To the Graduate Council:

I am submitting herewith a dissertation written by Sylvia Margarita Rojas-Drummond entitled "The Ontogeny of Abstracting Information from Narrative Discourse." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

Michael G. Johnson, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

THE ONTOGENY OF ABSTRACTING INFORMATION FROM NARRATIVE DISCOURSE

A Dissertation

Presented for the

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Degree

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DEDICATION

To Oralia and Edmundo, Hugh, and the children of Martin Carrera, Walden Dos, Fort Sanders, Pond Gap, and Norwood schools.

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ABSTRACT

The development of many conceptual and logical abilities in the transition from early to middle childhood has been thoroughly investigated. Much less is known about the changes by which children become increasingly able to deal with, and abstract information from, connected discourse during this age-span. Controversy exists over the relation between abilities related to information abstraction and conceptual abilities, as well as over what children in early childhood can and cannot do.

This study documents and attempts to account for the way children at the end of early childhood and in the mid-period of middle childhood abstract and use information from narrative discourse. To this end, kindergarten and third grade children were aurally exposed to two narratives differing in structural characteristics. Subsequent performance on three tasks was then compared. The tasks consisted of: retelling the narratives, answering questions about explicit and implicit information, and sequencing pictorially represented events. For both grades, matched groups were tested under four experimental conditions involving variations in the provision of visual aids during the story presentation and retelling phases. Quantitative and qualitative comparisons of performance on each task were made between grades, stories, and among experimental conditions.

Results revealed that third grade children displayed a consistently superior performance, compared with kindergarten children, on

most measures across tasks. These differences were particularly marked when aids were not provided. Substantially greater relative gains with the provision of visual aids were obtained for kindergarten than for third grade children. Unaided kindergarten children performed very poorly on all tasks in comparison with all other groups. However, their performance improved substantially when visual aids were provided at both the presentation and retelling phases, and particularly at the former. Unaided third graders, on the other hand, performed much better than unaided kindergarten children, although their performance improved significantly with visual aids at presentation, but not at retelling.

Story type effects varied substantially with grade and experimental condition, and across tasks, exhibiting subtle factor- and task-specific effects. In general, poorer performance was observed on some measures across tasks for the more loosely than for the more tightly structured story. Some of these effects were only apparent through qualitative analyses, however. Text characteristics other than structure also appeared important in determining story type effects.

Results point to a developmental improvement in several operations used to abstract information from narrative discourse. In addition to acquiring logical concepts, children appear to develop the ability to use independently appropriate strategies to abstract information, during both acquisition and subsequent use of the acquired information to perform tasks. While younger children appeared to depend on the information being organized, third graders displayed greater ability and flexibility in handling less organized information. In addition,

ability to derive non-explicit information was particularly apparent in the older children.

The underdeveloped logical concepts of the younger children may well contribute to their difficulties in abstracting information from prose, but do not seem to be the exclusive locus of them. A failure to apply independently appropriate strategies at different phases, particularly organizational ones, appears to play a significant part. These children may also be more able to capitalize on logical relations, and less bound by their conceptual limitations, than is commonly assumed. Some of their psycholinguistic capabilities also seemed better developed than is often suggested.

Results support the argument that psycholinguistic phenomena as complex as the abstraction of information should be investigated within a wider framework which takes due account of subtle interactions among many relevant variables. They also highlight the value of making fine-grained analyses of several dependent variables. The findings have significant methodological and educational implications. An experimental method of presenting stories is offered which allowed for control of important variables, and was motivating. In addition, methods could be derived from the present experimental procedures to help children deal more effectively with prose.

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INTRODUCTION

This study deals with the development of a series of operations and abilities which I have subsumed under the rubric of "abstraction of information." The term embraces all of those operations performed by an individual from first exposure to a given form of discourse, to subsequent use of the abstracted information in performing any behavior (e.g., producing a motor and/or verbal response, executing a requested task, etc.). These operations involve interactions among a number of cognitive and linguistic processes, including those referred to in the literature by such terms as "comprehension," "semantic integration," "elaboration," "drawing inferences," and "encoding"; as well as "storage," "memory," "retrieval," etc. The term "abstract" is meant to imply that under normal circumstances a person does not simply "copy" and "store" the particular forms of the information presented (e.g. specific auditory or visual forms), and later "retrieve" the "stored" forms. Rather, he or she attends to and extracts some aspects of the information and acts upon it in various ways (whether automatically or not) first in making sense out of its content and later in utilizing the information acquired. Many environmental and organismic factors (linguistic and non-linguistic) are assumed to interact in complex ways with the individual's operations before, during, and after exposure to discourse. These interactions are in turn taken to shape the specific ways he or she abstracts and utilizes the information provided.

The type of discourse under investigation is that contained in a structured and self-contained prose passage, represented in this study

by narrative discourse (e.g. stories, folktales, fables, etc.). The focus of the study is on: (a) the way children of two developmental levels abstract information from orally presented narratives and utilize it in performing a series of tasks (namely retelling, answering questions about explicit and implicit information, and sequencing events); (b) the differences/similarities between the children's operations and abilities; (c) the locus (or loci) and nature of such differences (if any); (d) the relation of performance to the nature of the linguistic input; and (e) the way children might learn to perform such operations.

The developmental levels chosen are roughly the end of early childhood (5 to 6 year olds) and the mid-period of middle childhood (8 to 9 year olds). These levels were selected because of the important cognitive changes assumed to take place between these two periods. Although these changes have been very thoroughly investigated for the acquisition of logical and conceptual abilities, there is scanty information on the development of psycholinguistic capacities related to abstraction of information from connected discourse. The prevailing assumption used to be that the acquisition of logical concepts in this age-span accounted on its own for the development of all other cognitive changes, including changes related to information abstraction. This view, however, has recently been challenged. Controversy also exists over what the capacities of children in early childhood are related to information abstraction, and over how bound these children are by their conceptual limitations. The present study addresses these issues.

CHAPTER I

DEVELOPMENTAL RESEARCH ON CHILDREN'S ABSTRACTING OPERATIONS

Contemporary views of cognitive development emphasize changes in three interacting activities that Brown (1975b) has labelled: knowing (acquisition and accumulation of information), knowing how to know (repertoire of strategies to acquire information), and knowing about knowing (information that humans have about their own processes, called "metacognition"). Brown has pointed out that developmental changes are especially apparent in tasks that require active strategies. Similarly, Paris (1975) suggests that particular development is to be expected in tasks that involve semantic processing. If this is so, one might expect developmental changes in several operations and abilities related to the abstraction of information. Some of these include integrative and elaborative operations related to information acquisition in general, while others include abstracting abilities related specifically to the ordering of temporal events. Finally, there is a class of operations particularly relevant to the comprehension and recall of narrative discourse. Unfortunately, we still have only a scanty picture of the changes in these abilities during given age-spans. Because of their central role in understanding the development of information abstraction, these topics will form the basic structure of the following review of the relevant developmental literature.

A. Abstraction of Information: Integrative and Elaborative Operations

Integrating and making inferences have been shown to be basic operations that enable people to comprehend discourse. The former refers to the act of combining and organizing strings of information, sometimes involving synthesis and reduction for efficient processing. At times, some of the information is not explicit in the message; then inferences must be drawn. An inference is an information expansion and/or completion operation which provides elaborative contexts and relations (Paris, in press). The definition in this text is limited to those inferences that are either authorized or implied by a speaker in conversation ("implicatures," Clark, 1977), or implicit in the information and/or context of a message. The appropriateness of an inference can, in principle, be determined by the speaker, the writer, or a set of judges. Any other constructions or elaborations (such as free associations) are excluded by this definition.

Integrative and elaborative phenomena in adults were first widely explored by Bransford and co-workers (e.g. Bransford et al., 1972; Bransford and Franks, 1971; Bransford and Johnson, 1972; Bransford and McCarrell, 1974; Franks and Bransford, 1974; Johnson et al., 1973). In general, their studies showed that adults' retention of verbal materials after listening to, or reading, passages is primarily a function of memory for the holistic semantic relations expressed, as opposed to specific words, forms, or grammatical constructions. Their line of research has since been followed by several investigators of the same phenomena in children. These authors have used the "false

recognition" methodology developed by Bransford and Franks (1971), which consists of presenting sets of sentences to subjects and of later administering a recognition test in which subjects have to indicate which sentences were originally presented. The sets of sentences used in the recognition test typically include: (1) those originally presented; (2) sentences whose meaning is consistent with the original sentences (sometimes adding more information or integrating it) even if the syntactic structure and/or wording is different; (3) sentences whose meaning is inconsistent with the original information or with implied inferences, even if the syntactic structure and/or wording is similar; and (4) control sentences.

Paris and Carter (1973), for example, read short passages expressing spatial-locative relations to second and fifth graders. They later administered a recognition test of the kind described above. Although overall performance improved with age, children in general did not discriminate between old and new sentences representing true inferences, while rejecting false inferences. Similarly, Paris and Mahoney (1974) demonstrated semantic integration and inferential phenomena for spatial-locative relations when second and fourth graders were presented with stories portrayed in sentences as well as related pictures. Also dealing with pictures, Brown (1976a) demonstrated semantic integration in children's reconstruction of pictorial narrative sequences. Nursery school, second and fourth grade children did not discriminate pictures originally seen and those that were consistent with the overall gist or theme of the narrative. She found no age effects for this task.

In sum, these studies suggest that when children are presented with aural and pictorial information (at least of the types used in the studies), they, like adults, seem to integrate it into a holistic semantic representation, including inferences consistent with the overall meaning.

Unfortunately, the recognition task employed in these studies suffers from several potential weaknesses:

(1) It is not clear whether integration, inference and/or other elaborative phenomena actually occur during the phase of acquisition of the information, or whether these are induced by task demands of the recognition test (i.e. during retrieval).

(2) The recognition test sometimes presents sets of contradictory statements which may be confusing and affect performance in unknown ways.

(3) The task suffers from an inherent contradiction which renders it insensitive to differences among groups, such as developmental variations. Very few age differences have been detected. When they do show up, they tend to be reversed. That is, the trend is for older subjects to make fewer false recognitions, including those for new but semantically congruent information. Thus, an improvement of integrative and/or inferential capacities with age, if it exists, is confounded with a possible increase of attention and memory for details. These opposing forces might obscure true developmental changes.

Other studies have used different methodologies to analyze more directly the development of children's ability to draw inferences whose heuristic derivation depends on the content and context of the arguments (this type of inference is called "pragmatic" by Paris, in press). Paris and his co-workers have examined developmental trends in children's

inferential abilities in a series of studies. In two of these experiments, Paris and Upton (1976) presented several paragraphs to children from kindergarten through fifth grade. Children were then asked questions about verbatim (i.e. explicit) information and about events where they had to infer certain presuppositions, consequences, and/or instruments of actions. The first two types of inferential questions involved information contained in several sentences; these inferences were called "contextual inferences." A third type of inference was called a "lexical inference" since it involved one word. In one condition, they were asked simply to recall the stories. Performance improved with age on all categories of question but most dramatically on those concerning contextual inferences. This improvement seemed to reflect more than a simple growth in memory capacity. Also, the ability to make contextual inferences was highly correlated with recall, and these correlations increased with age. Thus, the results showed evidence of developmental improvement in skills to answer inferential questions in children from 6 to 11 years old. It is worth noting, however, that even kindergarten subjects answered inferential questions correctly. In addition, the studies suggest that inferential operations (whether automatic or deliberate) are important for better abstraction and retention of information. The authors argue their results are in accordance with Craik and Lockart's (1972) proposed framework from which to investigate memory. In their view, improved retention of information is assumed to be a function of successively "deeper" levels of semantic analysis.

Paris and Lindauer (1976, Experiments I and II), and Paris et al. (1977, Experiment I) further studied the development of

spontaneous inference and its role in comprehension and memory. In a series of studies, they used a cued recall procedure which consisted of presenting different age children with sentences that either explicitly or implicitly stated the instruments and consequences of actions. Later, they provided the children with the implicit and/or explicit information as retrieval cues, and asked them to recall the sentences. In general, implicit cues were much less effective than explicit ones for 5-to-8 year olds (even when they had shown that they could understand the relationships). The two types were equally effective for 11-to-12 year olds and adults. The results do not imply that young children make no inferences; rather, they suggest that young children do not spontaneously add implied information during encoding, nor in memory representations, and hence cannot make efficient use of such information as retrieval cues.

Paris's interpretation of these developmental trends (e.g., Paris, 1975; Paris and Lindauer, 1976) is that children change strategies for monitoring comprehension during listening, so that older children elaborate more on information and hence recall better. Thus, young children show a "production deficiency" in that they do not employ appropriate strategies in comprehension and memory <u>for the kind of task demands</u> posed by the studies reviewed. As Paris puts it, "young children simply do not approach laboratory memory tasks with strategic plans" (Paris and Lindauer, 1976, p. 225). More recently, Paris (in press) suggested that the fundamental problem in young children's recall is the subordination of available strategies specifically to memory goals. However, it is important to stress that laboratory situations do not test optimal levels of performance and in fact might hinder them.

This is especially so if children do not perceive the need to apply strategies (for inferring and/or remembering information) which they might employ in more natural situations such as classroom activities and/or normal conversations.

In short, according to some investigators, and especially those following a constructivist approach to comprehension and memory, integrating and elaborating on information enriches understanding and retention by: (1) insuring organization of information into a coherent, meaningful, holistic representation, and (2) allowing for a quality of processing which augments the discovery of relations between events. Uncovering developmental changes related to organizational/integrative abilities has been hindered by limiting methodology. Children's ability to elaborate on information by drawing inferences seems to develop throughout early and middle childhood. However, the patterns of developmental changes in these and other operations related to the acquisition of information from prose are just starting to emerge.

B. Abstracting Information From Ordered Sequences

The developmental study of sequencing, inferential, and many other cognitive abilities has received much inspiration from Piagetian theory. In general, Piaget considers the individual's operational mode of intelligence attained at different stages by far the most important determinant of how information is acted upon, the significance it achieves, and the way it is transformed and incorporated into existing knowledge (schemata) (Piaget and Inhelder, 1973).

Piagetian theory holds that children attain the concept of identity (understanding that certain characteristics can remain invariant

while others change) at the pre-operational stage, but that the concept is restricted to qualitative invariants. Likewise, the pre-operational child has a qualitative (but not quantitative) understanding of functional relationships and covariations among events (called "functions"). It is not until the concrete-operational stage is attained that the quantitative invariants and relations among events are well understood ("conservation"). In addition, the pre-operational child relies more on perceived appearances, centers more on particularly salient portions of a stimulus display ("spatial centration") as well as present states ("temporal centration"), and his thought tends to be "irreversible" (he cannot run mentally through sequences in either direction). In contrast, the concrete operational child is more prone to make inferences about the reality that underlies appearances, attends more to the various parts of displays and transformations of states ("decentration"), and his thought is "reversible." This means that he has the capacity for flexible mental operations that act upon information in different directions. Certain reasoning abilities are not attained until the formal-operations stage, however. It is only here that thinking can be totally abstract and formal-logical in nature. It thus becomes hypothetical-deductive rather than empirico-inductive (Flavell, 1977).

Piaget (1926, 1969) and Fraisse (1963) have both been particularly concerned with the child's ability to reconstruct ordered series. Piaget's (1926) pioneering studies of children's ability to track logical series of events were concerned mostly with communication among children before and after the onset of concrete operational thought. In these studies (1926, Chapter III), different age children were told

a short narrative and/or given an explanation of the functioning of mechanical objects. The children were then required to tell the story or give the explanation to a second child under several circumstances (e.g., adult present or absent). The second child's understanding of such explanations was then tested. Although expressive performance was relatively better for stories than for explanations, in general, children under 7 expressed themselves rather poorly, so that they were poorly understood by the other children. Their retellings were characterized by elliptical style, use of undetermined pronouns, lack of order of events, juxtaposition of events so that they did not hold logical relations, etc. Piaget considered this to be evidence for an "egocentric" style of communication before 7 or 7-½ years old, where the child, considering himself the center of the universe, is not concerned with the objectivity of his utterances, but rather, assumes that people will understand. "The natural order is assumed to be known by the hearer, the logical order is assumed to be useless" (Piaget, 1926, p. 108). Piaget further argued that the lack of order in the youngster's retellings reflected a lack of concern with "how" things happened.

> Given that a child has simply to note facts without occupying himself with their connections, he is not likely to worry about how these facts are produced in detail. He is content to feel this detail, but ego-centrically, i.e., without trying to express it (Piaget, 1926, p. 112).

Piaget thus placed the beginnings of verbal understanding between children approximately between the ages of 7 and 8.

Although in his early writings Piaget emphasized this lack of preservation of the order of events when children retold stories, he attributed it to the child's lack of desire to be objective in

communication as opposed to the lack of an understanding of temporal order. He argued that children did understand the order of events themselves (as shown by their correct answers to probe questions) but did not express this order because of their egocentrism. In later writings, Piaget seems to have abandoned this position, favoring the argument that before the stage of concrete operations, children have problems with the concept of temporal succession. For example, according to Piaget (1969), understanding temporal concepts requires a cognitive construction based on operations similar to those involved in other forms of logical reasoning. Therefore, the developmental stages of the acquisition of temporal knowledge are parallel to those of general cognitive development. In order for the child to acquire operational conceptions of time, he must have acquired several basic rules, among them seriation, which serves as foundation for all subsequent operations. Seriational abilities are said to be a part of operational reasoning and to presuppose reversibility of thought. In particular, the ability to reconstruct a temporal succession of events is said to come with the onset of concrete operational thought around 7 to 8 years of age (Piaget, 1969).

Piaget (1969) investigated children's ability to construct and reconstruct stories from a series of pictures which depicted either an entire sequence or only the beginning and end points. He again reported that before 7-8 years, children's narratives were not chronological, causal or deductive. Rather, events were linked on the basis of personal interest instead of temporal order. The reason for the child's failure to reconstruct order is said to lie in his

inability to carry out reversible operations: those which would permit him to go up and down the time scale.

Piaget, Fraisse (1963) observed that preoperational children's retelling of stories is "completely jumbled up" because they have not learned to reconstruct their past (p. 254). He argued that adults rely on logical and inferential reasoning to produce and reconstruct ordered series, but that young children are unable to do so because of a failure to capitalize upon logical relations founded on probability.

In sum, the apparent difficulty shown by children prior to the onset of concrete operations in reconstructing ordered series is said to lie in the child's lack of an internal representation and conceptual mastery of temporal order. This internal representation of temporal order presupposes reversible thought. A strict interpretation of these claims leads to the conclusion that order-reconstruction is not within the problem solving capacity of preoperational children. However, some of Piaget's deductions pose problems for interpretation and for finding valid tests (see below, and Brown, 1976b).

For a long time, Piaget and Fraisse's claims went essentially unchallenged. Recently, however, several authors have questioned some of these claims. Brown and her colleagues, for example, have demonstrated that children of 5 to 6 years old can in fact both match and reconstruct simple ordered series from memory when temporal and spatial cues correspond (see Brown, 1975a). Dealing with simple, short narrative sequences, Brown (1975a) questioned whether a child's failure to retell events in order reflects a true failure to comprehend and hence reproduce ordered sequences, or whether it might stem principally from poor expository skills on verbal tasks. In order to resolve this

question, she used sets of three pictorial representations of story events in four experiments. Kindergarten and second graders were tested for regeneration of ordered series in recognition, reconstruction and verbal recall tasks. The narratives were either logical, arbitrary or created by the child. The results were interesting. (1) Second graders retold and reconstructed the sequences equally well. In contrast, pre-operational children failed to retell events in order of occurrence (verbal recall task), hence corroborating Fraisse's and Piaget's claims. (2) However, the latter's failure stemmed from difficulties with the demand characteristics of the verbal recall task as opposed to inability to comprehend and remember ordered relations. They were capable of reproducing the order of events when their memory was assessed by recognition and reconstruction. Furthermore, their own story narratives were logical and acceptable, and involved causal relations. (3) For all subjects, logical and self-produced meaningful sequences were retained better than arbitrary sequences. This suggests that even pre-operational children are capable of using inferential reasoning to seek and produce the most probable order of events.

Differences in the types of relationship holding among the series of events to be reproduced were further analyzed by Brown and Murphy (1975). They tested preschool children's (4-5 years old) ability to reconstruct (i.e., seriate) series of pictures from memory that were either logical (connected events that could compose a narrative or which followed logically from each other) or arbitrary (series of objects which held no relationship among them). Form of presentation (simultaneous or successive) and lag before testing were varied. In general,

children could reconstruct the arbitrary series only if: (a) reconstruction took place in the presence of a model or followed immediately upon its removal, and (b) the original sequence was presented simultaneously. In contrast, reconstruction of the series of pictures which were logically related was possible even after a longer interval between presentation and testing and when the pictures were successively presented.

The above results suggest that either reversible operations are within the cognitive capacities of 5-year-olds, or the reconstruction of narrative sequences does not demand reversibility. To resolve this, Brown and French (1976) used stories composed of four pictures representing temporal sequences. Kindergarten, second and fourth graders were given parts of the series coming from different positions (initial, middle or terminal), and required to complete and recall the rest of each story. Children over 7 years performed equally well finding either antecedent or subsequent events, and recalling the remainder facts when given any position items as retrieval cues. Children below this age, on the other hand, performed reliably better when completing subsequent events. Likewise, they recalled more events when offered initial items.

Schmidt and Paris (1977) have corroborated and extended Brown's findings, using tests based on causal relationships portrayed in pictorial sequences. They found that 5-year-olds could remember and infer possible consequences of sequential events even if these had not been provided in the stories. This ability improved with age. Furthermore, 5-year-olds could infer the antecedent of a sequence given the terminal events, although there was an asymmetric preference in the opposite direction (as suggested by Brown).

In general, this later group of studies demonstrates that under the most favorable conditions, pre-operational children can seriate events in time. But their ability is very much dependent on many variables related to the conditions under which they are tested. Should we conclude that children attain reversibility at an earlier age than Piaget norms indicate or that seriation does not require reversibility? These conclusions are not really warranted since the criteria for true reversibility are sometimes, but not always, met by pre-operational children. Although Piaget's arguments about the performance criterion for reversibility are somewhat contradictory (cf. Piaget, 1926; 1969; Piaget, 1970; see also Brown, 1976b), in his more systematic accounts a reversible concept of order "should be an internalized, stable, and rational concept of direct and reversed order involving a cohesive system of rules that allows internalized inferences and deductions by means of negation and reciprocity" (from Brown, 1976b, p. 77). Thus, Brown (1976b) reached the conclusion that although pre-operational children can seriate under some circumstances, their concept of order appears fragile, i.e., it is disrupted by seemingly trivial changes and we cannot talk about true reversibility.

Following Piaget (1970), Brown (1976b; Brown and French, 1975) has interpreted the results of her (and others') studies as evidence for the existence of a period of <u>semilogical thought</u> (called "articulated intuitions" by Piaget) that precedes the period of concrete operations, and which is characterized by a logic that works efficiently in only one direction. In this transitional period, (from approximately 4 to 6 or 7 years old):

(1) Children can seriate series of pictorial events (such as those contained in short, simple narratives) into the correct order under the most favorable conditions where (a) only one sequence must be considered at a time, (b) the order of events must be reconstituted in the order of their original occurrence; and (c) an immediate test of retention is made.

(2) The provision of meaningful and/or logical connections among the events to be seriated enhances performance so that (a) children can also seriate when the items are presented in succession, and (b) they maintain the sequence over longer retention.

(3) Logical sequences are easier to regenerate than arbitrary ones indicating that even preoperational children have some ability to exploit causal and logical relationships to infer the most probable order of events.

(4) Children can apply rules, but their application is unidirectional and lacks the flexible reversibility of operational thought (Brown, 1976b).

