sentences of much greater length than this. This observation is inconsistent with the finding that the grammatical structure of children's imitations is the same as that of their spontaneous speech, but of course adults can speak utterances of much greater length than they can remember on the basis of one trial.

Some recent research shows that familiarity is important and that children pick out the content words they know rather than lose or omit the function words because of some processing limitation (Scholes 1970; Smith 1970). In this experiment nouns were repeated in sentences more

frequently than any other kind of word, and even allowing for their terminal position it looks as though they were selectively processed.

The term telegraphic implies that the child omits, or fails to produce certain words in his speech as though some kind of filter is operating. Yet there is now some evidence to suggest that the child does not say certain words because he does not fully appreciate their meaning or because he is in the process of learning to speak them. Transformational grammar contributes to the idea that young children omit parts of sentences because it is based on the sentence as the fundamental unit of language. This means that utterances that are not complete sentences have to be derived from full sentences by deletion transformations in the grammar, as in the work of Bloom (1970). In contrast, Schlesinger's theory lends itself to the production of both incomplete and complete sentences because in his theory utterances are built up from meaning using realisation rules. The fact that both adults and children use incomplete sentence utterances so readily and so often indicates that Schlesinger's theory has more promise as a description of human utterance production than transformational grammar. In Schlesinger's theory the individual is free to select those parts of his thoughts and perceptions that he wishes to express in words, and to produce an appropriate utterance whether this be one word or a long sentence. There is no obligation to produce all utterances via complete

sentences as would appear to be the case in a theory of production based on transformational grammar.

It was noted that many of the spontaneous utterances collected in this experiment were incomplete sentences, usually the elliptic forms common in everyday conversation. The next chapter deals with the production of such forms and it investigates their relative productive complexity as a way of finding out which theory is more appropriate, transformational grammar or Schlesinger's theory of utterance production.

Chapter 3

Experiments 2 and 3 - Utterance Structure, Productive Complexity, and Discourse Agreement

General Introduction

The first experiment investigated the hypothesis that the productive complexity of utterances depends on their depth and the short-term memory capacity required to handle that depth. It was concluded that utterance depth is not a good predictor of productive complexity, and that Yngve's model of sentence production does not apply to human utterance production.

In the conclusion of the last chapter it was noted that the children used in the first experiment produced many incomplete sentences in their spontaneous speech. Most of the utterances were incomplete by way of ellipsis but some were incomplete because they lacked certain function words, usually definite or indefinite articles. Ellipsis is also common in adult conversation.

It was argued in the first chapter that, although transformational grammar is not presented as a model of utterance production, it is reasonable to use it as a starting point for developing such a model. In transformational grammar the basic unit of language is the sentence, therefore utterances that are not complete sentences are derived from complete sentences in the grammar. Therefore,

if the production of elliptic forms corresponds with their derivation in transformational grammar, elliptic forms should have greater productive complexity than the complete sentences they are derived from. This is because the derivation of elliptic forms is more complex than that of their related complete sentences, since the derivation of elliptic forms from their related complete sentences will include deletion transformations that eliminate those parts of the complete sentences that do not occur in the elliptic forms.

Transformational grammar is a context-free description of language which means that it defines the set of grammatical sentences that occur and might occur in a language regardless of context. While this kind of description may be linguistically satisfactory it constitutes a very limited description of human speech and comprehension. People use and understand elliptic utterances a great deal and this is one example of how human linguistic communication has as much to do with being able to say the right utterance at the right time as being able to form complete grammatical sentences. Even though elliptic utterances are not complete sentences they do exhibit grammatical structure, therefore a full account of human language should describe permissible elliptic forms as well as complete utterances. And a full account of human linguistic abilities should describe how all utterances, whether complete sentences or not, are related to the meaning they

express and to the linguistic and non-linguistic contexts they occur in. For instance, such a full account should describe the conditions in which it is acceptable to use complete sentences and the conditions in which it is acceptable to use elliptic utterances.

The same criticism could be applied to Schlesinger's theory of utterance production because in its tentative state it deals with the production of utterances without reference to context. However, although Schlesinger starts out by describing the conversion of intentions into utterances, his use of the word intention to refer to what goes into utterance production implies that the theory will eventually encompass contextual factors. As the theory stands, utterances are built up using realisation rules to convert ideas into words. There is no obligation to convert the whole of an idea into words in the way that transformational grammar is concerned with the complete sentence. So it seems that elliptic forms could be produced by selective use of those realisation rules that convert those parts of the speaker's thought and perception that he wishes to express in words. It follows that any elliptic form is productively simpler than its related complete sentence because less realisation rules will be needed to produce it.

Therefore, transformational grammar and Schlesinger's theory make quite different predictions about the productive complexity of elliptic forms, and the study of the

productive complexity of elliptic forms should yield some important information as to which theory is most psychologically realistic. The productive complexity of elliptic forms could be investigated by having children repeat them and their related complete sentences. Rodd and Braine (1971) have carried out this kind of investigation using four children aged between twenty-one and twenty-eight months. However, these authors were trying to find out something about the children's knowledge of linguistic structure and not the relative productive complexity of certain utterances.

In one of the experiments reported by Rodd and Braine the children were offered three kinds of model utterance for imitation (their use of imitation is retained because their subjects were reproducing utterances spontaneously whereas the subjects in my research were asked to repeat utterances). The three kinds of utterance were 'NP + VP' (e.g. the boy catches the ball), 'Pronoun + VP' (e.g. he catches a ball), and 'VP' (e.g. catches a ball). The children varied in their pattern of imitation but generally 'NP + VP' was imitated as such while the other two forms were imitated as 'VP'. Sometimes the other two were imitated as 'NP + VP', and one child imitated 'NP + VP' as 'NP' quite often. It should be noted that all the models were presented in appropriate contexts so that the children's imitations would show how satisfactory the models were as descriptions of the events referred to. (It

follows that Rodd and Braine were investigating aspects of acceptability as well as grammaticality despite their intention to learn more of the children's competence). For these children, then, producing the complete sentence 'NP + VP' seems to have been as easy as producing the elliptic form 'VP', but the omission of the pronoun from 'Pronoun + VP' would suggest that this form was harder to produce than either of the other two. Rodd and Braine suggest that the pronoun form was not well imitated because the children had only recently begun to use it. Six weeks later, one of the children was producing less 'VP' and more 'Pronoun + VP' and 'NP + VP' forms than he had done at the time of the experiment just described.

Rodd and Braine discuss their findings from a grammatical point of view. They are puzzled by the apparent freedom of the children to produce forms with and without the subject noun phrase. In grammatical terms the subject noun phrase appears to be optional in surface structure. The use of optional is misleading because it implies that the subject noun phrase occurs or does not occur unconditionally, which is not true. In fact, the authors note that the occurrence of the subject noun phrase in the children's speech seemed to be conditional on the prior reference to the subject by an adult. As it stands, transformational grammar has no way of accommodating this kind of linguistic pattern because it makes no attempt to relate sentence structure to linguistic and non-linguistic context. This experiment shows how limiting the concern

with context-free sentence structure can be.

Rodd and Braine also try accounting for the lack of subject noun phrases by performance factors. They hypothesize that the overall length of utterances might influence the inclusion of the subject noun phrase, and they do find that the utterances with subject noun phrases are consistently longer than those without. This finding does not mean very much and it is more significant that they find that the length of model utterances with subject noun phrases is not related to the absence of subject noun phrases in imitations. In other words, they were unable to demonstrate the operation of some performance factors that could account for the absence of subject noun phrases.

To solve this grammatical riddle they proposed that the occurrence of the subject noun phrase in surface structure is not optional. Instead, they suggest that the omission of the subject noun phrase is an early way of referring to the deep structure subject. Later, the child produces the subject noun phrase and later still he learns to refer to the deep structure subject with a pronoun. This is an arbitrary and highly suspect way of getting round the problem of explaining why the children do not always mention the subject noun phrase when they appear to be quite able to do so. It would seem to be more sensible to introduce a deletion transformation for eliminating the surface structure subject that is conditional on certain aspects of the linguistic and non-linguistic context.

The problem of the disappearing subject noun phrases would also be eliminated if the children's behaviour was described in terms of Schlesinger's theory of utterance production. In his theory there is no obligatory deep structure subject to worry about, and the presence or absence of the subject noun phrase could be accounted for by the use of certain realisation rules being governed by certain aspects of speaker's intention and the linguistic and non-linguistic context.

There is, in fact, a well documented explanation of some of the variation in the child's production of subject noun phrases that has to do with the semantic relationship between subject and predicate. McNeill (1970:30) describes how the occurrence of subjects is related to the difference between intrinsic and extrinsic predicates. A predicate is intrinsic when the relationship between the subject and the property assigned to it by the predicate is considered to be inherent or characteristic by the speaker. A predicate is extrinsic when the relationship between the subject and the property assigned to it by the predicate is considered to be adventitious or atypical by the speaker. For example, habitual activities would be described with intrinsic predicates whereas unusual activities would be described with extrinsic predicates. McNeill finds that both Japanese and American children include subject noun phrases when the predicates are extrinsic and exclude them when the predicates are intrinsic. He also finds that children produce twice as many intrinsic as extrinsic

predicates, and that when they talk about themselves they usually do not include a subject noun phrase referring to themselves. He suggests that this is an example of infantile egocentricity, meaning that to the child all statements about himself are inherently obvious so the intrinsic predicate is the appropriate form.

It is also possible that the child does not refer to himself because he learns that people usually realise he is saying something about himself. Similarly, it is possible that children do not include the subject noun phrases with intrinsic predicates because they have learned that people can usually understand what they are saying without explicit reference to the subject. Conversely, they may learn to include the subject noun phrases with extrinsic predicates because people would find it much harder to understand what they were talking about without them. In other words, the fact that children include subject noun phrases with extrinsic predicates before they do so with intrinsic predicates could be a consequence of communication pressure.

To return to the main point, the occurrence of subject noun phrases in some children's utterances and not others is partly a function of the semantic relationship between the subject and the property assigned to it by the predicate. In transformational grammar this behaviour pattern could be described by a deletion transformation that is conditional on the presence of an intrinsic semantic relationship in the input into the semantic

component. In Schlesinger's theory each type of semantic relationship that results in a subject-predicate surface structure would have to be assigned a special rule that limits the application of realisation rules if the relationship is characterised as intrinsic. For example, there is a realisation rule ' χ + locative' for producing two word utterances expressing location (e.g. baby highchair), and another realisation rule 'agent + action' for two word utterances expressing action (e.g. Bambi go). To produce intrinsic predicates without subject nouns for these two forms it is necessary to have two additional rules governing realisation on the basis of the presence of intrinsicity. When the property being assigned is intrinsic one rule would realise the locative predicate on its own and the other would realise the action on its own.

This means that the structural organisation of utterances relating to intrinsicity is more simply handled by transformational grammar than by Schlesinger's theory. This is because transformational grammar describes the structure of language to a greater degree of abstraction than Schlesinger's theory. In the latter theory the inclusion of the subject noun phrase is related to particular semantic relationships, whereas in transformational grammar this can be described as a structural generalisation beyond these particular semantic relationships. Schlesinger's theory deals with particular semantic relationships without reference to the similarities of form between the structures

used to express these relationships. On the other hand, transformational grammar deals with similarities of form with less concern for the fact that similar structures may be used to express different semantic relationships. Perhaps the best theory of utterance production will encompass both points of emphasis.

There is another explanation of the occurrence of elliptic forms, including subjectless predicates, and that is discourse agreement. Discourse agreement refers to the structural relationships between utterances. People construct their utterances to fit in with previous utterances and probably future ones, too, sometimes. For instance, when people ask me my name, I say Alan more often than my name is Alan. Susan Ervin-Tripp (1970) studied discourse agreement in young children's speech and she found a definite developmental pattern with agreement appearing early. She thought this was probably because of the high incidence of questions in parent-child communication. She considered there to be four stages in the development of discourse agreement, and the children used in the present experiments mainly belong to her third, elliptical stage, and fourth, full form stage. In the elliptic stage a child answers a question but does not produce a complete appropriate answer, whereas in the full form stage some of the child's answers are complete appropriate forms. She found that ellipsis decreased with age indicating that the lack of complete forms was the result of the development of productive ability and not grammatical deletion. She also found

that the children studied, aged about two years, tended to give the same form of answer to different questions. In time, there was a gradual differentiation of answer types with the child's pattern of discourse agreement increasingly matching that of adults. She attempted to find out what cues the children were using to base their discourse agreement on, and she reckoned that they did not make much use of the information contained in the question word, for example, 'where' and 'what'. Instead, the children made more use of other characteristics of questions like the transitivity of the verb, the animateness of the subject, and the presence of locative information.

The children used in the present research are generally older than those used by Ervin-Tripp, therefore they should definitely show discourse agreement in their answers to questions. The idea is to put discourse agreement to use to elicit elliptic and full forms in order that their productive complexity can be investigated. This method has the distinct advantage that the children's spontaneous speech is examined and not their repetition so memory is not involved to the same extent.

The type of discourse agreement to be used is one that was previously observed to occur frequently in the children's conversations. The pattern of discourse agreement is shown below in the three sample questions and answers. Since the questions are long, it will help to abbreviate or label them and these labels are given beside the samples. The labels for the questions are WH, WD, and

WO. The labels for the answers are FS, P, and O. According to the pattern of discourse agreement observed the full sentence answer FS is usually given to WH. The predicate answer P is usually given to WD, and the object answer is usually given to WO. The sample set of questions and answers would occur in the context of a girl brushing her hair.

<u>Question</u>	<u>Answer</u>
WH - What's happening there?-	- The girl is brushing her hair - FS.
WD - What's she doing?	- - - - Brushing her hair - P.
WO - What's she brushing	- - - Her hair - O.

This pattern of discourse agreement is a good one for investigating productive complexity because it yields a full sentence form and two elliptical forms. Moreover, the three answer forms vary in length and the number of basic linguistic elements included. This instance of discourse agreement is also good because all three question-answer sequences can be related to the same simple action such as a girl brushing her hair.

Answers P and O are elliptical forms which in transformational grammar would be derived by the application of suitable deletion transformations to the full sentence form FS. This means that, from a grammatical point of view, answers P and O are derivationally more complex than type FS answers. If productive complexity corresponds with derivational complexity answers P and O

should have greater productive complexity than type FS answers. In contrast, Schlesinger's theory would predict that FS answers have greater productive complexity than P and O answers because they require more realisation rules to produce them. P and O answers should have equivalent productive complexity because one realisation rule is enough to produce the key elements of both.

At this point it is worth noting that it seems to be theoretically feasible for one realisation rule to do the work of two. Thus, there seems to be no reason why there cannot be realisation rules that deal with more than one semantic relationship at a time. This would mean that one complex rule could realise the complete agent-action-object relationship instead of two or three. A complex rule of this kind would be similar to one of Bever's (1970:298) perceptual strategies, Strategy D, as follows: any noun-verb-noun sequence . . . corresponds to 'actor-action-object'. With this revision it is possible to predict from Schlesinger's theory that there will be no difference between the productive complexities of answers FS, P, and O.

To measure productive complexity it is necessary to postulate some behavioural variables that are likely to be affected by the load on the productive system of different kinds of utterance. Several variables are used in this experiment to increase the likelihood that some overall indication of productive complexity will be found. The

first variable is latency between question and answer, with utterances of greater productive complexity being assumed to take longer to produce. Johnson (1966b) found in one of his sentence repetition experiments that the latency between presentation and repetition of sentences was a function of their phrase structure. The more decoding operations required to produce the first lexical item the greater was the latency between presentation and repetition. However, Taylor (1969) found that the latency between presentation of a stimulus word and production of an utterance about the topic indicated by the word, was a function of the conceptual difficulty of the topic and not of the number of decoding operations required to produce the first word of the utterance. In the present experiment the topic for each set of three questions is the same, therefore the latencies between questions and answers should be more likely to reflect productive complexity than content difficulty. Each set of three questions has the same topic in that they all apply to the same picture, as will be explained in the method.

A second variable that could reflect productive complexity is article production. It is assumed that utterances which present a greater load to the productive system will be more likely to lack some or all of their articles. Therefore, depending on the hypothesis, FS answers should be more or less likely to lack articles than P and O answers. If article production does vary with utterance structure, and the other measures of

productive complexity vary with it in the same way, this would indicate that productive complexity is partly responsible for the telegraphic nature of early utterances.

The third variable to be used is repetition or fatigue. It is postulated that utterances of greater productive complexity will be more susceptible to the effects of repetition or fatigue. The effects of repetition are to be discovered by examination of the changes in answering behaviour to the three questions during the experiment.

The fourth variable is training. In this case it is postulated that utterances of greater productive complexity will be less susceptible to the influence of training. The idea is to teach the children to produce a greater number of answers in agreement, so that the answer types with greater productive complexity should show less increase in the degree of discourse agreement than those of lesser productive complexity.

So far, productive complexity and the variables used to measure it have been considered without reference to one very important variable, and this is development. The problem is that productivity probably depends as much on development as it does on productive complexity. Productivity is the term used to describe the incidence of a unit or form of language. This means that recently acquired forms probably occur less frequently when expected than forms that have been in use for some time. Consider the case of article production. A child who has recently

begun to produce articles is perhaps more likely to not produce them when productive complexity is high than when it is low. Whereas a child who has been producing articles for some time may now produce them regardless of productive complexity. Therefore, the critical behaviour of those children who do not always produce articles is likely to be masked by the behaviour of those children who produce articles regularly, unless their results are separated in the analysis.

Development will also complicate the interpretation of the repetition and training variables. This is because forms that have been more recently acquired are more likely to be affected by repetition and fatigue and less likely to be affected by training than forms that have been in use for some time. Given that development generally proceeds from simple to complex utterances, type O answers should be the longest used kind of utterance, then type P answers, and then type FS answers should be the kind most recently acquired. Accordingly, the effects of repetition should be greatest with FS and least with O type answers. And, conversely, the effect of training should be greatest with O and least with FS type answers.

Experiment 2 investigates the variables of latency, article production, and repetition, given that the sample of children examined show an adequate degree of discourse agreement to the three questions. The effects of training are described separately in Experiment 3.

General Method

The basic procedure was to present eight pictures of simple actions and ask the three questions, WH, WD, and WO about each, and record the answers obtained for subsequent transcription and analysis. The eight pictures were selected from a larger pilot group for their success in eliciting relevant and appropriate responses. Four pictures showed boys and four showed girls, all carrying out simple actions familiar to children. The eight pictures are shown in Appendix 2. The pictures used were coloured drawings made by the author but the Appendix shows them in outline form only.

Each picture was presented to each child three times, once for each question, making twenty-four presentations in all. Twenty-four seemed to be a number of presentations that most of the children could manage without becoming too tired or inattentive. The twenty-four presentations were done as three runs through the eight pictures, and the pictures were shuffled between runs and between subjects. The pictures were shuffled to control for order of presentation. The questions were assigned so that each was approximately equally frequent in each run, and the order of questions was varied between runs and between subjects. In this way it was possible to randomly control for the order of presentation of particular question and picture combinations so as to minimise the effects of pattern.

All the experiments were done with preschool children but some use was made of a small sample of six and

seven year old children too. A total of forty-four preschoolers gave data that was included in results. Several more were involved in the experiments to some degree that had to be excluded because of temporary absence, poor pronunciation, or poor acceptance of the experimental situation and procedure. Eight of the forty-four came from the preschool playgroup that the children used in the first experiment came from. Another fourteen of them were seen at a day nursery in Newcastle which is attended by children from a wide range of home environments. The remaining twenty-two children were seen at the nursery school they were attending in Durham. The fifteen six and seven year old children, who came from a local primary school in Durham, were seen in the Department of Psychology in the University of Durham. Some of the results are based on part of the total group of preschoolers, but none is based purely on the playgroup sample which mainly consisted of children of University staff. Although the children came from a variety of backgrounds they were used because of their availability and they were definitely not selected to make, or considered to be a representative sample of children of this age.

Apart from the group of older children who did not need the same introduction to the experimenter and his work, the procedure was roughly the same for all subjects. First of all, I visited the various sources and made myself familiar to the children. Then I got them used to leaving the main play area and spending some time playing

and looking at pictures in a nearby room where my equipment was set up. On experiment days the children who were available and willing would be invited to 'come and look at some pictures', and then one-by-one they would be taken away to do the experiment.

My questions and the children's answers were recorded on a cassette recorder for later transcription. Latency between question and answer was measured on the playback of the discourse using a standard laboratory timer and a voice key. The timer was set manually at the end of a question and stopped by the voice key at the beginning of the following answer. The manual set reduced the reliability of timing and extraneous noise on the recording upset the voice key at times, so each latency was measured three or more times until a consistent value was obtained to the nearest 0.05 seconds.

If a correct question and answer pair was marred by additional words in between, or a very indefinite start to the answer or end to the question, or a latency of more than two seconds, it was rejected. Since the questions were in sets of three, one set for each picture, some sets had to be discarded because defective pairs of questions and answers made them incomplete.

The distribution of articles and the effects of repetition were examined in the transcription. The experiment just described formed a baseline for the study of the effects of training, but since the method for the training experiment was more complicated it is described

separately as Experiment 3.

Results

The results of Experiment 2 are described under the headings, discourse agreement, question-answer latency, article omission, and repetition.

Discourse Agreement: There was a high degree of discourse agreement in the answers to the three questions, however, a large proportion of the full sentence answers to WH contained a pronoun subject, 'he' or 'she', rather than a noun subject. Thirty-eight out of the forty-four children produced decipherable answers to all three questions in combination with all eight pictures. In these children's answers to WH there were ninety-five instances of a pronoun subject but only seventy-two instances of a noun subject. Some children gave different kinds of answer to each question, for example, some children answered WH with some full sentences and some predicates. Therefore, to get an idea of the overall degree of discourse agreement it was decided to take the predominant answer form of each child to each question as representing a general tendency in his or her answering behaviour. An answer form was considered to be predominant even if it was in the majority by only one. For instance, suppose a child gave three full sentence answers, four predicate answers, and one inappropriate answer to WH, making eight answers in all. His predominant answer to WH would be taken as the predicate form even though he produced nearly as many full sentence answers.

Some children did not have a predominant pattern of answering behaviour to all three questions and so they had to be left out of this analysis of discourse agreement. In fact, only five children had to be excluded for this reason, which left a sample of thirty-three with a mean age of three years and nine months (S.D. 5.7 months). The distribution of their predominant answers to the three questions is given in Table 4. In this table each child contributes once to each row, or question, so that in the first row for WH, seventeen children gave answers to this question in which the full sentence, or type FS answer was predominant. Fifteen children gave answers to WH in which the predicate or type P answer was predominant, and one child gave answers to WH in which the object or type O answer was predominant.

Table 4: Distribution of predominant answer types to three types of question (N=33).

Question Type	Answer Type		
	FS	P	O
WH	17	15	1
WD	4	28	1
WO	2	3	28
Total	23	46	30

The distribution of predominant answer types in Table 4 is clearly indicative of the pattern of discourse agreement expected. Thus, type FS answers are more often

predominant to WH, type P answers are more often predominant to WD, and type O answers are more often predominant to WO. The totals for FS, P, and O show that the P type answer was the most frequently predominant one regardless of the question asked. The table also shows that many children who answered with discourse agreement to WD and WO, failed to do so to WH. These children tended to answer WH with type P rather than type FS answers. According to Ervin-Tripp's classification the children are at the elliptical and full form stages of discourse agreement development. Those that never answered WH with a full sentence are at the elliptical stage, and those that sometimes answered WH with a full sentence are at the full form stage. The high degree of discourse agreement to WD and WO suggests that the children were, consciously or unconsciously, intending to answer WH with discourse agreement even though they did not always manage to do this in the accepted adult way. For some reason, some of the children were unable to produce full sentence answers to WH in this kind of non-linguistic context. It was noticed that those children who gave full sentence answers to WH predominantly were not consistently the older ones, but then the age range for the total sample was only two and a half to four and a half years.

Question-Answer Latency: Latencies for complete sets of questions and answers were obtained from nine children of mean age three years and eight months. For each of the nine children three mean latencies were calculated, one

for WH-FS, one for WD-P, and one for WO-O. The sample is small because only those children who produced full sentence answers to WH could be used. Furthermore, there were so few complete sets with answers to WH including a noun subject that the latencies for the WH-FS combination were based on FS answers with pronoun subjects only. The nine children's means were then combined to yield sample means for each of the three question-answer combinations. These sample means, corrected to the nearest 0.05 seconds, are shown in Table 5.

Table 5: Sample mean latencies between questions and answers constituting three kinds of discourse agreement (N=9).

Question-Answer Combination	Mean Latency (secs.)
WH-FS (Pronoun subject only)	0.90
WD-P	0.80
WO-O	0.75

The mean latencies in Table 5 appear to vary with the kind of discourse agreement. However, there was great variation in the individual latencies and consequently there was no significant variation in mean latency with discourse agreement ($F=0.59$). The individual variation in latency is presumably a reflection of the content difficulty of different pictures for each child, and the children's widely fluctuating attention.

According to the analysis of latency between question and answer, the three kinds of answer have equivalent productive complexity. But since the individual variation was so great it was decided to repeat the experiment with an older group of children, with the hope that they would show less individual variation in latency and produce more full sentence answers with noun subjects. The older children, fifteen six and seven year olds, showed as much discourse agreement as the preschoolers and, like them, they tended to use pronouns rather than noun subjects. Nevertheless, enough of them produced both noun and pronoun subjects to make a comparison of latency between these. Nine out of the fifteen children produced satisfactory sets of latencies, with half the sets having FS type answers with noun subjects and half having them with pronoun subjects. For each child, six mean latencies were calculated, three for the sets with noun subjects, and three for the sets with pronoun subjects. Each set of three consisted of a latency for WH-FS, a latency for WD-P, and a latency for WO-O, all obtained in the context of one of the eight pictures. The children's mean latencies were combined to produce sample means, and these sample means are shown in Table 6.