C. Comprehension and Recall of Narrative Discourse

Linguists and anthropologists have long been concerned with different forms that narratives take within different cultures, and have demonstrated the existence of many structural and content regularities (Colby, 1973; Propp, 1968). Psychologists too have shown interest in stories, but mainly in relation to people's knowledge of these structures and the influence this knowledge has on comprehension and retention.

Although Bartlett's work had, until recently, been neglected, his classic studies (Bartlett, 1932) of constructive memory were seminal in the development of current conceptualizations. Recently, a whole line of research has been initiated, centered around his concept of "schema." This line of research has primarily been concerned with structural variables related to both aspects of the text and of the individual's postulated mental representations.

The study of processes related to stories and other complex prose has been hindered partly by a lack of a methodology for analyzing such complex forms. Recently, several "story grammars" and other structural accounts of stories have been proposed (e.g., Kintsch, 1977; Mandler and Johnson, 1977; Rumelhart, 1975, 1977; Stein and Glen, 1979). Although format and categories vary somewhat, these grammars converge at several points in their description of the structure of a story and its function. In general, the authors agree that stories have an underlying suprasentential structure and that people of different ages are sensitive to such structures. The listener/reader is said to use "story schemata" to guide encoding and retrieval of story information. In general, the grammars proposed are written as sets of rewrite rules capable in principle of generating well formed stories and/or of breaking down a well-formed story into its constituent units. These rules are in turn intended to represent the "knowledge" about structures that people have incorporated in the form of "schemata." The schemata are said to guide encoding by providing information (i.e. expectations) on the units composing stories, the ways in which these are sequenced, and the types of connections between units likely to occur. During retrieval: (1) the "schema" provides information about (a) what general

sort of information is to be retrieved and (b) the temporal sequence in which it is to be retrieved; (2) if the exact content of a category in the sequence cannot be retrieved, the schema allows generation of an approximation (e.g. Mandler and Johnson, 1977; Stein, 1979).

In analyzing the structure of stories, story grammars normally divide the text of the story into units which are further classified into different categories according to the type of information contained in each unit and its function in the overall narrative. The grammar contains rules which specify the relationships among the different story categories. Rumelhart's (1975, 1977) original grammar has been modified by several authors (e.g. Mandler and Johnson, 1977; Stein and Glen, 1979). The story grammar developed by Mandler and Johnson (1977) was adopted (with some modifications) as a method to analyze the structure of the stories used in the present study.

Methodology of Mandler and Johnson's Story Grammar

Mandler and Johnson's (1977) grammar divides the text of the story into units formed by a part or one or more sentences in the "surface structure" (i.e. text) each corresponding to a Terminal Node (TN) in the "underlying structure" (that described by the grammar). Each of these TN's represents either a State (a current condition of the world or state of affairs or of mind) or an Event (an internal or external happening). One or more TN's in turn compose a Basic Node (BN). Basic Nodes comprise specific types of events and states which carry special functions within the structure of the overall story. They represent the most important constituents of the story. BN's are themselves embedded and form part of larger categories.

In general, a story is composed of a Setting and an Event Structure. The setting sets the stage for the rest of the story by introducing the protagonist and other characters and the general context in which the story takes place (e.g. time, locale, a specific problem, etc.). The event structure is formed by one or more Episodes. Each episode consists of three parts: (1) a Beginning, (2) a Development, and (3) an Ending. The beginning describes one or more events which cause the protagonist to respond in some way and which give rise to events comprising the remainder of the story. The development, the most elaborate portion of an episode, then describes the series of events produced by the initial happening. It is composed of an Internal Reaction by the protagonist, which can be either Simple or Complex. A Simple Reaction leads the protagonist directly to an Action, while a Complex Reaction gives rise first to a Goal Path. The latter is formed by: (a) the protagonist's first reaction which leads to the formation of a Goal, (b) the protagonist's subsequent performance of an action which functions as an Attempt to fulfill the goal, and which in turn leads to (c) a given Outcome. The ending then describes the final state of affairs, produced by the preceding series of events.

The Basic Nodes are contained and represented in each episode. They are: (1) the beginning, (2) the reaction, (3) the goal, (4) the attempt, (5) the outcome, and (6) the ending of each episode.

Both Basic and Terminal Nodes are connected by three types of relationship: (1) Cause--the first node provides a reason for the occurrence of the next. The causation is not necessarily physical; it can be a looser one in which the first node provides a sufficient (and not necessary) condition for the next to happen. (2) Then refers

to the temporal relation between nodes which describe events ordered in time, where the first one precedes the next without actually causing it. The order of events can be arbitrary or arranged by expected sequences of actions. (3) And--this relation connects two nodes when the notion of simultaneous activity or temporally overlapping states is being expressed.

The underlying structure of the story is represented diagrammatically as a tree structure which specifies the overall constituent structure and the relationships among some of the constituents.

Developmental Research

The line of research used by investigators following a Schema approach to cognitive processing has been extended to study children's sensitivity to structural variables in prose and their postulated use of "schemata" for encoding and retrieving story information.

Several studies have been concerned with the importance and salience of story categories. Mandler and Johnson (1977) presented first and fourth graders and college students with two of a set of four stories. Children were asked to tell the story to an adult who had not been in the room during presentation. In general, across stories, adults recalled more than fourth graders who in turn recalled more than first graders. Age-groups all varied in performance on the Basic Nodes but the children's groups exhibited similar patterns of recall which were distinct from the adult pattern. The pattern for the first graders was formed by two clusters: settings, beginnings and outcomes were well recalled, while attempts, endings and reactions were poorly recalled. Fourth graders showed a similar pattern, although

attempts and endings gained more prominence than for first graders. For adults, all categories were well recalled except for reactions and endings, which lagged significantly behind. Thus, younger children focused mainly on outcomes of actions, rather than internal responses or attempts. Older children showed a tendency to converge toward the adult pattern.

Despite the differences found among age-groups, however, there was an overall pattern of regularity in the order of prominence achieved by the different types of information: settings, beginnings and outcomes were very prominent, followed by attempts, then endings and lastly internal reactions. Since these patterns were displayed during retelling, they do not necessarily reflect relative importance or lack of processing of these types of information during encoding. Rather, the authors interpret the patterns as those controlled by schemata operative at the time of recall. Thus, they argue that both children and adults are sensitive to the structure of stories and have schemata which organize retrieval in similar fashions but that certain differences in these schemata exist across developmental ages. They further argue that memory seems less rich and flexible than encoding, simplifying and transforming material to conform to a logical structure. From this they reach the conclusion that memory is less strictly determined by processes occurring at the time of encoding than authors such as Craik suggest (e.g. Craik and Lockhart, 1972; Craik and Tulving, 1975).

Similar recall patterns have been found by Stein and Glen (1975, 1979). Stein and Glen (1975) exposed first and third graders to an oral story and measured retention immediately and again after one week.

In general, older children recalled more, and immediate recall was better than delayed recall. The relative salience of story items was similar to that found by Mandler and Johnson (1977) and was fairly consistent between grades and over time.

Stein and Glen (1979, Exp. 1) gave two of a set of four stories to first and fifth graders, and measured immediate recall and delayed recall a week later. The results generally replicated those of Stein and Glen (1975), but there were differences between the stories. The overall pattern of recall was similar to that found by Mandler and Johnson (1977) and Stein and Glen (1975). There were no pattern differences between grades, except for fifth graders' better recall of internal responses. The authors interpret their results as evidence for children's use of story schemata to indicate the type of information and structural importance of category items during recall.

Stein and Glen (1979, Exp. 2) further investigated other aspects of processing by presenting first and fifth graders with the same four stories orally. After each story children were to indicate the three most important happenings. After they had heard all four stories, they were asked probe ("why") questions geared at tapping understanding of the causal relationships among events within and between episodes. Regarding the importance judgements, both groups mentioned different types of events and inferences derived from them. First graders mentioned consequences (outcomes) more often, followed by internal responses (reactions) and then by beginnings. The order of relevance for fifth graders was: internal responses, beginnings, and consequences. Also, older children's responses were more elaborate and sophisticated.

There was a high proportion of correct responses to the probe questions in both grades. Again, fifth graders' responses were more elaborate, containing more statements which were causally linked.

In general, children seemed to perceive the cause-effect relations indicated in the grammar. The salience of replies that included internal responses was greater than would be predicted by the grammar. Thus, the types of information mentioned in free recall and those judged to be important (as measured by comparing results of the first and second experiments) seem to overlap. But there were major differences in relation to the internal response category. When asked for the most important information children, especially older ones, stressed the motives, goals, feelings and thoughts of the protagonist to a greater degree than during free recall. The focus on internal responses was also evident in the children's responses to the "why" questions, where they frequently interpreted the internal responses as a focus of causality for the remainder events. Thus, in addition to structural factors, semantic ones seem very important in determining causal relations. Task demands (e.g. free recall versus questions) also influenced the type of information focused on. Since older children placed greater emphasis on internal responses than younger ones, the authors argue that the latter may not spontaneously attend to motivational factors in stories as consistently as older children. In general, the authors interpret their results as evidence for the contention that children, like adults, encode incoming information in accordance with already existing "schemata." These are said to cause them to expect certain types and patterns of information, to attend to sequences that match

these patterns, and to organize incoming information into such patterns for later retrieval. However, the difference in results obtained using different dependent variables should caution schema investigators from an overreliance on free recall measures as a reflection of both encoding and retrieval processes.

The studies reviewed so far have used mostly stories which conform to the expected story structure. In such cases, subjects seem to be sensitive to the categories proposed by the grammars. What if some of these categories are deleted from the story? Schema investigators (e.g. Stein, 1979) argue that since the "story schema" specifies the types of information which should occur, stories not containing all categories should be transformed so that recall will correspond more to this expected sequence. Thus, missing categories will tend to be added and "gaps" filled.

To test this prediction, Stein and Glen (1977) deleted each of five episodic categories from four stories, thus obtaining six different versions for each story (including the complete version). Six groups of first and sixth graders listened to one of the six versions of each of the four stories, and were required to retell them. In general, fifth graders recalled more than first graders. For both grades, when initiating events (beginnings), attempts and consequences (i.e., outcomes) were deleted, the number of new statements included in recall increased significantly (compared to a control group). Most of the imported statements matched the deleted category. In contrast, no similar effect was found for deletions involving internal responses or reactions. Although subjects drew more inferences for some category

deletions, these were accompanied by poor recall of the original information. Specifically, the major source of disruption for the older children was the deletion of initiating events, while both this category and consequence deletions disrupted first graders' performance.

In general, the authors interpret their results as supporting their hypotheses. Thus, they argue that: (a) when stories are incomplete, as indicated by the grammar, subjects show a strong tendency to draw inferences which fill the gaps and create a coherent and logical sequence. This type of constructive phenomenon is presumably the result of: (1) subject's knowledge about informational categories and their relations, (2) knowledge about the specific kinds of events portrayed in stories, and (3) the child's developmental level (Stein and Glen, 1979). (b) The explicit inclusion of internal responses and reactions in a story may not be structurally as decisive as that of other categories, especially when they are redundant, given the rest of the information. Thus, "schemata" may include "deletion rules" for such categories. (c) The inclusion of inferences may be made at the expense of original information. This may reflect the difficulty children have in generating information congruent with an entire sequence of events. Older children were less adversely affected by the deletion of outcomes than younger children. This was attributed to the former's greater ability to make the appropriate causal connections between the incoming story information and their importations to fill in gaps. The authors further argue that, despite differences in their performances, younger and older children use similar types of operations and schemata to recall stories. This is evidenced by the tendency of both age groups to fill in missing information.

The authors have taken the results of the studies reviewed in this section as evidence for the argument that elementary school children have developed "schemata." These schemata guide encoding and retrieval of structured prose such as stories. Although differences were found among grades in quantity of recall (and sensitivity for the different types of information conveyed in stories), there were also many patterns of regularities. This indicates that children expect certain types and forms of information to occur in stories. When stories conform to the expected structure, children recall them according to regular patterns. When some information is deleted, children tend to "fill in the gaps" by importing information. The ability to supply missing information depends on factors such as knowledge about structure and content of stories, and the child's developmental level. The most consistent developmental difference seems to lie in the increased ability of older children to organize input, to produce more complete information, and to deal with deviant forms by supplying missing information without much loss in recall. In addition, older children show a greater sensitivity to the importance of the protagonist's goals, motivations, etc. Younger children seem to focus more on outcomes of actions rather than motivations, at least during recall. At the same time, however, recall patterns showed many regularities across the elementary school years, which suggest similar manners of dealing with stories (at least during retelling). The studies do not provide much information on developmental differences more specifically related to comprehension or encoding of stories beyond parameters obtained at the time of recall.

The studies by Mandler and Johnson (1977) and Stein and Glen (1975, 1979) used simple, well-formed stories which generally corresponded to the structure and sequence defined by the grammars. In all cases, elementary school children (including first graders 6 to 7 years old) tended to preserve the original order of story events in their retellings. Mandler and Johnson's stories included a more structured and logically connected version of Piaget's (1926) original "Epaminodas" and "Niobe" stories and Stein and Glen (1979) also used a "well-formed" version of "Epaminodas." Results provided by Mandler and Johnson (1977) and Stein and Glen (1979) are said to contradict Piaget's (1926) findings related to poor sequencing of events in the story retellings of 6 to 7 year olds. Mandler and Johnson, and Stein and Glen attributed the differences in results to simpler language and to the better organization, linking and structuring of their story versions, which rendered them more easy to follow and organize. These variables are undoubtedly very important. However, the results are not directly comparable since we have to keep in mind that Piaget (1926) carried out his studies more than fifty years ago, with Swiss children who retold the stories to other children and in quite different circumstances. Likewise, Piaget's (1969) later claims about preoperational children's poor sequencing of stories due to lack of reversibility cannot be directly challenged by the present results. This is because the reviewed studies conducted within the story-grammar approach used first graders. There is no certainty that first graders, especially Americans, are preoperational or lack reversibility according to Piaget's theory. Kindergarten children represent a more appropriate population

for analyzing the relationship between developmental level and sequencing abilities.

In general, story grammars, although still unsatisfactory for dealing with many of the complexities of language, provide a wide and insightful framework for analyzing the structure of stories. Fine-grained analyses are enabling the uncovery of many subtleties resulting from the interaction between complex linguistic inputs and the processes of comprehension and recall. At the same time, however, story-grammar studies generally suffer from an overreliance on purely free recall measures to generate data which are supposed to shed light on both encoding and retrieval processes. If "schema" approaches are to be offered as models of comprehension, other more sensitive measures will have to be devised to examine encoding and understanding mechanisms. At the very least, several dependent variables should be considered. Although some authors acknowledge that encoding and retrieval processes might differ, they generally talk about them as if they were the same or very similar in their treatment of results. Furthermore, in this area authors often fail to distinguish between the structure of the story, on the one hand, and the postulated "structural mental representation," on the other, and tend to refer to them interchangeably. Similarly, the story "schema" is said to serve both encoding and retrieval of story information. Such accounts might be putting too many variables and cognitive functions under the same label. Studies are needed to investigate the separate contributions of these variables and functions to the abstraction of information. In addition, other variables beside structure will have to be investigated in greater

depth to determine whether some of the results which have been attributed to structure alone need to be explained as interaction between this and other variables. Lastly, the developmental research needs to be extended to investigate more closely the types of developmental changes occurring in comprehension and recall operations across different age ranges.

In short, although we have extensive information about some aspects of development, we are still far from having a complete picture of the changes by which children become increasingly able to deal with, and abstract information from, complex linguistic forms. The study to be presented in the following chapters is an attempt to fill some gaps in this picture.

CHAPTER II

OBJECTIVES AND RATIONALE OF THE STUDY

The present study was designed to document and shed light on some of the changes by which children become increasingly able to deal with, and abstract information from, linguistic prose (specifically narratives), in the transition from early to middle childhood. Several aspects were selected for detailed analysis. To investigate them children from two significant developmental levels were exposed to orally presented narratives which varied in certain structural and content characteristics. Their subsequent performances on three tasks were then compared: (1) retelling the narratives (Retelling Task), (2) answering questions about explicit and implicit information contained in the narratives (Question-answering Task), and (3) sequencing selected pictorially represented events from the narratives (Sequencing Task). For each task, quantitative as well as qualitative aspects of performance were investigated, in order to provide some insight into the nature of developmental and other differences under study. Relationships between the different measures were also assessed. For both age groups, there were four experimental conditions, comprised of variations in the provision of visual aids during two phases, namely story presentation and the subsequent Retelling Task. They were developed to help reveal the locus of the developmental differences encountered (see below).

A. Principal Issues Investigated

Otogeny of Abstracting Operations

The developmental levels investigated were approximately the end of early childhood (kindergarten children, 5 to 6 years old, commonly placed at the "preoperational" stage of cognitive development) and the mid-period of middle childhood (third graders, 8 to 9 years old, commonly placed at the "concrete operational" stage). The cognitive development literature has demonstrated that children going from the former level to the latter acquire many important cognitive abilities (e.g. seriation, reversibility, decentration, conservation) which enable them to operate more effectively and flexibly with the environment. How these and other changes relate to ways of dealing with complex linguistic forms, however, is poorly understood.

With particular reference to development of the child's ability to sequence events in time, previous research (see Chapter I) has indicated that sequencing tasks in general can pose problems for preoperational children, especially when asked to retell the events as opposed to other tasks such as sequencing pictures. There is controversy, however, concerning what youngsters actually can do, under what circumstances, and the reasons behind observed developmental differences. Although some recent studies have shown that when well-structured narratives are used, elementary school children (including first graders) do retell events in order, this evidence does not necessarily contradict claims about preoperational children's limitations. In the present study, kindergarten children were compared with third graders on a series of tasks involving the ordering of events, including

retelling and other non-verbal tasks (sequencing pictorially represented events), in order to reveal the differences in performance, the conditions under which performance differs, and the possible locus (or loci) of the differences. In addition, some indication of the nature of the developmental differences encountered was sought through the analysis of quantitative and qualitative (i.e., more fine-grained) aspects of the various measures obtained (see further description under "Parameters of Abstracting Operations").

Linguistic Materials: Narratives

Narratives were selected as stimulus materials for this study because they furnish a rich source of opportunities for tracing developmental trends in abilities and operations related to the abstraction of information. Unlike materials created in the laboratory, stories represent more "natural" units of discourse. Created by individuals of different cultures, they often reflect the culture's social and moral values, and they are passed from generation to generation (see, for example, Levi-Strauss, 1955). Most importantly, they represent a form of discourse encountered by children in their everyday dealings both at school and home. In addition, narratives have been shown to possess specific structures of their own which can now be analyzed in detail.

Two stories were selected to represent types of structure commonly found in narrative discourse. The two stories share some characteristics and vary in others. The most important difference between them is that the structure of one is more tightly and logically (i.e. non-arbitrarily) organized, with causally connected events occurring between episodes.

In contrast, the structure of the second story is more loosely and arbitrarily organized with its episodes connected only temporarily.

Stories which contrast mainly in the type of relationships among events (namely causal/logical against temporal/arbitrary) were used to fulfill two main aims. The most important was to test in detail the organizing and sequencing abilities of children of two developmental levels with regard to the above classes of relationships. This was to help delimit (1) the stimulus characteristics of stories which pose problems to children, and especially young ones, in retelling and sequencing tasks, and (2) the locus of developmental differences as they relate to the various stimuli under investigation. The effects of relations between events were examined by analyzing in particular two aspects of the dependent variables: (1) the order in which events were mentioned in the Retelling Task, and (2) the order in which children placed pictures depicting events in the subsequent Sequencing Task.

A secondary aim of contrasting these stimulus characteristics was to evaluate some predictions generated by story grammar research, in particular the assertion that events and episodes which are causally connected should be more readily remembered than those connected by weaker ties (see Stein, 1979).

Locus of Developmental Differences

Children's operations or strategies during two important phases of information abstraction were investigated: (1) those performed at the time of presentation (i.e., "encoding" or "comprehension" operations), and (2) those used in the subsequent Retelling Task (i.e., "retrieval" or "recall" operations). There are many difficulties in studying these

phases given that much of what happens is not directly observable. Certain manipulations, however, were carried out during each of these phases, and during both phases, to observe their effects on task performance. This enabled an indirect assessment to be made of the contributions of each of the phases to the abstraction of information.

By analyzing these effects, inferences could also be made about (1) the possible locus (or loci) of developmental differences in abstracting operations, and (2) the factors responsible for the alleged difficulties of young children with tasks similar to those used here. In other words, what is it that older children have developed? A central tenet of this study is that, beyond the acquisition of important logical concepts, children develop the ability to apply appropriate strategies to abstract information. It is also hypothesized that young children might not actively, spontaneously, or independently, apply such strategies.

If appropriate strategies are acquired during development, there still remains the question of which types, and during which phase(s) they are or fail to be adequately applied. Do young children have special difficulty following, retaining, integrating and/or organizing incoming information? Do they experience most trouble trying to recall and organize the information for retelling (or performance of other tasks)? Does their problem reside in a combination of factors during both phases?

To deal with these questions, four experimental conditions were devised. Briefly, children were provided with visual aids (VA's) during the presentation of each story (Condition III), during the

subsequent Retelling Task (Condition II), or during both phases (Condition IV), and their performances on the series of tasks were compared with each other and with the performances of a control group which received no aids (Condition I). The VA's employed were small models representing the main "referents" (i.e., agents and objects) of each story. In general, visual cues presented with the stories were designed to help children follow, retain and organize incoming information. Those provided during the Retelling Task were intended to aid recall, in an organized fashion.

Rationale. The rationale behind the visual aids procedures (for both the presentation and retelling phases) was as follows:

a. Visual cues were selected to aid performance because some developmental theorists contend that the primary mode in which children, and especially young ones represent information is visual (e.g. Bruner, 1966, 1973). Thus, a visual cue should be particularly appropriate for them. Furthermore, visual aids have been shown to enhance performance in related tasks (e.g. Levin, 1971, 1972).

b. The referents alluded to throughout the story were selected for representation by visual models in order to highlight them, since referents have been shown to play an important role in discourse processing (e.g. Carpenter and Just, 1977; Clark, 1977; Haviland and Clark, 1974; Kintsch and van Dijk, 1978). For example, Kintsch and van Dijk (1978) argue that during processing, a common comprehension strategy is to check for referential coherence by focusing on relevant propositions (predicates and their arguments), retaining them in memory, and integrating them with incoming information sharing the same

arguments, i.e., referents. One of the principal concerns of this study is to test the hypothesis that children, and especially young ones, may apply comprehension and/or recall strategies to a lesser extent or less adequately than older children. Providing referents visually during presentation could encourage the child to focus upon the propositions containing the referents so that he could retain these propositions, and integrate them with incoming information sharing the same referents. Likewise, during retelling, these visual referents could provide basic recall cues from which the child could reconstruct the story.

c. It is also hypothesized that children (especially young ones) might not actively apply strategies to organize information for efficient processing. In fact, pilot trials as well as the literature (e.g. Brown, 1975a and b; 1976b; Brown and Murphy, 1975; Fraisse, 1963; Piaget, 1926, 1969) support the contention that tasks which require children to organize and/or sequence certain items can prove very demanding, especially for "preoperational" children. To be effective, visual aids should provide cues to the organization and sequence of the narrative.

The procedures adopted were therefore designed to: (1) indicate the sequence of events by presenting the relevant referents one by one in synchrony with the narration, and leaving them in place for the child's reference; and (2) provide a cue to the organization/structure of the story by representing each episode by physical spaces in which the participating characters were placed and displaced, in accord with the structure of the story as described by story grammars. Similarly, for the recall task providing the VA's in the order in which referents were introduced in the story should also provide a cue into the sequence of some of the events in the narrative associated with those referents.