The mean latencies in Table 6 for sets of questions and answers in which the FS type answers have pronoun subjects are comparable, and there is no significant variation between them. However, the mean latencies for the other sets in which the FS answers have noun subjects do vary

significantly. This analysis of variance is given in statistical Appendix 3, and so are the subsequent selected contrasts. The only significant contrast was between WH-FS and WO-O. It is important to realise that the complete group of twenty-four presentations was arranged to control for order of questions, but since the sets used in the analysis were selected from the total this control could have been lost. A check showed that there was no significant order bias in the selected sets, therefore the analysis is considered valid in this respect.

Table 6: Sample mean latencies between questions and answers constituting three kinds of discourse agreement. Data from nine six and seven year olds.

Question-Answer Combination	Subject Type in FS	
	Noun	Pronoun
WH-FS	1.00	0.60
WD-P	0.65	0.65
WO-O	0.55	0.65

If question-answer latency is taken to be a measure of productive complexity these results mean that answer types FS, P, and O are equally difficult to produce, except when FS has a noun subject rather than a pronoun subject. There is no obvious reason why full sentence utterances with noun subjects should take longer to produce. Since the children had to produce roughly equal numbers of FS type answers with noun and pronoun subjects to be included

in the analysis, it is unlikely that the relative frequency of noun and pronoun subjects was responsible for the difference in production time.

Bearing in mind the overall greater frequency of pronoun than noun subjects, one possible explanation of the pattern of behaviour found is that children of this age and younger prefer to use pronouns because they are simpler than nouns. Pronouns are simpler than nouns in that they convey less information. On the other hand, the children very rarely used pronouns in the object position, so the use of pronouns is connected with subjectivity or agentivity specifically. The report of Rodd and Braine (1971) suggests that children use noun subjects before pronoun ones, and this seems to be the pattern of development in young children generally (Bloom 1970:132). Gruber (1971) has suggested that early pronouns are not true subjects but tags or prefixes to the verb. Braine talks about pronouns referring to the deep structure subject, and certainly the pronouns used by the children in this research referred to the agents in the pictures because they were appropriate in animateness, number, and sex. Pronouns convey less information than nouns in this case because they only differentiate the gender of the agent (he or she) whereas nouns differentiate age as well (man, boy or lady, girl). Perhaps pronoun subjects fall half-way between subject noun inclusion and exclusion, in which case the use of pronoun subjects would appear to be a kind of grammatical compromise when the predicate is intrinsic.

Intrinsic predicates are normally subjectless in the young child's speech, and maybe children learn to use pronoun subjects with them as a way of identifying the subject without saying very much about it. Whatever the case, the results of the latency analysis do not support the hypotheses about productive complexity based on transformational grammar or on Schlesinger's theory. However, as far as the data obtained from the six year olds is concerned, Schlesinger's theory seems to have the closer fit because FS type answers with noun subjects took longer to produce than P and O type answers.

Article Omission: Some children omitted articles more often than others, but only those who omitted at least one are needed for this part of the analysis. This is because children who never omit articles are assumed to be producing articles regardless of productive complexity. Furthermore, in order to have matching questions and answers it was only possible to use those children who produced at least one answer to WH that was a full sentence with a noun subject. This selection meant that the analysis of article omission was based on only nine children with a mean age of four years.

Articles occurred at four locations in the three types of answer and these are as follows: before the subject noun in FS, before the object noun in FS, before the object noun in P, and before the object noun in O. The rate of article omission at each location was calculated as the proportion of instances when an article could be

omitted in which it was actually omitted. Then these proportions were converted to decimals, and both the proportions and the decimals for each location are given in Table 7. In Table 7 the rate of article omission for before the subject noun in FS is given as 7/42. This means that there was a total of forty-two instances when articles could have been omitted, but in only seven instances was the article actually omitted. The number of potential instances of omission is merely the number of times that the nine children produced subject nouns in their full sentence answers to WH.

Table 7: Rate of article omission according to answer type and location (N=9).

<u>Answer Type</u>	<u>Location</u>	<u>Rate of Article Omission</u>
FS	Before subject noun*	7/42 or 0.17
	Before object noun	0/41 or 0.00
P	Before object noun	3/65 or 0.05
O	Before object noun*	27/63 or 0.43

*In these locations the article is the first word in the answer.

The distribution of article omission in Table 7 is significantly different from that expected by chance (Friedman analysis of variance with locations as columns: $\chi^2 = 11.53$, 3 d.f.; p less than 0.01). A two way analysis of variance, location by individuals, using the actual proportions obtained, was also significant. This analysis

and the subsequent examination of selected contrasts is given in statistical Appendix 4. In two locations the article is the first word in the answer, before the subject noun in FS and before the object noun in O. The evaluation of selected contrasts showed that the only significantly different contrasts were between 'before the object noun in O' and 'before the object noun in P', and between 'before the object noun in O' and 'before the object noun in FS'. This pattern of results suggests that the variable, article omission, is at this age dependent on location and not on answer form. As a measure of productive complexity it suggests that children of this age find it relatively easy to produce articles in non-initial locations, but harder when they come first in the utterance. There is one other factor that could have contributed to this pattern of results. This is that articles were harder to detect in the recording of the discourse when they came first, so some of the variation by location probably reflects errors in transcription.

Repetition: In the investigation of repetition it is assumed that forms with greater productive complexity will show the effects of repetition to a greater extent. It is also assumed that the most likely effect of repetition is a reduction of productive complexity. Productively complex utterances are expected to become simpler.

Development may also affect the changes occurring with repetition, with more recently acquired forms showing the effects of repetition to a greater extent. The effect

of repetition is likely to be a regression in maturity of the forms being produced. If repetition leads to a reduction in the number of FS answers to WH and a corresponding increase in the number of P answers, it would seem that the predicate is both productively simple and less recently acquired. If repetition leads to an increase in the number of FS answers to WH, it would seem that the full sentence form is both productively simpler and less recently acquired. However, the full sentence form is definitely not less recently acquired than the predicate form because the predicate appears before the full sentence in development. From the point of view of transformational grammar the full sentence is derivationally more simple than the predicate, and if productive complexity is equivalent to derivational complexity, repetition should lead to an increase in the number of full sentence answers. Schlesinger's theory predicts that, with repetition, there is likely to be a decrease in the number of full sentence answers to WH because the full sentence is productively more complex than the predicate. Therefore, the prediction based on his theory corresponds with the probable consequences of regression to less recently acquired forms.

Observation showed that there was little or no change in the answers to WD and WO through the twenty-four presentations. There did seem to be a change in the answers to WH, a change consisting of a reduction in the number of full sentence answers with repetition. To assess this change a

scale based on productive complexity was constructed, as follows:

1. All answers are full sentences with noun subjects.
2. Some answers are full sentences with noun subjects, and some are simpler forms.
3. All answers are full sentences with pronoun subjects.
4. Some answers are full sentences with pronoun subjects, and some are simpler forms.
5. All answers are predicates, or some answers are predicates and some are simpler forms.

In constructing this scale it was assumed, partly on the evidence from the latency section, that full sentences with pronoun subjects are easier to produce than ones with noun subjects. The scale is constructed so that it covers all the different patterns of answering behaviour to WH. In other words, the answers of every child can be used to place him somewhere on the scale.

Although the twenty-four presentations were done in three runs through the set of eight pictures, the eight WH questions were spread out between these runs, two in some and three in others. Therefore, it was decided to assess the changes in answering behaviour between the first four and the last four WH questions in each child's answers, rather than from run to run. So each child was assigned two points on the scale, one based on his first four answers to WH, and one based on his last four answers to WH. Then the numbers of children who moved up the scale, down the scale,

or stayed put between the two assignments were counted. Between the two assignments three children moved up the scale, fourteen stayed put, and thirteen moved down. Using the sign test (Siegel 1956:68) this change is significant ($N=16$, $x=3$; $p=0.22$, two tailed). Therefore, repetition has produced a reduction in the number of FS type answers to WH with a corresponding increase in simpler forms. Since repetition did not appear to affect the P and O type answers to WD and WO, it is concluded that, when repetition is used as a measure of productive complexity, full sentences appear to be harder to produce than predicates or objects. This effect could have also been the result of a regression from more to less recently acquired forms. This point is discussed further in the general conclusion after the training experiment.

Experiment 3--The Influence of Training on Discourse Agreement

Introduction

The aim of this experiment was to induce and reinforce discourse agreement, that is, to increase the number of appropriate answers to WH, WD, and WO by training. Then, having attempted to increase discourse agreement, it was hoped that the results would reveal something about the relative productive complexity of the three answer types, FS, P, and O.

It has already been noted that development may complicate this kind of experiment in that training may have

less influence on more recently acquired forms. However, most of the children under study should have been producing full sentences for at least eighteen months. Therefore, in most cases training should amount to teaching them when to produce the answers rather than how to produce them.

From the standpoint of transformational grammar, training should have less effect on the WD-P and WO-O kinds of discourse agreement because their answers are assumed to be productively more complex than full sentences. In contrast Schlesinger's theory predicts that training should have more influence on these two kinds of discourse agreement because they are assumed to be productively simpler than full sentences.

Method: To investigate the influence of training on discourse agreement an experimental group that received training and a control group that did not were constructed. The mean age of the experimental group was three years and nine months whilst that of the control group was three years and ten months. There were fourteen children in each group, and each child in the experimental group was matched to a child in the control group to make fourteen pairs of children. The children were matched according to their performance on the initial discourse agreement study in Experiment 2, which also constituted the pre-test for this experiment. As far as possible the children were matched in the number of full sentence answers with noun subjects given to WH, and overall degree of discourse agreement. The latter was

assessed by counting up the number of answers in agreement with each type of question and making a profile of the three sums obtained. The children were not matched for age or sex as these characteristics were considered to be less important than level of verbal ability within the age range studied and for this kind of experiment.

The fourteen pair members of the control group had no experience with the test and training materials between the pre-test and the post-test, although they were used in other experiments during this time. The fourteen pair members of the experimental group received two training sessions between the pre-test and the post-test, but because of the different arrangements with different sources the children were not all examined over the same time interval. Six children were pre-tested, trained once, trained twice, and post-tested with a week between each session. The other eight were pre-tested, trained once two days later, trained twice two days later, and post-tested five days later. Despite this inconsistency, the members of each pair were pre- and post-tested over the same time interval. The post-test was a complete repetition of the pre-test, the discourse agreement study just described in Experiment 2.

At each training session four new and different pictures were worked through in combination with the three questions, WH, WD, and WO, making twelve presentations in all. The order of the questions was varied and each question was asked once or twice so the maximum total amount of work was roughly the same as in the pre-test. The

children were trained in the following way: When a child failed to give an appropriate answer I would say No, you should say . . . and then the correct answer. Next, the child was asked to repeat the correct answer and encouragement was given if required. Then the question was repeated and the child answered again. Whether or not this answer was appropriate, the next picture and question were presented. When an answer was appropriate at the first or second questioning, I would say Yes, that's good or Yes, that's right, and carry on with the next picture and question.

Results: The children found this experiment much harder going and some of them became less keen to come for the subsequent experimental sessions.

To assess any general change in the degree of discourse agreement shown, it was necessary to count the numbers of answers that each child gave to each type of question that showed discourse agreement. This was done for the fourteen children in each group at pre- and post-testings, and the results are shown in Table 8. Each figure in Table 8 has a potential maximum of 112 since there are fourteen children and each question is presented eight times.

The pattern and degree of discourse agreement in Table 8 was evaluated statistically using a pseudo three-way analysis of variance (McNemar 1962:335). The variables were individuals, pre- and post-testing, and experimental

and control groups. This analysis is given in statistical Appendix 5. The variation due to the experimental control variable was not significant, and neither was that due to the pre- and post-testing variable. However, there was a significant interaction effect between these two variables. This means that, overall, training did have a significant influence on the amount of discourse agreement shown by the children. Then the results for the three questions were analysed separately in the same way, but only WH-FS yielded a significant interaction effect. These analyses are also in statistical Appendix 5.

Table 8: Numbers of answers in agreement to the questions WH, WD, and WO, at pre- and post-testing, given by the experimental and control groups. (N=14 per group).

<u>Group</u>	<u>Question</u>	<u>Pre-test</u>	<u>Post-test</u>
Experimental	WH	61	78
	WD	74	95
	WO	85	93
Control	WH	55	50
	WD	96	95
	WO	88	79

It was possible that training had induced the children to produce more full sentence answers to WH with pronoun than with noun subjects. To investigate this

possibility a second table was drawn up for WH alone, showing the numbers of FS answers with noun and pronoun subjects at pre- and post-testing produced by the two groups. This is Table 9.

Table 9: Numbers of FS answers to WH with noun and pronoun subjects at pre- and post-testing given by the experimental and control groups (N=14 per group).

<u>Group</u>	<u>Subject</u>	<u>Pre-test</u>	<u>Post-test</u>
Experimental	Noun	22	24
	Pronoun	39	54
	<u>Total</u>	<u>61</u>	<u>78</u>
Control	Noun	28	18
	Pronoun	27	32
	<u>Total</u>	<u>55</u>	<u>50</u>

It may be helpful to point out the relationship between Tables 8 and 9. In Table 9, four totals are given and these totals also occur in Table 8 as the numbers of answers in agreement to WH, given by the two groups at pre- and post-testing. In Table 9, these four totals are obtained by summing the figures in each quadrant for nouns and pronoun subjects. In other words, the information in Table 9 is a breakdown of a selected part of the information in Table 8, the part concerned with WH. There is a definite trend in Table 9 for the numbers of answers with

noun subjects to increase in the experimental group but decrease in the control group between pre- and post-testing. The answers with pronoun subjects show a similar trend except that the control group shows a slight increase between testings. These trends were evaluated by three-way analysis of variance and in neither case was the trend statistically significant. These analyses are shown in statistical Appendix 6.

The net gains in discourse agreement of the experimental group over the control group between pre- and post-testing are about the same for WH, WD, and WO (22, 22, and 17 respectively). So to the extent that training did influence the children's behaviour it appears to have influenced the three kinds of discourse agreement to the same extent. Moreover, judging by the net gains of the experimental over the control group once again, training appears to have increased the production of full sentence answers with noun and pronoun subjects to the same extent. Thus, it may be concluded that training did increase the degree of discourse agreement shown by the children. And although the individual kinds of agreements were not statistically significant they all showed a comparable effect in the same direction. Therefore, the results of this experiment indicate that the three answer types, FS, P, and O, are of comparable productive complexity.

General Conclusion

In the introduction it was noted that development was likely to influence the production of utterances in these experiments as well as productive complexity. Even though these children probably produced single object nouns before predicates, and predicates before full sentences, they should have been producing all three forms for some time. Since their mean age is nearly four years all of them should have been producing full sentences for several months, and well over a year in most cases. Confirming this, it has now been observed that some children who produced few full sentences or none at all in this experiment, were quite able to produce them in other contexts. No doubt recency of acquisition does influence utterance production, but its affect on the production of the three kinds of answer under study is considered to be minimal given the assumed general level of language development of the children.

Therefore, the results of the training experiment are considered to show that the three types of answers have the same degree of productive complexity, whereas the results of the repetition analysis show that they do not. However, if it is assumed that most, if not all, the children have the ability to produce full sentences, it is necessary to ask why they do not produce them in a context where adults normally would. The simplest answer is that they are still learning to produce them in this context.

It was noted at the outset that the degree of discourse agreement was less for WH than for WD and WO, but not so much less that one would say that the learning of discourse agreement for WH was generally just beginning. This observation leads to a reconciliation of the different findings concerning repetition and training. If the children were able to produce full sentences and the learning of discourse agreement was well under way, it would be expected that training would produce a general increase in discourse agreement. But at the same time, since the WH-FS kind of agreement was the least well learned it would be expected to show the greatest effect of repetition.

The results of the analysis of article omission are — — consistent with the conclusion that the three answers types have comparable productive complexity. The latency analysis for the three year old group would also be consistent with this conclusion, except that the individual variation in latency was so great that it was not clear what the results meant. The latency analysis for the six and seven year olds would be consistent with this conclusion except in the case of full sentences with noun subjects. Given that Taylor (1969) found that latency was related to the conceptual difficulty of the topic being talked about, maybe the differing picture content and the greater information content of nouns than pronouns could explain both the high individual variance at three years and the difference between noun and pronoun subjects at six years of age.

Taking all the findings of experiments 2 and 3 together, the conclusion that answer types FS, P and O have comparable productive complexity seems to be the most reasonable one. This conclusion is not consistent with the predictions about productive complexity based on either transformational grammar or on Schlesinger's theory. However, it would be consistent with the suggested modification to Schlesinger's theory in which one realisation rule is needed to produce both full sentences and predicates and object nouns.

On balance, Schlesinger's theory is a more satisfactory theory of utterance production than transformational grammar, according to the evidence collected so far.

Nevertheless, neither theory is able to account for the variability in behaviour because they both consist of rules which give them an all-or-nothing quality. As Ervin-Tripp (1970) says, elliptic forms gradually decrease in their frequency of occurrence and this gradual change is not satisfactorily accounted for by deletion rules. One solution is to invoke the competence-performance distinction and say that the gradual increase in full form production reflects the gradual reduction of some hypothetical performance factor with development. However, if ellipsis is accounted for by deletion rules these rules will add to the derivational complexity of elliptic forms, and so presumably to their productive complexity. This problem is the same as that which was discussed in the first chapter concerning Bloom's use of deletion rules to

describe the incomplete expression of deep structure in surface structure. And it is related to the problem of Rodd and Braine in their attempt to account for the apparently optional omission of subject noun phrases in early utterances when there do not appear to be any performance constraints. All these problems are avoidable if transformational grammar, with its emphasis on the formal structure of the complete sentence, is not used as a basis for a model of utterance production.

The complete sentence format of transformational grammar reinforces the idea that non-sentence utterances are produced by deletion from sentences. It may have been useful to describe young children's utterances as tele-__ __ _ graphic but this term also suggests that certain parts of sentences have been omitted or lost in production. The evidence would suggest that telegraphic utterances are produced by construction of what the child knows rather than by omission or deletion of what he knows but cannot produce. Therefore, there seems to be a need for a theory of utterance production that is not so strongly tied to the complete sentence of adult language. Schlesinger's theory does relate all utterances to the complete sentence but the relationship does not involve deep syntactic structure so his theory has greater appeal as a constructive model of utterance production. Yet Schlesinger's theory also uses rules so it does not satisfactorily account for the variability in production. It would seem possible to

invoke performance factors to explain the irregularities of usage of realisation rules, but the results of the training experiment indicate that to some extent the variability in production reflects the state of learning rather than the operation of some performance factor. This means that it may be more effective to construct a model of utterance production with probabilistic relationships rather than rules. The probabilities involved would reflect the state of learning and other variables like fatigue.

In the introduction to the two experiments it was argued that both transformational grammar and Schlesinger's theory of utterance production are inadequate as models of utterance production because they do not take account of the influence of context. Discourse agreement is an example of the influence of context, and the training experiment suggests that children can learn discourse agreement as a connection between a certain context and a certain utterance form. To put this another way; it was decided that most of the children were able to produce full sentences but the linguistic and non-linguistic context had a strong influence on whether they or not they did produce them. Furthermore, Ervin-Tripp (1970) says that children seem to learn to speak with discourse agreement in a general undifferentiated way, and then gradually their pattern of agreement differentiates and develops to match the adult pattern. Therefore it is apparent that

a full account of utterance production will require an extensive study of the contextual determinants of speech. Or as Ervin-Tripp puts it, "In the end, some situational contrasts will be necessary to provide evidence as to why certain features of the scene are encoded and not others. Until we have some evidence about factors affecting selection we cannot proceed further with the formulation of early sentence-making strategies than to organise strings of optional omittable elements" (1971a).

Chapter 4

Experiments 4, 5, 6 and 7 - Some More

Questions and Answers

General Introduction

Up to now the research has been concerned with the productive complexity of utterances in an attempt to learn more about utterance production. The original intention was to use the findings to determine the validity of Schlesinger's theory of utterance production or some alternative theory based on phrase structure or transformational generative grammar. All these theories are structural theories of language or language behaviour and the need for structural theories is unquestionable. However, these theories are inadequate in two respects. Firstly, they are not developmental theories and they do not describe the acquisition of linguistic knowledge of the learning of language behaviour. Secondly, they deal with utterances or sentences in isolation when it is clear that language is learned in relation to the linguistic and non-linguistic context.

The problem is that there is no theory of language learning that takes adequate account of the structural complexity of language and its relationship to meaning and linguistic and non-linguistic context. Yet learning clearly is involved in language development, and children

learn not only the structure of utterances but also the relationships between utterances and their contexts. This learning is not simple stimulus-response learning, either between the words of an utterance or between utterances and their contexts. It is a structural and systematic kind of learning that allows the child to understand and speak utterances which he has not heard before. The way in which discourse agreement develops is just one example of the way in which language development is more like the acquisition of a complex skill than a series of abrupt changes as rules of grammar acquired. If this reasoning is correct, the productive difficulty of an utterance will depend on the level of skill acquired in its use as well as on any grammatical measure like the number of transformations or realisation rules involved. It follows that whether or not such grammatical operations are involved in production, the speaker may be able to produce a grammatically simple utterance as easily as a grammatically complex utterance if his skills in producing them have developed to the same advanced degree.

At the end of the last chapter a need was expressed for a greater knowledge of the contextual influences on utterance production. In the present situation this need stems from the fact that children who produce full sentences in some contexts do not do so in others where it would be appropriate to do so. This behaviour suggests that perhaps children do not learn to produce full sentences in some

abstract way independently of context. Instead, they may develop skills to produce appropriate utterances with these skills becoming increasingly like those of adults with age. Therefore, if language development constitutes the acquisition of a highly complex system of skills, the study of the situational influences on utterance production could be very relevant to the study of productive complexity. So the next series of experiments investigates some of the contextual influences on the production of subject nouns in a continued attempt to learn more about the nature of utterance production and its development.

The striking feature about the use of pronouns in answers to WH was that they only occurred in the subject position. There is presumably some connection between the use of pronouns and subjectivity, or agentivity in this particular case. People tend to use pronouns when they think or know the listener knows whom they are talking about. For instance, we are more likely to say I know where Jack is. He's in the shed than I know where Jack is. Jack is in the shed. When the listener does not know whom is being talked about the pronoun subject is relatively uninformative, as in the following conversation. He's in the shed. Who is? Jack is.

There is possibly some connection between McNeill's extrinsic and intrinsic predicates and the use of pronouns. McNeill found that extrinsic predicates attribute adventitious properties to their subjects, properties that the listener is less likely to be aware of or to expect, and

it is extrinsic predicates that are produced with subject nouns first. It has already been suggested that the pronoun may act as a kind of grammatical compromise in which the speaker behaves grammatically by including a subject without giving very much information about it. This could be why the children tended to produce answers to WH that were predicates or full sentences with pronoun subjects. They could well have assumed that I knew whom they were talking about because only one picture was presented at a time and I would have been able to see the pictures as they spoke. On the other hand, as McNeill suggests, it may be the child's egocentricity that leads him to produce so many predicates. In this case the children behaved as they did without any conscious or unconscious consideration of my behaviour and the pictures.

To investigate these possibilities an attempt was made to increase the children's communicative concern with the agent of the actions. This was done in two ways. The first way of increasing interest in the agents was to ask questions about them. The second way involved the presentation of pictures with more background and a different question. This new question was What can you see there? which unlike What is happening there? does not put so much emphasis on action.

The third and fourth experiments in this series take up a different idea: that the children tend to mention or include the subject noun when it has greater personal interest value for them.

Experiment 4--What is happening to the subject?

Introduction

The first experiment in this series was aimed at encouraging the children to produce more sentences with noun or pronoun subjects by the use of a combination of questions which were intended to focus their interest on the agents of the actions shown in the same kind of pictures as before.

The first question is of the kind 'who is building the house?' and is abbreviated as WHO. This question asks specifically for information about the agent, and a noun or pronoun describing the agent would be an appropriate answer showing discourse agreement. The answers to this question should show whether the children have some general difficulty in producing descriptions of agents, which is highly unlikely, and whether they have a general preference for describing agents with pronouns rather than nouns.

The second question is of the kind 'What is happening to the house?' and it is abbreviated or labelled as WHT. This question makes a direct reference to the object of the action while asking for information about the agent and action involved. So this question should lead to a greater interest in agents, too. In this case, answers of the kind 'the man is building the house' are appropriate, but answers like 'the man is building it' show more discourse agreement. The object noun may be replaced by a pronoun for the very reason just discussed. Since the

object is referred to in the preceding question the respondent may use a pronoun instead of a noun because the listener will know what he is talking about.

It is hypothesized that these two questions should elicit answers with a higher frequency of subjects, noun or pronoun, than was obtained in answers to WH in Experiment 2. Moreover, a larger proportion of noun subjects may be produced because these are more informative than pronouns, although both are appropriate.

Method

Ten new and different pictures of simple actions were drawn up and these are shown in Appendix 3. This set of ten was presented twice to each child so that each picture could be paired with each question. The questions were presented alternately so that there might be as much interaction between the two questions as possible. The first question was always a WHO type of question. The pictures were shuffled between children to randomly control for any effect that the order of picture presentation might have.

The subjects for this experiment were fourteen children from the day nursery source who had taken part in Experiment 2.

Results

A combination of experimenter error (asking the wrong questions), poor material, and difficult subjects

resulted in an incomplete set of data for this experiment. However, ten out of the fourteen children produced complete data on eight of the pictures in combination with WHT, and twelve produced nearly complete data on eight pictures in combination with WHO and WHT. Table 10 shows the frequencies of the different kinds of answers given to WHO and the numbers of children giving each kind. Table 11 shows the frequencies of the different kinds of answer given to WHT and the numbers of children giving each kind. Both tables are based on the twelve children who gave almost complete data on eight pictures. Thus in both tables the frequencies total to almost ninety-six, that is twelve children by eight pictures. Since some children gave more than one kind of answer the tables of the second columns are greater than twelve.

Table 10: Types of answer given to the question WHO, the frequencies with which they occurred and the numbers of children using them (N=12).

Answer Type	Frequency	Numbers of Children
Noun subject alone	68	11
Full sentence with noun subject	3	1
Pronoun subject alone	16	4
Full sentence with pronoun subject	4	3
Predicate alone	2	2
Total number of answers	93	

Table 11: Types of answer to the question WHT, the frequencies with which they occurred and the numbers of children using them (N=12).

Answer Type	Frequency	Number of Children
Full sentence with noun subject	11	3
Full sentence with pronoun subject	32	7
Predicate alone	46	7
Other	5	2
Total number of answers	94	

The results in Table 10 show that the answer type, Noun Subject Alone was by far the most frequent answer to WHO, and it was used by eleven out of twelve children. The noun subject was much more frequent than the pronoun subject. So the children were answering with discourse agreement in two ways: firstly, they tended to give the subject alone type of answer which was appropriate because the rest of the action was described in the questions. Secondly, they used nouns more than pronouns and in this instance the noun is more appropriate because it gives more information about the agent than the pronoun.

The pronoun subject alone answers to WHO stood out because many of them used the object pronouns 'him' and 'her' instead of the subject pronouns 'he' and 'she'. Four children gave this kind of answer and two of these used object pronouns once, one saying 'him' and the other

saying 'her'. Another child used pronouns six times and said both 'him' and 'her', while the fourth child used 'him' and 'she' exclusively. The latter two children behaved in a very interesting way in that one used 'he' for the subject in answers to WHT while the other, on the rare occasions that he used full sentences with pronoun subjects, also used 'he' and not 'him' for the subject. For some reason subject pronouns in isolation are different from subject pronouns in sentences for these two children.

The results in Table 11 show that the children answered WHT in much the same way that they answered WH in Experiment 2. In fact, when the answers of the ten children who produced a complete set of data in this experiment are compared with their answers to WH in Experiment 2, there is no significant difference in the number of full sentences produced. Furthermore, the ratios of noun to pronoun subjects in the two sets of answers were roughly the same, so that overall these children answered WHT in the same way that they answered WH. Their answers were not entirely the same though for they answered WHT in two ways that seldom occurred in their answers to WH. Firstly, there was a significantly lower production of the object noun in answers to WHT than in answers to WH (Siegel 1956:68 and 250. Sign test: $N=7$, $x=0$, two tailed $p=0.016$). And, secondly, there was a significantly greater use of the object

pronouns 'it' and 'them' in answers to WHT than in answers to WH (Sign test: $N=9$, $x=0$, two tailed $p=0.004$). Both practices reflect discourse agreement to WHT, and sensitivity to mention of the object in the question by either not producing it in the answer or by referring to it with a pronoun. This behaviour is important because it supports the argument in the introduction for this chapter that, if the speaker can assume that the listener knows what he is talking about, the person or object concerned may be referred to with a pronoun. This would support the idea that the children refer to agents with pronouns or not at all when they can assume that the listener knows whom is being talked about. This does not necessarily mean that the children were actively taking account of the listener's point of view and probable knowledge, for they could have learned to speak in this way without understanding why.

The pattern of discourse agreement to WHT is also important from the point of view of productive complexity. If the children did not produce subjects in answers to WH because of some limit to productive complexity they should have been able to produce more subjects in their answers to WHT since they produced fewer objects in these answers. This finding is of interest with regard to the kind of limit to utterance production described by Bloom for slightly younger children. She envisaged a limit that operated like a sampling process so that only a certain

amount of the deep structure of utterances could actually be expressed in surface structure. This particular finding indicates that it was unlikely that there was any kind of sampling limit causing the children to omit subjects in their answers to WH. The children appear to have been constructing their answers according to the linguistic and non-linguistic context without any obvious obligation to speak full sentences.

This experiment did not succeed in its aim to increase the number of full sentence answers produced by focussing interest on the agent and the action performed. However, some modification of behaviour was observed. The children certainly had no difficulty producing subject nouns on their own in answer to WHO, therefore there does not seem to be any general limitation on the production of subject nouns. The experiment does not offer any explanation of why the attempt to increase full sentence production did not succeed, but the evidence suggests that it was not because of any constraint on productive complexity.

Experiment 5--What can you see there?

Introduction

The second experiment in this series investigates the utterances produced in a new context with greater picture content and a new question, What can you see there?, labelled WST. It was decided to use pictures

with more content because one reason that the children did not mention agents as noun or pronoun subjects could have been that previous pictures only contained pictorial representations of the agent-action-object units which they were being asked to talk about. To add to the picture content too much would mean some loss of control over that aspect of the pictures that it was intended the children should talk about. Therefore, each new picture still contained one agent-action-unit, but more background was put in. Sometimes this background included animals, and in two cases it included other people. These new pictures are shown in Appendix 4.

It was also thought that the question, WH, might have been encouraging the children to focus on the 'happening' parts of the pictures, meaning the actions. So WH was replaced by What can you see there?, a question that seemed to be more open as far as the kind of information asked for.

It was hypothesized that these different pictures and the new question would lead the children to produce more full sentences in their descriptions of the picture content than they did in their answers to WH.

Method

A new set of eight pictures was drawn up as described in the introduction. One of the original eight showed a nurse at work, but she was poorly recognised, so this picture was replaced by the one of Santa Claus.

At the same time two more pictures were added, making ten in all, and both of these showed a man pushing a type of baby carriage on the left hand side of the picture. One of these two pictures had a man standing in the background, while the other had a large green bus. The idea behind these additions was to explore the sequence of encoding the children followed in describing picture content. It was expected that the bus would draw the children's attention from the man pushing the baby carriage, so that in that case they would be less likely to describe the man first.

Fourteen children from the day nursery did this experiment in its original form, then twenty-four nursery school children did it in its revised form. These nursery school children actually did this experiment before they did Experiment 2, so any differences in behaviour cannot be accounted for by prior experience of similar test material. The original and revised sets of pictures were presented in the same order to every child, each child seeing each picture once only. The question WST was presented simultaneously with each picture and the children's answers recorded as before.

Results

Thirty-four children produced satisfactory results for both this experiment and Experiment 2, the initial discourse agreement experiment using WH, WD and WO. The analysis of the children's responses to WST was more

complicated than those for previous questions because there was more to talk about and a greater variety of answer forms was produced. Those parts of each child's response for each picture that related to the key agent-action unit were picked out, and these isolated answers were of five types, as follows: If the answer is a full sentence with a noun subject it is classified as FS-noun, but if it has a pronoun subject it is classified as FS-pronoun; if the answer is a predicate on its own, it is classified as Predicate (a predicate could be an isolated verb or a verb and an object noun phrase); if the agent is described separately by an isolated noun the answer is classified as Agent Alone (sometimes there would be an appropriate predicate elsewhere in the total response); and, finally, if the object was described separately by an isolated noun the answer is classified as Object Alone. Table 12 shows the five types of answer, their frequencies of occurrence and the numbers of children using each type in their responses to WST and WH. Since a child could use more than one answer type in response to WST, the frequencies under WST sum to more than the product of the number of children and the number of pictures.

The results in Table 12 are consistent with the hypothesis, though this may not be immediately apparent. Taking the results for FS noun first, it is found that this form occurred slightly less often in answers to WST

Table 12: Five types of answer (explained in the text), their frequencies of occurrence and the numbers of children using them in responses to the questions WH and WST (N=34).

Answer Type	Frequency		Number of Children	
	WH	WST	WH	WST
FS-noun	71	61	17	21
FS-pronoun	74	13	22	8
Predicate	111	8	24	7
Agent Alone	3	179	1	34
Object Alone	10	120	7	33

than in answers to WH, although a few more children used it in this context than they did in answer to WH. The results for FS pronoun and Predicate are quite different. Between WH and WST there was a decrease in the number of full sentences with pronoun subjects and in the number of predicates produced. Moreover, far fewer children used these forms in answer to WST than in answer to WH. These differences were evaluated using the sign test, with the signs reflecting the relative frequencies of each form in each child's answers to WH and WST. As expected, there was no significant difference for full sentences with noun subjects (Siegel 1956:72. $N=27$, $x=13$, $z=0$, $p=0.5$). However, the differences for full sentences with pronoun subjects and for predicates were significant (respectively: $N=24$, $x=4$, $z=3.06$, p less than 0.003; $N=22$, $x=0$, $z=4.47$, p less than 0.001). These results

mean that, although the absolute usage of full sentences with noun subjects is not different between WH and WST, the usage of this form relative to the usage of full sentences with pronoun subjects and of predicates is greater in answers to WST than in answers to WH. Therefore, the combination of a different question and greater picture content achieved the aim of increasing the number of full sentences with noun subjects relative to the two other forms that were used in answer WH.

The different linguistic and non-linguistic context of this experiment affected answering behaviour in other ways. As Table 12 shows, there were very few answers to WH of the types Agent Alone and Object Alone yet these types predominated the answers to WST. Furthermore, the predicate was the predominant answer to WH yet it shows the lowest usage in answers to WST. The reason for these differences is assumed to be mainly in the differences between the two questions. Whereas WH, with its inclusion of the word 'happening' lead the children to focus on activities, WST lead the children to focus on things, both animate and inanimate. The focussing of the two questions was by no means exclusive, and some children produced verbs in answer to WST in much the same way as they produced isolated nouns. To demonstrate this, here is the transcript of one girl's answers to WST:

Picture 1. Washing.

2. He's gonna push it.
3. Skipping.
4. A man and a horse and a
5. A bus and a pram and a spade.
6. Pulling and a clock.
7. Running tree and a dog and a ball.
8. A cart.
9. Brushing and two mans a pram.
10. Santa Claus he's got his presents.

This girl was typical in the way she listed items of picture content. Her answers for the second and tenth pictures show that she is able to produce full sentences with pronoun subjects, yet in her descriptions of the other pictures and in her answers to WH she does not do so. This girl belonged to the experimental group in the training experiment and after training she produced five answers to WH with pronoun subjects and three without. This confirms her ability to produce full sentences and simultaneously makes the way she listed verbs as well as nouns in answer to WST all the more striking. The listing behaviour seemed to reflect the child's interest as his or her attention was drawn to the various parts of the pictures. Furthermore, it is as if activities are separated from their agents, and perhaps from the objects of those activities too. The girl behaved as though she looked at the pictures with tunnel vision, seeing and noting things

and events without integrating them, except as a sequence of items.

If an adult was to list things in this way he would probably start with I can see a . . . or there's a Very few of the children introduced their answers in this way but the following examples show that they did do it sometimes:

Picture 1. swing I can see.

3. can see a duck.

4. there's a horsie.

9. . . . and a man there a man coming along
with a baby in a pushchair.

6. . . . and that's a clock.

2. . . . the policeman's there trying to get
the car going.

9. that's a wall and that's a boy . . . and
there's a pram.

The use of these introductory words and phrases occurred much less often in answers to WH than in answers to WST. Some examples from WH answers are shown below and none of these has an introductory component:

a man who's jumping on a wall.

a man a silly old man reading a silly old book.

a choochoo train and a little girl's pulling

a choochoo train.

However, one of the six year olds produced there's a boy and he's jumping over the wall, an utterance that

appears to reveal a great deal about the way in which some answers to WH were produced. When an adult uses I can see . . . he would be likely to describe an action like this, (21) or (22) or (23):

I can see a boy jumping over a wall (21)

I can see a boy who is jumping over a wall (22)

I can see a boy and he is jumping over a wall (23)

The above example of a three year old using 'who' and a relative clause was the only one of its kind. But many of the children produced utterances like a boy jumping over a wall. Some of these utterances included the auxiliary verb 'is' and some did not. In fact, looking back at the data from Experiment 2 it is found that out of a total of seventy-two full sentence answers with noun subjects, thirty included the auxiliary verb and forty-two did not. When adults are asked WH they tend to answer like the six year olds usually did with utterances like a boy is jumping over a wall. So it would seem that the three year olds were moving towards the mature form and that the immature form that they used was similar to the adult constructions with introducers like (21), (22), and (23). If this is true it would be expected that they would produce more auxiliary verbs in full sentence answers with pronoun subjects to correspond with the difference between forms (21) and (23). This is what happens, for in the total of ninety-five full sentence answers to WH with pronoun subjects, eighty-four include the auxiliary verb 'is' and eleven do not.

The figures just given for the production of the auxiliary verb 'is' with noun and pronoun subjects cannot be evaluated statistically as they stand. Therefore, the children were divided into two groups according to whether their full sentence answers contained noun subjects predominantly or pronoun subjects predominantly. Eight children did not show a predominant pattern, which left thirteen who gave noun subjects predominantly, and seventeen who gave pronoun subjects predominantly. This division means that one group's answers contain mainly noun subjects, while the other group's answers contain mainly pronoun subjects. Then each child's answers were examined to see if more answers included the auxiliary verb or not, and a two-by-two table constructed. Of the thirteen producing predominantly noun subjects, six produced more answers with the auxiliary and seven produced more without it. All seventeen children with predominantly pronoun subject answers produced more answers without the auxiliary verb. The Fisher exact probability test was used to evaluate this pattern and it was found to yield a probability of 0.0008. Therefore it is concluded that the auxiliary verb 'is' was more often produced in answers with pronoun subjects than in answers with noun subjects.

If auxiliary verb production had been used as a measure of productive complexity in Experiment 2, it would have confirmed the difference in productive complexity between full sentences with noun and pronoun subjects found in the latency analysis of the six year

old's answers to WH. It was not used as a measure of productive complexity because that experiment was concerned with the relative productive complexity of answers FS, P, and O, and the auxiliary verb could only occur in FS. But now the present analysis suggests that the difference in the production of the auxiliary verb between FS answers with noun and pronoun subjects has another explanation. This explanation is that answers like a boy jumping over a wall do not appear to be like the adult model a boy is jumping over a wall with 'is' omitted, but more like the adult model I can see a boy jumping over a wall with the 'I can see' part left unspoken. Similarly, the answers with pronoun subjects may be like the six year old's utterance there's a boy and he's jumping over the wall with the first part concerning the identification of the agent left unspoken. Thus, the auxiliary verb 'is' occurs in the model sentence for the pronoun subject but not in that for the noun subject. This difference could account for the more frequent production of 'is' in answers with pronoun subjects than in those with noun subjects.

This argument helps to make sense of the behaviour of those children who used object pronouns in what appeared to be the subject position in their answers to WH. Both 'her' and 'him' were used but 'him' was used far more often. Four out of the five children who used these forms included the auxiliary verb 'is' with them and two did not, one being mixed. Those children who included

the auxiliary were behaving truly creatively: since these forms, for example him's reading, do not normally occur in adult speech the children could not have learned them by simple imitation. One of the children who used object pronouns in this way exhibited a diverse repertoire, specifically, 'she's', 'her's', 'her', 'him's' and 'him'. Two others used both 'him's' and 'he's'.

Gruber (1971) has suggested that the subject-predicate structure is a special case of the topic-comment structure which appears before it in language development, he says. One piece of evidence he gives for this is one child's use of the object pronoun 'him' as a subject. This child never produced 'him's' although he did produce 'he's'. Gruber interprets this behaviour to mean that the child changes from using the case-marked pronoun 'him', the topic form, to using the unmarked pronoun 'he' when he begins to use the subject-predicate structure. Although there is no such strict division of usage of object pronouns in the present results, Gruber's idea is a very relevant one. There is one adult model sentence with a pronoun that has not yet been presented and this is I can see him reading. Both this model and I see a boy reading have a kind of topic-comment structure in that the main clause is concerned with the identification of the agent and the relative clause adds some comment about the agent. The change from him reading to he's reading reflects a change from the topic-comment to the subject-predicate structure

in the same way that the change from a boy reading to a boy's reading does. Presumably some children produce him's reading sometimes as part of the tendency to the generalise in language development, in this case between I can see a boy and he's reading and I can see him reading. This odd form could also reflect the complexity of the transition taking place and the child's gradual progress from one kind of structure to another.

This reasoning makes sense of another aspect of the use of pronouns, this time in answers to WHO (e.g. who's kicking the ball?). It was noticed that some children produced object pronouns in answer to this question yet they tended to use the appropriate subject pronouns in full sentence answers to WH. This would make sense if the children had progressed further towards the subject-predicate structure in their answers to WH than in their answers to WHO. It was as though WHO elicited answers like it is him or perhaps I can see him. The tendency for the children to refer to the agent in a single word, either a noun or a pronoun, in answers to WHO is consistent with this interpretation. They produced nouns or pronouns alone more often than they produced full sentences in answers to WHO, and most significantly they did not produce the auxiliary verb 'is' after these nouns and pronouns as an adult would, as in Who's kicking the ball? The boy is. Whereas the adult's reply appears to relate to the form 'the boy is kicking the ball', the child's reply appears to relate to the form 'It is the boy who

is kicking the ball'.

It was pointed out before that the children tended to list items in their answers to WST, whereas they integrated the picture content into predicates and full sentences more often in answers to WH. At the same time the children produced fewer introductory phrases like 'I can see. . .' or 'that is . . .' in their answers to WH than in their answers to WST. These differences show that these two questions elicited different answering behaviour from the children. WST appears to have induced the children to describe picture content bit by bit, as though they were listing topics without adding comments. In contrast WH appears to have induced the children to identify and integrate picture content so their answers to this question were more like topic-comment and subject-predicate structures. If this reasoning is correct the children should have produced more topic-comment constructions in answer to WST than in answer to WH. In other words, they would be expected to have produced fewer full sentences with noun subjects with the auxiliary verb 'is' in answer to WST than to WH.

This hypothesis was investigated in a rather complicated way because the children did not conveniently produce the same numbers of full sentences with noun subjects in their answers to WH and WST. Each child's answers to the two questions were considered separately. If there were more sentences with auxiliary verbs in a

set of answers the child was given a plus; if the numbers of sentences with and without the auxiliary were the same the child was given an equal sign; and if there were less sentences with the auxiliary the child was given a minus sign. Thus the signs reflected the proportions of sentences with and without the auxiliary verb 'is'. Each child received two signs, one for his answers to WH and one for his answers to WST. Then the number of children whose signs were different were counted up and there was sixteen of them. When a child's signs are + for WH and = or - for WST, the difference in signs represents a reduction in the production of the auxiliary verb in the case of WST. This shows how the signs were used to evaluate the differences in production of the auxiliary verb between WH and WST. Twelve of the sixteen children showed sign differences representing a lower level of usage of the auxiliary verb for WST, and the other four showed sign differences representing a higher level of usage of the auxiliary verb for WST. The sign test was applied to these numbers, and since the hypothesis predicts a lower level of auxiliary usage for WST a one-tailed probability was used. The difference in usage is significant and the hypothesis is confirmed (Siegel 1956:62. Sign test: $N=16$, $x=4$, $p=0.038$).

Some of the agents used in the WST pictures showed ordinary men and women, but two of them showed people that were likely to have more interest value to the children. These special people were a policeman and a nurse, but

the nurse was replaced by Santa Claus who was also assumed to hold greater interest value. As an exploratory hypothesis it was predicted that the children might be more likely to produce sentences with noun subjects when the agents had greater interest value. The listing behaviour of the children allows a simple way to check if these two special people, the policeman and the Santa Claus, were of more interest value. If they did have more interest value the children should have been more likely to have mentioned them first in their answers. In the case of the second picture, the one with the policeman and the woman in a car, the children mentioned the policeman much more often than they mentioned the woman, but she is less obvious anyway. Furthermore, of the twenty-five children who saw the ten picture set, thirteen mentioned the policeman first and nineteen mentioned Santa Claus first in their descriptions of the pictures including these characters. This compares with eleven and eight children who mentioned the ordinary men first in their descriptions of the two pictures containing them. This pattern of behaviour supports the contention that the policeman and Santa Claus have greater interest value for the children. However, the investigation also showed that these agents were not produced as sentence subjects any more often than the ordinary men. Bearing in mind that the children tended to list items in their answers to WST rather than integrate them into sentences, this finding

may not be meaningful and the hypothesis requires further, specific exploration.

The interest value of picture items appears to be reflected in the order in which they are described. This pattern of behaviour may also be investigated by examination of the answers for the two additional pictures, the ones of a man pushing a baby carriage. In one picture there is a large green bus in the background and in the other there is another man. When there was no bus in the picture eight children mentioned the man first, four the pram, and the rest described parts of the background first. But when the bus was present three children mentioned the man first, one the pram, and seventeen mentioned the bus first. This is further evidence that the interest value and perceptual saliency of the various items in these pictures had a definite influence on the order in which children described the items.

Children are usually interested in animals, and animals have been used in projective tests for children rather than people in order to facilitate interest and projection. It was my own impression that children of this age were more likely to mention the animals in a picture than the people, unless these were special people like policemen or pirates. On the other hand, the one-word answers to WH in Experiment 2 tended to refer to the objects of the actions rather than their agents. Therefore, it was decided to conduct an experiment, based on

the order of description, to try and find out the relative interest value of people, animals, and objects.

Experiment 6--People, Animals, and Objects

Introduction

When a child looks at a picture like the ones used in these experiments he may notice some items of picture content before others. One factor that would be expected to affect the child's detection of an item is perceptual saliency. A large, brightly coloured item should be more likely to attract the child's attention than a small dull coloured one. In the last experiment it seems likely that the children mentioned the bus first rather than the man because they noticed it first. And they probably noticed it first because it was large, brightly coloured, and in the middle of the picture. Another factor that would be expected to influence the order in which children describe picture content is the relative interest value of the items in a picture. The next experiment investigates this factor of relative interest value, and in order to do this it was necessary to carefully control the perceptual saliency of the items used. The aim was to determine the relative interest value of people, animals, and objects for the children. On the basis of prior observations it was hypothesized that the children would show relatively greater interest in animals. There was no hypothesis regarding the relative interest value of the other two kinds of item, that is people and objects.

The intention was to show the children a number of pictures each containing one person, one animal, and one object. Then the order in which they described these items would reveal their relative interest value. The items to be investigated were all ordinary in the sense that the people were just plain men, women, boys, and girls; the animals were those assumed to be familiar to the children; and the objects were taken from everyday life.

Method

Six new pictures were made up and the person, animal, and object in each one were drawn without any suggestion of a relationship between them. They were drawn in this way because any indication of a relationship could influence the order of description. The six pictures were all drawn in colour and the items were all drawn about the same size. The six pictures contained the following items listed from left to right as they appeared in the pictures:

- | | | | |
|----|----------|------------|--------|
| 1. | scissors | rabbit | woman |
| 2. | girl | fire | cow |
| 3. | cat | woman | chair |
| 4. | cup | bird | man |
| 5. | man | television | monkey |
| 6. | elephant | boy | window |

This arrangement of the items controls for the order of the items, from left to right, in the pictures, while providing two occurrences of each kind of item in each position in the pictures.

Twenty-two children from the nursery school were the subjects for this experiment, which they did after they had done the previous experiment, number 5. Each child was presented with the pictures in the order shown above, 1 to 6, and as each picture was presented the child was asked What can you see there?

Results

A record was made of the order in which each child mentioned the items in each picture. Any item in any picture could be mentioned first, second, or third. The results were analysed by counting up the number of times each kind of item was mentioned first, taking all the answers for all the children together. Then the number of times each kind of item was mentioned second was computed, and finally the number of times each kind of item was mentioned third or last. Adults would probably describe the pictures by naming the items from left to right, but the children did not behave in this way. It is important to note this because the positioning of the items in the pictures from left to right should not be confused with the order of description of different kinds of item. The results of this analysis are shown in Table 13. This table shows that people were mentioned first in the children's answers eighteen times, second fifty-four times, and third sixty times. These figures produce a total of 132, which is the number of children, 22, multiplied by the number of people items, 6.

Table 13: Frequencies with which people, animals, and objects were mentioned first, second, and third (N=22).

Position in Answer	Kind of Item		
	People	Animals	Objects
First	18	74	40
Second	54	41	37
Third	60	17	55

The significance of the pattern of behaviour reflected in Table 13 was calculated in the following way. Firstly, this analysis concerned itself with the items mentioned first in the children's answers, that is the top row of figures in Table 13. Each child's answers were ranked so that the item that was mentioned first most often was given a rank of 1. Then the kind of item that was mentioned first the next most often was given a rank of 2. Finally, the kind of item that was mentioned first least often was given a rank of 3. Thus, for each child the three kinds of item were ranked according to their frequency of occurrence in the first position. The Friedman test was applied to these rankings and this showed that animals were mentioned first significantly more often than people or objects ($\chi^2 = 13.0$, 2 d.f.; p less than 0.01). Objects were mentioned first more often than people so the order of interest value for the three kinds of item appears to have been animals, objects, people. The fact that people may have less interest value than objects on

this measure is in agreement with the finding, in Experiment 2, that when a child produced a one-word answer to WH this word usually referred to the object rather than the agent.

Having established that, as far as these pictures are concerned, these children have greater personal interest in animals than people, it is now possible to find out if the interest value of the agent has any bearing on the likelihood of children mentioning it in his answer to WH. This is the subject of the next experiment.

Experiment 7--Human and Animal Agents in Answers to WH

Introduction

— The last experiment showed that these children tend to mention animals first when they are shown pictures, each of which contains a person, an animal, and an object. It was argued that this behaviour reflects the greater interest of the children in animals. In Experiment 2, it was common for the children to give a pronoun subject or no subject at all in their answers to WH. The agents in the pictures for this experiment were all people. This next experiment investigates the hypothesis that the children will give more noun subjects in their answers to WH when the agents are animals than when they are people because of the greater interest value of animals.

Method

A set of eight new pictures was prepared with four showing simple actions with human agents and four showing actions with animal agents. This set is shown in Appendix 5. These eight pictures were arranged in a special order to allow for the fact that, on the basis of the repetition analysis of Experiment 2, the children might be less likely to produce full sentences at the end of the series of eight pictures than at the beginning. As the pictures in Appendix 5 show, the first two pictures had human agents, the next two had animal agents, the next two had human agents, and the last two had animal agents. If all the pictures with human agents came first then the effect of repetition might be to mask some real difference between human and animal agents. On the other hand, alternating the pictures might result in more interaction between the two kinds of agent so that some real difference between them would again be lost. Therefore, the agents were put in blocks of two with human agents having priority because, if animal agents were given priority, a difference between animal and human agents would be confounded with any effect of repetition.

Twenty-four nursery school children did this experiment after they had done Experiment 5. The eight pictures were presented in the same order to every child and as each picture was presented the question WH, that is What's happening there? was asked.