Hypotheses:

1. The specific ways in which VA's were provided could lead to improvement in information acquisition and in performance on subsequent tasks in any of the following ways (among others):

i) During Presentation:

a. By highlighting important referents, VA's could help the child focus upon information containing them, and retain and integrate this information with incoming information sharing those referents.

b. VA's could help performance by structuring/organizing information and providing cues into the sequence of events.

c. VA's could facilitate retention of relevant incoming information by presenting the referents as cues. Similarly, VA's should provide supporting cues for back reference if needed, since the VA's were left in place. In this way the child could also follow the narrative more fully by relating what was being narrated to what had happened previously. In addition, the information highlighted by visual cues could be made more memorable.

ii) During Recall:

a. VA's could facilitate performance by providing recall cues to reconstruct the story.

b. They should also provide some cues into the sequence of events associated with the models, since they were presented in the order in which the characters were introduced in the story.

2. Comparisons among experimental conditions were planned for each grade. This is suggested by the prediction of an interaction between grades and conditions. That is, kindergarten children's

difficulties are expected to be greater and more widespread, such that their pattern of performance under the different experimental conditions will differ from that of third graders. More relative gains are expected for kindergarten than for third grade children. Subsequent comparisons between the patterns resulting from the analyses performed for each age level would indicate similarities and differences between the way children from the two developmental levels abstract information, and also the locus (or loci) of developmental differences in their strategies, abilities, and/or performances.

3. If poor performance of young children on organizational, sequencing, and recall tasks is due exclusively or primarily to underdeveloped logical concepts, no substantial gains should be observed by providing aids. If, however, poor performance is largely the result of a failure to apply appropriate strategies for abstracting information at the time of presentation and/or utilization, performance should be improved by aids. It must be emphasized that the factors mentioned above are not mutually exclusive. Children could lack both logical concepts and appropriate strategies. The latter factor was chosen for close investigation because there has been a tendency in the literature to emphasize only the former.

Parameters of Abstracting Operations

The three tasks required of the children (retelling, question-answering and sequencing) furnished the dependent variables of the study. The present definition of "information abstraction" includes the utilization of the acquired information in performing given tasks, and it is this aspect which is most directly analyzed by the series

of dependent variables included in this study. It is acknowledged, however, that these performance measures represent the end product of the interactions among a great number of processes, operations and variables which operate before, during, and after exposure to discourse. There are three major reasons for using a variety of measures to investigate information abstraction:

A. As pointed out in Chapter I, we do not yet have appropriate means of measuring the abstraction of information. At the start of the seventies there was an extensive search for "pure" measures of processes such as comprehension, "uncontaminated" by memory and other variables (e.g. Simons, 1971). It is now realized that comprehension and memory processes interact in complex ways, and recently the pendulum has swung in the opposite direction. Many researchers are now using exclusively recall measures, which purport to shed light on both "encoding" and "retrieval" processes. Since in the present study both phases of the cycle are of interest, the use of several tasks should yield a more complete picture than relying solely on one task, e.g. retelling.

B. A second reason for using a variety of measures was to look at indications of the nature of developmental differences in terms of quantity and quality. This poses special problems since quantitative and qualitative variations are intimately related; indeed, it is often impossible to assess whether an observed difference or change represents one or the other. Nevertheless, some aspects of the problem were examined by analyzing the following aspects of the tasks:

1) Retelling Task. This was essentially a free recall task in which the child was simply asked to retell the story he or she had heard.

In addition to amount of recall, other more qualitative aspects were investigated. These include: the completeness of the recall protocols, the types of information provided and their structural and semantic relation to the original stories, the types of information which were imported and/or transformed from the original stories, and the order in which story units were retold.

2) Question-answering Task. Following the Retelling Task, children were asked a series of questions about each of the stories to assess further the degree to which they had abstracted information from the original text. Half of the questions requested information which was explicit in the texts ("Ex" questions), while the other half required the child to provide information which could only be inferred from the information provided ("I" questions). These two types of questions were included to assess whether age differences were observed not only for the number of correct answers, but for the composition of the children's scores on the two types of questions. This would indicate whether the performance of the third graders was superior to that of the kindergarten children to the same degree on both types of questions.

On the basis of current knowledge it is reasonable to predict greater superiority of third graders on "I" questions than on "Ex" questions, when their performance is compared with that of the younger children. Results confirming this would suggest that the development of ability and/or strategies for deriving information which is only implicit might be an important developmental accomplishment. When a child answers correctly a question that demands implicit information,

there is admittedly no indication of when the information was derived. It could take place during the initial acquisition of the information, after further elaboration or when the question was asked. If the expected differential superiority were observed, it could indicate a possible qualitative developmental difference in information-deriving operations.

3) Sequencing Task. This task was designed to examine sequencing behavior in more detail than allowed by simply recounting order, and to examine the relations between sequencing performance and organizational strategies during information acquisition. The task consisted of arranging in order pictorial representations of selected events from each story. The events were selected to emphasize differences between the two stories; that is, causal/logical connections among events in Story 1, and temporal/arbitrary relations in Story 2. In this way, differences between experimental groups in sequencing behavior could be assessed, and related to the nature of the narratives.

In order to investigate qualitative aspects of sequencing performance, each story, and the series of events selected from it, was composed of two parts. In the first part, episodes were in a "forward" sequence; that is, they followed in simple chronological order. The second part was also chronological, but there was an order reversal: the episodes of the second part corresponded episode for episode with those of the first (they in fact resolved them) but followed the reverse order. Thus, the character who appeared first in Part 1 appeared last in Part 2, and so on. This was termed a "Reverse" sequence.

The above similarities and contrasts between stories and sequence types permit assessment of the flexibility of children required to sequence events in a forward manner, and then to "change the rule" and reverse the order in which the characters and events appear. This flexibility can also be assessed for causal/logical versus temporal/arbitrary relations. If the logic of "preoperational" children is very poor, (as claimed by Fraisse, 1963), we would not expect a great difference between the two stories on these tasks. If, on the other hand, young children could make some effective use of logic to seriate events, they would be expected to perform better when sequencing events related causally and/or logically.

Because a major focus of the Sequencing Task was to relate organizational strategies during story presentation to sequencing performance, comparisons between sequence types and stories for each grade were planned only for the two experimental groups which did not receive VA's during retelling (i.e., children under conditions I and III). This was because the performance of these two groups on the Sequencing Task was not contaminated by the provision of organizational cues during retelling (unlike experimental groups II and IV), and thus a more direct assessment could be made of performance with and without organizational aids during presentation. (Recall that VA's during retelling were presented in order and hence provided some organizational cues.)

C. A third aim of considering a variety of dependent variables was to investigate the pattern of relations among them. This could help assess the degree of consistency of effects of the independent variables across tasks, as well as task-specific effects.

B. Other Issues Investigated

Motivational Factors

A special procedure was designed to deal with motivational and attentional problems commonly reported in the literature and encountered in pilot trials. When a child (and especially a young one) is presented orally with a passage, and then asked to retell it, it is not uncommon for him to say very little, or nothing. Is it that he cannot remember, or simply that he is not willing to, or does not see the point in saying very much? After all, the experimenter (or an unknown recorded voice) has just told him the passage so why repeat it?

In addition to motivational and task perception factors, there is the problem of attention. Since it is important to eliminate variability between sessions and/or bias in speed of passage presentation, tone of voice, emphasis, clarity, etc., and since standardization is particularly important when comparisons are to be made across experimental conditions, a common standardization procedure is to present the text via a recording. However, recordings are usually poorly attended to. For example, Stein and Glen (1979) decided to switch from a recorded presentation to a live one due to attentional problems. Other researchers have attempted to solve these problems by presenting passages through earphones (Omanson, et al., 1978). This solution, however, raises doubts about generalizability of results beyond this constrained experimental situation.

To deal with some of the above problems, the overall task was presented as a game in which a hand puppet of Kermit The Frog

(a popular puppet of the T.V. series "The Muppet Show") supposedly told the story to the child via a recording, asking him/her to tell the story to the experimenter later. The purpose and potential usefulness of this procedure were fivefold: (a) to standardize testing sessions across experimental groups; (b) to help the child perceive a purpose for the session; (c) to reduce attentional problems so that this factor would not confound the experimental results; (d) to motivate the child to retell the story to the experimenter, and in a more complete way; and (e) to introduce a motivating factor in all experimental conditions, including the control condition, so as to minimize differences in attractiveness of the task between the control group and those receiving VA's.

Learning Strategies

Developing procedures for improving children's performance on tasks like the ones used here has important educational implications as well as theoretical relevance. Educators have long searched for optimum ways of presenting information and of training students to use appropriate strategies to acquire and use information efficiently, both during listening and reading. In the area of reading comprehension, for example, there is considerable interest in differences between strategies employed by good and less skilled comprehenders. Word recognition and vocabulary skills aside, there is substantial evidence showing that many of the problems of "poor" comprehenders are caused by failure to integrate and organize information into efficient, meaningful units (e.g. Cromer, 1970; Denner, 1970; Golinkoff, 1976; Oakan et al., 1971).

Levin (1971) distinguishes between what he calls "imposed" and "induced" facilitating strategies. The former are manipulations of learning materials or situations which render them more "learnable," i.e., more comprehensible, memorable, etc. The latter comprise training or prelearning instructions aimed at evoking subject-generated strategies to improve understanding and learning. (These strategies are normally used by some individuals and can be taught to others. The strategies are used by the learner as opposed to the educator.) These two types of strategies are not mutually exclusive and, in fact, may be best combined.

The procedures developed for the present study fall within the category of "imposed" methods in that the experimenter presented the child with VA's to improve performance. If successful, they could be adapted and used by teachers and/or those who prepare educational materials. In addition, it is possible that a set of strategies to deal effectively with information, which could be taught to children, could be derived from the present procedures (these would fall into the category of "induced" strategies). That is, to the extent that VA's provide the children with means of dealing with the information more effectively, children could be induced to do on their own what the procedures would otherwise do for them. In this way, children could be taught to perform operations that they might not otherwise employ. This would provide them with a more ample and effective repertoire of strategies for dealing with prose.

CHAPTER III

METHOD

A. Subjects

One important focus of the study concerned a comparison of the performance between two age groups of children in a series of tasks after exposure to oral narratives. One hundred and twenty-eight children participated in the study, 64 from kindergarten (mean age at start of testing = 5y 6m, range = 5y 0m to 6y 0m) and 64 from third grade (mean age at start of testing = 8y 6m, range = 7y 7m to 9y 5m).

The children were from three schools in Knoxville, Tennessee. School I is located in a suburban area and serves a primarily white, middle-class population. School II is also located in a suburban area, serving both middle and lower-middle class, predominantly white populations. School III is located in an urban area serving a mixture of black and white, middle- and lower-middle class populations. The number of participants from each school was approximately proportional to the number attending that school. For each grade, 50 percent of the children came from School I, 25 percent from School II, and 25 percent from School III. Thus, the sample covers a range of SES from middle to lower-middle class, although due to limitations of the subject pool, middle-class children were more highly represented. Approximately equal numbers of boys and girls were selected from each grade level and each school. The total distribution of males and

females for each grade was as follows: K = 32 M/32 F; third grade = 28 M/36 F.

The selection of children from each school was random, except for the following constraints:

(a) That they had returned informed consent forms signed by their parents.

(b) That they had not been diagnosed by the school as having special speech difficulties. (Analysis of recorded tapes would have been very difficult with unintelligible speech.)

(c) That matchings of age, sex and achievement level could be obtained. This was in order to form four matched, homogeneous groups for each grade level and allot them randomly to four experimental conditions (see below).

(d) In addition, from among the third graders, children with exceptionally low or high records of achievement were deleted. This was to prevent a very small number of subjects producing extreme variability in any of the experimental conditions. To achieve this, the following groups of children were deleted: (1) For low achievement, children participating in both a "Communication Skills Program" for readers two levels below their grade level, and a "Resource Program" for children diagnosed as especially slow learners. (The diagnostic procedures for admission to these two state programs are standard for all schools.) (2) For high achievement, children with scores in the ninth (highest) stanine on the Stanford Diagnostic Reading Test. This procedure, however, eliminated only seven children (five low and two high achievers) from those who returned informed consent forms.

Once a sufficiently large pool of children had been obtained, they were matched according to several criteria in order to form homogeneous groups (see below). Children satisfying a given combination of criteria were then randomly selected and randomly assigned to one of four experimental groups. The matching criteria for each grade were:

(a) Kindergarten. Children were matched for age, sex, school and classroom of origin, and achievement level. Achievement level, which was used as a blocking variable, was determined by asking each teacher to rate students according to overall quality of classroom performance. Teachers were instructed to focus particularly on language skills and performance on verbal tasks such as answering questions after hearing information. Students were assigned to one of two groups on the basis of the following achievement judgements: "High" achievement group = high and medium-high; "low" achievement group = medium-low and low. Children from each combination of achievement level (two groups), age level (two groups), sex, and school and classroom were then distributed randomly across four experimental groups (one for each experimental condition) to achieve maximum homogeneity. Each experimental group consisted of 16 children. The children of each of the combinations in each group were then assigned in equal numbers to two subgroups (A and B), which were also homogeneous according to the same criteria. These two subgroups were formed to counter-balance order of presentation of the two stories.

(b) Third grade. The same criteria and distribution procedures were employed for both third graders and kindergarten children.

To determine achievement level, however, a composite reading score was calculated for each child. This was based on his/her score on the Stanford Diagnostic Reading Test, the score obtained in class on the final test regarding the previous book covered (same for all children) and on the class reading group to which the child was currently assigned. Each set of scores was divided into four ranked intervals such that an equal number of scores occupied each rank. (The last criterion, class reading group, was simply either 1, 2, 3, or 4.) For each child, these values were then averaged and rounded to produce a composite reading score ranging from 1 (highest) to 4 (lowest). Children from each rank were then randomly selected and randomly distributed across the four experimental conditions, provided that homogeneity for the remaining criteria (i.e. age, sex and school and class of origin) was also achieved. The 16 children from each experimental group were assigned to the two subgroups (A and B) in the same manner as the kindergarten children. Children with ranks 1 and 2 formed the "high" achievement group; those with ranks 3 and 4 constituted the "low" achievement group. Table 1 shows the characteristics of the kindergarten and third grade experimental groups. All kindergarten and third grade experimental groups were matched on all criteria.

B. Materials

Two stories were selected from a pool of classic tales, folk-tales and fables. One story, "The Farmer," represents a shortened and modified version of an Old English folktale, "The Old Woman and Her Pig." Rumelhart (1977) wrote a new version of this tale under the

TABLE 1

MATCHED CRITERIA ACROSS GRADES AND EXPERIMENTAL GROUPS

Grade	Experimental Group	n	n of each school 1,2,3	n of each sex M,F	n of each achiev. level high,low	mean age y/m	age range from-to y/m-y/m
Kinder-	I	16	8,4,4,	8,8	8,8	5/6	5/3-6/0
garten	II	16	8,4,4	8,8	8,8	5/6	5/1-5/9
	III	16	8,4,4	8,8	8,8	5/7	5/1-6/0
	IV	16	8,4,4	8,8	8,8	5/6	5/0-5/11
Third	I	16	8,4,4	7,9	8,8	8/6	7/10-9/3
Grade	II	16	8,4,4	7,9	8,8	8/7	8/1-9/5
	III	16	8,4,4	7,9	8,8	8/6	7/7-9/1
	IV	16	8,4,4	7,9	8,8	8/7	8/1-9/5

title "The Old Farmer and His Stubborn Donkey," changing, among other things, some of the original characters. This version has since been used in research on comprehension and/or memory with adults (Neilsen, 1978; Thorndyke, 1977). This version was shortened in an adaptation appearing in Mandler and Johnson (1977), although these authors did not use it as stimulus material. Mandler and Johnson's adaptation of the story was used in the present study, with some modifications. The changes eliminated some complex forms and vocabulary that had proved difficult for the younger children in pilot trials, and helped match it to the other story used in the present study.

The second story, called "Lamby," is a shortened and modified version of a classic tale called "The Lambikin" (in Hunt, 1972). The modifications matched the story to "The Farmer" in a number of structural, linguistic and content characteristics. In addition, the structure was chosen for its looseness, to contrast it with the tighter organization of "The Farmer." Both stories were shortened, since longer stories tend to be more tiring for younger children, and their lengths were matched. Their selection and modification also insured a certain degree of structural complexity (see description of their respective structures below) which was not beyond the comprehension capacity of the kindergarten children, as demonstrated by pilot trials. The texts of both stories appear in Table 2.

The structures of both stories were analyzed according to the story grammar of Mandler and Johnson (1977), with certain modifications (see below). Some structural characteristics of the stories were matched very closely, while others were varied. Both stories are

TABLE 1

STORY TEXTS INCLUDING DIVISIONS AND UNIT CATEGORIZATION

Basic Nodes[1]	Termin. Nodes		STORY 1: THE FARMER (F)
S	1	1)	Once there was an old farmer.
	2	2)	He had a donkey who never did what he was told.
BI	1	3)	One evening, when it was already very late,
	2	4)	the donkey didn't want to go into his barn.
GI	1	5)	So the farmer decided to force him in.
AI	1	6)	The farmer pushed, and pushed, and pushed the donkey,
DI/BII	1	7)	but the donkey wouldn't move.
GII	1	8)	Next the farmer thought he could scare the donkey into the barn.
AII	1	9)	So he went to get his dog,
	2	10)	and asked him to bark at the donkey.
DII/BIII	1	11)	But the dog was very lazy,
	2	12)	and he refused to bark.
GIII	1	13)	Then the farmer thought that his cat could help him.
AIII	1	14)	So he went to get his cat,
	2	15)	and asked the cat if he could make the dog bark.
DIII/BIV	1	16)	The cat was very helpful,
	2	17)	and he said he could do it.
GIV	1	18)	The cat thought that if he made the dog angry, then the dog would bark.
AIV	1	19)	So he went and scratched the dog.
DIV/EIII	1	20)	The dog immediately began to bark.
DIV/EII	1	21)	The barking scared the donkey so much,
DIV/EI	1	22)	that he jumped into his barn.
E	1	23)	And the farmer went to bed.

STORY 2: LAMBY (L)

S	1	1)	Once there was a little lamb called Lamby,
	2	2)	who lived near many dangerous animals.
BI	1	3)	One day, Lamby was walking in the fields looking for food.
	2	4)	A lion saw him.
GI	1	5)	The lion wanted to eat Lamby,
	2	6)	but decided to wait until Lamby got fat.
AI	1	7)	The lion told Lamby to stay away from a fox who was nearby.
DI / BII	1	8)	But soon Lamby met the fox.
GII	1	9)	The fox thought of eating Lamby,
	2	10)	but decided to wait until he felt hungrier.
AII	1	11)	The fox told Lamby to be careful because there was a big snake nearby.
DII / BIII	1	12)	But soon Lamby met the snake.
GIII	1	13)	The snake thought he might eat Lamby,
	2	14)	but decided to take a nap first.
AIII	1	15)	The snake told Lamby there was a lot of good grass nearby.
DIII / BIV	1	16)	Then the snake went to sleep.
GIV	1	17)	Meanwhile, Lamby thought of a way to trick the animals.
AIV	1	18)	He got inside a barrel which was nearby,
	2	19)	and then started to roll home inside the barrel.
DIV/EIII	1	20)	When the snake woke up, he couldn't find Lamby.
DIV/EII	1	21)	Then the fox saw the barrel, but he didn't know Lamby was inside.
DIV/EI	1	22)	Then the lion saw the barrel, but he thought it was empty.
E	1	23)	And Lamby rolled all the way home.

[1](Legend: Ep.=Episode; S=Setting; B=Beginning; G=Goal; A=Attempt; O=Outcome; E=Ending.
Roman numerals represent number of corresponding Episode;
Arabic numberals stand for number of Terminal Nodes).

composed of four episodes. The first three narrate the initiation and development of the plot, and the fourth, the "Resolution," contains the solution of the problem(s) previously developed (see Table 2). The episodes of both stories could be regarded as "embedded" in that each episode is initially unfinished, leading to a new episode in turn, until the Resolution furnishes an ending to all previous episodes. Each new episode (except the first) represents, either directly (as in "The Farmer") or indirectly (as in "Lamby"), the "Outcome" of the previous episode, and follows an Attempt (called Outcome-embedding). The nature of the embedding differs in the degree of relatedness to the previous episode, the connection being causal for the first story, and only temporal for the second (see differences between stories below). The series of Outcomes in the fourth episode represent at the same time the Endings of Episodes I, II and III.

The above structural analysis differs from other grammars in several respects. First, a Resolution episode is not used in the story grammar of Mandler and Johnson (1977) (nor in similar versions). Kintsch's (1977) grammar does use the term to refer to a concept very similar to the one expressed here, which was adopted because it accurately described the function of events in the last episode. Second, story grammars do not normally allow a Terminal Node to play more than one role (except in special cases like embeddings). Other authors (e.g. Warren et al., in press) consider this a limitation. In the current analysis, nodes were allowed to play more than one role when this more accurately reflected interrelations among events. Thus, a Resolution Episode was created that had a structure of its own while

also providing an ending for previously unfinished episodes. In Mandler and Johnson's (1977) representation of "The Farmer," for example, the endings of Episodes I, II and III do not form part of the same episode. Finally, these authors used the term "embedded episode" only to refer to one causally connected to the previous one. If one uses the term only in that sense, the episodes in "Lamby" are not embedded, since they are temporally connected.

In both stories, each episode is composed of five Basic Nodes: a Beginning; a Complex Reaction formed by a Goal; an Attempt; an Outcome which forms at the same time the Beginning of the next episode; and an Ending which forms part of the Resolution. Each Basic Node is in turn formed by one or two Terminal Nodes, which represent the units into which each story is divided. While the number of Terminal Nodes in each Basic Node varies from one to two for each story, the total number of both Terminal and Basic Nodes is the same for both stories (23 Terminal and 5 Basic, see Table 2).

In addition to the structural characteristics already mentioned, other characteristics were also matched as closely as possible. Among these were length and, to a lesser extent, degree of difficulty with respect to complex grammatical forms and some vocabulary items that could pose problems for the young children. Rather than quantifying degree of difficulty with a formal measure (e.g. a readability formula), the degree of difficulty that each story posed for the younger children was determined empirically in pilot trials.

This decision was made because recently, many of the old notions about what makes a text difficult, such as those factors determined by

readability formulae (e.g. "vocabulary load," sentence length, etc.), have been challenged (see Pearson, 1974, 1978; Kintsch and van Dijk, 1978). Factors which are more subtle (and hence more difficult to measure), such as semantic cohesion, text structure, and number and type of inferences required to "fill gaps" have been shown to play more important roles. Since some aspects of the stories' structures were matched, other factors such as linguistic complexity were assessed by presenting kindergarten children with each story, sentence by sentence, and asking questions about the content and vocabulary. Those words and/or forms that proved difficult were rephrased.

For these two stories, the only grammatical forms that seemed to pose some problem for the young children were the ones containing reported speech (he asked/told him to . . .), and those describing a character's goals, thoughts or wishes (he thought he would . . .). For this reason, some of these sentences were modified to make them more intelligible, and were matched so that both stories contained such forms, and in the same types of Basic Nodes (namely Goals and Attempts, see texts).

Table 3 shows the composition and matching of both stories in terms of structural, linguistic, and content characteristics.