Results

The numbers of noun subjects given in the children's answers for each picture were counted up and these numbers are shown in Table 14. There does not appear to have been any repetition effect in that the total number of noun subjects for the first four pictures (41) is less than the total for the last four pictures (50). Counting up the numbers differently it is found that, overall, fewer noun subjects were produced when the agent was human (35) than when it was animal (56). However, there appear to be many more noun subjects produced to the second pair of pictures with human agents (23) than to the first pair (12).

Table 14: Numbers of noun subjects in answers given to the question WH with four pictures having human agents and four having animal agents (N=24).

	Agent Type							
	Human		Animal		Human		Animal	
Picture number	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Number of noun subjects	7	5	13	16	12	11	12	15
	└───┘		└───┘		└───┘		└───┘	
Block totals	12		29		23		27	
	└────────┘				└────────┘			
Before/After totals	41				50			

These results were analysed statistically using a three-way analysis of variance, with the three variables being individuals, human vs. animal agents, and before and after. The before/after variable refers to the

contrast between the first four and the last four pictures. The analysis is given in statistical Appendix 7. According to the analysis there was no overall difference between the production of noun subjects for the first four and the last four pictures. However, there was a significant difference between the production of noun subjects for the animal agents and the human agents. There was also a significant interaction effect between the human vs. animal agent variable and the before/after variable. This interaction effect means that the production of noun subjects for the second block of pictures with human agents was apparently influenced by the production of noun subjects for the preceding block of pictures with animal agents. This influence would have had greater credibility if some control had been placed on the order of the pictures. For instance, the blocks for human agents could have been changed round for half of the subjects, and similarly with the blocks for animal agents. Nevertheless, the numbers of noun subjects produced in each block for human agents are almost the same (7 and 5 : 12 and 11), and this consistency gives weight to the interpretation that interaction occurred.

Discussion and General Conclusion

The answers with noun subjects to WH in the last experiment confirm the interpretation of the children's answering behaviour given after Experiment 5. In this last experiment there seemed to be a higher proportion

of sentences without the auxiliary verb 'is'. In fact, twenty were produced with the auxiliary verb and seventy-one without it. Furthermore, the ratios of sentences with and without the auxiliary verb were roughly the same when the agents were people, seven with and twenty-eight without, as when the agents were animals, thirteen with and forty-three without. It has been suggested that the auxiliary less utterance is not really a telegraphic form but a kind of relative clause or topic-comment structure in which the agent of the action is predicated to some introductory component like 'I can see' or 'there's'. The last experiment provides some more examples demonstrating this construction, as follows:

— A horsie who's jumped.

It's a mummy washing her hands.

It's the man writing.

There's a horsie.

It was suggested that the various introductory phrases represent the identification of the agent, as a way of proposing a topic. Sometimes the children gave topics in this way and followed them with comments, and sometimes they just gave topics. The practice of identifying topics reflects a tie between the act of perception and that which is perceived. This tie is very evident in the almost universal inclination of the children to point at that which they are talking about in the pictures.

The other important findings to come out of this series of experiments concern productive complexity and

the nature of the productive process. At the end of Experiment 4 in which the children were asked questions like What's happening to the ball? and Who's kicking the ball? (WHT and WHO) it was argued that the lack of subjects in the children's answers to WH could not be the result of some limit to productive complexity. This was because when the children answered WHT and either referred to the object with a pronoun or not at all, there was no corresponding increase in the production of subject nouns. An increase of this kind would have been expected if there was a limit on the amount of deep structure that could be expressed in surface structure. Furthermore, the subsequent experiments have shown that the lack of subject nouns in answers to WH was partly a function of the children's interpretation of the question. WH seemed to orientate them to the actions in the pictures whereas WST tended to orientate them to the stative or objective elements. These experiments have also shown that the likelihood of the children producing noun subjects depends on the interest value of the agent involved. These findings all point to the need for a constructive theory of utterance production in which it is described how various linguistic and non-linguistic factors contribute to utterance production. --

A child's answers to WH in Experiment 7 are given below. The nature of the variation in these answers makes it unlikely that some of them were produced by deletion from full sentences because of some hypothetical

performance factor. It seems to be more reasonable to suppose that the child was putting together what he wanted to say, rather than leaving out bits he did not want to say, or could not say.

One child's answers to WH in Experiment 7:

1. a aeroplane
2. washing
3. cow
4. peacock trying to get eat the apple
5. watching the television
6. knocking on the door
7. the dog's trying to get that off
8. the dog's on the wall.

It follows that a theory of utterance production like Schlesinger's seems to have greater psychological reality to the extent that, in it, utterances are composed by realisation rules dependent on the input information. This kind of theory seems to have greater psychological reality than a theory based directly on transformational grammar in which all utterances would be derived from complete deep structure sentences in production. Moreover, it seems that a thorough theory of utterance production must account for the role of many linguistic and non-linguistic contextual factors like those demonstrated in this research. And, finally, the theory of utterance production with the most degree of psychological reality will be a developmental theory that accounts for the individual's ability to learn language skills, including

the ability to produce utterances that are appropriate to their contexts.

This research has demonstrated the variability in children's utterance production and some of this variability has been related to certain contextual or stimulus variables. It has been observed that the children produced more full sentences in some situations than in others, but even in the last experiment using animal agents, the children only produced full sentences in just over 50 per cent of their answers. It is concluded that perhaps there is some limit to productive complexity affecting some children's utterance production, or that the lack of full sentences merely reflects the general level of language development of some of the children. One way to test the productive complexity hypothesis would be to have the children produce the same kind of agent-action utterances with the added complexity of negation. However, there did not seem to be any satisfactory way of getting the children to produce such utterances, so it was decided to study the children's use of negation in a different kind of utterance. The rest of the research concerns this use of negation and the relationships between the children's behaviour in producing this negated form and their answers to WH, WD, and WO in Experiment 2.

Chapter 5

Experiments 8 and 9 - Productive Complexity, Negation, and Patterns of Development

Introduction

The idea that young children's speech is restricted by some limit to productive complexity has been explored in various ways, and so far without definitive result. The preceding experiments have focussed on the children's production of subjects in simple utterances, and these experiments have shown that many factors contribute to the productive process. Some children produced generally fewer subjects than others but it was possible to influence the number of subjects produced. Therefore, it is still possible but less likely that there is some kind of limit to productive complexity constraining the number of subjects produced.

If there is some limit to productive complexity at this age it should affect all forms of utterance. This means that the development of different forms should correspond as the limit to productive complexity decreases. The development of the active affirmative utterances studied so far should correspond with the development of other kinds of utterances if there is a constraint on productive complexity. It would have been interesting to have compared the form of utterance already studied

with the same kind of utterance complicated by negation. However, the negated form is not easily elicited, although it has been done (Huxley 1966:211). The problem is that most of the questions or statements that can be used to elicit negative forms can be acceptably answered or denied with just no. For example, if a child is shown a picture of a boy riding a bicycle and the experimenter says the boy is pushing the bicycle, the child may simply say No he's not, he's riding it. This form of communication occurred in Experiment 2 with the picture of the girl pulling a train. Some of the children said she was pushing the train, which is obviously not so from an adult point of view. The following conversation occurred with one child:

My Question: Is she pulling the train?

His Answer: No 's pushing the train. My trains don't pull.

This boy bluntly denied my proposal and explained his denial in an interesting way. Not only did he use 'pull' passively as though he were saying 'my trains can't be pulled', but he produced what appears to be a subject noun, 'trains', in this negative utterance. This is remarkable because he rarely produced subject nouns to WH and it suggests that in his case the reason was not a limit to productive complexity. Unfortunately, the children seldom gave such explanations and they tended to substitute the affirmative proposition that was appropriate from their point of view.

Although there did not seem to be a way of eliciting the kind of utterances obtained before with negation, a way was found of eliciting another kind of utterance with negation using a question and pictures as before. So it was decided to use this method and compare the development of this negative form with that of the affirmative previously studied. The question to be used was What's funny about this?, presented in combination with pictures of objects with parts missing. Since this question makes a specific reference to an object which could reduce the number of subjects produced, it was decided to use the more general question What's funny about these? and one picture showing all the objects. In this context adults usually produce negative possessive forms like the car hasn't got any wheels.

A great deal of research has been done on the development of negation by Ursula Bellugi (1967). However, the particular form of negation demonstrated above does not appear in her lists of children's utterances. A different kind of negative possessive occurs as in Paul can't have one and I don't have a book, but there are no negative possessive forms listed that include 'got'. Nevertheless, Bellugi's work is relevant to the present investigation because of the information it provides about the development of negation and its implications regarding the nature of language acquisition. Young children are said to show a remarkable degree of syntactic regularity in their negative and interrogative utterances (Klima and Bellugi

1966), and Ervin-Tripp (1971b:204) says that the apparent formal structural basis of these kinds of utterances is something not easily explained by traditional learning theories.

Bellugi describes four stages in the development of negation, as follows. In the first stage the child produces utterances like no wipe finger and no singing song. In these utterances the negative element 'no' usually precedes the rest of the utterance, and according to Klima (1964) this is the order of the elements in the deep structure of adult negative sentences. In transformational grammar the deep structure of a negative sentence is generated from a base rule like $S \rightarrow (\text{Neg}) + \text{NP} + \text{VP}$ in which the optional negative element precedes the other base elements. Bloom (1970) found that many of these first stage negative utterances were anaphoric, meaning that the child said 'no' to deny what had already been said, and followed this with his own assertion. According to Bloom the other utterances starting with 'no' had an underlying deep structure in which the negative element was within rather than before the other deep structure categories. The negative element appeared first in the utterances because the preceding elements were not produced. McNeill (1970:89) says that the inconsistency between these interpretations of early negation has yet to be resolved.

At stage 2 in Bellugi's scheme the child produces stage 1 forms plus various others, for example:

I can't see you	There no squirrels
Don't leave me	I want no envelope
That no mommy	

These utterances suggest that a major grammatical advance has taken place, but the structure of these utterances is said to be simpler than it seems. The child produces 'can't' and 'don't' but not the corresponding affirmatives, 'can' and 'do', which lead Bellugi to propose that these forms were special negative auxiliary verbs. At the third stage the corresponding affirmatives appear and it is then that the first transformation rule is required to account for the derivation of negative utterances. This rule transports the negative element, (Neg), from the beginning of the base string to a different position after the modal auxiliary, as in 'can not'. McNeill (1970:90) argues that a simpler and more satisfying description is obtained if the first transformation is introduced at stage 2. This is because the negative auxiliary verbs of stage 2 are inconsistent with the universal base order 'neg + s', and because the children produce some utterances with 'no' before the main verb in stage 2 too. Both anomalies can be resolved by a transformation rule in stage 2 that places the negative element before the main verb and where the negative element may be realised as 'don't', 'can't', 'no', or 'not'.

To continue with the characteristics of stage 3, Bellugi found that other modal auxiliaries appeared at

this stage, for example 'won't' and 'didn't'. The proliferation of auxiliaries at this time was one feature that confirmed that the children had now acquired the auxiliary verb as a distinct syntactic category.

In stage 2 the child also produces a kind of double negative such as Why not cracker can't talk?, but by stage 3 the child is said to have mastered the transformation required to produce just one negative element in surface structure, as in Why I didn't live in Italy?. The inversion required to produce the normal form of such a question, Why didn't I live in Italy, comes later.

More complex negative forms like you said you can't play with it and I don't know what is missing appear in stage 4. A different kind of double negative appears in this stage, for example, he can't have nothing and it wasn't no chicken. And it is found that children start to produce negated words like 'nobody' and 'nothing' at this stage too. The kind of double negative that occurs at this stage is different from that occurring in stage 2 in that it involves the negation of indefinite pronouns and quantifiers. Here again the structural changes that take place are found to correspond with the formal organisation of negation in English described by Klima (1964). The child seems to learn to negate a whole variety of elements with different meanings at the same time.

In adult English people do not usually say I don't want some bread but I don't want any bread. But children

in stage 2 are likely to produce utterances of the first kind. Now in adult English the grammatical generation of 'any' depends on the scope of negation: we may say I don't want any bread or I want no bread, depending on whether negation is applied to the verb or to the object noun. It is not good English to say I don't want no bread, and this restriction is accounted for by a restriction on the scope of the base negative element--either it applies to the verb or the object noun but not both. It is not good English to use this kind of double negative but they are used in some dialects more than others, and often in emphatic speech. When children begin to use negative pronouns, etc., they use them liberally, as in utterances like I can't do nothing with no string. Then gradually their use of these forms exhibits the restrictions of scope of adult English. This pattern of development shows some similarity with the temporary over-generalisation of regular verb past tense endings to irregular verbs, such as the use of 'bayed' instead of 'bought' that occurs in the fourth year of development.

Bloom (1970) also found a period when 'can't' and 'don't' occurred but not 'can' and 'do' in her studies of language development. The children in her study did not produce any double negatives of the stage 4 type, probably because they had not reached that level of development. Her lists of negative utterances do not include any negative possessive forms involving 'got' either, though

there are some involving 'have' as follows:

<u>Page no.</u>	195	this one have no	(24)
	191	no have this	(25)
	196	I not have some fruit	(26)
	204	- didn't have it	(27)
	204	no have it	(28)
	207	have no shoes	(29)

Bloom suggests that the occurrence of 'no' at the end of (24) is an anticipatory form of 'none'. The child who produced this utterance seems to have been at stage 2 because most of her negative forms either started with 'no', as in no children, or they had a negative element within the utterance, as in this not fits and this one don't fit. Most of the samples above include the negative element before the main verb but (29) is an exception. The child who said this had just been asked Does the little boy have shoes?. Bloom says that (29) was unusual for this child who had progressed from the stage predominated by nominal negation (e.g. no book) to the stage predominated by verbal negation (e.g. no have book). This progression from nominal to verbal negation is apparent in Bellugi's first three stages as well.

There is a simple explanation of the absence of 'got' from the forms of negation discussed, and that is that the research described was done in America where this word is possibly less often used in this way. The present research was carried out in the north of England where the use of 'got' is possibly greater than it would be in other parts of Britain.

The children's use of 'got' in affirmative and negative utterances did not strike me as at all unusual but then I am from the north of England and I would probably say has the little boy got shoes? rather than does the little boy have shoes?.

To go back to Bloom's analysis of negation, it is useful to note that she found three semantic categories of negation in the language of the three children she studied. These categories were non-existence, rejection, and denial. The category of negation dealt with in this experiment is non-existence in that the children are to describe the absence of parts of objects. In her study non-existence was first expressed using 'no' and 'no more' as in no pocket and no more cleaner. In the context to be investigated non-existence can be expressed in another way using words like 'lose', 'broken' and 'take off'. 'Off', 'broke' and 'all gone' occurred in the early language of Bloom's children and Miller and Ervin (1964) found one child who used 'off' a great deal in her first two-word utterances. However, when these children used these words they were either asking for the removal of something, as in sweater off, or indicating perception of disappearance or removal, as in all gone milk. Bloom does not include these words in her account of negation development, and it is not clear if she considers that these words express non-existence. These words do have a negative connotation sometimes, in the sense that all gone milk and

no more milk may be used equivalently. Furthermore, Klima (1964) brings them into his discussion of negation when he makes a distinction between syntactic negation, in which there is a distinct negative element such as 'no' or 'not', and lexical negation in which the negative meaning is borne by other lexical items. For example, 'scarcely ever' is not far removed from 'never', just as 'lose' is not far removed from 'not have'. Klima certainly recognised the negative equivalence of such words although he considered them to be grammatically distinct from negation proper.

De Boysson-Bardies (1970) has done some research into the use of words like 'lose' and 'take off' by children aged between two and three and a half years. He noticed that these children rarely negated these words as in 'not lose', and he wondered if this had anything to do with the complexity of negation involved. So he tested the children's recall of sentences with varying structure: some sentences had positive verbs like 'put on' and some had negative words like 'take off', and some included syntactic negation and some did not. His results showed that both types of negative expression (e.g. 'lose' and 'not have') made sentences harder to recall. The actual order of achievement in recall, beginning with the most well recalled form, was positive words, negated positive words, negative words, negated negative words. These findings suggest that negative words are more complex

than positive words with and without syntactic negation. However, they do not take into account the relative frequency of use of the different constructions. This does seem to be important because active affirmative sentences are usually recalled better than any other type and they are also most frequent in ordinary adult speech (Goldman-Eisler and Cohen 1970). Moreover, the work cited above shows that young children use these so-called negative words a great deal sometimes, which would be inconsistent with their supposed greater structural complexity.

The development of negation has been fairly well plotted and so it should be possible to determine the children's level of negation development on the basis of their utterances in the context to be used. Then their level of negation development can be compared with their level of development in producing answers to WH in Experiment 2. The hypothesis is that these levels of development should show a significant positive correlation if there is some general constraint on utterance complexity operating at this age.

Method

Material: The material for the missing parts test consisted of ten pictures of objects drawn on one sheet of paper. These objects were all drawn with some obvious part missing, as follows: a man's face without one eye, a tricycle without its front wheel, a bird without one

leg, a teapot without a handle, a clock without one hand, a house without a door, a car without its front wheel (side view of car), a table without one leg, a basin without one tap, and a car without any wheels (side view again).

Procedure: The sheet of objects with missing parts was presented to each child who was then asked the question What's funny about these?. Unfortunately, this question frequently failed to elicit a response and it was usually necessary to follow it with What's funny about this? with the experimenter directing the child's attention to one of the objects with his finger.

Subjects: Two groups of children took part in this experiment, the first one comprising the fifteen six and seven year olds who also did Experiment 2, and the second one comprising forty children from the nursery school and day nursery sources. The latter group had a mean age of three years and ten months at the time of testing (age range was two years eleven months to four years six months).

Results

The fact that the original non-specific question had to be replaced in most cases by a question that made a specific reference means that the production of subject nouns would have been dependent on discourse agreement as well as on productive complexity. The children did not appear to produce so many subject nouns in this context but they used the pronouns 'it' and 'he' a great deal

which indicates discourse agreement was operating. It was observed that the few children whose answers to WH were predominantly full sentences with noun subjects shifted to using pronoun subjects almost exclusively in this context. At the same time two of the four children who produced no full sentences of any kind in answer to WH were observed to have produced some answers with pronoun subjects in this context. One of these children produced some answers with noun subjects in this context such as that car's got no not a wheel there, that house has not got a gate, and it hasn't got no thing to stand on. This particular child did this experiment on the same day as he did Experiment 2 which makes this difference in answering behaviour even more striking. Since this child was here able to produce utterances like this with noun and pronoun subjects, that are also complicated by negation, it seems unlikely that he was prevented from producing subjects in his answers to WH because of some constraint on productive complexity. On the other hand, the child who produced the lowest mean utterance length in answers to WH achieved the same distinction in her answers in this context. Most of her answers to WH were single words but she did manage cleaning the windows and riding a bike. Unlike the previous child her answers in the missing parts test were generally shorter and less complicated than her answers to WH. She tended to just name the missing parts as in the eye, a wheel, a tap. This girl was exceptional in that she did

not use any form of negation, be it of the no leg or of the leg gone type. Nevertheless, her productive behaviour was not universally restricted because in Experiment 7, the one contrasting human and animal agents, she produced the following set of answers:

1. a man
2. washing
3. a donkey
4. a cockledoodledoo eating a apple
5. a girl
6. somebody at the door
7. a dog trying to get the ball
8. a donkey on the wall.

These individual examinations are presented in lieu of an analysis of subject production for three reasons. Firstly, they demonstrate the individual variation in answering behaviour that is not easily accounted for by a limit to productive complexity. Secondly, discourse agreement has been manifested in a variety of contexts and any difference in the pattern of subject production between this and other contexts is possibly adequately accounted for by discourse agreement. Lastly, the considerable variations in the constructions used to describe the missing parts made it very difficult to get a general measure of subject production in utterances involving negation.

The utterances produced in the missing parts test varied much more than those produced for action scenes. Not only were there different forms of negation as expected,

such as no eye, got no eye, and hasn't got an eye, but there was also considerable use of negative words such as 'lost', 'come off', 'gone', and 'broken'. The words, called negative for want of a better term, and negated forms of the possessive verb, to have, constituted 70 per cent of the relevant answers given by the younger group. The other 30 per cent included answers like just got one leg, and only got one leg, and answers which merely named the missing part.

The missing parts test was given to the six year olds in order to determine the kind of answering behaviour the three year olds were presumably moving towards. Table 15 shows the various forms that occurred in the three year olds data to any meaningful extent. The form 'has no' rarely occurred so it is not included in the table. Three of the forty three year olds did not produce any of the forms in Table 15 and so this table is based on the responses of the remaining thirty-seven children. Table 15 shows the frequencies with which these forms were used by two groups of children. These frequencies are expressed in two ways as before, that is, as the numbers of answers including each form (# answers) and as the numbers of children using each form (# children).

The results in Table 15 are presented differently from before in that the forms listed do not constitute types of answer but forms of lexical and syntactic negation. For instance, the form 'off' occurred in several types of answer such as the wheel's off, a wheel's come

off, its got a wheel off. Sometimes two negative words occurred together, as in the wheel's lost off. Furthermore, 'no' as a lexical item occurs in got no legs but in this case 'no' refers specifically to constructions like no legs. Therefore, it made more sense to analyse the results in terms of forms of negation than answer types. Three of the negation forms have items in brackets after them. This means that the 'no' part of these forms was sometimes replaced by one of the items in the brackets. The children said none legs as well as no legs, and got none legs as well as got no legs. Since most children produced a variety of forms none of the columns in Table 15 sums to any meaningful total.

Table 15: Rates of usage of various forms to describe missing parts by thirty-seven three and four year old children and fifteen six and seven year old children. Rate of usage is expressed as the numbers of answers including each form (# answers) and the numbers of children using each form (# children).

<u>Answer Form</u>	<u>Three and Four Year Olds</u>		<u>Six and Seven Year Olds</u>	
	<u># Answers</u>	<u># Children</u>	<u># Answers</u>	<u># Children</u>
Broken, broke	26	13	0	0
Off	31	13	7	2
Lost	11	5	13	3
No (none)	28	12	6	1
Got no (not, none)	44	17	10	3
Hasn't got no (none)	35	12	1	1
There's no	5	4	4	3
Hasn't got	31	10	7	8

The results in Table 15 show that the form most frequently used by the six and seven year olds in answers in the missing parts test was 'hasn't got'. The forms least frequently used by them were 'no' and 'hasn't got no'. The younger group behaved somewhat differently. They used 'got no' most frequently while they used 'no', 'hasn't got no', and 'hasn't got' roughly equally often. With regard to the negative words the older children used 'lost' most frequently whereas the younger ones used 'lost' least often. The differences in usage between the two ages were analysed using fourfold tables and chi-square. However, in most cases the lowest expected frequency was near or below five, and none of the differences that could be evaluated in this way was significant. Therefore, the Fisher exact probability test was used and the values obtained for the seven forms are given in statistical Appendix 8. These values suggest that the major changes in usage occurring between these ages were for 'no', 'hasn't got no', and 'broken'. This change in syntactic negation is as expected since 'no' and 'hasn't got no' appear to be less mature forms than 'hasn't got'. Since negative words are no more productively complex at three than at six they are of less immediate relevance. Yet it may be assumed that those three year olds who are more advanced in their development of negation should use 'broken' less often than the others of that age.

It was hypothesized that those children who behaved more maturely in describing the actions in Experiment 2

should be the same ones that produce the more mature negative forms in this experiment, if there is some general constraint on productive complexity operating. This means that those children who produced full sentences with noun subjects in their answers to WH in Experiment 2 should be more likely to use 'hasn't got' if the development of utterance production is generally constrained. To find this out two groups of children were picked out, each containing twelve children. The first group, labelled A, contains children who produced no noun subjects and not more than four pronoun subjects in their answers to WH. The second group, labelled B, contains children who produced at least two noun subjects and any number of pronoun subjects in their answers to WH. According to this division group A is less mature in its description of actions than group B. Next, the numbers of children in each group who used 'broken', 'no', and 'hasn't got' were counted up, and the results are shown in Table 16.

Table 16: Usage of selected forms to describe missing parts by twenty-four three and four year old children, divided into two groups according to their level of development in answering WH in Experiment 2 (B more advanced than A).

<u>Answer Form</u>	<u>Number of Children Using Each Form</u>	
	<u>Group A (N=12)</u>	<u>Group B (N=12)</u>
Broken	7	1
No	3	4
Hasn't got no	2	3

According to Table 16, groups A and B used 'no' and 'hasn't got no' to roughly the same extent. There is a difference between the groups in usage of 'broken' that is consistent with the hypothesis. However, this form does not vary in complexity so its development is less relevant to the hypothesis regarding productive complexity. Therefore, the results of this analysis suggest that, for these twenty-four children, there is no correspondence between their maturity of description of action scenes and their maturity of use of negation in describing missing parts. This is evidence that their language development was not being restricted by some general limit to productive complexity.

Discussion

The number of children used in the above analysis was not very large but the two groups were selected to take in the extremes of development in the children's descriptions of actions. Thus, although the groups produced the same mean number of full sentence answers with pronoun subjects to WH (1.5), group A produced no noun subjects while group B produced a mean number of noun subjects of 4.5. If there was some general limit to productive complexity it was assumed that it would restrict the development of different utterances to a noticeable extent. Therefore, the lack of correspondence of development in this case means one of two things: either there is no general limit to productive complexity at this age and

the development of different forms takes place relatively independently, or there is a limit but it was not this limit that caused the children to produce incomplete sentences in answer to WH, or immature negation forms in the missing parts test. One way of deciding between these two options is to explore the children's abilities to understand and repeat the negative possessive forms that have been observed, and this is the topic of the next experiment.

Before the next experiment is presented, it is important to discuss the particular forms of negation observed because they are not entirely the same as those described by Bellugi (1967). The first point is that this sample of children used 'got no' predominantly. In Bellugi's and Bloom's studies forms with the negative element before the main verb predominated, such as 'doesn't have' which is similar to the form 'hasn't got' that was used by these children. This means that if the present sample of children had behaved as the American children did they should have said 'not got' rather than 'got no'. Unfortunately, no information about the children's use of negation in other contexts was collected so it is not reasonable to draw any general conclusions about this behaviour. The form 'got no' is used by adults in Britain although some people would question its grammatical status. It is possible that this form is an aspect of the local dialect in the north-east of England. The form 'has no' rarely occurred which indicates that 'got' is dominant

over 'have' in the language of these children. It was noted that they tended to use 'got' rather than 'have' in affirmative utterances too.