With respect to linguistic features, the number of words and sentences across stories are very similar. Sentence types which could pose special problems were also matched: (a) both stories have three sentences with reported speech (mainly as Attempts); (b) although "Lamby" has more sentences expressing goals (thought . . . , decided . . . , wanted . . .) than "The Farmer," the sentences in "Lamby" are

TABLE 3

MATCHING OF THE STORIES ON THE BASIS OF STRUCTURAL, LINGUISTIC AND CONTENT FEATURES

	Structural Features			Linguistic Features					Content Features											
											No. of Characters Introd. and Particip. in Each Episode									
											Introduced in Episode:				Participating in Episode:					
Story	No. of Epis.	No. of BN/Epis.	No. of TN	No. of Words	No. of Senten.	Senten. w/Rep. Speech	Senten. about Goals	Story	No. of Charac.	No. of Objects	I	II	III	IV	I	II	III	IV		
FARMER	4	5	23	183	17	3	4	FARMER	4	1	2	1	1	0	2	2	2	4		
LAMBY	4	5	23	198	18	3	7(rep.)	LAMBY	4	1	2	1	1	0	2	2	2	4		

also more repetitive (e.g., cf. TN no. 9 and 13 which are almost identical) so that few new forms are introduced. The content features described in Table 3 are perfectly matched across stories: in addition to having the same number of characters and objects, both stories have, in each episode, the same number of characters introduced and participating. There are also close parallels between characters across stories in relation to which particular character(s) is (are) introduced or participates in each episode: the farmer, donkey, dog, and cat corresponding respectively to Lamby, the lion, the fox, and the snake. These content features were matched primarily to make the presentation of visual aids across stories equivalent (for some experimental conditions), and to match a series of drawings designed for the Sequencing Task. (See "Experimental Manipulations," and "Sequencing Task" below.)

The stories differ in several respects. Although some aspects of content were matched, the thematic content of both stories obviously differs. Another basic difference characterizing both stories is the type of relationship holding among the events, and especially between the episodes of each story. The farmer story is more tightly and logically structured in that most of the events within and across episodes are causally connected and follow logically (i.e. non-arbitrarily) from each other. Each unsuccessful outcome induces the farmer to form a new subgoal in the service of his main one--which is to put the donkey in the barn--giving rise to the formation of a new episode. Thus, each episode follows logically from the preceding one so that the sequence of episodes could not be changed without altering the logical sequence of events. The same is true for the series of outcomes in the last episode.

By contrast, "Lamby" is more loosely and arbitrarily structured, with more temporal relations among events, especially across episodes. Preceding events sometimes set the occasion for the ones to follow, without actually causing them (e.g. the lion's warning Lamby about the fox, followed by Lamby meeting the fox). The sequencing of events, especially across episodes, is arbitrary in the sense that any episode could have followed any other without distorting the story's coherence. The same is true for outcomes in the last episode. Most events are more or less accidental and the distribution of characters across episodes, events and actions is arbitrary (except for Lamby). Thus, many of the events attributed to the characters (excluding the lamb) are reversible in principle. For example, the farmer goes to get his cat to make the dog bark, which will in turn drive the donkey into the barn (logical sequence). In contrast, Lamby's encounter with the snake does not follow as a consequence of his encountering the fox and/or the lion. Likewise, the cat scratching the dog causes him to bark, which in turn causes the donkey to get scared and enter his barn. In contrast, the waking of the snake does not cause the fox to see the barrel, and this does not cause the lion to see it either; these events are only temporally and arbitrarily connected. Although at first sight "Lamby" appears complicated, it is, in fact, a simple story. Disregarding some information such as each animal's reasons for deciding to wait before eating Lamby, and the reasons for their not eating him at the end, the rest of the story follows a very regular, repetitive pattern.

C. Procedures

Experimental Manipulations

Aspects of the presentation and testing of the stories were varied by providing visual aids (VA's) in different combinations. This was done (1) to permit analysis of two phases in the process of abstraction of information from the narratives presented and (2) to help isolate the locus (or loci) of the developmental differences encountered. The variations comprised four experimental manipulations. Each manipulation was applied to one of the four homogeneous groups formed for each grade. Each experimental group was exposed to the same type of manipulation for both stories.

The experimental manipulations (summarized in Table 4) consisted of the following:

Condition I. This group received no visual aids during either the presentation or retelling of the stories (Control Group).

Condition II. This group received VA's during the retelling of the stories, but not during presentation.

Condition III. VA's accompanied the narration of the stories, but were not presented during the subsequent Retelling Task.

Condition IV. For this group, VA's were provided both during the presentation of each story, and during the Retelling Task.

The VA's consisted of eight small (5 to 6cm high), colorful, three-dimensional dolls made of wool and felt. They were made by

TABLE 4

TIMES AT WHICH VISUAL AIDS (VA'S) WERE PRESENTED FOR EACH EXPERIMENTAL CONDITION

Phases	Experimental Conditions			
	I	II	III	IV
Story Presentation			VA's	VA's
Retelling Task		VA's		VA's

modifying some commercially-available dolls (caricatures of animals and a sailor) to represent the four characters in each of the two stories: namely a farmer, a donkey, a dog and a cat for "The Farmer"; and a lamb, a lion, a fox and a snake (made of rubber, 20cm long) for "Lamby." To accompany "The Farmer," a small (13 x 11cm) barn was made out of red and white cardboard. In the case of "Lamby," a 7 x 4.5cm barrel was made of brown cardboard. The five items of each story represented the five referents (i.e. the agents and objects in this case) alluded to throughout the story.

The specific way in which VA's were presented to children in the different experimental conditions are described below.

(a) VA's during story presentation (Conditions III and IV for both stories). A major aim of providing children with VA's during the presentation of each story was not to represent the events in the narrative visually nor to compare "visual" versus "auditory" encoding. Rather, these models were provided as extra, supporting cues to aid

(and not to substitute for) information acquisition, specifically the organization, integration and retention of incoming information.

To avoid giving a complete representation of the stories, the dolls were very simple in form and lacking in mouths or any other features which could give a clue to mood or other particular characteristics of a character, as narrated in the story (e.g. happy, angry, helpful, etc.). The faces and appearances of the characters were thus neutral with respect to the story content. Extreme care was taken to move the models only minimally so as not to represent the events in the story beyond indicating who interacted with whom. The events were not represented fully so that the child could not rely solely on VA's or his/her memory of them to perform adequately on subsequent tasks. Rather, the child still had to listen to the content of the story to make any sense out of it, especially since both stories were full of reported speech, events and facts that were not conveyed through simply watching the models. As a result of trying different ways of presenting models in pilot trials, the procedure was refined to achieve a mode of presentation that was neither confusing nor disturbing to the child.

During actual experimental sessions, a 34 x 18 x 11cm cardboard box was placed in front of the child as a "stage." The surface of the box was visualized as comprising three adjacent rectangles. Faint marks enabled the experimenter to keep this spatial organization consistent across sessions. For both stories, rectangles were designated (from left to right) for placing the models of the first three successive episodes in the story. The same three spaces were

used for displaying models in the fourth episode, since the Resolution of each story overlapped both in terms of characters and spaces with the previous episodes. The precise location and orientation of models was held constant for all subjects.

Before each story was narrated, the five models (four characters and one object) were concealed behind the box. The child was told that he was going to be shown some dolls while he listened to the story, to help him follow the story. He was also told that the dolls would not move very much, would not do everything that the story said, and that, for him to learn the story, he not only had to watch the dolls but to listen carefully to the story. (If the child had questions or doubts, the instructions were repeated).

Following these instructions, the tape recorder was turned on, and in synchrony with the narration of the story, models were discreetly displayed in a predetermined, standard way, according to the following rules:

(1) Whenever a character (or an object) was verbally introduced, the corresponding model was simultaneously placed on the box in its proper location. Thus, two or more models would be placed in the same rectangle if they were introduced in the same episode.

(2) After a model had been placed in a given space, it was simply left there either for the remainder of the narration, or until (and if) it was involved in a subsequent episode. In the latter case, as the character or object was mentioned again, the corresponding model was displaced from its original place to its proper place in the rectangle corresponding to the episode being narrated. (The displacement was done by simply lifting the model and placing it again in the

new place, discreetly so as not to distract the child. No action of walking or rolling was represented.) Often one model was displaced at the same time another model was introduced in the story, in which case they were simultaneously placed on the appropriate rectangle. In the particular case of Lamby at the end of the story, as Lamby was said to get in a barrel, the lamb was simply removed from the box and the barrel was placed in Lamby's place. From there on, the barrel became the "protagonist."

(3) An additional rule applied to Episode 4. At the start of this episode, the three rectangles were occupied by models. As the episode was related, the model representing the "protagonist" was displaced once (as for the cat) or twice (as for the barrel) from one rectangle to the next in synchrony with events such that it was adjacent to the model representing the character with which the "protagonist" was interacting. This was the only case where a model (the barrel) was moved more than once during an episode.

Some models remained in their original places after being first introduced (namely the donkey, the barn, and the dog in "The Farmer" story; and the lion, the fox, and the snake in "Lamby"), while others were displaced one or more times (namely the farmer twice, the cat once, the lamb three times, and the barrel twice). In general, two models of characters on the same rectangle indicated that the characters interacted during the corresponding episode. Appendix A describes the specific way in which each model was presented and displaced for each story. When the story finished, the experimenter quickly removed all models.

(b) VA's during the Retelling Task (Conditions II and IV for both stories). The same five models used during presentation were used as VA's during the subsequent Retelling Task. The reason for presenting VA's at this time was to provide children with relevant recall cues from which they could recreate the events in the story. On the basis of the results of pilot trials and previous research, models were presented in a spatial arrangement reflecting the order in which they were introduced in the story.

Five minutes after story presentation, the child was asked to retell the story to the experimenter. For children in Conditions II and IV, the procedure was as follows:

(1) Prior to story presentation, each child was instructed to listen carefully so that he could learn the story. He was further informed that he would be later shown some dolls who would participate in the story, when it was his turn to tell the story. Children in Group IV were told these were the same dolls they were about to see.

(2) For the recall task, the experimenter told the child she would show him the dolls who had taken part in the story he had heard and which might help him remember the story.

(3) One by one the five models were presented to the child, in the same order in which they had been introduced in the story. As each item was presented, the experimenter asked the child: "Who is this in the story?" If the child answered correctly, the experimenter said: "Yes, it's the X," and placed it in front of the child. If the child did not know or answered incorrectly, the experimenter said: "(No), it's the X," giving simply the name of the character or object

without any other information, and then placed it in front. (In the case of Lamby, the experimenter simply referred to it as "the lamb" so as not to interfere further with recall.)

All models were placed on the table, one by one in order of appearance, from left to right. For each story, the four characters were placed in a line, and the object was placed behind the characters of the corresponding episode. (See sketch in Appendix A II.)

(4) After the last model had been identified and placed on the table, the experimenter asked the child to tell the story he had heard before. When the child indicated he had finished, the models were put away.

Dependent Variables

Three tasks were given consecutively to the children five minutes after each story. These furnished the main dependent variables (DV's) of the study, although a number of parameters were measured within each task.

Retelling Task. The first task provided a global measure of retention of the information provided. It was essentially a free recall task (although in Conditions II and IV there was an element of cued recall because of VA's) in which the child was simply asked to retell the story he had heard. Among the parameters of interest were:

(1) Number of story units (i.e., Terminal Nodes) mentioned by the different experimental groups.

(2) Types of information provided by the different experimental groups:

a) Reflecting the information explicit in the text. Types of Basic and Terminal Nodes, and their frequencies.

b) Imported and transformed. Types of information added to and changed from the original text, and their semantic congruency with it.

(3) Order of story units. Comparison of the order in the child's recall protocol and that in the original text. This is one measure of the child's ability to track the sequence of events.

Question-answering Task. To assess further the degree to which the child had abstracted information from the original texts, a series of questions probed each child's recollection and understanding of direct and implied information from given parts of the stories.

For each story, questions about explicit and implicit information were selected from a larger pool. The pool was composed of multiple-choice, true/false, and open questions. These questions probed information from different parts of the text, and concentrated on important information. They were assessed in the manner described below. The 24 most appropriate questions in each questionnaire were matched and adopted for the final format:

(a) Eight judges (one elementary school teacher, two university professors, and five undergraduate and graduate students) were asked to give their opinion of the questionnaires' completeness, the adequacy of questions asked and answers provided, their overlap/redundancy, and to make any other comments. Questions consistently judged inadequate were dropped, while others were modified.

(b) Ten children were individually given each questionnaire after they had heard each story. After every answer, they were further questioned to assess whether they had understood the questions. Older children were asked for additional comments. Questions which proved difficult to interpret were modified or dropped. The final number of items (24) seemed well within the capabilities of the younger children.

(c) The items selected were matched for form across stories (see below).

(d) The final 24 questions were further tested in pilot trials, and necessary changes were made.

The final format of each questionnaire contained 12 questions calling for information explicitly stated in the text ("Ex" questions, commonly called "literal") and 12 whose answers were only implied or could be inferred from the information provided ("I" questions, commonly called "inferential"). The questionnaires, with "Ex" and "I" questions indicated and all questions in the original order, are reproduced in Appendix B.

The questionnaires contained the following matched items:

(a) First, ten three-choice questions of the "Who" type were presented. The first six were "Ex" questions while the remaining four were "I" questions. During testing, choices were offered in the form of character drawings. Thus, the child had only to point to the selected picture without having to produce oral choices. The drawings, in black and white on 15 x 10cm cards, were realistic copies of the three-dimensional models, and they were consistent with the models to which children in Conditions II and IV had been exposed. The alternatives of the multiple-choice questions were limited to depictable,

one-word choices, because an oral rendition of longer choices would have posed considerable retention and analysis problems, especially for the younger children.

(b) The next ten items were "Yes/No" questions, the first four of which were of the "I" type and which required the child to give a reason justifying each answer. The next six were of the "Ex" type. For each type of "Yes/No" question, half of the correct answers were "yes" and the other half "no."

(c) The last four questions in each questionnaire were of a "Why," open, "I" type in which the child had to infer the reasons behind the goals or attempts of each protagonist in each of the four episodes.

In general, both "Ex" and "I" questions tap information from throughout the text, particularly information which is important to the structure of the story and important in the opinion of five judges.

Sequencing Task. An additional task was designed to analyze sequencing behavior in more detail than allowed by simple examination of recounting order (in recall task). For each story, eight Basic Nodes judged important for the story's coherence and structure were selected (same type and position within the structure for both stories). Then the major event(s) described in each Basic Node was depicted in a black and white drawing on a 15 x 10cm card. Again, the dolls serving as VA's for the experiment were used as models for these drawings. In this case, however, all characters were shown in action.

While the eight events selected correspond to the same type and position of Basic Node in both stories' structures, the most

important difference between the two stories is the type of relationship obtaining among events. Events which were selected for this task reflect the differences between the causal/logical events of "The Farmer" and the temporal/arbitrary events of "Lamby."

For each story, the eight cards were divided into two sequences of four cards each. The first sequence ("Forward") was composed of the principal events described in each of the four Attempts in the story (one for each episode). The child was required to arrange these events in the correct sequence (Sequencing Trial), which required ordering the four episodes of the story. The second sequence ("Reverse") was composed of the series of events representing the four Outcomes of the Resolution, which are at the same time the Endings of Episodes IV, III, II and I. The names of these two sequence types reflect the fact that, for both stories, the first sequence goes primarily "forward" (from Episode I to IV), while the second sequence represents a kind of "reversal" of the previous order (from Episode IV to I), both in terms of episodes and characters.

Appendix C shows the composition of the "Forward" and "Reverse" sequences for each story, together with events represented in each card, the drawing and descriptive "label" used, and the Basic and Terminal Nodes they stand for. The label for each card represents a simple, summary description of the event(s) depicted. This description was used to identify the card during testing. The eight events, in themselves, form a coherent "summary" sequence of some of the most important events in each story.

Besides one "Sequencing" trial for each sequence type (i.e., Forward and Reverse types), the child was given two additional trials

each time, one "After" and one "Before" trial. Each trial consisted of presenting one card as the "model," and the other three cards in the series as alternatives. In the first trial, the child had to choose from among the three alternatives (first, second and fourth cards), the event which had happened after the model event (the third card in this case). In the second trial, the second card in the series was the "model," and the child had to choose among the three alternatives (first, third and fourth cards), the one representing the event happening before the "model."

The testing procedure that was followed for the "Forward" and "Reverse" sequences was as follows:

(1) The experimenter showed the child the four cards of the corresponding sequence, one by one in a random order, and identified each card by saying: "This is when . . . (giving the standardized label corresponding to that card as described in Appendix C)." The card was then placed in front of the child, and the experimenter proceeded to identify the next card. The four cards were placed on the table so as to form a rectangle, with the cards in a random order.

(2) Sequencing Trial. The experimenter then asked the child to place the cards in a line (marking the places on the table), in order, according to the order in which each event had happened in the story. This was explained further by saying: "Put here (pointing) the card with the thing that happened first, then here the one that happened next, second, then . . . third and then . . . fourth." (Both kindergarten and third grade children were familiar with sequencing tasks from classroom activities.)

(3) After and Before Trials. The experimenter proceeded to give the individual trials for that sequence corresponding to the selection of first one "After" and then one "Before" event, as described above.

(4) Then the next sequence ("Reverse") was presented, and a "Sequencing," an "After" and a "Before" trials were again given following steps 1, 2 and 3.

Thus, the total number of trials given for each story was six, three for the "Forward" and three for the "Reverse" sequences.

Testing Procedure

Schedule. The 128 subjects were tested over three months, with testing sessions carried out during ordinary school hours. Subjects in each experimental group were tested at different times of day and in different months, so that time of testing was not a factor. Each child was tested twice, in sessions separated by one week. In each session the child was exposed to one of the stories. In order to control for possible order effects, half of the children (sub-groups A) received "The Farmer" first and "Lamby" the next week. The other half (B) received the reverse order. Each session lasted 20 to 25 minutes.

Testing sessions. To maximize standardization of the testing procedure across sessions, the same experimenter conducted all 256 sessions, after practicing the steps extensively during pilot trials. For each session, the experimenter brought the child from his/her classroom after the materials had been set up. The experimenter talked to the child and introduced the materials around the room to make

him/her feel comfortable. Throughout the session, the atmosphere was relaxed and friendly and all activities were treated more like a game than a test. The session proper consisted of the following phases:

(1) Instructions. The task was presented as a game in which Kermit the Frog told the child a story, and then the child told the experimenter the same story. A commercial hand puppet of Kermit the Frog was used for this purpose.

What was supposedly Kermit's voice came from tapes prepared prior to the experiment, and tested and refined during pilot trials. "Kermit" first greeted the child, and then gave him/her instructions, while the experimenter operated the puppet. The procedures were the same for all children regardless of story and experimental condition, except for a slight variation in the greeting appropriate for the child's first or second session, introduced to make the interchange with Kermit more natural. Then extra, specific instructions to the different experimental groups were given, as described under "Experimental Manipulations." (The specific procedures followed to prepare the tapes, and during this phase, as well as the content of the tapes, are described in Appendix D.) All children (whether receiving VA's or not) were encouraged, first by Kermit and then by the experimenter, to listen carefully to the story.

(2) Story presentation. During this phase, to avoid distracting the child, the hand puppet was not operated. The experimenter simply perched it on the tape recorder, and told the child that Kermit would tell the story from there. After the child had indicated that he/she was ready, the tape recorder was turned on again, and the narration of the story started.

For conditions without VA's during this phase (I and II), the experimenter simply sat quietly so as not to distract the child. For groups receiving VA's at this time (III and IV) the models were quietly and discreetly set on the box in front of the child, in synchrony with the story. The experimenter did not give any other cues or signs. If the child made any comments during the narration, the experimenter simply put her finger on her mouth as a sign of "silence," without stopping the tape recorder. The duration of "The Farmer's" narration was 1 minute, 24 seconds, and Lamby's was 1 minute, 35 seconds.

(3) Delay interval. A 5 minute interval elapsed between the end of the story and the beginning of testing. The child was told that after 5 minutes (pointing to where the needle of a stop watch would be at that time) it would be his/her turn to tell the experimenter the story.

During this interval the experimenter and the child played card games. For the kindergarten children the games consisted simply of matching and grouping cards according to common characteristics (e.g. color, figure). For the third graders they were simple, familiar games like "War" and "Go Fish." (The criterion was that the games be relaxing and not demanding.)

(4) Retelling. After the delay interval, the experimenter asked the child to tell her the story that Kermit had told the child. The child's recounting of the story was tape-recorded for later analysis.

For children receiving VA's during this phase (Conditions II and IV), the experimenter first introduced and laid the five models in front of the child and then proceded (in the same way as for the rest of the groups), without giving any other help, cues or information.

For all conditions no help, prompt, or feedback during retelling was provided. If a child reported not remembering anything, he/she was encouraged to try harder and mention anything that could be recalled.

(5) Question-answering. The child was first asked what he/she thought was the most important thing in the story. Then he/she was asked the 24 questions of the corresponding questionnaire. The experimenter did not provide any help, but encouraged the child to continue by saying "very good x" after every section.

(6) Sequencing. Each child was presented with the series of eight drawings developed for the Sequencing Task and told he would arrange the cards in the order in which the things in them had happened in the story. After identifying each of the four cards of the "Forward" sequence, the experimenter proceeded to give the "Sequencing," "After" and "Before" trials in the manner described under "Sequencing Task." Then she presented the child with the next four cards corresponding to the "Reverse" sequence, following the same procedure as for the "Forward" sequence.

When the session had finished, the child was praised and thanked for participating in the session. If it was his/her first session, the experimenter also told him/her that next week they would play the same game with another story.

Sessions lasted from 20 to 25 minutes, with both the time and amount of work within the reach of most kindergarten children. If the child showed or expressed fatigue, the experimenter waited a bit, then encouraged the child and continued. The variety and apparent attractiveness of the activities sustained the children's interest. In general

most children showed great enthusiasm for the sessions, and expressed their willingness to come back.

Scoring Procedures

Retelling Task. The tapes containing the children's recounting of the stories were transcribed and the resulting "recall protocols" analyzed by five independent scorers. A system was developed to score both quantity of recall (i.e., number of story units recalled) and the quality of information provided. The latter refers to the degree of congruence between the information in the original text and that furnished by the child, the types of information more and less frequently mentioned, and their relation to the stories' structures, and the completeness of the protocols; and the types of augmentations and transformations included in the children's retellings. (For specific procedures followed for transcribing, analyzing and scoring the recall data, see Appendix E.)

Reliability of scorings. For every recall protocol, reliability between scorers was calculated before communication between scorers. Three separate reliability scores were calculated for each of the recall protocols:

(a) Number Reliability: Calculated by comparing each of the numbers assigned to each unit (from 1 to 24) on the basis of those of the Terminal Nodes in the original text.

(b) Credit Reliability: Obtained by comparing the credit value given to each unit (either 0, ½ or 1 point).

(c) Category Reliability: Obtained by comparing the types of categories assigned to each unit according to whether they contained transformed and/or augmented information (on the basis of the categories described in Appendix E).

For each recall protocol, each of the 3 types of reliability scores was calculated by using the percent agreement formula:

$$\text{Percent agreement} = \frac{\text{Agreements}}{\text{Agreements + Disagreements}} \times 100.$$

The mean reliability values, and ranges, for each type of reliability, calculated across all 256 sessions were as follows:

	$\bar{X}$	Min. Value	Max. Value
Number Reliability	92.3%	63.6%	100%
Credit Reliability	90.4%	62.5%	100%
Category Reliability	86.3%	66.7%	100%

It is worth noting that these values underestimate the consistency of scoring of the data as finally computed, since (after calculating reliability) for each disagreement encountered additional scorers re-scored the items and agreements were eventually reached, at least among a majority of scorers.

Question-answering Task. The correct answers to the Multiple-choice and Yes/No questions for each questionnaire are indicated in Appendix B. For the open questions, a set of possibilities and requirements for considering a response adequate were established in advance by the scorers. When an obtained response was not included in the

set and the scorer was in doubt, more than one scorer judged the adequacy of the response and an agreement was reached.

Sequencing Task. Only one correct response was possible for the "After" and "Before" trials. Each correct response was assigned two points. For the "Sequencing Trials" (where the child had to order sets of four cards), a scoring system was developed to reflect various aspects of sequencing in greater detail than could be obtained by simply assigning a "correct" or "incorrect" label to a given sequence. A score from 0 to 10 was assigned to each of the 24 possible combinations of 4 cards. The rules and steps followed in calculating the scores are described in Appendix F. Using this system, only one sequence (3,1,4,2) was given a score of 0, since the maximum number of points was subtracted and no points were added by following the rules. Likewise, only the correct sequence (1,2,3,4) obtained the maximum score of 10. All other possible combinations received scores ranging in value between these two extremes.

Experimental Design

Each main dependent variable corresponding to the total quantitative score for each task was treated individually under a separate analysis of variance, with the design and model the same for each case. Further, more qualitative analyses of each task were performed mainly by planned comparisons, or using non-parametric or other statistics.

Originally, each analysis of variance design included seven main factors. Three of these factors, namely Order of Story Presentation within Conditions (Sub-groups A and B), Sex, and Schools were

only included as controls or for completeness, but were not the focus of the present study. Given the complexity and awkwardness of a model including all seven factors, these three factors were tested using a preliminary analysis of variance. Since none of the three main factors were significant ($p > .05$), they were pooled across the remaining factors. All subsequent analyses of variance (and other analyses), consisted of four main factors which are described in Table 5.

While Grade, Condition, and Story Type are the most important factors for the purposes of this study, Achievement Level was included as a blocking variable to reduce variability.

The statistical model was a mixed factorial (2x4x2x2) design with Grade, Condition, and Achievement Level as between-subjects factors, and Story Type as a within-subjects factor. All four main factors were completely crossed, and were considered fixed.[1] Subjects was considered a random factor.

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[1]Whether Story Type should be considered a fixed or a random factor is debatable (cf. Clark, 1973, 1976; Keppel, 1976; Wike and Church, 1976). The decision to treat Story Type as a fixed factor was taken following Keppel (1976). Keppel argues that when linguistic materials are matched for a set of characteristics so as to minimize the covariation of stimulus attributes other than those under investigation, type of linguistic material should be considered a fixed factor. Several aspects of the stories were matched in the present study.

TABLE 5

MAIN FACTORS PRESENT IN EACH EXPERIMENTAL DESIGN

Factor	Levels of Factor	Class of Factor
1. Grade (Gra)	1=Kind; 2=3rd Grade	Fixed, Between
2. Experimental Condition (Con)	I; II; III; IV	Fixed, Between
3. Story Type (Sto)	1="Farmer" (F); (causal/logical) 2="Lamby" (L); (temporal/arbitrary)	Fixed, Within
4. Achievement Level (Ach)	1="high"; 2="low"	Fixed, Between

CHAPTER IV

RESULTS

A. Retelling Task

Number of Story Units Recalled

The key variable for the Retelling Task was the total number of story units recalled. The data corresponding to the mean number of story units recalled by kindergarten and third graders, for stories 1 ("Farmer" = F) and 2 ("Lamby" = L), under each experimental condition, are shown in Figure 1. (Achievement Level is pooled across the rest of the factors, since this factor is not a main focus of this analysis, and it was not involved in any significant interaction.)

Results of the analysis of variance appear in Table 6. Significant effects were found for all four main factors (Grade, Condition, Story Type, and Achievement Level). Results for achievement level show that in general, "high" achievers recalled significantly more than "low" achievers, and this variable was not involved in any interactions.

With respect to the other three factors, the second-order interaction involving all three (Gra x Con x Sto) was not significant, but each factor was involved in significant first-order interactions with each of the other two factors, indicating that each factor should be looked at in reference to the other two.

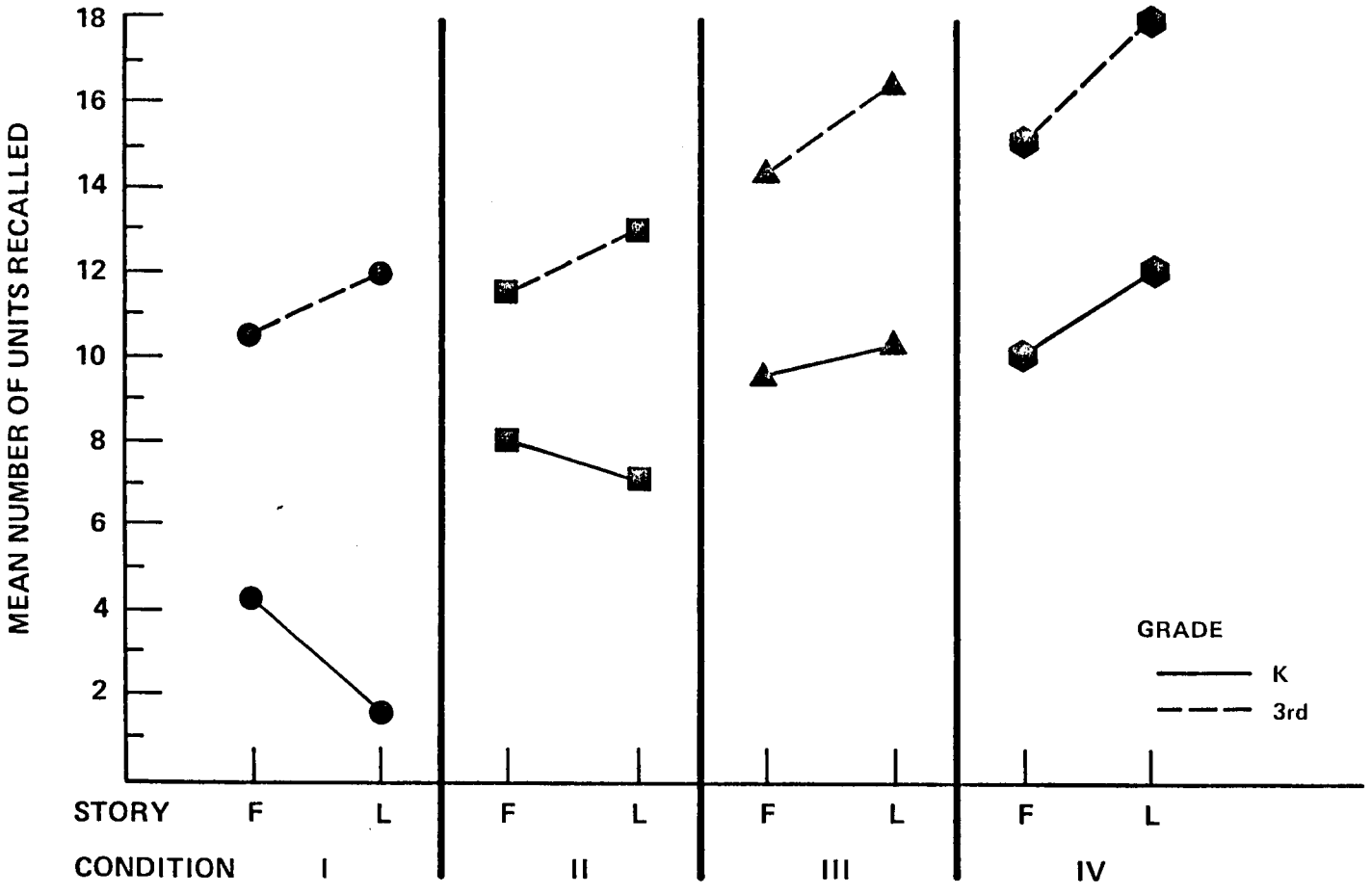


Figure 1. Mean number of story units recalled by each grade and for each story, under each experimental condition. (n = 16 per plotted value)

TABLE 6

ANALYSIS OF VARIANCE SUMMARY TABLE. DV: NUMBER OF STORY UNITS RECALLED

Source	SS	df	F	Significance[1] Level
Between Subjects				
Grades (Gra)	2295.61	1	156.73	***
Exp. Conditions (Con)	1709.91	3	38.91	***
Achievement Level (Ach)	315.95	1	21.57	***
Gra x Con	117.78	3	2.68	*
Gra x Ach	4.68	1	0.32	ns
Con x Ach	66.64	3	1.52	ns
Gra x Con x Ach	42.68	3	0.97	ns
Subjects w. groups (Sub)	1640.48	112		
Within Subjects				
Story Type (Sto)	53.11	1	8.35	**
Gra x Sto	85.10	1	13.37	***
Con x Sto	82.25	3	4.31	**
Ach x Sto	0.35	1	0.05	ns
Gra x Con x Sto	22.96	3	1.20	ns
Gra x Ach x Sto	0.81	1	0.13	ns
Con x Ach x Sto	44.44	3	2.33	ns
Gra x Con x Ach x Sto	7.27	3	0.38	ns
Sto x Sub	712.75	112		

[1] *p <.05; **p <.01; ***p <.001

These effects can be seen in Figure 1. For the third graders the pattern of effects between stories and conditions is fairly regular, but this is not the case for kindergarten children. For the latter, the effects of stories vary more according to conditions.

Further analyses of variance were performed in the form of tests of Simple Interactions (SI) and Simple Main Effects (SME) (see Kirk, 1968, and Winer, 1971). These tests were first carried out to analyze differences between grades and stories (and their interactions), at each of the four levels of Condition. Table 7 shows the results of this analysis. Each F was tested at $\alpha = .0125$, to yield an overall α-level of .05 for the four levels of the Condition Factor (see Kirk, 1968).

The effect of Grade was significant at all levels of the other two factors (i.e., for both stories and all conditions). Thus, third graders recalled significantly more than kindergarten children, regardless of story and experimental condition.

The effects of Story Type, however, did vary according to both Condition and Grade:

1. For the control groups (Con I), although the effect of Story Type was not significant in itself, the interaction between this factor and Grades was significant. Further tests of SME applied to the effects of Story Type for each grade (within Con I) revealed that kindergarten children receiving no aids, although performing very poorly on both stories in comparison with other groups, recalled significantly less of "Lamby" than of "The Farmer" ($F_{(.025)} = 8.254_{(1,112)}$; $p < .01$). In fact, they told hardly anything of

TABLE 7

FURTHER ANALYSIS OF VARIANCE FOR SIMPLE INTERACTIONS AND SIMPLE MAIN EFFECTS. DV: NUMBER OF STORY UNITS RECALLED

Source[1]		SS	df	F	Significance[2] Level
Between Subjects					
Between Gra at Con	I	1089.83	1	103.74	***
	II	356.27	1	33.91	***
	III	475.79	1	45.29	***
	IV	489.52	1	46.60	***
Within cell (from overall Anova)		2353.23	224		
Within Subjects					
Between Sto at Con	I	5.01	1	0.79	ns
	II	1.89	1	0.30	ns
	III	30.94	1	4.86	ns
	IV	97.52	1	15.32	***
Gra x Sto at Con	I	64.20	1	10.09	**
	II	30.25	1	4.75	ns
	III	10.97	1	1.72	ns
	IV	2.64	1	0.41	ns
Sto x Subjects (from overall Anova)		712.75	112		

[1]Factors: Gra = Grade; Con = Experimental Condition; Sto = Story Type.

[2]Experimentwise Error Rate (EW) was set at .05; the significance level actually used to test each term was = $\alpha/4$ = .0125.

**p <.01; ***p <.001

"Lamby" ($\bar{x}$ = 1.81, s = 2.83). In contrast, third graders who did not receive aids recalled both stories about equally well ($F_{(.025)} = 2.62_{(1,112)}$; $p > .05$).

2. Under Condition II, the Story Type effect was not significant for either grade ($p > .05$). When children were provided with VA's during retelling only, they recalled the two stories about equally well.

3. Contrast of stories for Condition III (VA's during story presentation only): Given that the interaction between grades and stories was not significant for this condition ($p > .05$), the effects of Story Type are presumably applicable to both grades. The comparison of stories yielded a p-value of $.0125 < p < .05$. Therefore, Story Type is not significant at the more conservative .0125 level recommended by Kirk (1968) and adopted here. It follows that children of both grades recalled the two stories about equally well when VA's accompanied story presentation only.

4. For children receiving VA's during both the presentation of each story and the Retelling Task (Con IV), the effect of Story Type was significant across grades ($p < .001$), favoring "Lamby."

The effect of Story Type for each grade and for the different conditions can be summarized as follows:

1. Kindergarten children receiving no aid during either the presentation of the stories or the Retelling Task, while performing poorly on both stories, recalled significantly less of "Lamby." Kindergarten children receiving VA's during retelling only, or only during the presentation of each story, recalled both stories about equally well. Providing VA's during both phases actually reversed

the effect found for the control group, so that children recalled more of "Lamby" than of "The Farmer."

2. Third graders receiving no aids, or aids during either the presentation or the retelling of each story, recalled both stories about equally well. Providing VA's at both phases was particularly successful in promoting recall of "Lamby" as it was for kindergarten children.

Experimental Condition effects. The above analyses do not permit direct comparisons of experimental conditions. Results from the overall analysis (see Table 6, p. 83) showed the predicted interaction between Grade and Condition. This interaction, although significant only at the .05 level, is an important one. It can be better appreciated in Figure 2, where mean scores across stories are shown for each Grade and Condition. Kindergarten children in the control group performed more poorly than children of their own age group who received aids, and third graders under any condition. We have already seen that third graders recalled significantly more than kindergarten children under all experimental conditions. Regarding Experimental Condition effects for each grade, tests of SME of the Condition factor were significant at each grade level (K: $F_{(.025)} = 27.68_{(3,112)}$; $p < .0001$. Third G: $F_{(.025)} = 13.87_{(3,112)}$; $p < .0001$).

A set of pairwise and non-pairwise planned comparisons of Experimental Conditions was run across results of the present study. These were performed for each grade, and compared the mean numbers

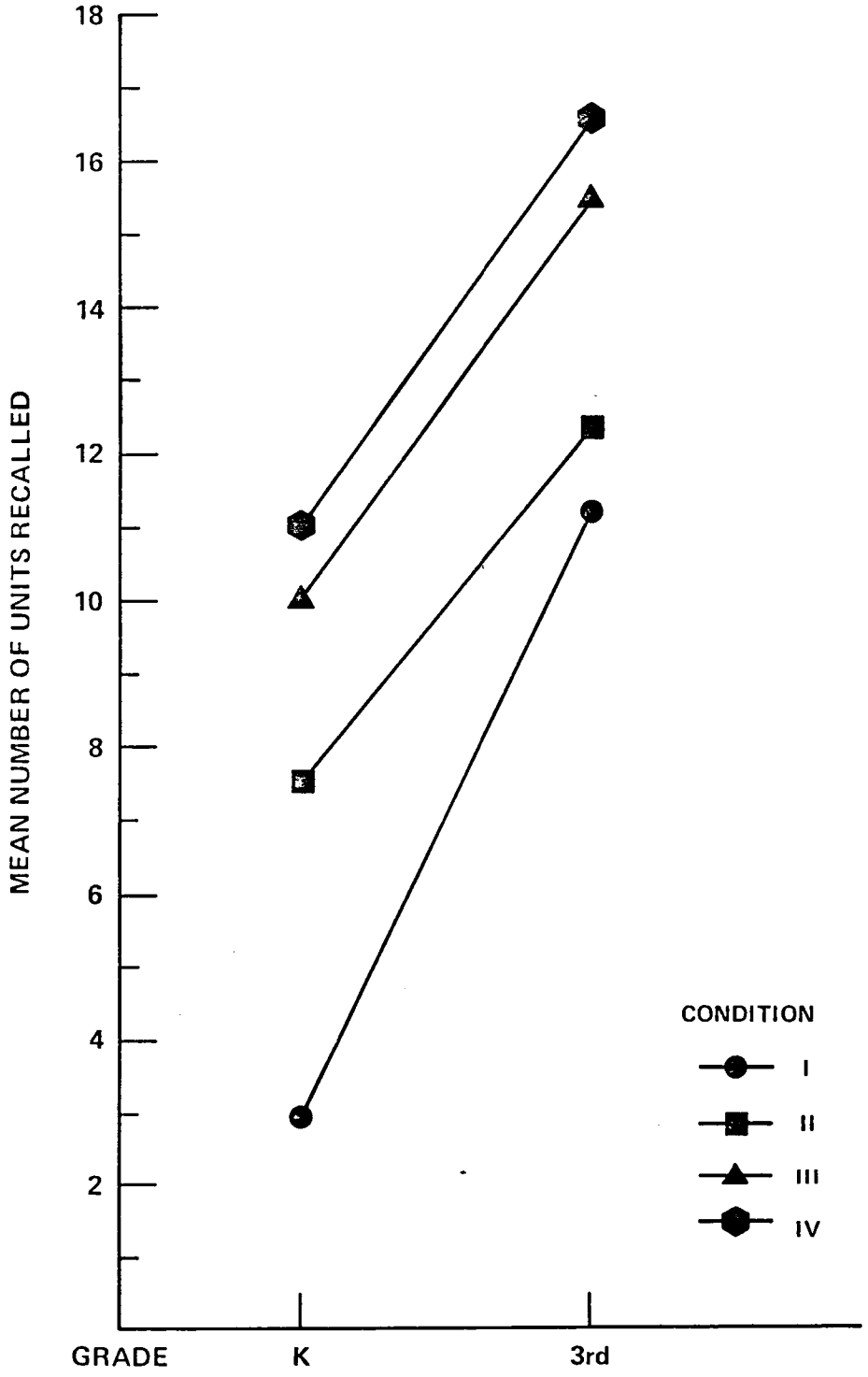


Figure 2. Mean number of units recalled for each grade and experimental condition. (Data are pooled across stories.) (n = 32 per plotted value)

of units recalled under each condition, pooling the data across stories (n = 32). Appropriate results are presented in Table 8:

(a) For kindergarten children, each of the experimental groups receiving VA's performed significantly better in the recall task than did the control group. Regarding which form of VA's was most successful in promoting recall, Conditions II and III do not differ significantly although there was a tendency for Condition III to promote higher recall ($p < .01$). Thus, providing aids at either recall only (Condition II) or presentation only (Condition III) seems to promote recall to a similar degree, although there is a tendency for the latter to work better. Performance under Condition IV was significantly higher than that under Condition II, although it did not differ significantly from the performance of Group III. This indicates that providing VA's only at retelling was not nearly as effective in promoting recall as providing VA's during both phases, while VA's during presentation only was almost as effective as VA's during both phases.

It is possible that the performance of children of this age group under Condition IV reached a ceiling. While children in the control group recalled an average of only 3.1 units across stories (13.48 percent), children who were provided with aids at both phases recalled an average of 11.1 units (48.26 percent). The latter value represents an unusually high performance for children of this age group and stories of this degree of complexity, as supported by the fact that this value is remarkably similar to the average recall observed for third graders who received no aids.

In sum, the pairwise planned comparisons for the kindergarten children show that those who received VA's at either recall,

TABLE 8

PAIRWISE AND NON-PAIRWISE PLANNED COMPARISONS BETWEEN EXPERIMENTAL CONDITIONS FOR EACH GRADE. DV: MEAN NUMBER OF UNITS RECALLED ACROSS STORIES

Planned Comparison			Grade: Kindergarten t[1]	Kindergarten Signif.[2] Level	Grade: Third t[1]	Third Signif.[2] Level
a. Pairwise						
1.		I vs. II	4.685	***	0.993	ns
2.		I vs. III	7.319	***	4.339	***
3.	Cond.	I vs. IV	8.327	***	5.475	***
4.		II vs. III	2.629	ns	3.396	**
5.		II vs. IV	3.642	***	4.483	***
6.		III vs. IV	1.013	ns	1.080	ns
b. Non-pairwise						
7.	Conds.	I+II vs. III+IV	7.745	***	6.274	***
8.		I+III vs. II+IV	4.035	***	1.470	ns

[1]df for all Planned Comparisons = 112. Each mean comprises 32 observations.

[2]Experimentwise Error Rate (EW) was set at .05; the Error Rate per Comparison (EC) actually used was $1-(1-\alpha)^{1/8}$ = .00639. All tests were one-tailed except for comparison 4, II vs. III, which was two-tailed.

**p <.001; ***p <.0005

presentation or both phases recalled significantly more than those receiving no aids. Although groups receiving aids at either recall or presentation only did not differ significantly, there was a tendency for VA's at presentation to be relatively more successful in promoting recall. For this age group, providing VA's at both phases seemed to have been the most successful condition, or at least more successful than VA's during recall alone.

The two non-pairwise planned comparisons for the kindergarten children throw further light on the effects of the VA's procedures. Both comparisons were highly significant. The comparison assessing the specific effects of VA's at presentation (I + II versus III + IV) shows that the two groups receiving aids at this phase (i.e., III and IV) performed remarkedly better on the recall task than those not receiving aids at this phase (I and II). Likewise, the comparison testing the specific effects of VA's during recall (I + III versus II + IV) indicates that the two groups receiving VA's during retelling (II and IV) recalled significantly more than the groups not receiving aids at this phase (I and III). Thus, kindergarten children performed very poorly when required to recall the stories on their own, and were greatly aided by the provision of visual aids at both phases.

(b) For third grade, the planned comparisons yielded a somewhat different pattern of results than those for the younger children (see Table 8 and Figure 2). The pairwise comparisons revealed that Groups I and II were not significantly different from each other as did the comparison between Groups III and IV. On the other hand, Groups III and IV performed significantly better than Groups I and II. The non-pairwise comparisons confirm these results: when groups were

combined, Groups III and IV recalled significantly more than Groups I and II. In contrast, Groups II and IV, when combined, did not differ significantly from Groups I and III. These results reveal that performance can be substantially improved by presenting third grade children with VA's during the acquisition phase, but that providing VA's during recall did not promote better performance. Thus, although the performance of third graders on their own was by far superior to that of the younger children on their own (Condition I), it was still substantially aided by VA's at presentation, but not by VA's at retelling.

In summary, the analyses of variance in number of story units recalled showed that:

1. Older children recalled significantly more than younger children across both stories and all experimental conditions.

2. "High" achievers, as defined in this study, recalled more than "low" achievers.

3. The effects of Story Type varied with both grade and condition. When provided with no aids, younger children, although performing very poorly on both stories, recalled significantly more of the more tightly structured story while third graders recalled both stories about equally well. With VA's at <u>either</u> the presentation or retelling phase alone, children recalled both stories about equally well. VA's during <u>both</u> phases promoted particularly the recall of the more loosely structured story.

4. The VA's procedures enhanced the performance of both grades, although patterns observed for each grade differed. Kindergarten children performed poorly in the absence of VA's and were

greatly helped by aids at both the acquisition and retelling phases--particularly the former. Their performance was best when helped at both phases, and almost identical (regarding number of units recalled) to that of third graders receiving no aid.

Taken together, these observations suggest kindergarten children's poor performance relates to a failure to apply appropriate strategies at both the acquisition and recall phases. Third graders perform far more adequately on their own, but their performance can be further improved by providing them with VA's during the acquisition phase. This is not the case for the provision of VA's during retelling. Their strategies for acquiring information might not be fully developed for the task demands of this study.

Qualitative Measures of Recall

The number of units recalled does not in itself reflect other qualitative aspects related to the content of recall protocols. Other aspects of recall were also analyzed, including: (a) the congruency between the information in the text and that provided by the children, and (b) augmented and transformed information. These qualitative analyses are complex and not directly related to the main objectives of this study. Therefore, only some preliminary results will be presented, those which reflect qualitative recall differences between the stories--differences which do not become apparent through simple analysis of numbers of units recalled.