The second point is that these children used 'none' considerably more often than was expected. This use of 'none' as a substitute for 'no' in forms like none wheels and got none wheels suggests that 'no' operates in these forms as 'not any' or 'not one', as Bloom proposed for her case of 'have no'. There were some other unexpected forms which are interesting as well as rare. Three children produced these utterances:

it hasn't a no wheel on
cockle with a beak with a no toe
a teapot's got a no handle

Several other children produced utterances with 'no two' in them, such as he's got no two legs, and 'no one' was also produced. These examples presumably reflect the struggles of the children to use the forms they know, to express what they want to say. The first example shows some similarity with the early double negatives like why not he can't talk? but all three examples and that for 'no two' reflect a mixture or confusion of the affirmative and negative constructions. Another unusual form that was produced once by two children was the use of 'any' on its own as follows:

a man got any hat
got any doors

Both children also produced 'hasn't got any' so perhaps these utterances were merely errors of production. Klima (1964) says that 'any' only occurs after negation in some constructions and this association with negation could lead the child to interpret 'any' as a negative element by mistake. Therefore these examples could also reflect some misunderstanding about the meaning of 'any', a possibility to be explored in the comprehension test of the next experiment.

One of the more surprising findings was the considerable individual variation in negative forms produced, which is demonstrated in the answers given by two children shown below:

Child 1

it hasn't got wheels in the back	no legs
he hasn't got no wheels in the front	no legs
it hasn't got any legs in the back	the handle
he hasn't got a eye	has no door

Child 2

that car's got no not a wheel there
it hasn't got none of those onto there
that house has not got a a gate
and he got not a a hand
he hasn't got a hand
hasn't got no legs
it hasn't got no thing to stand
it hasn't got no thing to go on

According to Bellugi's study there are definite changes during the development of negation, for instance, the form 'no' is said to have disappeared from use by stage 3, in which case the stage 4 form 'hasn't got no' should not occur in the same sets of answers as 'no'. This did not appear to be true for the present data so a statistical analysis of co-occurrence of the different forms was carried out using chi-square. The forms considered were 'no', 'got no', 'hasn't got no', and 'hasn't got'. For each pair of forms a fourfold table was constructed showing the number of times they occurred together and separately in the forty children's sets of answers. For example, 'got no' was used by seventeen children and 'hasn't got no' by twelve. These forms occurred together in two children's answers. This degree of co-occurrence yields a chi-square of 3.29 with Yates correction for continuity (lowest expected frequency is 5.1). This value is not significant (for $p=0.05$, $\chi^2=3.84$). It was found that all four forms could have occurred together in the children's answers on the basis of chance, and the sample chi-square just given was the highest one obtained. In other words, 'no' and 'hasn't got no' which occurred together in five children's answers, were not as exclusive as expected.

The systematic changes in negation development observed by Bellugi are consistent with the conception of language acquisition as a progressive accumulation of linguistic rules that together enable the speaker to

produce increasingly complex utterances. The present findings seem to be far less systematic, judging by the high degree of variety in some children's answers and the chance degrees of co-occurrence. These findings seem to reflect a different kind of language acquisition, and one in which development takes place by the gradual shift from one kind of response to another, so that a variety of responses may be produced at any one time.

When a child produces a predicate in answer to WH it may be supposed that this utterance was formed by deletion from a full sentence. But when a child produces no legs and it hasn't got wheels it is not possible to relate these in the same way that predicates and full sentences are related. This is because the simplest grammatical system for generating 'hasn't got' does not generate 'no' and cannot be made to do so by simply adding deletion rules. This means that the grammatical system for generating both forms is considerably more complex than that for generating each of them alone. So from a grammatical point of view it is surprising that the children do use both when it would be simpler to shift from one form to the other.

According to Bellugi double negatives like 'hasn't got no' occur when the child has mastered predicate negation and is learning to master the negative quantifiers. But in her research the children seem to have shifted from nominal to predicate negation (e.g. from 'no soap' to 'doesn't have some soap') well before they learned about

negative quantifiers. In the present research the same shift is observed, but it is not as consistent since 'got no' is used a great deal by the three and four year olds and to some extent by the older children. The prevalence of 'got no' means that 'hasn't got no' may have another explanation besides that suggested by Bellugi. Assuming that the children produce 'no' first, and then 'got no', and finally 'hasn't got', it is reasonable to suppose that 'hasn't got no' occurs as an intermediary between 'got no' and 'hasn't got'. Furthermore, if it is argued that the negative element in 'got no' is related to 'none' as a form of negative indefinite quantifier it is hard to account for the utterances in which got not occurs, as follows:

it hasn't got not three wheels
its got not taps
the car's got no not a wheel there
he got not a hand
its got not another leg.

These utterances are not normal adult English and they appear to be intermediate between 'not got' and 'got no', just as 'hasn't got no' was thought to be intermediate between 'got no' and 'hasn't got'. In fact, one child produced 'not got no' which could also be an intermediate or hybrid form rather than a negative predicate, 'not got', mistakenly combined with a negative indefinite quantifier. These examples suggest that the shift of the negative element from after to before the verb is not perfect and that various odd forms are produced as it takes place.

The children that used 'only' tended to say 'only got' but one child said 'got only' so it may be that the acquisition of this construction also involves a shift from after to before the verb sometimes. I attempted to teach this child to use 'only got' and the transcription of this exercise is shown below. This boy was one of the children who used 'none' as in got none handles. I also tried to teach him to use 'not got' without much success in either case. It is interesting to note in the transcriptions that he could say 'only got' and 'not got' when my models did not have subjects. When my models included subjects again he reverted to his original pattern of behaviour. He was taught by asking him to repeat my utterances, and these models and his repetitions are reproduced below without the additional words of introduction and encouragement given:

<u>Model</u>	<u>Child's Repetition</u>
its got only one leg	got only one leg
table got only one leg	-
(repeated)	table got only one leg
table only got one leg	table got only one leg
only got one leg	only got one leg
only got one wheel	only got one wheel
car only got one wheel	car has got only one wheel
table has only got one leg	table's got only one leg
only got one leg	only got one leg
table's only got one leg	table's got only one leg

what's funny about this?	got none handles
got no handle	got none handle
not got a handle	not got a handle
teapot's not got a handle	teapot's got no handle
not got a handle	not got a handle
teapot's not got a handle	teapot's got no handle
not got a handle	not got a handle
teapot's	teapot's got not*
teapot's not got a handle	teapot's not got a handle
bird's not got a foot	bird's not got a foot
house not got a door	house got not a door*
house not got a door	house's not got a door
what's funny about the house?	got none door
what's funny about the bird?	got none foot
what's funny about the car?	got only one wheel

The two repetitions marked with an asterisk have been picked out to show the difficulty this child seems to have been having in shifting the negative element from after to before the main verb. It seems to have been even harder for him to shift 'only' from after to before 'got' in the first session. This child definitely found it easier to carry out the shifts when the models lacked subjects. The most obvious explanation for this would be that the models without subjects presented less load to the psychological mechanisms involved. Moreover, in the models without subjects the critical elements come first and therefore would be more easily perceived and learned, than when they are preceded by the subject.

Ten other children were taught in the same way. Teaching was more successful with some of them but three others showed the same difficulty with the order of 'not' and 'got'. One of these, like the child just described, used 'none' as in none legs on and hasn't got none handle in the test, but during a preliminary conversation she uttered not got a fish and haven't got a bunny rabbit. This is how her training session went:

<u>Model</u>	<u>Child's Repetition</u>
its got no leg	-
no leg	no
no leg	no leg
got no leg	got no leg
its got no leg	not no leg
its	hasn't got none leg
its got no leg	got none leg
its got no leg	got none leg
not got	not got
not got a leg	got not got a leg
not got a wheel	got not a wheel
not got a handle	got not a handle
not got	not got
a handle	handle
not got a handle	not ha' got a handle
not got a foot	not got a foot
its not got a leg	not got a leg
say its first-	
its not got a leg	its not got a leg

These examples indicate that, for some of the children, the elements 'no', 'none', and 'not', were interchangeable in spontaneous speech and repetition, which implies that they constituted equivalent symbols of negation for these children. However, the equivalence is not complete because there were no occurrences of 'no got' or 'none got' recorded. It seems as though the initial elements of nominal negation, 'no' and 'none', remain tied to their prenominal position but the tendency for nominal negation remains strong enough for some children to err with 'not', the preverbal element, and produce 'got not'. Bloom collected some utterances in which 'no' preceded the verb as in no have it, a finding that is consistent with the apparently earlier and stronger shift to verbal negation in some American children. Therefore, this research has produced some evidence to show that the structure and function of forms in the development of negation is less clearcut than Bellugi's stages suggest. Indeed, the language behaviour that has been observed is perhaps more easily accounted for by a system of plans for the organisation of utterances that gradually changes in development than by a system of rules that changes abruptly as rules are acquired.

This discussion has examined some individual cases of repetition and it constitutes an appropriate introduction for the more systematic investigation of repetition in the next experiment.

Experiment 9--Repetition and Comprehension of
Negative Possessive Forms

Introduction

Having failed to find any developmental correspondence between answers produced in completely different contexts, but having found that the children often used a variety of negation constructions of apparently different degrees of maturity, it behoves to explore the children's repetition and comprehension of the various negative possessive forms to find out if they are saying as much as they are capable of repeating and understanding. The hypothesis is that a child will find it harder to repeat and understand forms beyond the level of his knowledge as reflected in his spontaneous speech.

This experiment is similar to that of Fraser, Bellugi, and Brown (1963) in which they investigated the abilities of young children to imitate, produce, and understand a variety of constructions. Their subjects were aged between thirty-seven and forty-three months, with a mean age of forty months, so they were about the same age as the children used in these experiments. These authors found that these children generally imitated the constructions better than they understood them, and that they understood them better than they produced them. Turner and Rommetveit (1967) used the same kind of tasks as Fraser et al. in their investigations of sentence voice and reversibility. They also found that children imitated sentences generally better than they comprehended them,

and that they comprehended them better than they produced them. Although two and three year old children appear to imitate parental utterances, so that their imitations are not more advanced grammatically than their spontaneous utterances (Menyuk 1963), these findings strongly suggest that children between three and four can understand and imitate sentences that they cannot so easily produce. However, this is not necessarily so.

The first point is that there may be a genuine difference between comprehensive and productive abilities but this does not necessarily mean that children have a greater knowledge of syntactic structure than is manifest in their speech. This is because people can guess the intended meaning of a sentence without full appreciation of its syntactic structure. Piaget (1926:150) gives many examples of this behaviour in children.

The second point concerns the nature of the task used to measure production by these authors, for they did not collect samples of spontaneous speech. The children were required to carry out a kind of imitation so that strictly speaking the task was not a measure of spontaneous production. In this task the children were presented with two sentences such as the sheep is jumping and the sheep are jumping. They were also shown a picture which would be appropriate to one of these sentences, and then they were required to say the sentence that they considered fitted the picture best. In the Imitation task they were required to imitate sentences as they were shown the

pictures to which they were appropriate. Since the Production task required the children to make a judgement about appropriateness as well as imitate the sentences it was inherently more difficult than the Imitation task so the results could have reflected the relative difficulty of the tasks rather than any difference between imitation and spontaneous production. As Baird (1972) says it is hard to make these tasks equally difficult, but it would be more satisfactory to assess production by examination of spontaneous speech than by any kind of imitative task. With these considerations in mind it was hypothesized that the children would find it harder to repeat and understand the forms of the negative possessive that they did not spontaneously produce.

Method

Repetition Task: To test the ability to repeat the various negative possessive forms a set of eight phrases including them was constructed. They were as follows:

1. no door
2. the car's got no wheel
3. the table hasn't got no leg
4. the house hasn't got a door
5. the car hasn't got any wheels
6. the sink's got only one tap
7. the table's got two legs
8. the car's only got one wheel.

The first five phrases contain true negative possessive forms and these are placed in their supposed order of appearance in development. Phrases 6 and 8 were put in to investigate the preferred ordering of 'only' and 'got', and these two phrases were separated by an affirmative phrase to reduce interaction between them.

To make the task more like a normal speaking and learning situation, each phrase was presented with an appropriate picture, such as a car with only one wheel (side view) for phrases 2 and 8. These pictures were all drawn on one card and I pointed to the appropriate one for each phrase as I uttered it. Each child was encouraged to 'say what I say' at the start of the experiment and whenever he did not attempt to repeat a phrase.

Comprehension Task: For the comprehension task four new cards were drawn up with three pictures on each, and these are shown in Appendix 6. These pictures provide material from which the children may select an appropriate item in answer to a question like Which man hasn't got a hat?. The three pictures for each question include a complete item (e.g. man with a hat), an appropriately incomplete item (e.g. man without a hat), and an inappropriately incomplete item (e.g. man without a tie). The inappropriately incomplete items were put in so that the test would require the children pay attention to more than just the absence or presence of negation. On the other hand, the key discrimination as far as the experiment was

concerned, was between the absence and presence of negation so the questions were alternatively affirmative and negative. None of the four negative questions included 'no' or 'got no' as it was assumed that all the children would be able to understand these. Instead, the forms used in the questions were all of the kind in which the negative element precedes 'got', except for one in which negation was doubly marked--Which man hasn't got no hat?. The eight questions are shown below in their basic order of presentation. Some of the children received the questions in this basic order, and some of them received them in the revised order, indicated by the numbers to the right of the questions.

- | | |
|-------------------------------------|---|
| 1. Which house has not got a door? | 2 |
| 2. Which man has got a hat? | 1 |
| 3. Which car hasn't got any wheels? | 4 |
| 4. Which teapot's got a handle? | 3 |
| 5. Which house's just got a door? | 6 |
| 6. Which man hasn't got a hat? | 5 |
| 7. Which car has got any wheels? | 8 |
| 8. Which man hasn't got no hat? | 7 |

Questions 5 and 7 are special. Question 5 was included to find out if the children really understood the meaning of just. Several of the children produced 'just got' but it was suspected that they used it to mean 'got'. For this question the three pictures were of a house with a door and windows, a house with a door but no windows,

and a house with windows but no door. If 'just got' is interpreted as it should be the only appropriate picture is that of the house with a door but no windows. If 'just got' is interpreted as 'got' the children should pick both pictures with a house and a door.

Question 7 is a trick question put in to find out if the children have any tendency to interpret 'any' to mean 'no'. Both questions 7 and 2 are between negative questions which means that their locations are comparable. Therefore, if the children do think 'any' means 'no', they should interpret question 7 negatively far more often than question 2.

The comprehension test is easier than the repetition task for several reasons. Firstly, the children need only concern themselves with the predicate part of the questions in the comprehension test, although they may not realise this. Repetition requires the child to speak, comprehension requires the child to point. Repetition requires the child to listen but he does not necessarily have to understand what he hears or pay any attention to the pictures. Comprehension requires the child to look and discriminate certain features of the pictures, and to listen and understand what he hears. Comprehension and repetition do involve different skills and there is no way that tasks can be designed to measure them that have equivalent difficulty.

Subjects and Procedure: The eight questions were presented in the basic order to twelve children at the day nursery

who did the two tasks, repetition and comprehension, sometime between the pre- and post-testing of the training experiment. And then the eight questions were presented in the revised order to twenty children at the nursery school, some of whom did the two tasks between pre- and post-testing and some of whom did them after the post-testing. All the children did the two tasks together, repetition then comprehension, and they all did them after they had done the spontaneous speech part of Experiment 8, in which their spontaneous production of negative possessive forms was explored.

The children's repetitions in the repetition task were recorded and transcribed afterwards, and in the comprehension task a note was made of the picture or pictures pointed to in answer to each question by each child.

Results

Only thirteen of the nursery school children and twelve of the day nursery children were considered for the analysis because some children did not do all three parts of the experiment and eight of those who did, did not produce any negative possessive forms in the spontaneous speech part. The final twenty-one selected had mean age of three years and eleven months (S.D. 6 months).

Repetition: The children varied in how much they repeated of the phrases and some phrases seemed to be generally harder to repeat than others. Since most errors, apart from subject omission, involved the negation components,

repetition was scored as correct if the main constituents were repeated but articles and auxiliary verbs left out. In fact, when the subject was omitted the main verb was usually omitted as well.

The twenty-one children were arranged into three groups according to the level of development of their spontaneous negative possessive utterances. The most mature form that a child produced was used to allocate him to one of three groups. Thus, group HGN contained the children who produced 'no' or 'hasn't got no' but not 'got no' or 'hasn't got'. The children who produced 'got no' but not 'hasn't got' were put in group GN, and those who produced 'hasn't got' to any extent were put in group HG. These particular group titles were chosen as convenient abbreviations of the main components of each form, thus 'Hasn't Got No' becomes HGN. Table 17 shows the scores for each group on each phrase, where a score is a correct repetition as defined above. There are seven children in group HG, eight in GN, and six in HGN. The first row of figures in Table 17 shows that all seven children in HG repeated 'no door' correctly, all eight in GN did so too, but only five of the six children in HGN repeated it correctly.

According to the results in Table 17 groups HG and GN were able to repeat the phrases to roughly the same extent, with HG being able to repeat slightly more than GN. The third group, HGN, repeated less of the phrases

than HG and GN. A two-way analysis of variance was carried out using the first five phrases only because it is these that contain negative possessive forms. The between groups source of variance was significant ($F=4.07$, $n_1=2$, $n_2=18$, p less than 0.05). This analysis was followed up with an examination of selected contrasts using the t test. According to this, groups HG and HGN performed significantly differently ($t=2.86$, 11 d.f., p less than 0.02) but the differences between HG and GN, and between GN and HGN were not significant (HG/GN : $t=0.72$, 13 d.f., GN/HGN : $t=2.01$, 12 d.f., p less than 0.1).

Table 17: Numbers of children who correctly repeated the eight phrases of the repetition task. The children are divided into three groups, HG, GN, and HGN according to the maturity of their spontaneously produced negative possessive forms (see text for explanation).

Phrase	HG (N=7)	GN (N=8)	HGN (N=6)
1. no door	7	8	5
2. the car's got no wheel	3	2	0
3. the table hasn't got no leg	6	6	1
4. the house hasn't got a door	6	7	2
5. the car hasn't got wheels	5	4	3
6. the sink's got only one tap	3	3	0
7. the table's got two legs	4	6	3
8. the car's only got one wheel	5	6	2
Mean score for all 8 phrases	5.57	5.25	2.67
Mean score for first five phrases	3.85	3.38	1.83

The results in Table 17 did not entirely meet expectation. Firstly, 'got no' was repeated less well than expected, especially by the GN group. Most of the children erred on this phrase by reducing it to no wheel. Secondly, HGN repeated 'hasn't got no' less well than expected considering that most of them produced this form spontaneously. This is particularly noteworthy as this group repeated the two more advanced forms, 'hasn't got a' and 'hasn't got any', better than they repeated their own form, 'hasn't got no', and the simpler form, 'got no'.

If spontaneous speech was influencing repetition it would be expected that the children would repeat the forms they used themselves better than those they did not. Although the more advanced group repeated more of the phrases than the least advanced group, the less advanced groups did not repeat their own spontaneous speech forms as well as expected. Therefore, the influence of spontaneous speech does not appear to have been very great, yet there possibly was some influence in that of the nine children who erred in repeating 'hasn't got any', the two who substituted 'no' for 'any' both used 'hasn't got no' in their spontaneous speech.

The sixth phrase including 'got only' was less well repeated than the eighth one which included 'only got'. Many of the errors in the repetition of 'got only' amounted to a permutation of this form to 'only got' which indicates that this form was the preferred order of these words. This permutation is the opposite to that carried out by

the child described at the end of the last chapter who tended to permute 'only got' to 'got only'. Only two children produced utterances involving 'only' spontaneously so no general statement can be made about the difficulty of repeating these words in, and not in, the order they are usually produced in. However, the results do show that the children were quite able to repeat a form that they did not use in this context.

The results do not support the hypothesis that children of this age find it easier to repeat the negative possessive forms that they themselves use. Instead, the results show that HGN, the group which appears to be least mature in its development of the negative possessive form, is less able to repeat phrases containing negative possessive forms than HG, the group of greatest maturity in this respect. The third group, GN, appears to be nearer in maturity to HG than to HGN according to these results. This would be consistent with the fact that 'got no' occurs in adult English but 'hasn't got no' does not.

Comprehension: Sometimes the children pointed to more than one picture in answer to the questions and in such cases the first response was taken to be the child's answer for scoring purposes. The exception to this rule was for the question Which house's just got a door? to which there is only one truly correct answer. If a child gave more than one response to this question his answer was automatically marked incorrect. The same groups were used in this part of the experiment as were used in the investigation

of repetition. Table 18 shows the numbers of children in each group who answered each question correctly. The answers to Which car has got any wheels? were classified as negative, N, if 'any' appeared to have been interpreted to mean 'no', and as positive, P, if 'any' appeared to have been interpreted to mean 'some'. The critical questions for finding out about the children's comprehension of negative possessive forms are all except numbers 5 and 7 in the basic order, and the mean scores for these six questions are given at the foot of the table.

Table 18: Numbers of children who correctly answered eight questions about the absence and presence of parts of objects. The children are divided into the groups HG, GN, and HGN as in Table 17. For the seventh question N means negative and P means positive interpretation.

Question Form	HG (N=7)	GN (N=8)	HGN (N=6)
1. has not got	7	8	5
2. has got	7	8	5
3. hasn't got any	7	8	6
4. 's got	7	8	3
5. 's just got	5	1	3
6. hasn't got	7	7	4
7. has got any	N-3, P-4	N-6, P-2	N-5, P-1
8. hasn't got no	6	7	4
Mean score for all questions except #5 and 7	5.86	5.75	4.50

The distribution of correct answers in Table 18 was analysed using a two-way analysis of variance based on all the questions except Nos. 5 and 7. According to this analysis there was significant variation between the groups ($F=8.27$, $n_1=2$, $n_2=18$, p less than 0.01). Selected contrasts were then examined using the t test and it was found that both HG and GN were significantly different from HGN (HG/HGN : $t=3.2$, 11 d.f., p less than 0.01. GN/HGN : $t=3.04$, 12 d.f., p less than 0.02). But as the results suggest HG and GN were not significantly different ($t=0.05$, 13 d.f.).

These results for comprehension correspond with those for repetition in that HGN does less well than the other two groups on both tasks. Furthermore, in both cases the HG group does slightly better than GN. However, HGN shows itself to be just as able to comprehend the three questions with negation before 'got' as it is to comprehend its own distinguishing form 'hasn't got no'. The same is true of GN whose utterances never had negation preceding 'got' yet they are just as able as the HG group in understanding them. Therefore these results do not generally support the hypothesis that the children understand more easily those forms that they themselves use.

As far as question 5 is concerned the results support the idea that some of the children using 'just got' did not appreciate its exclusive meaning and used it as though it meant 'got'. As far as question 7 is concerned the results also confirm supposition because there are

altogether twelve negative interpretations and only seven positive interpretations of the question, Which car has got any wheels?. Since the children understood 'has got' and 'hasn't got' far more consistently than they understood 'has got any' it would seem that some of them interpreted 'any' to mean 'no'. This finding helps to make sense of the two spontaneous uses of 'any' as though it meant 'no'. Both behaviours are assumed to relate to the fact that 'any' tends to occur in certain negative utterances which would make it harder for the child to discriminate the meaning of any and negation.

Conclusions and Discussion

These investigations of the comprehension, repetition, and spontaneous production of negative possessive forms show that there is correspondence between the levels of development in each. However, the relationship between spontaneous production and comprehension and repetition is not simple, because the children who do not produce the mature form 'hasn't got' are able to repeat and understand it, though not as well as those who do produce it. Thus, it is noted that the least mature group, HGN, had in effect ten opportunities to use 'hasn't got' and never used it once. They also had two opportunities to understand this form and did so correctly ten out of twelve times. And they had two opportunities to repeat this form and did so correctly five out of twelve times. In contrast, the HG group, who all produced 'hasn't got' at least once, were

able to comprehend this form correctly fourteen out of fourteen times and repeat it correctly eleven out of fourteen times. In some ways the third group, GN, is the most interesting because they never produced 'hasn't got' yet they were able to understand it correctly fifteen out of sixteen times and repeat it correctly eleven out of sixteen times.

In the case of HGN it is reasonable to say that these children's comprehension is more advanced than their production because they do not produce the mature form that they understand fairly well. The case of the GN group is slightly different because adults do use 'got no' whereas they do not normally use 'no' or 'hasn't got no'. So although the GN group can understand 'hasn't got' well the fact that they do not produce it does not make their production less advanced than their comprehension. These children are quite possibly able to produce 'hasn't got' but they choose to produce 'got no'. The proximity of the GN and HG groups in repetition and comprehension is consistent with the supposedly equivalent maturity of 'hasn't got' and 'got no'. HGN children appear to have a schema for understanding predicate negation of 'got' but not one for producing it, which is evidence of some disparity between comprehensive and productive abilities. GN children appear to have a schema for understanding predicate negation of 'got', and they may have a schema for producing it but they prefer to use nominal negation.

In both cases the diversity of comprehensible forms is greater than the diversity of produced forms, but only in the case of the HGN children is it reasonable to say that this disparity is evidence of some limit to the ability to produce utterances.

There is a general trend in these results for comprehension to be superior to repetition. This is shown by the figures in Table 19 which gives the percentage scores of the three groups on repetition and comprehension. The HG group understood the six selected questions forty-one out of forty-two times (6 questions by 7 children) and this proportion yields a percentage of 97.5. The other percentages were computed in the same way and those for repetition were based on the first five phrases including negative possessive forms.

Table 19: Percentage scores for the three groups of children on the comprehension and repetition tasks.