Appendix E, step 4, contains a description of the procedure followed to categorize augmented and transformed information provided by subjects during recall. Each of the eight categories used to

classify information (and, when applicable, its subcategories) is accompanied by a definition, as well as examples taken from recall protocols. Table 9 shows the total number (and percentage) of statements falling within each of the eight categories (and subcategories). The data are presented separately, first by grade and pooled across all other variables ("Sub-total Grades"), and then for the retelling of each story, also pooled across all other variables ("Sub-total Stories"). Preliminary comparisons of frequencies between grades, as well as those between stories, were performed for each of the eight category statements (and the four subcategories of two of the types), using 2 x 2 χ^2. Results appear in Table 10.

There are possible pitfalls involved in the pooling of data across all groups. These dangers stem primarily from the possibility of pooling data from heterogeneous groups, which can generate unrepresentative results. Preliminary χ^2 analyses of homogeneity of data across experimental conditions for each grade showed that in some cases (i.e., for some of the categories) the groups were heterogeneous. Thus, pooling of groups for comparisons of grades in some cases was not justified, and therefore the results will only be offered as tentative. Among the comparisons of kindergarten and third graders, the following yielded a significant χ^2 value:

1. Third graders furnished more Correct statements and more Expansions than did kindergarten children.

2. Kindergarten children produced more Incorrect statements, more Role Changes (specifically of the Role Transfer subcategory) and more total Node Inversions (although only the type representing

TABLE 9

TOTAL NUMBER (AND PERCENTAGE) OF RECALLED STATEMENTS FALLING WITHIN EACH CATEGORY OF AUGMENTED AND TRANSFORMED INFORMATION, BY GRADE AND BY STORY

		CORR	INC	INF	ADD	EXP	SI	RC	- RT	- RTT	NI	- NI/V	- NI/NV	TOTAL
Sub-Total Grades:														
K	total frequency[1]	1019	94	63	62	8	82	49	42	7	49	18	31	1246
	%	81.8	7.6	5.1	4.9	0.6	6.6	3.9	3.4	0.6	3.9	1.5	2.5	100.0
3rd	total frequency	1785	65	97	126	31	106	44	36	8	47	19	28	2095
	%	85.2	3.1	4.6	6.0	1.5	5.1	2.1	1.7	0.4	2.3	0.9	1.3	100.0
Sub-Total Stories:														
1-F	total frequency	1344	55	97	63	38	160	24	12	12	53	5	48	1588
	%	84.6	3.5	6.1	4.0	2.4	10.1	1.5	0.8	0.8	3.3	0.3	3.0	100.0
2-L	total frequency	1460	104	63	125	1	28	69	66	3	43	32	11	1753
	%	83.3	5.9	3.6	7.1	0.1	1.6	3.9	3.8	0.2	2.5	1.8	0.6	100.0
TOTALS:														
	total frequency	2804	159	160	188	39	188	93	78	15	96	37	59	3341
	%	83.9	4.8	4.8	5.6	1.2	5.6	2.8	2.3	0.5	2.9	1.1	1.8	100.0

[1]The values in the upper of each pair of rows (total frequency) represent the number of statements provided by all the subjects in each particular group (i.e., the data were pooled across the 64 subjects in the group). The values in the bottom of each pair of rows represent percentages, i.e., the number of statements falling within a particular category over the TOTAL number of statements furnished by the group. (This TOTAL, i.e. denominator, is entered in the last column. It is obtained by adding up the number of statements across the first 5 categories. The remaining categories overlap some of these 5 categories.)

TABLE 10

CHI-SQUARE VALUES FOR COMPARISONS OF NUMBER OF RECALLED STATEMENTS FALLING WITHIN EACH CATEGORY OF AUGMENTED AND TRANSFORMED INFORMATION, BETWEEN GRADES, AND BETWEEN STORIES

	CORR	INC	INF	ADD	EXP	SI	RC	- RT	- RTT	NI	- NI/V	- NI/NV
BETWEEN GRADES (K vs. 3rd G)												
χ^2	6.81	34.04	0.58	1.58	4.75	3.42	9.54	9.37	0.57	8.00	2.07	5.98
Significance[1] Level	**	***	ns	ns	*	ns	***	***	ns	***	ns	*
BETWEEN STORIES (1-F vs. 2-L)												
χ^2	1.17	11.20	11.57	15.68	39.42	112.83	18.11	33.08	6.37	2.34	17.35	27.57
Significance[1] Level	ns	***	***	***	***	***	***	***	*	ns	***	***

[1] df = 1 for all χ^2 tests. Values entering the χ^2 calculations are those shown in Table 9.

*p <.05; **p <.01; ***p <.005

Non Violations of order yielded further significance), than did the older children.

Because these generalizations in some cases do not apply equally to children from all experimental groups, however, these results should be considered preliminary.

Pooling across groups was more satisfactory for the comparisons of stories, since pooled groups were more homogeneous, presumably because the same subjects were represented in each story's score. Thus, comparisons of the different types of statements between stories yielded more representative and revealing results. The χ^2 values in Table 10 show the following:

1. There were no significant differences between stories in the total number of correct statements per se. However, many consistent qualitative differences emerged, with all but one of the comparisons significant, and all reflecting characteristic differences between the stories.

2. Children produced significantly more statements for "The Farmer" than for "Lamby" of the following types (i.e., categories): Inferences (INF), Expansions (EXP), Semantic Integrations (SI), Role Transfer and Transformations (RTT), and Node Inversions which do not violate the logical sequence of story events (NI/NV).

3. The same children produced significantly more statements of the following kinds for "Lamby" than for "The Farmer": Incorrect (INC), Additions (ADD), Role Changes (RC), and particularly of the Role Transfer (RT) type, and more Node Inversions which do represent a violation of the sequence of events in the original story (NI/V).

It is important to note that for Story 2, 68.8 percent (i.e., 22 out of 32) of the statements classified under the latter category (NI/V) correspond to Terminal Nodes numbers 21, 22, and 23, which form part of the "Reverse" sequence, as defined for the Sequencing Task. This finding is consistent with more inversions in this sequence during the Sequencing Task (see below).

The overall pattern of results for the qualitative analyses is interesting, clear-cut and consistent, and appears to reflect the structural differences between the stories (i.e., causal/logical versus temporal/arbitrary relations among events) which were not detected by the quantitative analysis presented in the previous section.

B. Question-Answering Task

Total Number of Questions Answered Correctly

The main dependent variable of the Question-answering Task was the total number of correct answers to the 24 questions for each story. Figure 3 shows the mean number of correct answers provided by kindergarten and third grade children for each story and for each experimental condition. (For simplicity, data were pooled across achievement levels.) Total number of correct answers was used in an analysis of variance in the same format as that described under "Experimental Design." The four factors of the Anova were: Grade, Experimental Condition, and Story Type (most important factors); and Achievement Level (blocking variable). Results of this analysis are presented in Table 11. The effects of all four factors

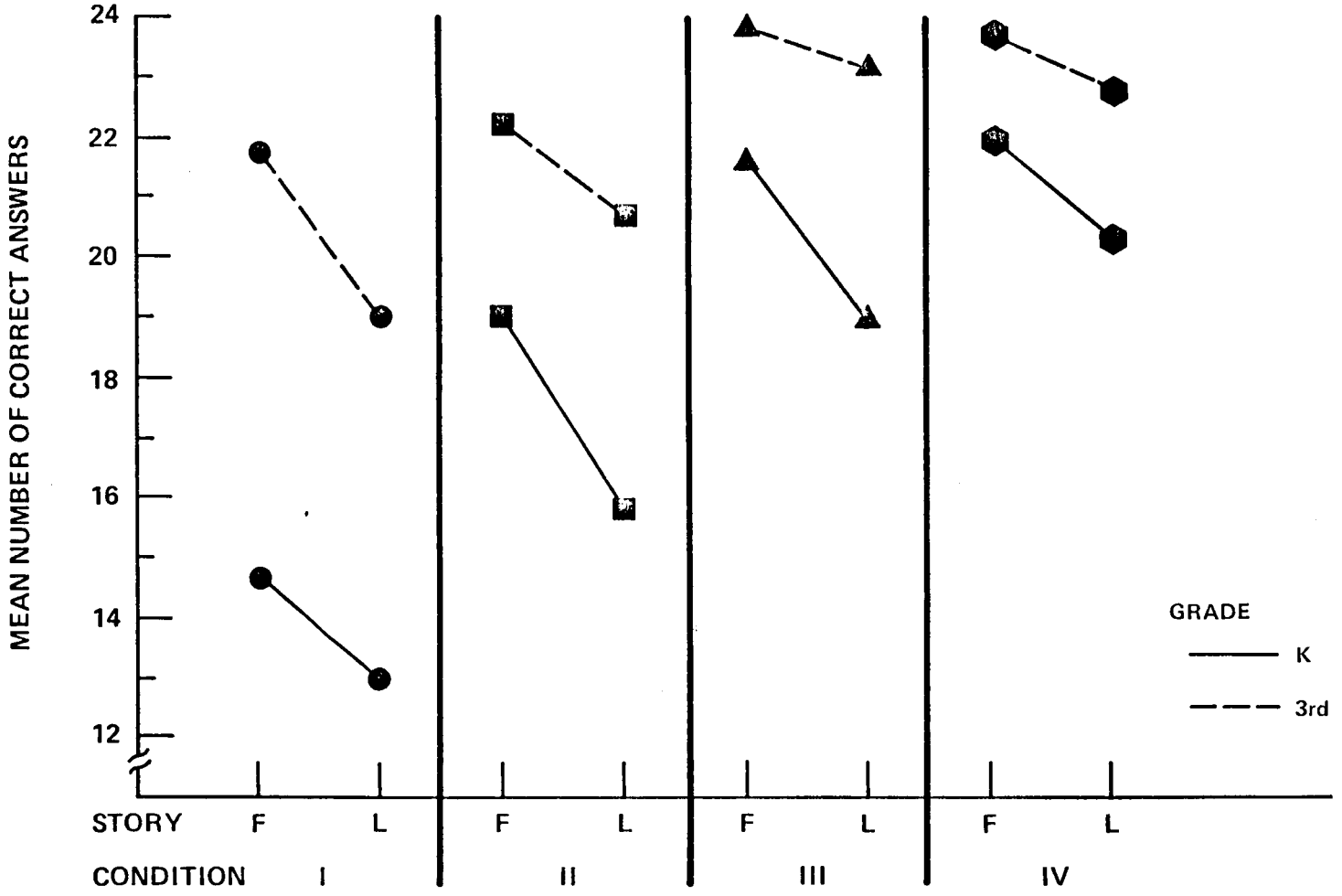


Figure 3. Mean number of questions answered correctly by each grade and for each story, under each experimental condition. (n = 16 per plotted value)

TABLE 11

ANALYSIS OF VARIANCE SUMMARY TABLE. DV: TOTAL NUMBER OF QUESTIONS ANSWERED CORRECTLY

Source	SS	df	F	Significance[1] Level
Between Subjects				
Grades (Gra)	1024.00	1	81.69	***
Exp. Conditions (Con)	1090.55	3	29.00	***
Achievement Level (Ach)	132.25	1	10.55	**
Gra x Con	175.50	3	4.67	**
Gra x Ach	34.52	1	2.75	ns
Con x Ach	59.88	3	1.59	ns
Gra x Con x Ach	53.67	3	1.43	ns
Subjects w. groups (Sub)	1403.88	112		
Within Subjects				
Story Type (Sto)	221.27	1	61.94	***
Gra x Sto	10.56	1	2.96	ns
Con x Sto	12.55	3	1.17	ns
Ach x Sto	0.56	1	0.16	ns
Gra x Con x Sto	25.31	3	2.36	ns
Gra x Ach x Sto	4.52	1	1.26	ns
Con x Ach x Sto	7.56	3	0.71	ns
Gra x Con x Ach x Sto	3.55	3	0.33	ns
Sto x Sub	400.13	112		

[1] *p <.05; **p <.01; ***p <.001

(Gra, Con, Ach, and Sto) were statistically significant, as were those of the interaction between Grade and Experimental Condition.

For the two factors not involved in significant interactions (namely Ach and Sto), direct assessment of main effects is possible. For Achievement Level, "high" achievers answered more questions correctly than did "low" achievers. For Story Type, children across grades, conditions, and achievement levels answered more questions correctly about "The Farmer" than about "Lamby."

The next two factors, namely Grades and Experimental Conditions are best considered together because of the significant interaction between them. This interaction is represented in Figure 4, which depicts the mean number of questions answered correctly by kindergarten and third grade children under each of the four experimental conditions. It is apparent that the younger children's pattern of results is more variable than that of the older children.

These results are remarkably similar to the patterns obtained for the Recall Task (cf. Figure 4 and Figure 2, p. 88). Here again, kindergarten children who received no aid (Condition I) performed much more poorly than the rest of the children. Recall that this significant interaction and pattern of results was predicted and has been confirmed for both the Retelling and Question-answering tasks. The effect of Grade on the number of questions answered correctly reveals that third graders answered significantly more questions correctly than kindergarten children ($p < .0001$, see Table 11).

Tests of Simple Main Effects were carried out separately for each grade to assess further the effects of Experimental Condition.

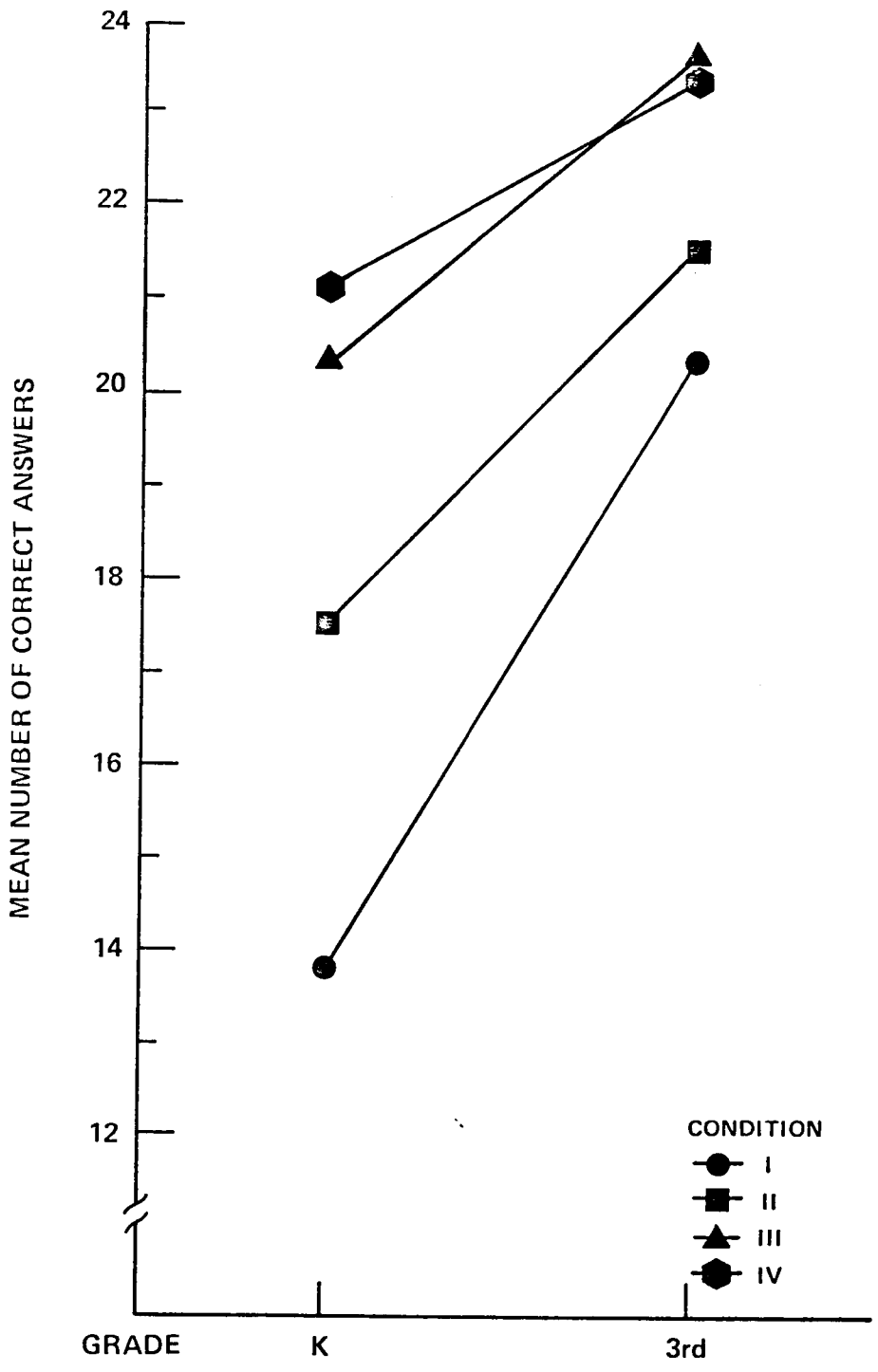


Figure 4. Mean number of questions answered correctly for each Grade and Experimental Condition. (Data are pooled across stories.) (n = 32 per plotted value)

These tests yielded significant effects of Experimental Condition for both grades. (Kindergarten: $F = 28.03$, $df = 3,112$; $p < .0001$. Third Grade: $F = 5.64$, $df = 3,112$; $p < .01$. EW = .05; significance level for each test = .025).

Given these results, the next step was to evaluate the differences between the various experimental conditions for each grade. The eight planned comparisons applied to the recall data presented previously were performed (separately for each grade) on the number of questions answered correctly across stories. Results appear in Table 12.

For kindergarten children, all planned comparisons were significant, except for the comparison of Conditions III and IV. Thus, children receiving VA's at either or both phases (Conditions II, III, and IV) answered more questions correctly than children in the control group (Condition I). From those groups receiving VA's, children receiving VA's at either the presentation phase alone (Condition III), or the presentation and recall phases (Condition IV), answered more questions correctly than those receiving VA's during recall only (Condition II). At the same time, the two groups receiving VA's at presentation (III--presentation only and IV--presentation and retelling) did not differ significantly. In sum, providing VA's at retelling only (Condition II), although successful in reference to the control group, was not nearly as successful in enhancing performance in the subsequent Question-answering Task as the provision of VA's during acquisition of information (Conditions III and IV).

Both non-pairwise comparisons for this group were significant. Children provided with VA's at presentation (Conditions III and IV)

TABLE 12

PAIRWISE AND NON-PAIRWISE PLANNED COMPARISONS BETWEEN EXPERIMENTAL CONDITIONS FOR EACH GRADE. DV: MEAN NUMBER OF QUESTIONS FROM TOTAL ANSWERED CORRECTLY ACROSS STORIES

Planned Comparison			Grade: Kindergarten t[1]	Kindergarten Signif.[2] Level	Third t[1]	Third Signif.[2] Level
a. Pairwise						
1.		I vs. II	4.167	***	1.201	ns
2.		I vs. III	7.345	***	3.531	***
3.	Cond.	I vs. IV	8.298	***	3.213	**
4.		II vs. III	3.179	**	2.331	ns
5.		II vs. IV	4.131	***	2.013	ns
6.		III vs. IV	0.953	ns	-0.318	ns
b. Non-pairwise						
7.	Conds.	I+II vs. III+IV	8.115	***	3.914	***
8.		I+III vs. II+IV	3.610	***	0.062	ns

[1]df for all Planned Comparisons = 112. Each mean comprises 32 observations.

[2]Experimentwise Error Rate (EW) was set at .05; the Error Rate per Comparison (EC) actually used was $1-(1-\alpha)^{1/8}$ = .00639. All tests were one-tailed except for comparison 4, II vs. III, which was two-tailed.

**p <.002; ***p <.0005

performed better than those not provided with VA's at presentation (Conditions I and II). Similarly, children provided with VA's at the preceding Retelling Task (Conditions II and III) answered more questions correctly than those not provided with VA's at retelling (Conditions I and III). Thus, as was the case for the Retelling Task, kindergarten children seem to benefit from aids presented during acquisition and recall.

The pattern of results for the third graders is somewhat different. The only statistically significant comparisons were those between Conditions I versus III, I versus IV, and I+II versus III + IV. This consistent pattern reflects the fact that VA's presented during story narration increased performance in the Question-answering Task (to almost 100 percent), but that VA's presented during retelling did not. These results are quite similar to those obtained for the previous Retelling Task.

In sum, results obtained from comparing conditions revealed that unaided kindergarten children (Condition I) performed poorly when answering questions about the stories (58 percent correct) in comparison with all remaining groups. They benefitted from both VA's during the acquisition of information and during retelling, although the former procedure was more effective in enhancing performance on this task. Third graders, on the other hand, performed much more effectively on their own (85 percent correct) than kindergarten children, although they still benefitted from VA's during the presentation of the stories. In contrast, performance was not further increased in this age group by providing VA's during the Retelling Task.

Also consistent with the findings for the Retelling Task is the fact that the scores of those youngsters who were provided with VA's during the presentation of the stories (or during both phases) were quite similar to those of the older children who were given no aids (or VA's at retelling only).

Further Analysis of the Question-answering Task: "Ex" Versus "I" Questions

The above analyses were performed on the total score for the Question-answering Task, so the results do not reveal which types of questions posed more or less difficulty for the different age groups. Recall that the questions comprising this task were of two main types: (1) those requesting information explicitly stated in the original texts ("Ex" questions) and (2) those requiring derivation of information which could only be inferred from the original texts ("I" questions). One important reason for including these two types of questions was to compare the performance of the two grades on each question type. Mean scores for answers to "Ex" and "I" questions for each grade, with the data pooled across all other factors, are shown in Figure 5.

Four planned comparisons were applied to the scores on the "Ex" and "I" questions, in order to detect differences between grades and question types. The data were pooled across all other factors. Because a significant interaction was obtained between Grade and Condition effects on the Total Question-answering score (see previous section), an objection could be raised against the pooling of data across conditions for each grade. Preliminary analyses of "Ex" and

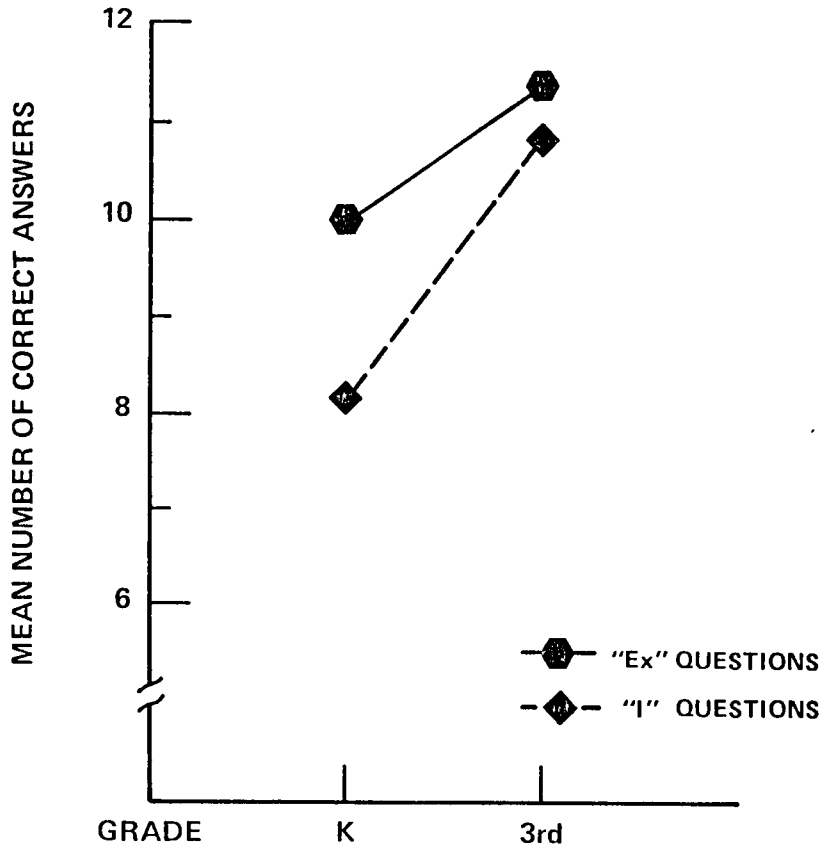


Figure 5. Mean number of "Ex" and "I" questions answered correctly by each grade. (Data are pooled across stories and conditions.) (n = 128 for each plotted value)

"I" questions for each grade and each condition revealed that the differences between "Ex" and "I" scores across conditions were quite homogeneous for each grade. Thus pooling across conditions for each grade is justified. Results of the planned comparisons of question types within and across grades are shown in Table 13. Comparisons of scores on the "Ex" and "I" questions between grades were significant ($p < .001$), especially for the comparison of "I" questions. Third graders answered more questions correctly about both explicit and (especially) implicit information than kindergarten children.

Results of comparing question type within each grade are particularly relevant to the purposes of this study. The comparison of "Ex" versus "I" questions for kindergarten children was highly significant ($p < .001$), while the same comparison applied to the scores of third graders was not ($p > .05$). (These results imply an interaction between Grade and Question Type). Thus, while third graders answered questions about explicit and implicit information about equally well, kindergarten children performed significantly more poorly when required to derive information <u>not</u> explicitly stated. This pattern of results confirms the prediction made for these comparisons. This result <u>does not</u> imply that kindergarten children cannot derive implicit information, as shown by the fact that the mean score for this age group on "I" questions was 68 percent.

TABLE 13

PAIRWISE PLANNED COMPARISONS OF "EX" AND "I" QUESTIONS, WITHIN AND ACROSS GRADES. DV: MEAN NUMBER OF "EX" OR "I" QUESTIONS ANSWERED CORRECTLY

Planned Comparison[1]			t[2]	Signif.[3] Level
a. Within each Grade				
	Comparison of Q. Types	Grade		
1.	"Ex" vs. "I"	K	4.002	***
2.	"Ex" vs. "I"	Third	1.375	ns
b. Across Grades				
	Comparison of Grades	Q. Type		
1.	K vs. Third	"Ex"	3.210	***
2.	K vs. Third	"I"	5.837	***

[1]Data are pooled across Stories and Conditions. Each mean comprises 128 observations.

[2]df for all Planned Comparisons = 112.

[3]Experimentwise Error Rate (EW) was set at .01; Error Rate per Comparison (EC) actually used was $1-(1-\alpha)^{\frac{1}{4}}$ = .00251. All tests were one-tailed.

[4]$p < .001$.

C. Sequencing Task

Total Sequencing Score

The Sequencing Task followed the Question-answering Task. Scores obtained on all six trials comprising this task were added to yield a Total Sequencing Score (the six trials included three for "Forward" and three for "Reverse" sequences). This total score, which ranged from 0 to 28, was entered into the analysis of variance to be presented in this section. The results for this task are summarized in Figure 6, which shows the mean values of the Total Sequencing Score for each grade, story, and experimental condition.

It should be noted that pooling of partial scores (namely those corresponding to the "Forward" and those for the "Reverse" sequences) into a total score yields, in some instances, a score which is unrepresentative of the component sequence types. Since an important aim of the Sequencing Task was to compare these two types of sequences for each story, this more qualitative analysis was carried out separately and will be presented below.

The Total Sequencing Scores were entered into an analysis of variance with the main factors being Grade, Experimental Condition, and Story Type. Achievement Level was a blocking variable. Results are shown in Table 14.

There were significant effects associated with each of the four main factors. All first and second order interactions between and among Grade, Experimental Condition and Story Type were also significant, as was the interaction between Grade and Achievement Level effects. Further analysis of this latter interaction revealed that the

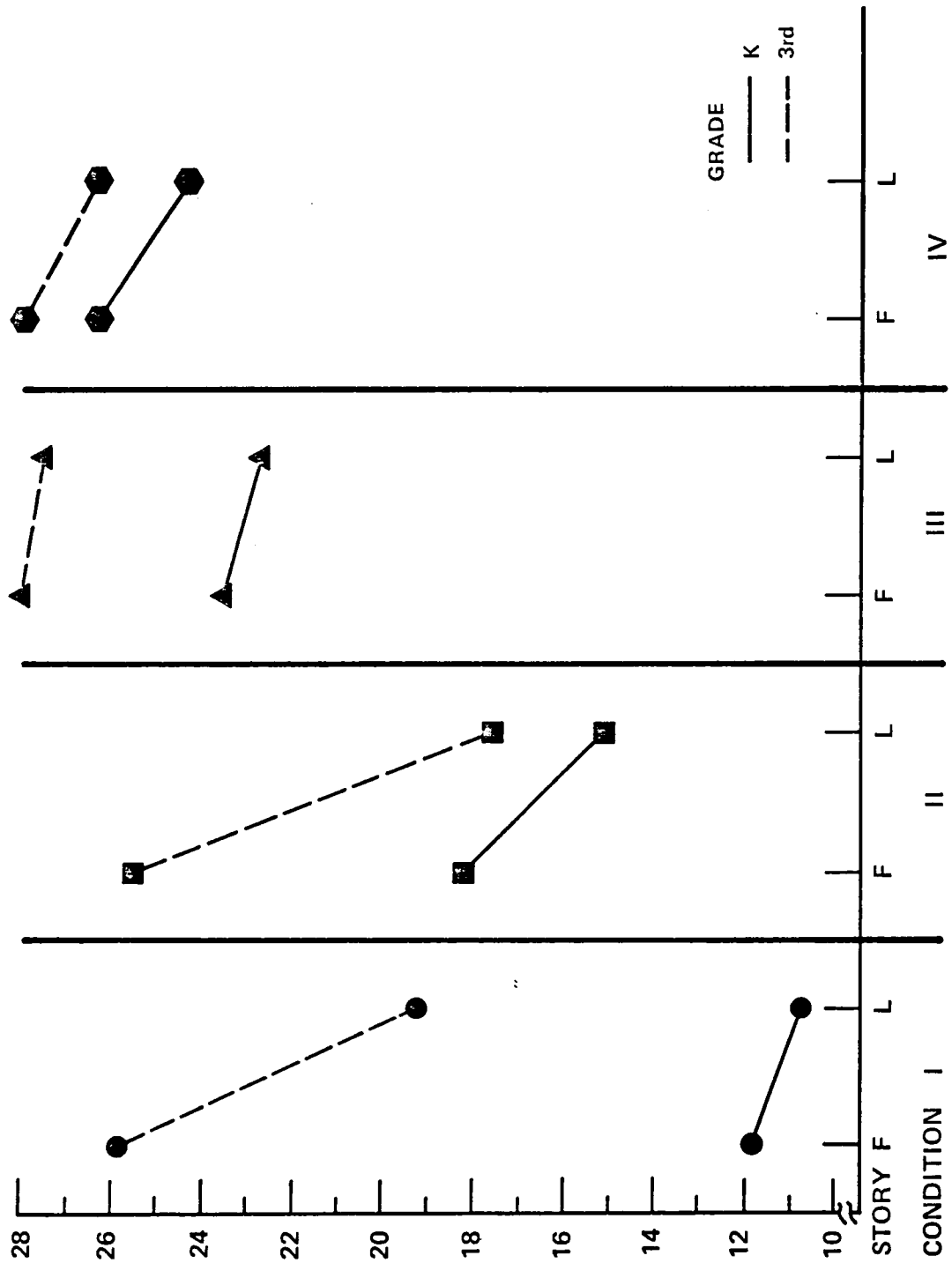


Figure 6. Total Sequencing Score for each combination of Grade, Story, and Experimental Condition. (Each plotted value represents the mean of 16 observations.)

TABLE 14

ANALYSIS OF VARIANCE SUMMARY TABLE. DV: TOTAL SEQUENCING SCORE

Source	SS	df	F	Significance[1] Level
Between Subjects				
Grades (Gra)	2053.22	1	67.02	***
Exp. Conditions (Con)	4056.17	3	44.13	***
Achievement Level (Ach)	295.41	1	9.64	**
Gra x Con	767.42	3	8.35	***
Gra x Ach	173.91	1	5.68	*
Con x Ach	151.17	3	1.64	ns
Gra x Con x Ach	173.73	3	1.89	ns
Subjects w. groups (Sub)	3431.19	112		
Within Subjects				
Story Type (Sto)	573.00	1	41.80	***
Gra x Sto	96.29	1	7.02	**
Con x Sto	230.64	3	5.61	**
Ach x Sto	0.47	1	0.03	ns
Gra x Con x Sto	122.79	3	2.99	*
Gra x Ach x Sto	12.69	1	0.93	ns
Con x Ach x Sto	85.79	3	2.09	ns
Gra x Con x Ach x Sto	16.64	3	0.40	ns
Sto x Sub	1535.19	112		

[1] *p <.05; **p <.01; ***p <.001

significant effects of Achievement Level only hold for the kindergarten children. Among kindergarten children, "high" achievers performed significantly better than "low" achievers ($p < .01$). This difference was not significant for the third graders ($p > .05$).

The significant second order interaction of Grade, Condition, and Story Type effects can be seen in Figure 6. The performance of third graders for "Lamby" under Conditions I and II was much lower than for the other conditions. To analyze this significant interaction further, tests of Simple Interactions (SI) and Simple Main Effects (SME) were performed on Grade and Story Type at each of the four levels of the Experimental Condition factor. Results are shown in Table 15.

There were highly significant effects of Grade for Conditions I through III, although the effects for Condition IV did not reach significance. Thus, for Conditions I, II, and III, third graders performed significantly better in sequencing than did kindergarten children. For Condition IV, although third graders still performed better than the younger children, the difference was not statistically significant.

Story Type effects varied with both Grade and Condition. For Conditions I and II, the interaction between Grade and Story Type was significant ($p < .01$). Further tests of SME assessed the effects of Story Type for each Grade. For Condition I (control group), Story Type effects were significant only for third graders. (Kindergarten: $F_{(.025)} = 25.1_{(1,112)}$; $p > .05$. Third grade: $F_{(.025)} = 25.1_{(1,112)}$; $p < .0001$). When provided with no aids, third graders performed much better when required to sequence events linked by causal/logical

TABLE 15

FURTHER ANALYSIS OF VARIANCE FOR SIMPLE INTERACTIONS AND SIMPLE MAIN EFFECTS. DV: TOTAL SEQUENCING SCORE

Source[1]		SS	df	F	Significance[2] Level
Between Subjects					
Between Gra at Con	I	2036.27	1	91.84	***
	II	380.25	1	17.15	***
	III	351.56	1	15.86	***
	IV	52.56	1	2.37	ns
Within Cell (from overall Anova)		4966.38	224		
Within Subjects					
Between Sto at Con	I	252.02	1	18.39	***
	II	495.06	1	36.12	***
	III	7.56	1	0.55	ns
	IV	49.00	1	3.58	ns
Gra x Sto at Con	I	118.23	1	8.63	*
	II	100.00	1	7.30	*
	III	0.56	1	0.04	ns
	IV	0.25	1	0.02	ns
Sto x Subjects (from overall Anova)		1535.19	112		

[1]Factors: Gra = Grade; Con = Experimental Condition; Sto = Story Type.

[2]Experimentwise Error Rate (EW) was set at .05; the significance level actually used to test each term was $\alpha/4 = .0125$.

*p <.01; **p <.001; ***p <.0001

relations ("Farmer" story) than those linked only by temporal/arbitrary ones ("Lamby" story). Kindergarten children, on the other hand, generally performed about equally poorly in sequencing events from both stories.

The significant interaction between Grade and Story Type for Condition II reflects the fact that the effects of Story Type were more marked for third graders than for kindergarten children. This is evident from the significant effects of Story Type at each grade. (Kindergarten: $F_{(.025)} = 5.47_{(1,112)}$; $p < .02$. Third grade: $F_{(.025)} = 37.94_{(1,112)}$; $p < .0001$). Thus, children of both grades who were provided with VA's during retelling only sequenced events from "The Farmer" better than from "Lamby."

For Conditions III and IV, there was no significant interaction between Grade and Story Type. Thus, results related to Story Type effects should apply to both grades. In neither condition was there a significant effect of Story Type. Thus, children receiving VA's during the presentation of each story, and those receiving them during the presentation and recall phases, in general sequenced events from both stories about equally well.

The effects of Story Type on performance on the Sequencing Task can be summarized as follows: When the partial scores corresponding to the two types of sequences ("Forward" and "Reverse" types) were pooled, some experimental groups performed better on "The Farmer." That is, third graders in the control group and children of both grades given VA's during recall only were better at sequencing events from the story whose events were causally and logically related.

In contrast, the scores of kindergarten children in the control group, and of children of both grades receiving VA's at presentation or during both phases do not differ significantly. The further qualifications offered in the next section will help clarify these findings.

Comparisons among experimental conditions. Thus far, we have seen that, except under Condition IV, third graders perform better than kindergarten children across stories and conditions. At the same time, effects of Story Type vary according to grades and conditions: in some instances performance is better on Story 1; in others, performance on the two stories does not differ significantly. These findings, however, do not permit direct assessment of the effects of Experimental Condition on this task. These effects can be appreciated in Figure 7, which summarizes the Total Sequencing Scores of kindergarten and third grade children across stories, under each of the four experimental conditions.

These results, which are quite similar to those obtained for previous tasks, again confirm a major hypothesis of this study--namely, that a greater spread of scores and relative gains are expected for the kindergarten children throughout the experimental conditions than for the older children. For this task, as for the previous two, the performance of kindergarten children receiving no aid was significantly poorer than that of all other groups.

To analyze these results further, planned comparisons, applied to the data of the previous two tasks, were also applied to the Total Sequencing Scores (mean values). Results appear in Table 16.

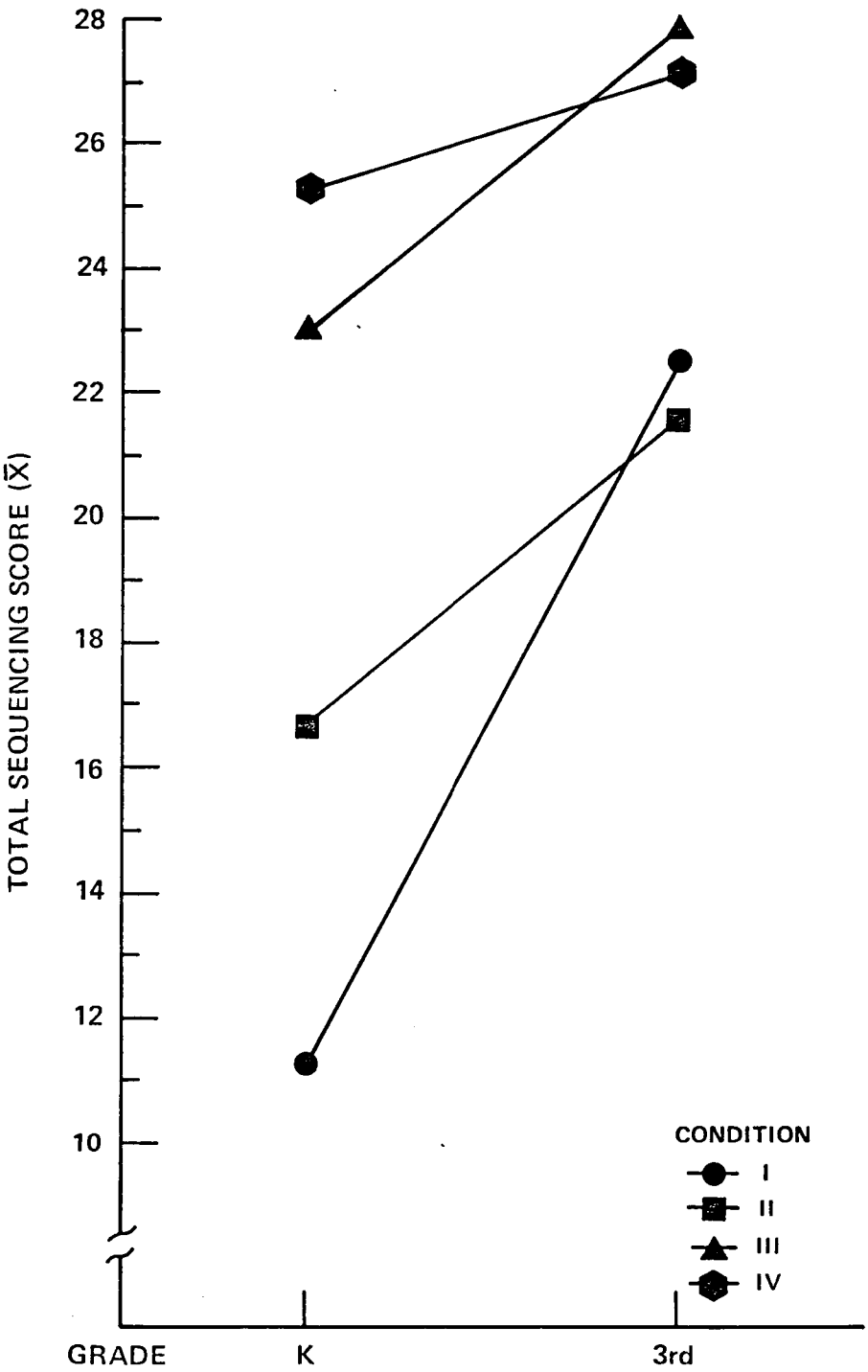


Figure 7. Total Sequencing Score for each Grade and Experimental Condition. (Data are pooled across stories.) (Each plotted value represents the mean of 32 observations.)

TABLE 16

PAIRWISE AND NON-PAIRWISE PLANNED COMPARISONS BETWEEN EXPERIMENTAL CONDITIONS FOR EACH GRADE. DV: MEAN SCORE FROM TOTAL SEQUENCING TRIALS, ACROSS STORIES

			Grade			
			Kindergarten		Third	
Planned Comparison			t[1]	Signif.[2] Level	t[1]	Signif.[2] Level
a. Pairwise						
1.		I vs. II	3.909	***	-0.720	ns
2.		I vs. III	8.533	***	3.770	***
3.	Cond.	I vs. IV	10.116	***	3.273	**
4.		II vs. III	4.624	**	4.494	**
5.		II vs. IV	6.207	***	3.990	***
6.		III vs. IV	1.582	ns	-0.498	ns
b. Non-pairwise						
7.	Conds.	I+II vs. III+IV	10.419	***	5.490	***
8.		I+III vs. II +IV	3.882	***	0.863	ns

[1]df for all Planned Comparisons = 112. Each mean comprises 32 observations.

[2]Experimentwise Error Rate (EW) was set at .05; the Error Rate per Comparison (EC) actually used was $1-(1-\alpha)\ 1/8 = .00639$. All tests were one-tailed except for comparison 4, II vs. III, which was two-tailed.

**p <.001; ***p <.0005

Again, it is worth noting that these results are only general and represent the pooling of scores for both types of sequences and both stories.

For kindergarten children, all planned comparisons were significant, except for that comparing Conditions III and IV. Thus, kindergarten children provided with VA's (Conditions II, III, and IV) performed better on the Sequencing Task than those provided with no aid (Condition I). Providing VA's during the presentation of each story (Conditions III and IV) was much more effective for enhancing performance on the Sequencing Task than during the Retelling Task only. At the same time, it made little difference whether VA's were provided only during presentation (Condition III), or during presentation and retelling (Condition IV). Thus, although provision of VA's during retelling enhanced performance, it was not nearly as effective as their provision during presentation. Both non-pairwise comparisons were significant, indicating that performance on the Sequencing Task was improved by providing VA's during both presentation and retelling--although the former was more effective. These results are consistent with those of the two previous tasks.

Results for third graders were somewhat different from those of kindergarten children, but consistent with results on the two previous tasks. Third graders provided with no VA's performed far better on their own (mean score higher than 75 percent) than did unaided kindergarten children (mean score less than 43 percent). Providing VA's during the presentation of each story enhanced performance to nearly 100 percent accuracy. On the other hand, whether VA's were provided

during presentation or not, providing VA's during the Retelling Task did not enhance performance for this grade.

Further Analysis of the Sequencing Task: "Forward" versus "Reverse" Sequences

One of the aims of the Sequencing Task was to compare the "Forward" and "Reverse" types of sequence for each story and each grade, for children under Conditions I and III. Figure 8 shows the "Forward" and "Reverse" sequencing scores obtained by each grade, for each story, under Conditions I and III. It is clear from the graph that the patterns of results for the younger and older children were different. Furthermore, the scores obtained in the "Reverse" sequence of "Lamby" tend, in general, to be substantially lower than the rest of the scores. To analyze these patterns further, a set of planned comparisons was applied to the partial sequencing scores of the children from each grade exposed to Conditions I and III. The aim was to compare sequence types within and between stories for each grade. Results appear in Table 17.

In the previous section it was shown that kindergarten children's general performance on the Sequencing Task (Total Scores) was substantially better under Condition III than under Condition I. It is apparent from Figure 8 that this result holds for both stories and both sequence types. In spite of these differences between conditions, however, the pattern of results for the partial scores within and between stories was similar for both conditions. For this reason, the planned comparisons to assess differences within and between stories

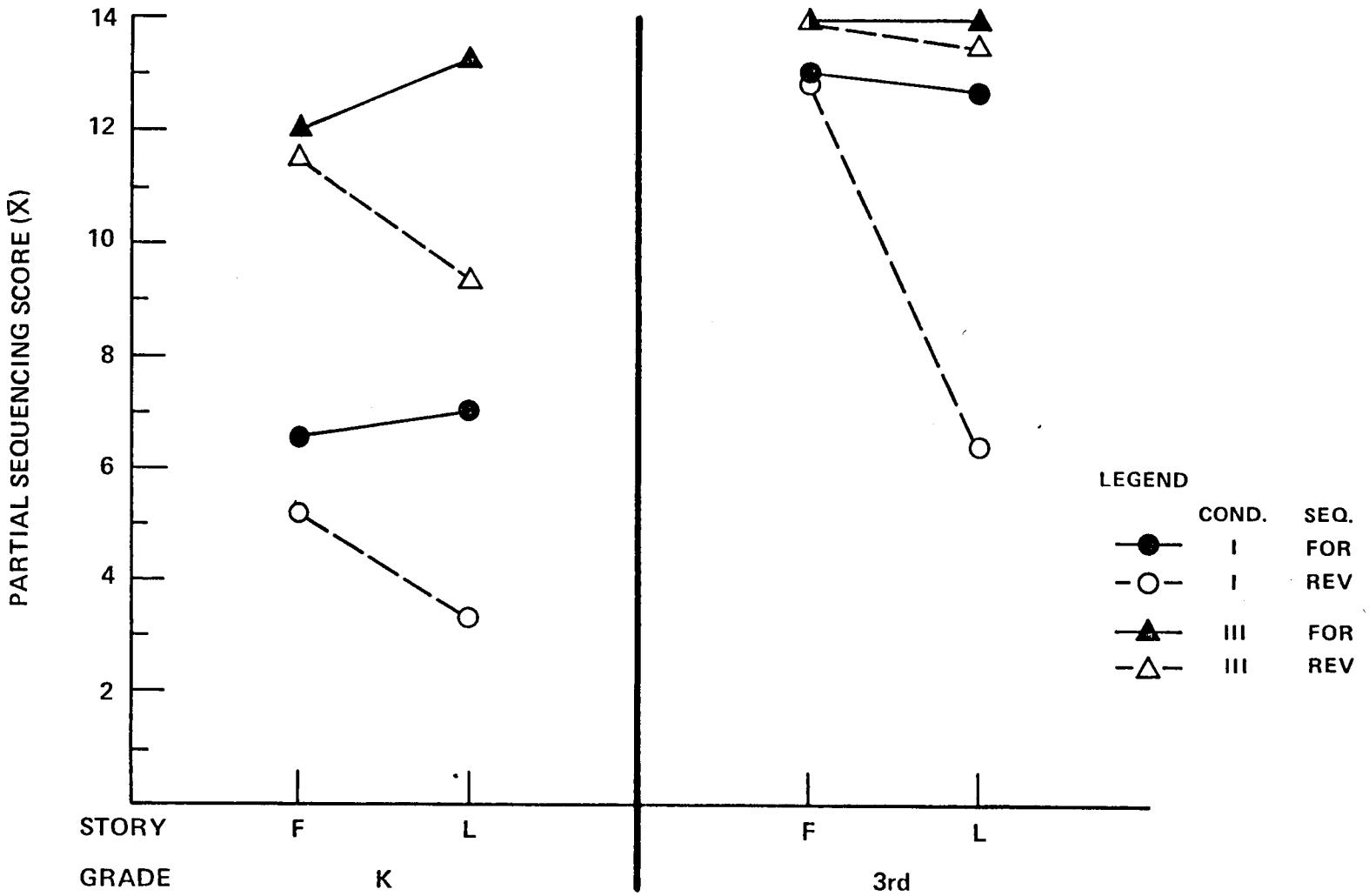


Figure 8. Comparison of "Forward" (For) and "Reverse" (Rev) Sequencing Scores for each Story and each Grade, under Conditions I and III. (Each plotted value represents the mean of 16 observations.)