Task	Group		
	HG	GN	HGN
Comprehension	97.5	96.0	75.0
Repetition	77.0	67.5	36.5

This apparent superiority of comprehension over repetition is inconsistent with the superiority of imitation over comprehension found by Fraser et al. (1963) and

Tumer and Rommetveit (1967). It is quite likely that this inconsistency arises from the different tasks used to measure comprehension and repetition. For instance, the fact that a sequence of phrases was used in the repetition task could have contributed to the children's difficulty in repetition. These findings do suggest that comprehensive^{8/8} and repetition abilities in young children need further study before any definite statements can be made about their relative developmental levels.

The investigations of 'only' and 'just' with 'got' show that sometimes children can repeat and produce forms which they do not comprehend exactly. The repetition task made use of 'only' while 'just' was used in the comprehension task. Thirteen out of twenty-one children repeated 'only got' correctly while nine out of twenty-one understood 'just got' correctly. Now this proportion of children understanding 'just got' could have easily occurred by chance, so a second question Which house has only got a door? was given to the sixteen children available. Five of these sixteen had got 'just got' right and four of these sixteen got 'only got' right. These proportions could have easily occurred by chance, however, three children got both 'only got' and 'just got' right. This indicates that only a small proportion of the children who repeated 'only got' understood the real meaning of this form.

Taking all these findings together it looks as though there is no universal order of ability in repetition,

comprehension and production. The order obtained appears to depend on the form of utterance investigated, the tasks used to measure these abilities, and the child's level of development.

The reason for investigating the repetition and comprehension of negative possessive forms was to obtain some information which would help decide if the children's production was limited in some way. As far as the description of action scenes is concerned it was established that, although the production of full sentences could be manipulated by varying the linguistic and non-linguistic context, some of the children exhibited a general tendency of producing predicates or less complex utterances rather than full sentences. This behaviour is indicative of the existence of some limit to productive complexity if one assumes that all utterances are derived from a full sentence structure in production. If there is such a limit it should affect the development of different kinds of utterances approximately equally. An investigation of the developmental correspondence between utterances used to describe action scenes and utterances used to describe missing parts suggested that there was no general limit to productive complexity. However, the fact that the children were free to produce whatever language they felt appropriate to use in the description of missing parts, and the fact that such a diversity of forms was used meant that the samples collected might not

have been reliable indicators of developmental level. The investigations of repetition and comprehension have confirmed the reliability of these speech samples by showing that the children who did not produce mature forms were less able at comprehension and repetition than those who did. Therefore, it seems that the evidence collected so far indicates that at this age there is no general limit to productive complexity and that the development of different kinds of utterance can proceed independently. But it also indicates that children of this age can understand a form of negation that they do not appear to have the ability to produce, a finding that might suggest the operation of some limit to productive complexity. However, this discrepancy may be viewed as an aspect of the commonly observed discrepancy between human perceptual and recognition abilities and recall and constructive abilities. Just as we can, with a certain amount of learning, understand more of a second language than we can speak, it is reasonable to suppose that the child may develop the skills for understanding utterances before he develops the skills for producing them.

Chapter 6

Hasn't got no and Riding on

Introduction

This chapter pursues a certain line of thought arising from the previous experiments. For the most part it amounts to an analysis of data already collected, but there is one new investigation at the end.

As the title suggests this chapter is concerned with the two forms, 'hasn't got no' and 'riding on'. 'Hasn't got no' was produced in the description of missing parts, while 'riding on' was used in the description of certain actions in the basic discourse agreement experiment in Chapter 3. Both forms stand out because they are unusual in adult English and because they appear to be structurally excessive.

'Hasn't got no' is structurally excessive in that it has two negation items where one is enough. According to Bellugi (1967) this kind of double negative arises when the child starts to use negative quantifiers and pronouns. Thus the children she studied went through a distinct phase of producing utterances like he can't have a cake and he can't have some cake, in which there is only one negative element in the verbal component, before they produced double negative utterances like he can't have no cake. These children apparently shifted from nominal to predicate negation completely before acquiring

negative pronouns and quantifiers. However, the children studied in these experiments did not show such a complete shift from nominal to predicate negation. For example, they were producing forms like 'got no' and 'got none' as well as the form 'hasn't got' as though these were alternatives. The absence of a definite shift means that the form 'hasn't got no' may have another origin besides that proposed by Bellugi. It is suggested that this form may occur as a transitional form in the development of 'hasn't got'. And it is further suggested that 'hasn't got no' constitutes an undifferentiated assimilation of the various forms the child hears, namely, 'no', 'got no', and 'hasn't got' which disappears as these individual forms become clearly differentiated.

It is this idea of undifferentiated assimilation that links 'hasn't got no' to 'riding on' because this form could also constitute the global acquisition of a number of forms. 'Riding on' is structurally excessive in that it is enough to say the boy is riding a bicycle rather than the boy's riding on a bicycle as many children said. In this case 'on' is the extra or redundant element that does not normally occur in this kind of utterance, although it does occur in the related utterance he's having a ride on a bicycle. The children also produced utterances like she's riding on a rocking horse and he's climbing up the ladder. In the latter utterance, 'up' is relatively redundant since you climb (up) something and come down it. But just as 'up' makes the direction

of movement explicit in this case, 'on' may make the location of the action explicit in the others. The structural excess of 'riding on' is more definitive than that of 'climb up', and since there are two pictures that elicit the 'riding on' form this investigation is confined to 'riding on', and the pictures of a girl on a rocking horse and a boy on a tricycle in Experiment 2.

Ervin-Tripp (1971a) says that children tend to use first those parts of adult utterances that regularly come at the end. For example, Susan's (Miller and Ervin 1964) use of 'on' and 'off' in her two word utterances is a demonstration of this kind of behaviour since these words do come at the end of some adult utterances, such as put your coat on. This use of terminal words is consistent with the serial learning effect whereby children with limited grammatical knowledge would only be able to retain the last few words of adult utterances in short-term memory. This means that children would be more likely to learn terminal words first. Ervin-Tripp finds that when a verbal unit is composed of a verb and a locative element, and the verb is somewhat redundant as in 'sit down', children are likely to use the locative element rather than the verb in their early utterances. For example, young children often say 'down' when they want someone to join them on the floor.

This use of terminal words was observed in the children's descriptions of missing parts, as in wheel's off

and eye out. The children also produced longer utterances which seemed to be expansions of these two-word forms, for example, he's got two wheel's off, a wheel's broke off, it's a tap come off, and a plug's lost off. In the same way it could be that the children begin by saying 'no', which is expanded into 'got no' and then sometimes into 'hasn't got no' on the way to 'hasn't got'. Now 'on' occurs at the end of many adult predicates so it is possible that children first produce utterances like man on and then develop these into utterances like man get on, man sit on, man go on. Children will hear utterances like he's riding the bicycle and he's on the bicycle, and probably some like he's riding on the bicycle, too, sometimes. Therefore, in progressing from using just 'on' to using 'riding' or 'on' it is likely that the children produce 'riding on' more often than adults do as a step in the differentiation of the two forms. In the same way, as children progress from using just 'no' to using 'no', 'got no', or 'hasn't got' they may produce the irregular form 'hasn't got no' as a step in the differentiation of these alternative forms.

The work done with negative possessive forms indicates that 'hasn't got no' is an immature form relative to 'hasn't got'. The following investigation was intended to find out if 'riding on' was an immature form relative to 'riding' too, and if those children who produced 'riding on' were also the ones who produced 'hasn't got no'.

To investigate these hypotheses the usages of the various forms in answers to the questions about the picture of a boy on a tricycle and a girl on a rocking horse were worked out. Then a comparison was made between the use of these forms at three and six years of age. The findings are presented under several headings, as follows:

Riding and Riding On at six years of age

The picture of the boy on a tricycle is henceforth referred to as context TR and the picture of the girl on a rocking horse is referred to as context RH. Since the children were asked two questions that were likely to elicit predicates, namely WH and WD, each child had two opportunities per context to produce the forms this analysis is concerned with.

The data for the older group were examined first and the results are shown in Table 20. For each context a list of the forms used in it and the number of children using each form is given. There were fifteen six and seven year olds but since the children could use more than one form in each context the numbers sum to more than fifteen.

For context TR there is a simple distribution of 'on', 'riding on', and 'riding', but for context RH there are also the forms 'rocking on' and 'rocking'. Fourteen out of fifteen children used 'riding' in context TR and this is clearly the predominant form for this context. 'Riding' was used more often than any other form in context RH but not quite as often as it was used in context TR.

Table 20: Numbers of children using the various forms given in answers to WH and WD in contexts TR and RH. Data for fifteen six and seven year olds.

<u>Answer Form</u>	<u>Context TR</u>	<u>Context RH</u>
On	1	3
Riding on	3	4
Riding	14	9
Rocking on	0	3
Rocking	0	4

Riding and Riding On at three years of age

Thirty-nine three and four year old children contributed to this part of the analysis and their use of the various forms in contexts TR and RH is shown in Table 21. This table shows that in context TR the younger children used 'riding on' and 'riding' equally often, while 'on' was used infrequently. However, in context RH they used 'on' much more often, and they used 'riding on' slightly more often than they used 'riding'.

The behaviour of the children at the two age levels is similar in that both groups tended to use 'riding' more frequently in context TR than in context RH, but it is different in that more of the three year olds used 'riding on'. The differences in usage between the ages were evaluated using fourfold tables and chi-square. Thus, in context TR twenty of the thirty-nine three year

Table 21: Numbers of children using the various forms given in answers to WH and WD in contexts TR and RH. Data for thirty-nine three and four year olds.

Answer Form	Context TR	Context RH
On	5	15
Riding on	20	16
Riding	21	10
Rocking on	0	5
Rocking	0	1

olds used 'riding on' and nineteen did not, while three of the fifteen six year olds did and twelve did not. The fourfold table for these figures has a lowest expected frequency of 6.38 so Yates' correction for continuity was needed. The hypothesis is that the younger group used 'riding on' more often than the older group so a one-tailed probability value may be used. McNemar (1962:227) suggests that in this situation when there is also one degree of freedom, it is reasonable to use a one-tailed probability for chi-square, obtained by selection of the chi-square value for double the level of significance being used. On this basis the sample distribution is significant ($\chi^2 = 3.15$, 1 d.f., p less than 0.05) in which case the hypothesis is supported. However, there was not a significant difference between the ages in the use of 'riding on' in context RH ($\chi^2 = 0.44$). There were

also no significant differences between the ages in the use of 'on' ($RH: \chi^2 = 0.93$. TR: Fisher exact probability test; p greater than 0.3). But the differences between the ages in use of 'riding' were both significant ($TR: \chi^2 = 5.77$, 1 d.f., p less than 0.02. $RH: \chi^2 = 4.2$, 1 d.f., p less than 0.05). As the use of 'riding on' was predicted to decrease between three and six so the use of 'riding' should increase, and the results confirm both predictions.

This analysis demonstrates a change in answering behaviour to WH in these particular contexts between the ages of three and six years. However, the changes in the two contexts were not identical and the use of 'riding on' and 'riding' appeared to depend on the context being shown. Further statistical analysis was carried out on the three year old's data using McNemar's test for the significance of changes (1962:224). The difference in use of 'riding on' between the contexts was not significant ($\chi^2 = 3.31$). But the difference in use of 'on' between contexts was significant ($\chi^2 = 4.05$, 1 d.f., p less than 0.05) and so was that for 'riding' ($\chi^2 = 6.66$, 1 d.f., p less than 0.01). Therefore, the two contexts definitely did elicit similar but not identical behaviour.

Riding On and the development of language describing action scenes at three years of age

The next step in this investigation is to find out if the use of the various forms in contexts TR and RH

bear any relationships with the children's level of development in the language used to describe action scenes. In other words, do those children who produced predicates in answer to WH tend to use 'riding on' rather than 'riding'? And do those children who produced full sentences in answer to WH tend to use 'riding' rather than 'riding on'?

To find this out the two groups, A and B, used before in Experiment 8 were reanalysed to see if the more mature group B used 'riding' more often and 'riding on' less often than group A. Group A included twelve children who produced no noun subjects and not more than four pronoun subjects in their answers to WH, while group B included twelve children who produced at least two noun subjects and any number of pronoun subjects. Table 22 shows the numbers of children in each group who used the various forms under consideration. The use of the forms was combined across questions, WH and WD, and contexts, TR and RH, in this case.

Table 22: Numbers of children using various forms in answer to WH and WD in contexts TR and RH combined. The children are divided into two groups according to to their level of development in answering WH (B more advanced than A).

<u>Answer Form</u>	<u>Group A (N=12)</u>	<u>Group B (N=12)</u>
On	6	4
Riding On	9	6
Riding	5	8
Rocking On	3	2

The pattern of results in Table 22 conforms with expectation since more children in group B used 'riding' while more children in group A used 'riding on', however none of the differences in usage is significant (in no case is χ^2 greater than 1.00).

Riding On and Hasn't Got No

In order to find out if the children who used 'riding on' were also the ones who used 'hasn't got no', further use was made of the three groups, HG, GN, and HGN, from Experiment 9. These groups were distinguished on the basis of the most mature forms produced by the children in their descriptions of missing parts. HGN contained six children who used 'no' or 'hasn't got no' but not 'got no' or 'hasn't got'. GN contained eight children who used 'got no' but not 'hasn't got', while HG contained seven children who used 'hasn't got' as well as other forms. Since this particular investigation deals with the relationship between the utterances produced in Experiments 2 and 8, there are more children available and now the groups are enlarged. HGN now has nine children, GN has eleven, and HG has eight.

Table 23 shows the various forms used in contexts TR and RH combined, and the numbers of children in each group who used them. The pattern of results does not reflect any systematic relationship between the language used to describe missing parts and the language used to describe actions in contexts TR and RH. Furthermore, if the two contexts are considered separately there is still

no relationship to be found, even though TR seems to be more sensitive to the transition from 'riding on' to 'riding' than RH.

Table 23: Numbers of children using various forms to answer the questions WH and WD in contexts TR and RH combined. The children are divided into three groups according to the level of development of their answers in the missing parts test (HG and GN more advanced than HGN).

Answer Form	HGN (N=9)	GN (N=11)	HG (N=8)
On	5	7	2
Riding On	6	8	5
Riding	5	6	5

The previous investigation of the relationship between language used to describe missing parts and language used to describe actions failed to show any connection between them. And now this investigation of a specific aspect of the language used to describe actions has also failed to find any correlation between them. Therefore the language used to describe missing parts appears to be developing independently of the language used to describe actions. The children who use 'hasn't got no' are not the only ones to use 'riding on' even though there is evidence that both forms are immature.

Experiment 10--Riding On and the Discrimination of
Phrases of Certain Action Sequences

Introduction

From a communication point of view, 'hasn't got no' and 'hasn't got' are equally effective in describing missing parts. The meaning of these two forms appears to be the same although their structure is different. And their meaning appears to be the same because they are used in the same context to describe the same kind of event. This does not seem to be quite so true for 'riding on' and 'riding' because their usage was found to be related to the context of production. There is a difference between the contexts TR and RH in that, when a child rides a tri-cycle, he actively pedals it to make it move along. Whereas when a child rides a rocking horse his movement makes the horse move, but the horse does not move along the ground. It is possible that the greater use of 'on' in context RH and the greater use of 'riding' in TR reflect this difference between the actions. 'Riding' appears to express movement whereas 'on' expresses location. This hypothesis would be supported if 'riding' was used more often to describe a person riding a real horse than someone on a rocking horse. And if this hypothesis is supported it would suggest that 'riding on' has a dual meaning, covering both movement and location.

To investigate this hypothesis a new experiment was devised in which the children were shown pictures of people

getting on, being on, and moving on three kinds of transport. These three kinds of transport were a tricycle and a rocking horse as before, and a real horse as well. It was predicted that the children would tend to use 'on' to describe being on or the mounted state, and to use 'riding' to describe the moving state. It was further predicted that 'riding on' would be used to describe both of these states, and that this form would be used more often in the descriptions for the rocking horse sequence than for the other two.

Method

Material: The material for this experiment is shown in Appendix 7. There are three picture sequences as follows. The first concerns a girl and a rocking horse; the second concerns a boy and a tricycle; and the third concerns a girl and a horse. These picture sequences each consist of three pictures. In the first picture of each sequence the person is shown mounting; in the second picture of each sequence he or she is shown in the mounted position, and a second person is shown in the same position relative to the rocking horse, tricycle, or horse to indicate that movement has not yet occurred; in the third picture of each sequence the person is shown moving by displacement of his or her body and the object being ridden. It is advisable to study the pictures in the appendix to understand the organisation of the pictures. As before, this material was drawn in colour by the author.

Subjects: The sixteen children for this experiment all came from the nursery school, and all but one of them had done Experiment 2. This was the last experiment carried out, and since it was only a few weeks since the research was begun at the school, the ages of the children had changed little. The mean age of the sixteen children at the time of this experiment was three years and ten months.

Procedure: Each child was told that he or she was going to see a story in pictures, and this was done to encourage perception of the pictures as integrated sequences. As each sequence was presented the experimenter pointed to the first picture and asked What's happening there?. Then when the child had given an answer for this picture the same question was asked of the second picture, and then of the third picture. The three sequences were presented in the same order to all children, that is, girl and rocking horse, boy and tricycle, and girl and horse.

Results

Most of the children gave satisfactory answers for each picture but 'riding on' occurred much less frequently than it had in Experiment 2. Here it was used sixteen times whereas 'riding' was used thirty-two times. This was not the result of subject selection because eleven of the children had used 'riding on' before whereas only seven of these did so now. None of the five who did not use it before used in here. This change in behaviour is further evidence of a developmental progression from 'riding on' to 'riding' at this age.

There was a great variety of answers produced in this experiment and a scheme was drawn up for classifying them as indicating either mounting, or mounted, or moving. 'Riding on' was put as a separate class, but 'on' was put in the mounted class and 'riding' was put in the moving class. This scheme is shown below with examples of the forms belonging to each class.

1. Mounting--for example, 'getting on', 'trying to get on', and 'climbing on'.
2. Mounted --for example, 'got on', 'sitting on', and 'got up'.
3. Moving --for example, 'riding', 'going', and 'rocking'.
4. Riding On--

Table 24 shows the numbers of children using each class of form to describe each phase of the three sequences. The phases are labelled mounting, mounted, and moving, to correspond with the three pictures of each sequence. Table 24 also shows the usage of the four classes of form for the three sequences combined. Thus, fourteen children used a mounting form to describe mounting in the rocking horse sequence; ten used a mounting form to describe mounting in the tricycle sequence; and fourteen used a mounting form to describe mounting in the horse sequence. The combined usage of mounting forms to describe mounting is fifteen, which means that fifteen children used a mounting form to describe mounting in one or more of the sequences.

Table 24: Four classes of answer to WH and the numbers of children using each class to describe each of three phases of three action sequences. Values are given for each sequence separately and for all three sequences together (N=16).

	<u>Answer Form</u>	<u>Sequence Phase</u>		
		<u>Mounting</u>	<u>Mounted</u>	<u>Moving</u>
<u>Rocking Horse</u>	Mounting	14	1	0
	Mounted	0	6	3
	Moving	1	4	9
	Riding on	1	4	2
<u>Tricycle</u>	Mounting	10	1	0
	Mounted	1	7	3
	Moving	1	8	8
	Riding on	2	0	1
<u>Horse</u>	Mounting	14	0	0
	Mounted	1	10	3
	Moving	0	3	10
	Riding on	1	3	2
<u>Combined Sequences</u>	Mounting	15	1	0
	Mounted	1	13	7
	Moving	2	9	13
	Riding on	2	5	3

The results in Table 24 show that the children generally discriminated the three phases of each sequence. Mounting forms were generally used to describe mounting and moving forms were generally used to describe moving. In between, mounted was described with both mounted and moving forms suggesting that the children found it difficult to distinguish being on from going on, as it were. These results were analysed statistically using a chi-square for correlated proportions (McNemar 1962:227), in which Q follows the χ^2 distribution with $C-1$ degrees of freedom. C is the number of correlated proportions, which is three in this case. For example, the use of a mounting form to describe the three phases of the first sequence is correlated in the sense that the same subjects are describing each phase. For each analysis each form is taken relative to the use of any other. For instance, the use of the mounting form in the first phase is contrasted with use of any other form. The analyses show that use of mounting forms was significantly associated with the first phase in all three sequences (rocking horse, $Q=25.7$; tricycle, $Q=18.2$; horse, $Q=27.2$; all 2 d.f. and p less than 0.01). Next, the use of mounted forms showed a significant degree of association with the second phase of all three sequences (rocking horse, $Q=7.7$; tricycle, $Q=9.3$; horse, $Q=12.3$; all 2 d.f. and p less than 0.02). Finally, the use of moving forms showed a significant degree of association with the third phase in all three sequences (rocking horse, $Q=10.0$; tricycle, $Q=9.8$;

horse, $Q=15.8$; all 2 d.f. and p less than 0.01). Given that the sample size of sixteen is smaller than it should be for compatibility of Q with chi-square (McNemar suggests N greater than 30), the probability values are likely to be greater than indicated. However, the overall variation in behaviour shows, without much doubt, that the children matched their answers to the phases.

Given that the children generally discriminated the three phases of the sequences the use of 'riding', 'on', and 'riding on' may now be examined. The usage of these forms may be given in two ways; firstly, as the number of times a form was used to describe a phase, and, secondly, as the number of children using a form to describe a phase. The two kinds of usage of the three forms were worked out and they are shown in Table 25. Both measures of usage indicate that 'on' and 'riding' were used differently to 'riding on'. Whereas 'on' and 'riding' were primarily used to describe the mounted and moving phases, 'riding on' was used to describe all three phases. In terms of meaning, it looks as though for these children 'riding' means being on and moving but not mounting, while 'on' appears to mean being on and probably moving but not mounting. On the other hand, 'riding on' was used as though it meant getting on, being on, and moving.

Table 25: Use of three forms to describe three action sequences, expressed as (a) the number of times each form occurred in the descriptions of each phase, and as (b) the number of children who used each form to describe each phase.

(a) number of occurrences

<u>Answer Form</u>	<u>Sequence Phase</u>		
	<u>Mounting</u>	<u>Mounted</u>	<u>Moving</u>
On	2	10	5
Riding	1	14	18
Riding on	4	7	8

(b) number of children

On	1	6	5
Riding	1	9	11
Riding on	3	5	4

This pattern of behaviour is not as predicted for it was hypothesized that the children would be more likely to use 'on' to describe the state of being on or mounted, and to use 'riding' to describe the state of going on or moving. Although this invalidates the supposition that 'riding on' would be different from both 'on' and 'riding' in encompassing both their meaning, the fact that 'riding on' was used to describe mounting to a much higher degree compared to 'on' and 'riding', does show that its meaning was less specific than that of the other two forms. So it is still

reasonable to say that 'riding on' has a less well differentiated usage and meaning, and therefore that it appears to be an immature form relative to 'riding'.

A difference in the distribution of forms produced between the contexts TR and RH was noted before, and this difference is maintained in the present experiment. Combining the data for the second and third phases it is found that in the tricycle sequence ten children used 'riding' and only one used 'riding on', but in the rocking horse sequence it is found that seven children used 'riding' and six used 'riding on'. It was predicted that the children would use more 'riding' forms in describing the horse sequence than in the rocking horse sequence because real horses move along the ground but rocking horses do not. In fact, in the horse sequence ten children used 'riding' and five used 'riding on'. This distribution appears to be halfway between that for the tricycle and that for the rocking horse sequence, as though the children were compromising between horsiness and movement along the ground.

Conclusion and Discussion

This series of investigations has consistently shown 'riding on' to be a less mature form than 'riding', which parallels the finding that 'hasn't got no' is less mature than 'hasn't got'. This is interesting because both immature forms are structurally excessive, which means that the development of these particular aspects of language is not simply an accumulation of surface structure. Furthermore,

use of these immature forms is not correlated in the sample studied, a finding that confirms the previous conclusion that the language used to describe actions is developing independently of the language used to describe missing parts. In turn, this pattern of development is inconsistent with the idea that the utterances produced in these early years of development are generally restricted by some kind of limit to productive complexity.

The observations collected suggest that there is a shift from 'riding on' to 'riding' in the age range studied. 'Riding on' was not the only form to include 'on' in this way; there was 'rocking on' too. Although there were only a few cases of 'rocking' and 'rocking on' at both ages, there was a higher proportion of 'rocking on' forms at three years of age than at six (see Tables 20 and 21). Not much weight can be attached to the latter shift on its own, but it does correspond with the more definitive shift from 'riding on' to 'riding'. Looking back in time it is assumed that most of these children were once saying just 'on', which means that 'riding on' must have increased in frequency some time during these children's past development as now it seems to be decreasing in frequency.

These shifts in the general pattern of behaviour could reflect two possible modes of individual change of behaviour: either each child changes from one form to another and the time at which each child does this varies; or each child has a repertoire of several forms and the general change in behaviour reflects changes within individual repertoires as some forms increase and some forms

decrease in frequency. The first mode would presume a lesser degree of individual variation in behaviour in any point in time than the second mode. Examination of the answers used to describe missing parts revealed considerable variety in individual behaviour, and the degrees to which the various forms occurred together in children's answers were all within the range of chance association. The same is true of the behaviour of the children in the two contexts TR and RH: the children tended to use a variety of forms, and when the co-occurrences of 'on', 'riding on', and 'riding' were computed it was found that the degrees to which these forms occurred together in the children's answers were all within the range of chance association. These findings with two quite different constructions and contexts show that the second mode of individual development is more tenable than the first because of the degree of variety of individual children's answers.

Shifts in behaviour with context have been observed, as well as shifts in behaviour with age. A good example of a context-dependent shift comes from the last experiment in which the proportions of 'on', 'riding on', and 'riding' produced were found to be a function of the picture content or non-linguistic context. The pictures of a boy and tri-cycle elicited a higher proportion of 'riding' forms, whereas the pictures of a girl and a rocking horse elicited a higher proportion of 'on' forms.

These shifts in behaviour with age and context indicate that the linguistic ability of utterance production is

a system that relates the linguistic and non-linguistic context as input to the utterances produced or output in an extremely complicated way. These children have not behaved as though they possess a set of rules which abruptly changes from time to time, and nor have they behaved as though the input was related to the output through a set of discrete stimulus-response connections. Instead, they have behaved as though the utterances produced were systematically related to the input such that a slight change in the input caused a change in the relative frequencies of the output utterances. A major change in the input, such as a different kind of picture and a different question, causes a major change in the output such that the frequencies of some utterances effectively decrease to zero while those of others increase from zero. In the same way age appeared to result in changes of the relative frequencies of utterances, some increasing and some decreasing. Furthermore, the children have behaved as though there is interaction on the output side as well as on the input side. Not only do various contextual factors appear to have interacted to determine the set of utterances produced and their relative frequencies, but the utterances themselves appear to have interacted. Thus, the children did not just produce copies or shortened copies of adult utterances, they also produced their own adaptations of adult utterances. Sometimes these adaptations appeared to reflect interaction between alternate plans or schemas for producing utterances, as when children produced 'got not' rather than 'not got' or 'got no'. This

kind of interaction seems to explain the occurrence of 'riding on', and it provides an alternative explanation of 'hasn't got no' than that of grammatical development in the scope of negation.

Chapter 7

Conclusion

Aims

The aim of this research was to investigate children's utterance production in order to find out more about the psychological processes involved in utterance production and any restrictions that affect utterance production in childhood. This research is different from most studies of language development because it does not set out to describe children's knowledge of language in terms of grammars. The reason for not adopting this approach is based on certain arguments concerning the distinction between competence and performance as it is represented in the distinction between knowledge and use of knowledge. Essentially, the argument is that in any reasonable psychological account of linguistic abilities there is no need to make this distinction, and in fact, it is sometimes considered unrealistic to do so.

There are plenty of grammatical descriptions of child and adult language but few theories of utterance production. Furthermore, the theories of utterance production that do exist are either controversial or tentative, therefore this research is necessarily exploratory.

Methods

A child may speak spontaneously or repeat the utterances of another person, which means that there are two

basic methods of investigating utterance production. This research has made use of both repetition and spontaneous speech, with emphasis on the latter because it does not involve memory to the extent that repetition does.

The children's spontaneous utterances were obtained in two ways. To some extent these were obtained by observation of the children's ordinary conversation, but to a much greater extent they were obtained by experimental manipulation of the context of speech. The linguistic context was varied by asking the children different questions and the non-linguistic context was varied by showing the children different pictures.

The children were mainly of preschool age, an age that has been less thoroughly studied than the preceding years when language is in its earliest stages. The children were not used as, or taken to be, a representative sample of children of this age, or of children living in the locality where the research was carried out. However, the numbers of children used tended to be larger than those used in the studies of the earlier stages of language development.

Summary of Findings

The first experiment investigated the model and hypothesis of language structure proposed by Yngve. According to his model short-term memory is a crucial factor in determining the size and complexity of utterance a person can produce. The applicability of his model to children's utterance production was investigated by

measuring a group of preschool children's auditory-verbal short-term memory capacity and their ability to repeat sentences varying in depth. There was a significant positive correlation between these two variables, which was to be expected since both involve memory, but the pattern of correlation did not support the depth hypothesis. In other words, the errors made in repetition were not consistently those expected on the basis of the depth hypothesis. Furthermore, examination of the children's spontaneous speech showed that some of them were producing utterances of greater depth than their short-term memory capacity would allow, if they were behaving like the model. These findings confirm some recent research with adults that found no evidence in a similar experiment to support the applicability of the model and the depth hypothesis to human utterance production.

It was noticed in the first experiment that the children produced a good many non-sentence utterances, most of which were elliptic forms that are common in ordinary conversation. The next piece of research (Experiments 2 and 3) investigated the production of two of these elliptic forms and a full sentence form in order to learn something of their relative productive complexity. These forms were elicited by asking the children questions about simple actions so that these questions and the desired forms of answer exhibited discourse agreement. The questions were labelled WH, WD, and WO. Productive complexity was evaluated in four ways. The first index of productive complexity

was the latency between the experimenter's question and the child's answer, and the second was the rate of article omission in the different forms. The third index was concerned with the changes that took place in answering behaviour during the experiment, changes that were assumed to result from the repetitive nature of the task or fatigue. The fourth index was concerned with the changes that took place in answering behaviour as the children were taught to answer the questions with discourse agreement. Although these four different ways of evaluating productive complexity did not entirely agree it was concluded that the three forms of utterance studied appeared to have equivalent productive complexity.

The three forms of utterance investigated in Experiment 2 were a full sentence form like he's riding the bike, labelled FS, a predicate like riding the bike, labelled P, and a direct or indirect form like the bike, labelled O. These three forms vary in length but since they appear to have equivalent productive complexity utterance length does not appear to determine productive complexity. The three forms also vary in the complexity of their grammatical derivation. In transformational grammar answers P and O, being elliptical, are derived from full sentences by deletion transformations. This means that the two elliptic forms are derivationally more complex than the full sentence form. If production corresponds with grammatical generation and productive complexity with derivational complexity, the two elliptic forms should show greater

productive complexity than the full sentence form, but they do not. Therefore, these findings do not support any direct correspondence between generation and production, and they indicate that transformational grammar may not be altogether satisfactory as a basis for a model of human utterance production. The other theory considered was Schlesinger's theory of utterance production which he says is only tentative. This theory has been applied to the two-word utterances of young children and so its present application to more complex utterances is only tentative too. If Schlesinger's original ideas of realisation rules are adhered to a full sentence form should have greater productive complexity than elliptic forms like P and O. However, it was suggested that his ideas be modified so that there could be one complex realisation rule for processing basic utterances like the agent-action sentence studied in these experiments. If this modification is tenable, the revised theory would predict no differences in productive complexity between FS, P and O, as seemed to be the case. It was concluded that neither transformational grammar nor Schlesinger's theory of utterance production account for the findings exactly, but Schlesinger's shows a closer fit.

In Experiments 2 and 3 the children behaved with discourse agreement and yet some of them did not give full sentence answers to WH as would be expected. The training experiment showed that the number of full sentence answers could be increased as much as the others to raise the general level of discourse agreement, which suggests that

the production of full sentence answers was not being restricted by any kind of limit to productive complexity. In which case, there remains the question of why some children did not produce full sentence answers to WH. The subsequent investigations (Experiments 4, 5, 6 and 7) attempted to find out if and how the production of full sentence utterances could be increased by varying the linguistic and non-linguistic context. Some attempts to increase full sentence production were successful and so it was concluded that there was unlikely to be any formal constraint on the complexity of utterances. In particular, it was found that the children produced more full sentence answers to WH when the agents were animal rather than human. This pattern of behaviour seemed to reflect the greater interest value of animals than people in pictures.

The next piece of research (Experiments 8 and 9) was based on the assumption that if the children's utterance production was being affected by some kind of constraint on productive complexity, this constraint would affect the various constructions used by the children such that their development of these constructions would show a definite correlation. Whereas the preceding research had been concerned with the children's descriptions of simple actions, this research investigated their ways of describing missing parts. This kind of task was chosen to elicit utterances involving negation, given that these should have greater productive complexity than the affirmative utterances used to describe actions. Unfortunately,

the probable influence of discourse agreement invalidated any comparison of the rates of subject production in the two kinds of utterance, but an anecdotal exploration suggested that some children were producing full sentences with negation, who had produced few or no full sentences in their descriptions of actions. Furthermore, the study showed that the development of language used to describe actions did not correlate with the development of the language used to describe missing parts. Therefore, it was concluded that whatever it was that led some children to not produce full sentences in answer to WH, it was unlikely to be a constraint on productive complexity.

One of the arguments in favour of there being a limit in productive complexity is the disparity between comprehension and production. It is often said that young children understand more than they speak, and this disparity is taken to mean that the child's knowledge of linguistic structure is greater than is apparent in his utterances. It is supposed that some reductive process is occurring that limits the expression or manifestation of this knowledge in speech. Therefore it was decided to investigate these children's abilities to understand and repeat the kinds of negation that some of them were producing to find out if the children, who produced immature forms, could understand and repeat the mature forms as well as the children who produced the mature forms. The results were not clearcut, but there was evidence that the children, who produced immature forms, were generally less able in

comprehension and repetition than those who produced mature forms. However, this difference in abilities did not result from greater difficulty with forms more advanced than those being produced. This would appear to be the only strong evidence resulting from this research that supports the role of a limit to productive complexity in early utterance production. However, it was emphasized that this difference between comprehension and production could reflect the normal lag in learning between perceptual and reconstructive skills rather than any distinct constraint on productive complexity.

The final piece of research involved the further analysis of some results already collected and the tenth and last experiment. This research investigated the nature of and connection between two unusual forms, 'hasn't got no' and 'riding on'. The results confirmed the lack of correlation between the children's development of language for describing actions, and of language for describing missing parts. Both of these forms are structurally excessive, a characteristic that appears to be inconsistent with the idea of a limit to productive complexity. Moreover, these forms seem to appear in development before simpler forms, that is 'hasn't got' and 'riding'. It was concluded that these forms could have arisen as a result of the gradual transition from one simple form to a variety of forms. These forms seemed to represent the early stages of learning when the variety and complexity of the language being learned is simplified, and different but related forms are

insufficiently differentiated.

Discussion--Towards a theory of utterance production

The term, productive complexity, has been used rather loosely to refer to any characteristics of utterances that makes them more difficult to produce. The research originally concerned itself with those kinds of characteristics that derive from structural considerations of language. For instance, the notion of sentence depth is closely related to a certain kind of phrase structure grammar.

Although transformational grammar is not a theory of utterance production but a theory of language, it would be unreasonable to ignore it in any investigation of utterance production. However, the predictions about productive complexity based on transformational grammar have not been confirmed, which means that it seems to lack a certain degree of psychological realism as a theory of production. Transformational grammar has two major drawbacks as a theory of production. Firstly, it deals with language in abstraction. It defines the set of sentences that constitute a language. It describes the structure of sentences in abstract terms, and not the construction of utterances. The fact that it defines a set of sentences by generating these and only these sentences, means that it gives the impression that it is a theory of production, but it is not. Now it was argued that transformational grammar might make a good starting point for the development of a theory of production, but there is no a priori

reason that what is the most simple, explicit and systematic description of the sentences of a language should also be the most psychologically valid or realistic theory of language behaviour. This is apparent in the fact that a theory of utterance production must, as Schlesinger says, describe how the speaker's intentions become words. But transformational grammar is not a theory of behaviour and so it does not concern itself with either intentions as input or utterances as output. Chomsky says the grammar would have to be incorporated in any serious theory of language behaviour. Yet, it is very difficult to imagine how it could be incorporated because it is so abstract from behaviour and lacking in a psychodynamic perspective.

The second drawback of transformational grammar as a theory of production is that all utterances are necessarily related to full sentences, because the sentence is the basic unit of language. A sentence may be defined as a group of words that expresses a complete thought. This means that there is a certain amount of psychological sense in taking the sentence as the basic unit of language, because of the connection between sentences and logical and meaningful thought. However, transformational grammar is not based on considerations of meaning or thought but of the regular formal organisation of language. Furthermore, people produce a great many non-sentence utterances, just like the children did in the present research. Elliptic utterances like the answers to WD and WO, may be grammatically related to full sentences, but there is no a priori reason why such

non-sentence forms should be produced from full sentences. The grammatical relationships reflect the psychological relationships between certain concepts, but there is no obvious reason why the speaker should have to encode a complete thought in words when it is his intention to speak or communicate only part of that thought. Schlesinger's theory, in which realisation rules transform the various parts of complete thoughts into complete sentences, shows that, theoretically, the speaker may only encode in language those parts of a complete thought that he wishes to communicate.

The fact that Schlesinger's theory is a theory of utterance production that describes how intentions become utterances, and that it can describe the production of elliptic utterances without the involvement of full sentences means that it seems to have greater potential as a theory of language behaviour than transformational grammar. However, the research did not confirm the predictions about productive complexity derived from his theory either. Since his theory is only tentative and it has only been put forward as an account of early two-word utterances, this outcome is less meaningful than that regarding transformational grammar.

This evaluation of transformational grammar as a theory of language behaviour is important because some of the arguments for the existence of a constraint on productive complexity stem from the grammar and the linguistic theory encompassing it. The grammar is said to represent knowledge of language which is used in various linguistic

abilities as though there is one source of linguistic knowledge that is tapped in both, say, comprehension and production. Miller and Chomsky (1963:422) put it this way: "In proposing models for a user of language - a user who is simultaneously talker and listener - we have assumed that the theoretically significant aspects of verbal behaviour must be common to both productive and receptive functions," and "Once a formal theory of communication or language has been constructed it generally turns out to be equally useful for describing both sources and receivers." These authors do not explain what they mean by the theoretically significant aspects of verbal behaviour, but presumably what is significant for them is what is included in competence, the knowledge of linguistic structure. It is here argued that, from a psychological point of view, the distinction between competence and performance is of questionable value and that all aspects of behaviour have significance for a theory of verbal behaviour. As Halliday (1970) puts it, the distinction between competence and performance is misleading except to the extent that it differentiates what we have been able to describe in the grammar from what we have not.

Miller and Chomsky do not say that most sources and receivers are the same, but that certain principles are usually common to both. They do not mean to say that comprehension is the reverse of production, but that the knowledge of linguistic structure used in comprehension is generally the same as that used in production. However,

such statements have generated some confusion about the psychological organisation of linguistic knowledge. When the discrepancies between children's comprehension and production were used as evidence for the need for separate grammars, Chomsky (1964) said that this represented a misunderstanding of linguistic theory. He gave the impression that there is just one source of linguistic knowledge in the mind, and that production appears less advanced than comprehension because of discrepancies in the use of knowledge and not in the knowledge itself. This reasoning led to the idea that the child's linguistic competence was more accurately assessed by investigation of his comprehension than of his production. It also implies that the child has the knowledge required to speak the utterances he comprehends, but he does not do so because of certain restrictions in the use of this knowledge in production. This is one of the main arguments for some constraint on productive complexity during childhood.

Bloom's research appears to support this conception of linguistic abilities because she found evidence that the deep structure of some young children's utterances was very likely more complex than their surface structure suggested. She reckoned that these children were constrained in what they could say by some kind of sampling process that eliminated certain parts of their utterances during production. However, her findings could also be explained by a theory of linguistic abilities involving learning which assumes no distinction between knowledge and use of knowledge. The

way Bloom uses deletion transformations to describe the sampling process demonstrates the real difficulty in trying to make a distinction between knowledge and its use. For in a dynamic theory of utterance production, the 'knowledge' is active and there is no a priori reason for separating production processes that construct utterances from production processes that eliminate certain parts of utterances. It is not so much a matter of using or not using knowledge, but of having or not having the knowledge or ability to produce an utterance. Against this it could be argued that Bloom's deletion transformations were not rules of grammar because they described the creation of utterances and not sentences. Certainly, the utterances produced by her children were often ungrammatical with regard to adult English, but the children gave no indication that their utterances were linguistically unacceptable to them. Therefore, it would be presumptive to say that their utterances were not sentences in their language.

Comprehension and production are here considered to be related abilities. There may indeed be characteristics that are common to both comprehension and production, but the differences between them are just as important. The differences seem to be especially important with respect to a theory of human communication because of the heuristic nature of some human behaviour. Since the listener can use his knowledge of the meanings of constituent words and of the context of speech to facilitate comprehension, his knowledge of linguistic structure is relatively less

important in comprehension than in production. The present investigation of the negative possessive demonstrates this, for some children were quite able to understand the mature form that they did not produce spontaneously. In this case, a child could understand the mature form just by detecting the presence of negation; its position in the form was relatively unimportant. So he could understand a variety of negative possessive forms while only having sufficient knowledge to produce one simple form involving nominal negation. The fact that some children misinterpreted the trick question including 'any', suggested that they did not know as much about negation as they appeared to, because 'any' was used as a cue for negation when it is anything but a negative operator.

It follows that during development children may often have sufficient knowledge of language to be able to understand utterances but not produce them. This discrepancy between comprehension and production would be consistent with the general difference between human receptive and expressive abilities. For instance, a child learns to read and recognise words before he can spell them. There is a lag between acquisition of the ability to recognise a word and acquisition of the ability to reproduce it. This lag seems to be a fundamental characteristic of human learning and long-term memory.

The limits to human short-term memory are quite apparent in the adulthood and childhood, whereas the limits to long-term memory are relatively unknown. The research

done with the learning of lists of words shows that there may be a limit to long-term memory, which has to do with the capacity of the person to detect or create organisation in the material being learned (Mandler 1969). Learning and remembering lists of words is not the same as learning to talk, yet there is possibly a connection between them. The structure that the learner detects or develops to facilitate recall can be considered as a plan for retrieving information from memory. The more learning has occurred the more complex the plan for retrieving information becomes. In the same way the structure of utterances can be considered as a system of plans for constructing them. The difference is that in recalling a list of words, the learner has one plan that is put into operation by a specific request for recall, whereas the speaker has a system of plans which adapts to his intentions in a highly sophisticated way. Applying this idea to the difference between comprehension and production, it would seem that children may have the ability to understand utterances before they have developed the plans to produce them.

This reasoning is very relevant to Bloom's findings and her idea of the incomplete expression of utterances in speech as a kind of sampling process. Her research suggests that young children are systematically limited in their ability to construct utterances. In terms of plans for retrieving information from long-term memory, her research suggests that in the early stages of development, some of the plans are only capable of encoding part of the speaker's

intention. As development proceeds, these plans can organise utterances of greater complexity such that the speaker's intention can be fully expressed.

Bloom's own interpretation of the limitations to utterance production is coloured by her use of transformational grammar to describe child language. In her interpretation these limitations are represented as transformations that delete certain parts of the deep structure of utterances. This interpretation assumes that transformational grammar is a satisfactory model of production, but as Schlesinger says, the whole idea of deep syntactic structure may be irrelevant to production. He argues that utterances can be directly related to meaning through realisation rules. His idea of realisation rules is attractive because it takes a constructive approach to utterance production, whereas transformational grammar provides a reductive interpretation of the production of elliptic forms, and of utterances generally in Bloom's work.

Transformational grammar has another disadvantage as a theory of production, and this concerns its use of certain transformations. The grammar generates passive sentences by modification of their active base strings. This technique does increase the simplicity of the grammar as a description of the sentences in a language, but it also seems to make the production of passive utterances unnecessarily complicated. The passive transformation reorders and adds to the elements in active base strings. Now people appear to be particularly able at reproducing

sequences of words, meaning that they can learn serial order relatively easily. Therefore, it would appear to be simpler for people to learn to use a variety of sequential patterns than to learn one basic pattern that has to be transformed to obtain the variety of patterns occurring in a language. In this view the human speaker has separate plans for producing active and passive utterances. Clark's (1965) research with active and passive sentences supports this idea because he found that people constructed these two kinds of sentence in different ways. His subjects had to fill in active and passive sentence frames using a limited vocabulary of nouns and verbs.

If transformations are not involved in production it would mean that phrase structure grammar, despite its linguistic inadequacies, might provide a good basis for a model of production. This is important because the studies of sentence learning that have been carried out seem to yield more evidence of phrase structure than of transformations. For example, in transformational grammar a sentence like the person who jumped over there is good is generated as two separate sentences (the person is good; the person jumped over there). These separate sentences are then combined with an embedding transformation. This means that the phrase marker assigned to this sentence in transformational grammar does not look at all like the phrase marker assigned to it in phrase structure grammar. If this sentence is produced the way it is generated in transformational grammar, the pattern of errors made in remembering it should

not show much connection with phrase structure grammar. However, Johnson (1966b) found that the forward transitional error probability patterns for this kind of sentence, corresponded with its phrase structure in just the same way as they did for simple active sentences. Furthermore, the latency between the stimulus for recall and reproduction of the first word of such a complex sentence was sensitive to quite small changes in structure. When the sentence was changed to the person over there who jumped is good the latency and pattern of transitional error probabilities changed accordingly. Therefore, there is evidence that people use the structure of phrase structure grammar to learn sentences rather than that of transformational grammar. And there is no obvious reason why production should involve a completely different kind of structure than learning.

Spontaneously producing utterances is different from learning them in one very important way. Learning starts and ends with the same thing, the utterance, whereas spontaneous production involves the conversion of the speaker's intentions into words. Yngve's model is the only model of production based on phrase structure grammar, but it does not account for this conversion. Johnson's model has only been applied to sentence learning. On the other hand, transformational grammar has the potential for relating sentences to their meanings and vice versa, although its grammatical processes are not supposed to represent the psychological processes of production or comprehension.

However, even if projection rules did represent the conversion of intentions into deep structure, the syntactic organisation of the grammar does not appear to be entirely psychologically realistic.

Schlesinger's theory tackles the problem of conversion directly, but his theory has yet to be developed into a general theory of utterance production. His theory does not involve phrase structure grammar or transformational grammar. Although a phrase structure seems to be involved in sentence learning it has yet to be shown that it is involved in spontaneous production. His theory only relates utterances together to the extent that they represent similar ideas. So if studies of production show that the speaker can be creatively productive beyond the degree of generalisation allowed by similarity of meaning, this would be evidence that some abstract structural knowledge like that contained in phrase structure grammar is involved in production.

Schlesinger's theory uses rules just like any grammar, but rules seem to describe production in what might be called its ideal rather than its real state. Thus, rules imply that there is a perfect relationship between ideas and the utterances representing them. This relationship is unlikely to be perfect and a probabilistic relationship like that proposed by Osgood is more realistic. Furthermore, probabilistic relationships have the distinct advantage that they fit in with a learning theory of language acquisition more reasonably than rules do. It is

easier to account for the changes in the frequency of discourse agreement observed in Experiment 3 with a probabilistic/learning model of production than with a model consisting of rules. And the variability observed in the children's production generally is also more easily accounted for by a probabilistic model of production.

The first part of this discussion introduced the notion of plans for constructing utterances which are similar to the plans or schemas for retrieving information from long-term memory. It seems likely that the plans for constructing utterances do so in a way that more closely resembles the generative process of phrase structure than of transformational grammar. And now it is suggested that these plans consist of probabilistic relationships rather than rules. The last point to be made is that these plans are related to form a complex system for producing utterances. The plans do not seem to be as related as transformational grammar would suggest, but it would be equally untrue to think that there was just a collection of plans from which an appropriate one is selected. This research has yielded considerable evidence of the systemic nature of production in the way that the children's utterances could be manipulated by changing the linguistic and non-linguistic context. Given that the children tended to produce a variety of utterances in any one context, it would appear that a change in the context of speech causes a change in the set of available utterances, rather than a simple change from one utterance to another. In other

words, contextual changes cause changes in the relative frequencies of the utterances produced. This operation corresponds with the way in which training produced a change in the relative frequencies of certain utterances, rather than an abrupt switch from one utterance to another.

In conclusion, there seem to be certain characteristics that a realistic theory of utterance production must possess. Firstly, the theory must account for the production of all utterances regardless of whether they are complete grammatical sentences or not. The children studied in this research produced a great number of non-sentence utterances, and many of these were produced in discourse agreement. However, a significant proportion could not be accounted for by discourse agreement. Since little evidence could be found to support the idea of a general limit to productive complexity, it is concluded that these children were not behaving as though they were under any obligation to produce sentences. It follows that a model of production based on a grammar is likely to have an unrealistic bias towards the sentence rather than the utterance. This is not to say that grammars are irrelevant, but that grammatical structure appears to be involved in production in a more flexible way than grammars suggest.

Secondly, a realistic theory of production must account for the complex relationships between the utterances produced and the speaker's intentions and the context of speech. It must be a theory of communication.

It has been suggested that these relationships are more realistically described as probabilistic connections than as rules of grammars. The probability of an utterance appears to depend on the level of learning and the context of speech.

Thirdly, a realistic theory of production must account for the acquisition of this ability. It is important to know what utterances a child produces at a certain age, but it is also important to know how the child acquired the ability to produce those utterances. The present research confirms that young children do not readily alter their utterances by way of imitation of adults, but the training experiment showed that sometimes their behaviour can be influenced fairly easily. Furthermore, the investigation of certain unusual utterances confirms that learning to talk is a complex kind of learning that involves the processes of generalisation and differentiation. Children do not just develop a separate plan for each kind of utterance by simple imitation. Sometimes they develop generalised plans that combine different but related forms, and which they use more extensively than an adult would. As learning progresses, these plans differentiate and develop, so that the utterances produced increasingly match those of the child's parents and peers in form and function.

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Appendices

Appendices

Appendix 1 - Material for Experiment 1.

The Sentence Repetition Test: (Each set was repeated by two children)

1. There are the widely read books
The very badly made toys were there
Here are the lovely old stone houses
2. The very well built houses were there
Here are the lovely old story books
There are the very badly made toys
3. Here are the lovely old wooden toys
There are the very well built houses
The very widely read books were here
4. There are the quite easily read books
The quite strongly made toys are there
Here are the large green dolls houses
5. The quite nicely built houses are there
Here are the large green picture books
There are the quite strongly made toys
6. Here are the large green plastic toys
There are the quite nicely built houses
The quite easily read books are there

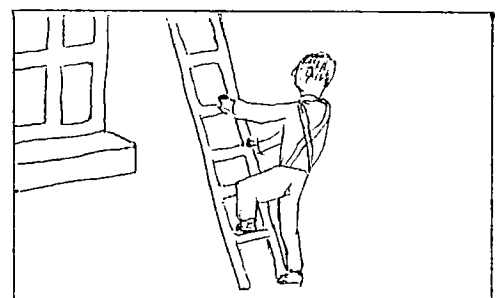
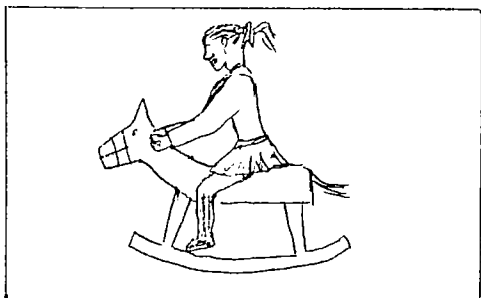
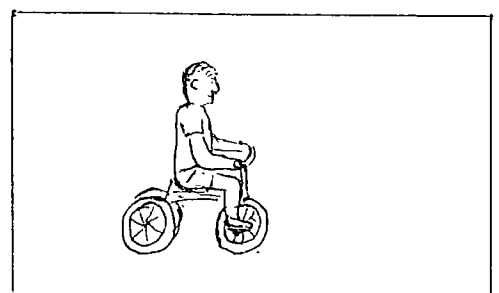
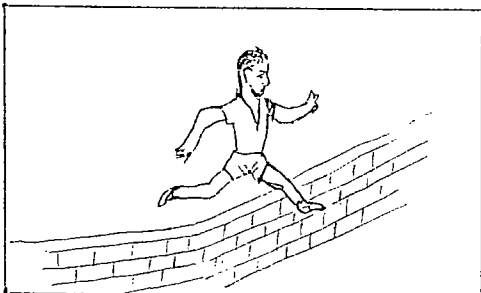
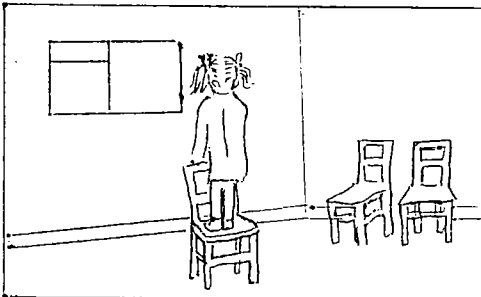
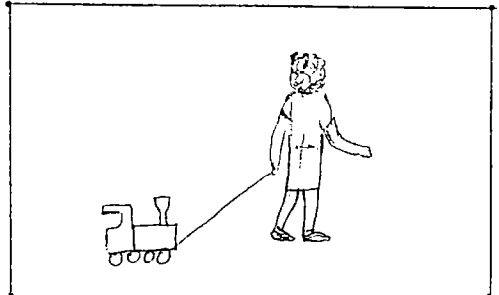
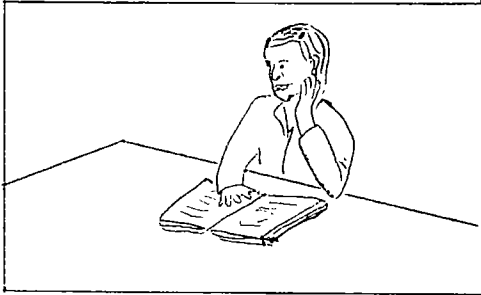
Appendix 1 continued

The Short-Term Memory Test:

1.	Bring	Learn	Close	Make
2.	Speak	Give	Reach	Take
3.	See	Know	Hope	Wish
4.	Meet	Lift	Build	Sell
5.	Pick	Stand	Count	Keep
6.	Hurt	Grow	Ask	Feed
7.	Walk	Clean	Lose	Stick

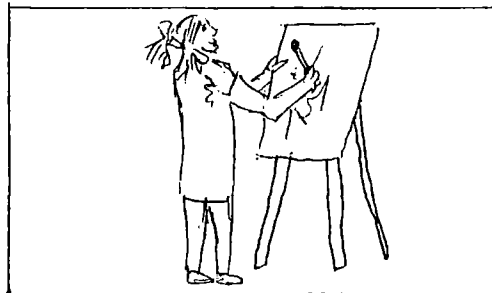
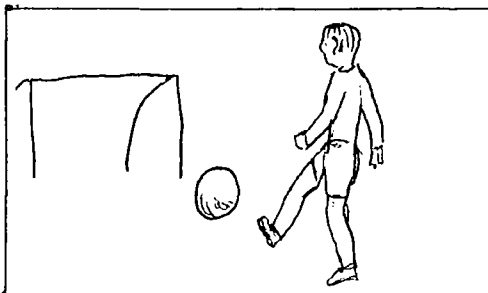
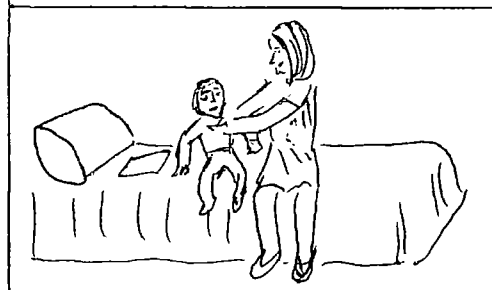
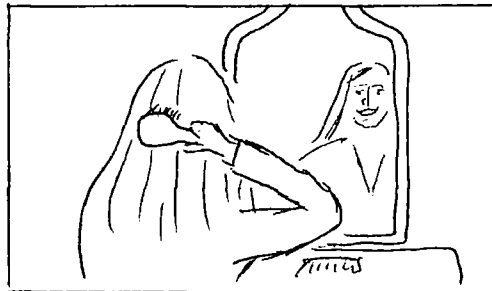
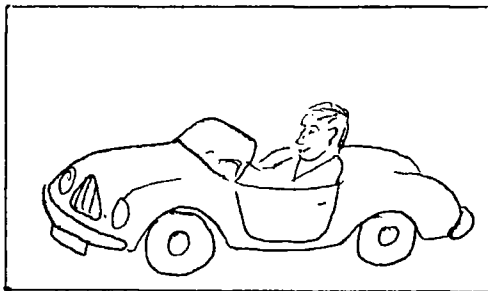
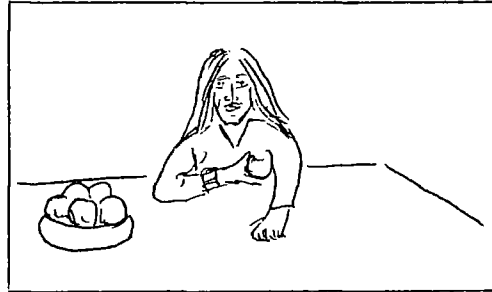
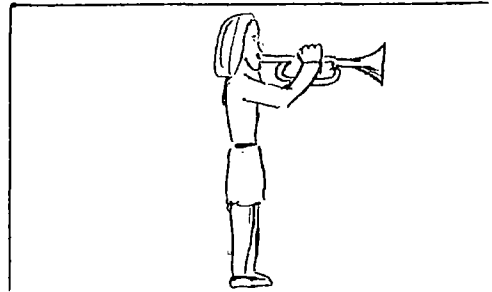
Appendix 2 - Material for Experiment 2.

The actual size of each picture was 3 by 5 inches.



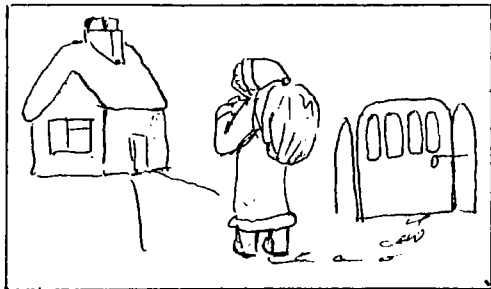
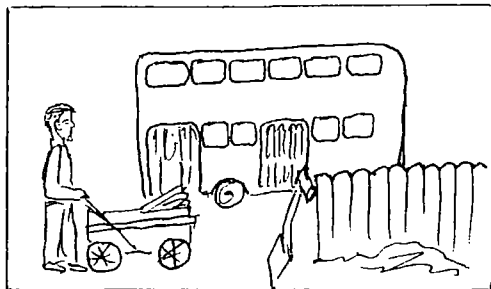
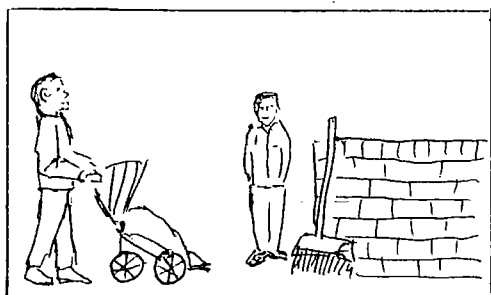
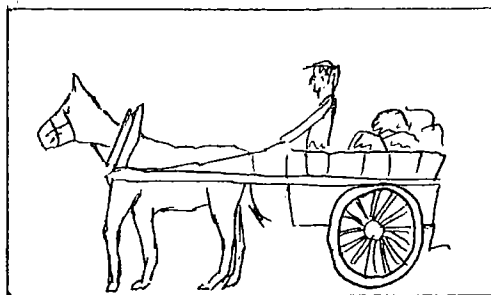
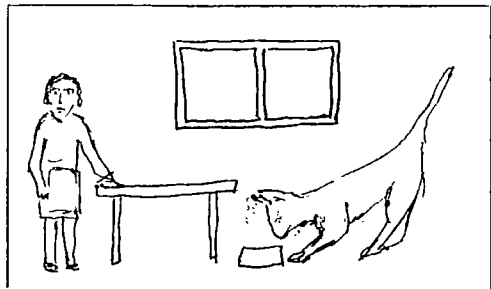
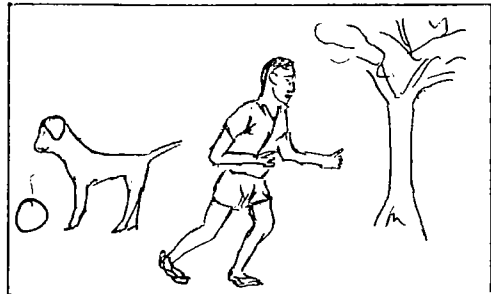
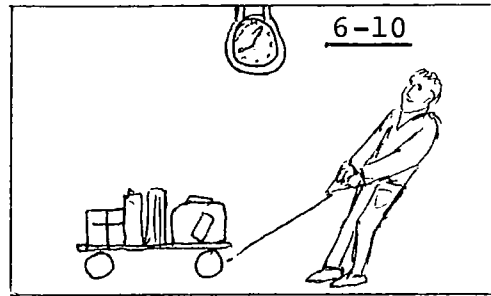
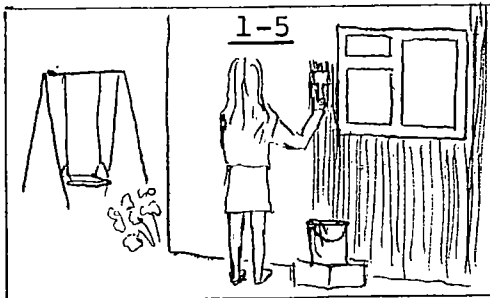
Appendix 3 - Material for Experiment 4.

The actual size of each picture was 3 by 5 inches.



Appendix 4 - Material for Experiment 5. (Set of 10 revised pictures)

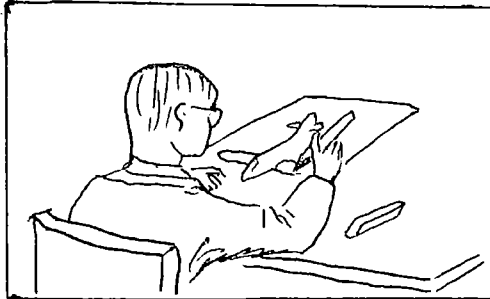
The actual size of each picture was 5 by 7 inches.



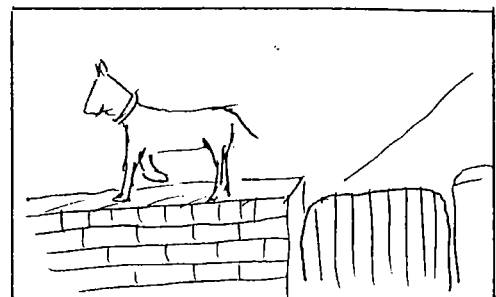
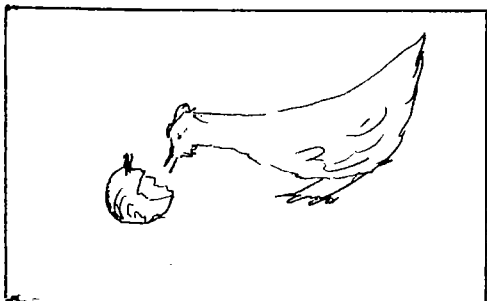
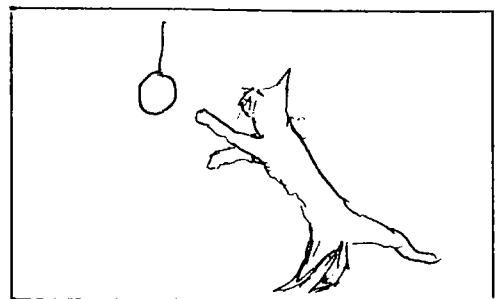
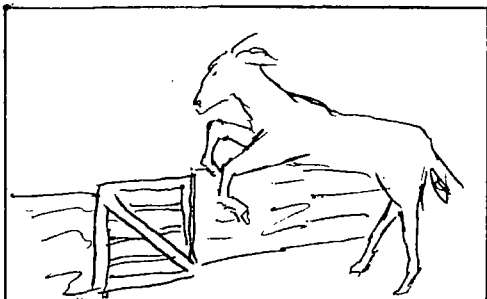
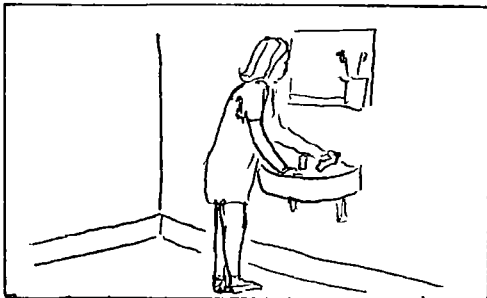
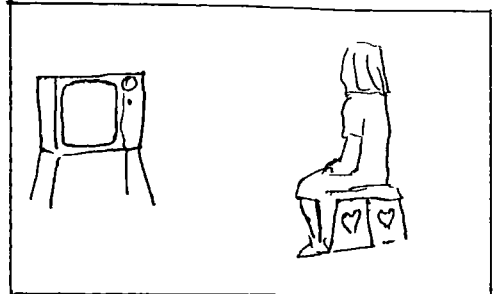
Appendix 5 - Material for Experiment 7.

The actual size of each picture was 3 by 5 inches.

1-4

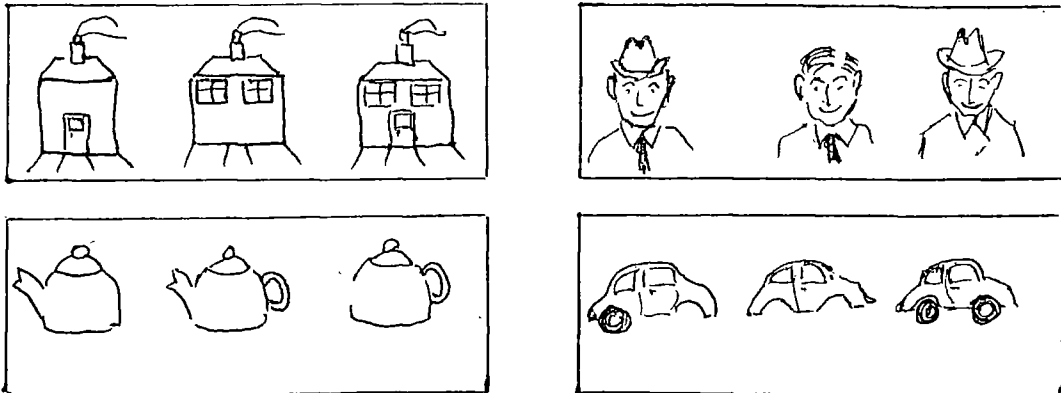


5-8



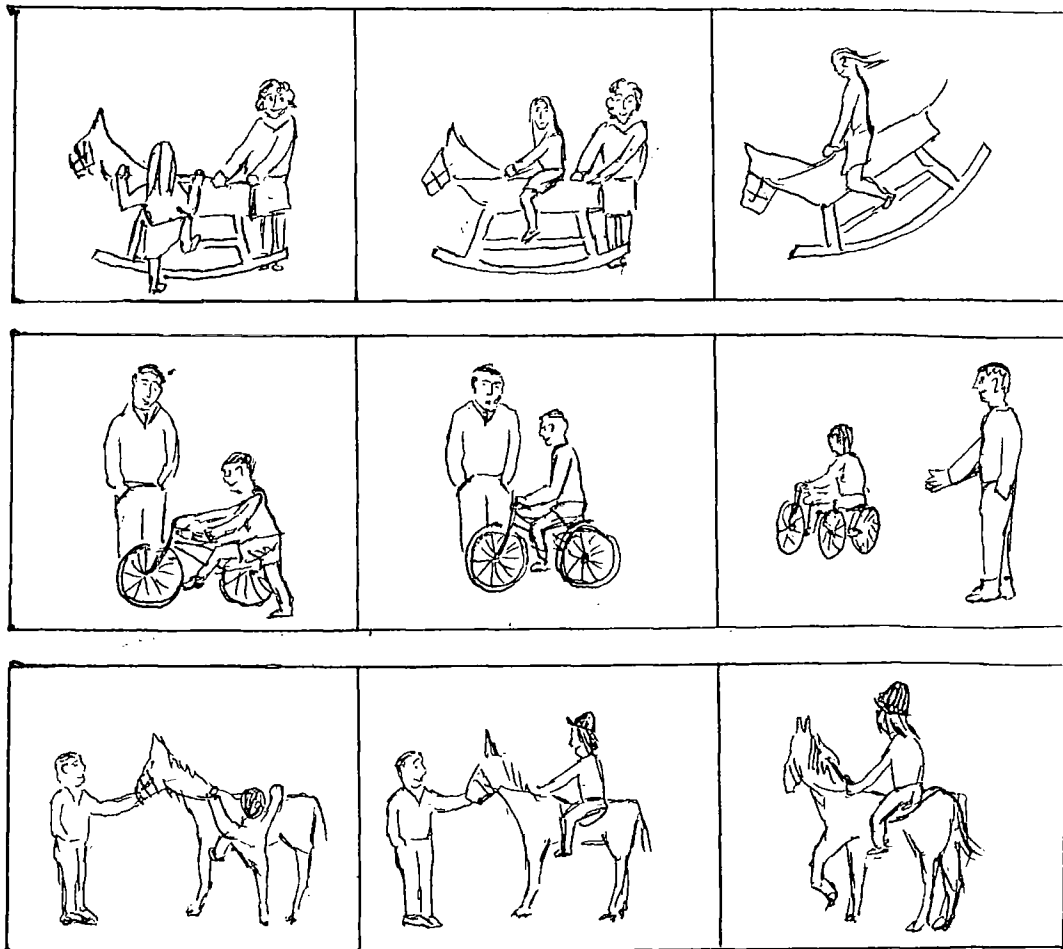
Appendix 6 - Material for the Comprehension Task in
Experiment 9.

The actual size of each card was 2½ by 7 inches.



Appendix 7 - Material for Experiment 10.

The actual size of each card was 3 by 11 inches.



Statistical Appendices

Statistical Appendix 1: Three way analysis of variance in Experiment 1 to investigate pattern of repetition of sentences.

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Depth	1.16	2	0.58
B - Serial position	4.76	6	0.79
C - Individuals	17.44	11	1.59
AxB interaction	5.17	12	0.43
BxC interaction	12.48	66	0.19
AxC interaction	2.36	22	0.11
AXBxC interaction	15.31	132	0.12

Depth: $F=0.58/0.11$, $F=5.45$, p less than 0.05.

Serial position: $F=0.79/0.19$, $F=4.20$, p less than 0.01.

Depth x Serial position: $F=0.43/0.12$, $F=3.72$, p less than 0.001.

Statistical Appendix 2: Three way analysis of variance in Experiment 1 to investigate pattern of repetition of five-word phrases.

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Depth	1.30	2	0.65
B - Serial position	5.91	4	1.48
C - Individuals	10.82	11	0.98
AxB interaction	2.42	8	0.30
AxC interaction	4.03	22	0.18
BxC interaction	7.82	44	0.18
AXBxC interaction	10.25	88	0.12

Depth: $F=0.65/0.18$, $F=3.55$, p less than 0.05.

Serial position: $F=1.48/0.18$, $F=8.31$, p less than 0.001.

Depth x Serial position: $F=0.30/0.12$, $F=2.59$, p less than 0.05.

Statistical Appendix 3: Two way analysis of variance of latencies produced by 9 six and seven year olds in Experiment 2.

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
Question type	0.96	2	0.48
Individuals	1.47	8	0.18
Remainder	1.89	16	0.12

Question type (WH or WD or WO): $F=0.48/0.12$, $F=4.0$,
 p less than 0.05.

Selected Contrasts (McNemar 1962:345)

The t statistic is used, and for significance t must be greater than K . K is the square root of the product of $(C-1)$ and the F required for the chosen level of significance.

For 0.05, $K=2.69$, and for 0.01, $K=3.53$.

- a) WH and WD: $t=2.10$,
- b) WH and WO: $t=2.72$, significant at 0.05 level.
- c) WD and WO: $t=0.62$.

Statistical Appendix 4: Two way analysis of variance for article omission in Experiment 2. This analysis was carried out with the actual fractions obtained. These were adjusted with the arcsin transformation (Edwards 1965:130; Guildford 1954:574, Table L).

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
Location	7882.66	3	2627.55
Individuals	3398.59	8	424.82
Remainder	7538.75	24	314.11

Location: $F=2627.55/314.11$, $F=8.4$, p less than 0.001.

Specific Comparisons (McNemar 1962:345)

The t statistic is used, and for significance t must reach K . K is the square root of the product of $(C-1)$ and the F required for the chosen level of significance.

For 0.05, $K=3.00$, and for 0.01, $K=3.77$.

- a) Before subject in FS and before object in FS: $t=2.37$.
- b) Before object in P and before object in FS: $t=0.87$.
- c) Before object in O and before object in P: $t=3.63$,
significant at 0.05 level.
- d) Before object in O and before subject in FS: $t=0.87$.

e) Before object in O and before object in FS: $t=4.49$,
significant at 0.01 level.

Statistical Appendix 5: Pseudo three way analysis of variance to evaluate effects of training. The analysis is not a proper three way one because different but matched individuals were used in the experimental and control groups.

Overall discourse agreement

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	954.89	26	36.73
B - Experimental/Control	9.45	1	9.45
C - Pre/Post-testing	17.16	1	17.16
BxC interaction	66.45	1	66.45
Remainder	170.89	26	6.57

Experimental/Control: $F=9.45/36.73$, F less than 1.

Pre/Post-testing: $F=17.16/6.57$, $F=2.61$.

Experimental/Control x Pre/Post-testing: $F=66.45/6.57$,
 $F=10.11$, p less than 0.01.

Discourse agreement for WH-FS

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	403.21	26	15.51
B - Experimental/Control	30.61	1	30.61
C - Pre/Post-testing	2.57	1	2.57
BxC interaction	8.65	1	8.65
Remainder	49.93	26	1.92

Experimental/Control: $F=30.61/15.51$, $F=1.97$.

Pre/Post-testing: $F=2.57/1.92$, $F=1.34$.

Experimental/Control x Pre/Post-testing: $F=8.65/1.92$,
 $F=4.5$, p less than 0.05.

Discourse agreement for WD-P

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	155.07	26	5.96
B - Experimental/Control	8.64	1	8.64
C - Pre/Post-testing	7.14	1	7.14
BxC interaction	8.64	1	8.64
Remainder	76.21	26	2.93

Experimental/Control: $F=8.64/5.96$, $F=1.45$.

Pre/Post-testing: $F=7.14/2.93$, $F=2.44$.

Experimental/Control x Pre/Post-testing: $F=8.64/2.93$, $F=2.95$.

Discourse agreement for WO-O

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	283.89	26	10.92
B - Experimental/Control	2.16	1	2.16
C - Pre/Post-testing	0.02	1	0.02
BxC interaction	5.16	1	5.16
Remainder	82.32	26	3.17

Experimental/Control: $F=2.16/10.92$, F less than 1.

Pre/Post-testing: $F=0.02/3.17$, F less than 1.

Experimental/Control x Pre/Post-testing: $F=5.16/3.17$, $F=1.63$.

Statistical Appendix 6: Further analyses of variance of the results of the training experiment. Analyses of WH-FS with sentences containing noun and pronoun subjects.

Noun subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	276.88	26	10.65
B - Experimental/Control	0.0	1	0.0
C - Pre/Post-testing	1.14	1	1.14
BxC interaction	2.57	1	2.57
Remainder	72.27	26	2.78

Experimental/Control: $F=0.0$.

Pre/Post-testing: $F=1.14/2.78$, F less than 1.

Experimental/Control x Pre/Post-testing: $F=2.57/2.78$,
 F less than 1.

Pronoun subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Individuals	339.79	26	13.07
B - Experimental/Control	20.64	1	20.64
C - Pre/Post-testing	7.14	1	7.14
BxC interaction	1.79	1	1.79
Remainder	87.93	26	3.38

Experimental/Control: $F=20.64/13.07$, $F=1.58$

Pre/Post-testing: $F=7.14/3.38$, $F=2.11$.

Experimental/Control x Pre/Post-testing: $F=1.79/3.38$,
 F less than 1.

Statistical Appendix 7: Three way analysis of variance to investigate the production of human and animal agents in Experiment 7.

<u>Source</u>	<u>Sum of Squares</u>	<u>Degrees of Freedom</u>	<u>Variance Estimate</u>
A - Human/Animal	4.59	1	4.59
B - Before/After	0.84	1	0.84
C - Individuals	34.49	23	1.50
AxB interaction	1.77	1	1.77
BxC interaction	7.91	23	0.34
AxC interaction	16.16	23	0.70
AxBxC interaction	8.98	23	0.39

Human/Animal: $F=4.59/0.70$, $F=6.56$, p less than 0.05.

Before/After: $F=0.84/0.34$, $F=2.47$.

Human/Animal x Before/After: $F=1.77/0.39$, $F=4.54$, p less than 0.05.

Human/Animal x Individuals: $F=0.70/0.39$, $F=1.79$.

Before/After x Individuals: $F=0.34/0.39$, F less than 1.

Statistical Appendix 8: Differences in usage of negative possessive forms between three and six years in Experiment 8, evaluated with the Fisher exact probability test.

<u>Form</u>	<u>Probability</u>
broken	0.0056
off	0.11
lost	greater than 0.25
no	0.012
got no	0.074
hasn't got no	0.012
hasn't got	greater than 0.05