TABLE 17

PAIRWISE PLANNED COMPARISONS OF SEQUENCE TYPES WITHIN AND BETWEEN STORIES FOR EACH GRADE (CONDITIONS I AND III ONLY). DV: PARTIAL SEQUENCING SCORES (MEANS)

		Grades[1]					
		Kindergarten		Third			
		Conds. I and III		Cond. I		Cond. III	
Planned Comparison		t[2]	Signif.[3] Level	t[2]	Signif.[3] Level	t[2]	Signif.[3] Level
A. Between Sequence Types: (within story)							
Seq. Type	Story						
"Forward"	1. "Farmer"	1.383	ns	0.130	ns	0.000	ns
vs.							
"Reverse"	2. "Lamby"	5.808	***	6.582	***	0.521	ns
B. Between Stories: (within seq. type)							
Story	Seq. Type						
"Farmer"	3. "Forward"	-1.429	ns	0.260	ns	0.000	ns
vs.							
"Lamby"	4. "Reverse"	3.000	**	6.712	***	0.521	ns

[1]For Kindergarten children data was pooled across conditions I and III, therefore each mean comprises 32 observations. For third grade, comparisons were made separately for each condition, with 16 observations per mean. (For rationale behind differences in pooling between grades, see text.)

[2]df for all Planned Comparisons = 120.

[3]EW was set at .05; EC (Error Rate per Comparison) used was $\alpha/4$ = .0125. All tests were one-tailed.

**p <.005; ***p <.0005

were applied by pooling group means across these conditions for the kindergarten children.

Results of comparing sequence types within each story showed that this difference was not significant for "The Farmer" but was significant for "Lamby," favoring the scores of the "Forward" sequence. Comparisons of stories for each sequence type revealed that they did not differ significantly with respect to the "Forward" type of sequence. In contrast, the difference was highly significant for the "Reverse" type, favoring "The Farmer."

Kindergarten children scored significantly lower on the "Reverse" sequence of "Lamby" than they did on the "Forward" sequence of the same story, and lower than on both types of sequences of "The Farmer." This poorer performance on the "Reverse" sequence of Story 2 (when compared to the rest of the means within each condition), was found for Conditions I and III. To confirm these results, a separate set of comparisons was performed for each condition, yielding the same pattern of results.

For children in third grade the previous section showed that planned comparisons of the Total Sequencing Scores under Conditions I and III yielded a significant result. It is apparent from Figure 8 that for this grade, the pattern of results within and between stories was different for Conditions I and III. While all four mean scores were very high for Condition III (100 percent or thereabouts), all scores for Condition I were also very high (close to 90 percent) except the mean of the "Reverse" sequence for Story 2. This latter score was substantially lower (close to 50 percent).

Given this difference, pooling of data across the two conditions was not justified for the third grade, and the set of planned comparisons to assess story and sequence type differences was applied to each condition separately (see Table 17). The only significant differences found apply to Condition I and pertain to the "Reverse" sequence of "Lamby." Here, children of the control group performed significantly worse on this sequence and story than elsewhere. The other three mean scores did not differ significantly from each other. This result is quite similar to the pattern of results for kindergarten children under both Conditions I and III.

When third graders were provided with VA's during the presentation of each story (Condition III) the differences found for Condition I failed to appear: the performance of the children was equally accurate (close to 100 percent) on both stories and on both types of sequences. For this grade, the only gain realized by providing VA's during presentation was a very substantial improvement in performance on the "Reverse" sequence of "Lamby."

Post-hoc Tukey A comparisons applied to all eight scores (for Conditions I and III) confirmed this pattern of results: there were no significant differences between any of the means except between the mean scores for the "Reverse" sequence of "Lamby" and all other means. The remaining seven means did not differ significantly from each other. These results contrast with those obtained for the kindergarten children. For the latter, there was a substantial improvement in performance when VA's were provided during presentation across both stories and both types of sequences.

Summary of sequencing results. The comparisons between grades presented in the previous section showed that, for both Conditions I and III, third graders performed substantially better than kindergarten children when sequencing events, across both stories. The superiority of their performance was particularly marked for Condition I, where children were provided with no aids. When Total Sequencing Scores were considered, the comparisons between Conditions I and III for each grade were significant in both cases. A more qualitative analysis of partial scores disclosed differences between the patterns of results of the two grades: For kindergarten children, the superiority of performance under Condition III applied to both stories and to both types of sequences. In contrast, third graders performed very accurately without VA's (Condition I) on all but the "Reverse" sequence of "Lamby." This last score was low when VA's were not provided, and substantially improved when they were. There were no other significant differences between Conditions I and III.

For comparisons of partial scores within and between stories, the pattern of differences was very similar for kindergarten children under both conditions (I and III), and third graders under Condition I. The sequencing performance of these three experimental groups was substantially worse when dealing with events corresponding to the "Reverse" sequence of "Lamby" than with either the "Forward" sequence of that same story or both types of sequences of "The Farmer." Thus, for these three groups, differences between stories were found only for "Reverse" sequence types and not for "Forward" ones. Likewise, the differences were found between sequence types only for Story 2.

Further analyses of this observed poor performance revealed that a common tendency in ordering incorrectly this particular sequence by kindergarten children and third graders not receiving VA's during presentation, was to match the order of the second sequence to that of the first. That is, these children actually ignored the reversal of the order of characters in the second sequence, placing (some or all of) the first three cards in exactly the inverse order, so that the order of characters in the "Reverse" sequence matched the order in which they appeared in the previous "Forward" sequence. The incorrect order of the "Reverse" sequence in this case was 3,2,1,4 thus placing the lion first instead of third, etc. (This tendency to match the first sequence encountered was also observed for the Node Inversions representing Violations involving this reverse sequence, produced during retelling.)

The total proportion (and percentage) of children from each grade who ordered the "Reverse" sequence of Story 2 incorrectly (total incorrect), and the proportion from among these who made the particular mistake of matching the order in this sequence to the "Forward" sequence is as follows:

	Kindergarten		Third Grade	
Condition	Total Incorr.	Incorr. match	Total Incorr.	Incorr. match
I	15/16 (93.8%)	6/15 (40.0%)	11/16 (68.8%)	8/11 (72.8%)
III	7/16 (6.3%)	5/7 (71.4%)	1/16 (6.3%)	0/1 (0.0%)

For the kindergarten children the data are not directly comparable because of the differences in the proportions of incorrect sequences with and without VA's during presentation. For the third graders, however, it is clear that among those not provided with VA's, the tendency to ignore the reversal and match the order of the "Reverse" to the "Forward" sequence was very apparent. In contrast, third graders receiving VA's at presentation performed extremely well across both stories and both types of sequences, including the "Reverse" sequence of Story 2. None of them made this particular matching mistake during the Sequencing nor the Retelling tasks.

D. Relationships Among Dependent Variables

In the previous sections, quantitative and qualitative data from each of the three tasks used in this study were presented. One aim of the study was to investigate the relationships among the different dependent variables, both in terms of similarities and differences. To analyze the associations between these different measures, Pearson product-moment correlations were calculated for all pairwise combinations of seven measures produced by the three tasks. These include: (1) total number of story units recalled; (2) total number of questions answered correctly; (3) number of correct answers to "Ex" questions; (4) number of correct answers to "I" questions; (5) total sequencing score; (6) partial sequencing score for "Forward" sequences; and (7) partial sequencing score for "Reverse" sequences. The correlation matrix for these variables is shown in Table 18.

TABLE 18

CORRELATION COEFFICIENTS (PEARSON PRODUCT-MOMENT) AMONG SEVEN DEPENDENT VARIABLES

	Retelling[1] Task	Question-Answering Task[1]				Sequencing Task[1]		
	1. T/Rec	2. T/Q-A	3. P/"Ex"	4. P/"I"	5. T/Seq	6. P/"For"	7. P/"Rev"
1. T/Rec		.741 ***	.671 ***	.701 ***	.651 ***	.629 ***	.515 ***
2. T/Q-A			2	2	.784 ***	.725 ***	.642 ***
3. P/"Ex"				.721 ***	.688 ***	.674 ***	.539 ***
4. P/"I"					.758 ***	.672 ***	.640 ***
5. T/Seq						2	2
6. P/"For"							.465 ***
7. P/"Rev"							

[1]Each DV corresponds to either the Total (T/) or a Partial (P/) score of the Retelling, Question-answering or Sequencing Tasks. (N = 256)

[2]Meaningless correlation due to the fact that half of the values correlated would be the same.

***p <.0001

All 17 correlations were positive, and highly significant ($p < .0001$) with values ranging from .47 to .78. In particular, correlations were high for each of the three pairs of total scores: Total Recall scores and Total Question-answering scores, $r = .74$; Total Recall scores and Total Sequencing scores, $r = .65$; and Total Question-answering scores and Total Sequencing scores, $r = .78$. Correlations of partial scores within tasks were also high: for the Question-answering Task, "Ex" and "I" questions were highly correlated ($r = .72$). For the Sequencing Task the two types of sequence ("For" and "Rev") correlated less well ($r = .47$).

The above high correlations reflect a high degree of consistency of results across tasks. This consistency may be partly due to similarities in the effects produced by the different independent variables investigated in the study. This interpretation seems to be at least partially supported by the following facts: (a) the effects of some of the factors were consistent across tasks; (b) at the same time, however, the effects of other factors were very different across tasks, indicating subtle task-specific effects. While the first fact applies specifically to effects of Grade, Experimental Condition, and Achievement Level, the second applies mostly to Story Type effects.

The subtle interactions and task-specific effects encountered for Story Type are not reflected in the high correlations obtained in the overall matrix presented. This might be partly due to the fact that all factors were pooled for this analysis. Further correlational analyses were performed separately for the different factors and their combinations. These analyses are involved and numerous,

so only a few observations are reported here. Briefly, preliminary analyses revealed no systematic changes between the overall correlational matrix and matrices obtained separately for each grade and separately for each story. Further breaking down of the various factor combinations, however, produced a substantial decrease in several of the correlation values, so that a separate analysis for each Grade by Story Type by Experimental Condition combination yielded numerous low (i.e. non-significant) correlation coefficients between several of the dependent variables for many of the groups. This observation further suggests that the dependent variables were not simply measuring the same behavior.

E. Summary

The effects of Grade, Experimental Condition, and Achievement Level were fairly consistent across tasks, while Story Type effects varied considerably with grade and experimental condition, and across tasks:

(1) Grade effects: Third graders performed consistently better than kindergarten children on all quantitative measures across all other factors and across all three tasks. The only exception was performance on the Sequencing Task under Condition IV, where grade effects did not reach significance although differences were in the expected direction. At the same time, qualitative analyses showed that, during retelling, third graders produced more correct statements and more expansions, as well as fewer incorrect statements, role changes and node inversions, than the kindergarten children.

Third graders also answered more questions correctly than kindergarten children, particularly, as was predicted, when required to express information that was only implicit in the original stories. Finally, third graders also sequenced more accurately than the younger children across both "Forward" and "Reverse" sequence types.

(2) Experimental Condition effects: The pairwise planned comparisons revealed some differences in Experimental Condition effects across tasks. However, the non-pairwise comparisons revealed very consistent effects across tasks, within each grade:

(a) For all three tasks, the range of scores obtained by kindergarten children was much greater across conditions than that of the third graders (as predicted). Kindergarten children receiving no aids performed very poorly across tasks, in comparison with the rest of the groups. They performed far better when given VA's during the presentation of each story, than when not provided with them. Their performance also improved significantly (although not as much) when they were provided with VA's during the retelling of each story.

(b) The performance of third graders without VA's was much better than kindergarten children's performance under the same condition, on all three tasks. However, the performance of third graders was still improved by providing VA's during presentation, although not by the provision of VA's during retelling, again on all three tasks.

(3) Achievement Level effects: "High" achievers in general performed better than "low" achievers on all tasks, except for third graders on the Sequencing Task, where the difference was not significant.

(4) Story Type effects:

(a) For the Retelling Task, story effects varied across both grades and conditions. Kindergarten children under Condition I retold significantly less of Story 2 than of Story 1, while for third graders there was no difference for this condition. Nor were there significant differences between stories for either grade children under Conditions II and III. In contrast, for Condition IV children of both grades retold more of Story 2 than of Story 1. At the same time, however, many other subtle story effects were revealed by the qualitative analysis of the retelling data. These subtle story effects seemed to reflect the structural differences underlying the two stories. In general, more changes representing distortion of the original information were produced for the more loosely structured story.

(b) For the Question-answering Task, results were much more consistent. Across all other factors, children answered more questions correctly about Story 1 than about Story 2.

(c) For the Sequencing Task, results again varied according to both grades and conditions, but not in the same way as the Retelling Task. In general (across sequence types), third graders not receiving VA's during presentation performed significantly poorer in sequencing Story 2 than Story 1. With VA's at presentation, these effects disappeared. The general performance of kindergarten children between stories was poorer for Story 2 than for Story 1 under Condition II, while it did not differ significantly under any other condition. Further comparisons of sequence types, however, revealed poorer performance for Story 2 than for Story 1 (especially for kindergarten

children across all conditions) than had been detected by analyzing total sequencing scores. This poorer performance in sequencing events from Story 2 was particularly observed for the "Reverse" sequence. All children performed more poorly on this particular sequence than on the others, except for the third graders who were provided with VA's during the presentation of each story. The latter performed extremely well on both stories and sequence types.

CHAPTER V

DISCUSSION AND CONCLUSIONS

A. Ontogeny of Abstracting Operations

In this study, children in approximately the mid-period of middle childhood (8 to 9 years old) displayed consistently superior performance on a series of tasks following aural exposure to narrative discourse in comparison with children in the end of early childhood (5 to 6 years old). These differences point to a developmental improvement in the operations used to abstract information across this age-span.

Younger children exhibited numerous difficulties, particularly when not aided. Although underdeveloped logical concepts (e.g. lack of conservation) may well have been involved, these did not seem to be the exclusive locus of their problems. The data indicate that a failure to apply, spontaneously and/or independently, appropriate strategies for abstracting information, during both acquisition and subsequent use, played an important part. Kindergarten children seem to lack effective strategies for keeping track of, retaining, integrating, and/or organizing incoming information. They also had problems following the sequence of events, and subsequently recalling and/or using the information acquired. The failure to apply organizational strategies was particularly apparent. These youngsters were dependent, for adequate performance, on the information being well organized, either through the nature of the text or by supporting cues.

This study does not support, however, claims such as those made by Fraisse (1963), that children at this age are insensitive to logic and/or fail to make use of it to solve tasks; that they retell events in an illogical and/or "completely jumbled up" fashion; and that they are unable to draw inferences.

The evidence for the above conclusions concerning younger children's problems and capacities includes the following findings:

1. Although performance of unaided kindergarten children was very poor across tasks, a substantial improvement was observed when VA's were provided during both presentation and retelling. The VA's accompanying story presentation were particularly successful in enhancing performance across tasks.

2. Whereas an organized display of VA's during retelling enhanced performance on the Retelling, as well as subsequent tasks, in pilot trials, when VA's were provided in a random order during this phase, children exhibited great difficulty in trying to retell the stories.

3. The performance of these children was better, even when unaided, on the logical and tightly organized story than on the arbitrary and more loosely organized one. This was true for several different measures including number of units recalled, number of questions answered correctly, and sequencing scores for the "Reverse" type of sequences. These data provide evidence that these children are sensitive to, and can capitalize on logical relations, in performing tasks like those used here. This evidence is in agreement with Brown's findings (e.g. Brown, 1975a; 1976b; Brown and Murphy, 1975).

4. A relatively small proportion of statements produced by kindergarten children during retelling actually represented distortions of the information. There were a few cases of very disorganized retellings, in which information was also incorrect. These children seemed to have missed most or all of the story, and "made up" their own story using some of the characters from the original story. In general, however, the tendency was either to produce fairly organized retellings (especially when aided by VA's), to omit seemingly confusing or difficult information, or to refuse or fail to retell most or all of the story. Unaided kindergarten children retold very little across stories, saying hardly anything of the more loosely structured story. Rather than "jumbling up" the story, they simply did not retell it. There was a similar tendency for youngsters to omit information from the "Reverse" part of the sequence of events of Story 2, which proved difficult for children in general.

5. Distortions which did occur during retelling occurred significantly more frequently for the more loosely structured story, suggesting that the quality of kindergarten children's retellings was to some degree dependent on the degree of organization of the input. This observation is in agreement with findings by Mandler and Johnson (1977) and Stein and Glen (1979) for elementary school children, including first graders.

6. Of the spontaneous retelling statements produced by kindergarten children, 5 percent were classified as inferences. Although their performance on questions calling for inferential information

was not nearly as accurate as that of older children, it did reach 79 percent when VA's accompanied story presentation. Such results are consistent with Paris's findings that there is a developmental increase in the ability of children to derive and use implied information over this age-span, and that kindergarten children are able to draw inferences (e.g. Paris and Upton, 1976; Paris and Lindauer, 1976; Paris et al., 1977). Moreover, even if kindergarten children generally perform poorly when requested to derive information not explicitly stated in a passage, this does not imply that they cannot or do not perform such operations in other linguistic contexts.

The older children appeared to have developed the ability to apply independently appropriate strategies to abstract information, during both acquisition and subsequent use of the acquired information to perform tasks like the ones administered. Children may be presumed to develop these skills like they develop other abilities, such as the acquisition of important logical concepts.

The skills responsible for the observed developmental improvement seem to be more adequate, effective, and flexible strategies for dealing with incoming information, as well as strategies for subsequent recall and/or use of the information. In addition, the development of more adequate operations to deal with loosely structured input, to follow and reconstruct series of events, and to "go beyond the information given" and derive information not explicitly stated in a passage appeared prominent over the age-span investigated.

The evidence for the above conclusions includes the following findings:

1. The performance of older children was superior to that of younger children on all tasks, and across stories, conditions and achievement levels. This difference was particularly marked when VA's were not provided.

2. The performance of unaided third graders was similar to that of kindergarten children provided with VA's at both presentation and retelling (and at presentation only) on all main quantitative measures of the tasks.

3. Third graders performed accurately on all sequences of the Sequencing Task in Condition III, and on all except the "Reverse" sequence of Story 2 in Condition I.

4. The superior performance of older children on the Question-answering Task was particularly marked for questions which requested information to be inferred.

The evidence concerning older children's developmental accomplishments does not imply that their operations for abstracting information are completely developed. Several observations point to areas where some weaknesses might exist, at least in terms of present task-demands.

One of these concerns the sharp differences in performance on the "Reverse" sequence of the loosely structured story with and without VA's at presentation. Seventy-three percent of unaided third graders who ordered this sequence incorrectly, ignored the reversal, and matched the first three events to the order of characters of the previous "Forward" sequence. This mistake suggests that these children

overgeneralized the "rule" or order first encountered. This could have been induced partly by the difficulty of the reversal, the arbitrary nature of the relations among the events being ordered, and/or their repetitiveness. The VA's accompanying the story provided cues for the complete sequence of events, including the reverse part. Third graders receiving them appeared to have benefitted to the extent of performing as accurately in the "Reverse" as in the "Forward" sequence.

The above observations are somewhat paradoxical. While there are indications that third graders are flexible in sequencing events in both directions, there is also a tendency to overgeneralize a previously learned order. When children of this age confront arbitrary sequences (particularly repetitive ones) with no supporting cues, they might tend to rely on the application of a given learned order which can lead to mistakes. However, supporting cues (at least visual) may permit closer monitoring of the whole sequence, and it is this effect which reveals their flexibility in ordering events.

Another apparent limitation of the older children is suggested by the significant improvement of their performance on all tasks when VA's were provided during story presentation. This result indicates that the acquisition strategies of these children are not fully developed. Once these children have abstracted information, their own strategies for recalling and/or using the information appear at least as effective as providing them with aids during this phase. This conclusion is supported by their lack of improvement across tasks when aids are provided at retelling. This lack of improvement does not imply, however, that performance could not be improved further

by other recall cues nor that their recall strategies are well developed.

In general, much of the evidence concerning developmental differences (and areas of strengths and weaknesses in the operations of both grade children) stems from differences in performance obtaining with and without VA's at each phase. Although it is difficult to determine the specific factors responsible for effects observed, results do provide evidence that VA's led to improvement in acquisition of information and general performance as hypothesized.

The hypothesis that the VA's provided during presentation could highlight and help integrate relevant information is indirectly indicated by the significantly better performance on all tasks of the groups (of both grades) receiving VA's at this phase. Several observations also provide strong support for the hypothesis that VA's during presentation help children structure and organize incoming information, and follow the sequence of events:

1. For the Retelling Task, a comparison of the organization of retellings with and without VA's during this phase is not possible for the kindergarten children, because groups were not comparable (children in the control group said hardly anything). Among third graders, however, groups <u>not</u> receiving VA's during this phase were responsible for 94.7 percent of all Node Inversions representing violations of the order of events, while the groups receiving VA's at this phase were responsible for only 5.3 percent ($\chi^2 = 20.75$; $df = 3$; $p < .0001$).

2. For the Sequencing Task, all groups receiving VA's performed significantly better than control groups and those groups receiving VA's only during retelling. Furthermore, third graders receiving these aids performed extremely well on the "Reverse" sequence of Story 2, which proved difficult for all other children.

In both grades, children provided with VA's at presentation only recalled significantly more than control groups (and in the case of third graders, more than children provided with VA's at retelling only), which provides support for the hypothesis that VA's during this phase aided retention of the information. Some anecdotal observations also support this contention. For example, some children in Condition III, before starting to retell, apparently tried to use (their recall of) the models previously presented as retrieval cues to reconstruct the narrative (e.g. one child said almost to herself: "Let's see . . . you first put this farmer here . . . and a donkey . . . and a house. . . . I think the farmer was trying to put the donkey in his house . . ."). Although children's behavior during presentation could not be monitored very closely, many children (from both grades) were observed to turn back repeatedly to models which had been presented previously (and left in place) as new characters were introduced and/or new events narrated during both stories. Children could have been using models left in place for back reference; that is, to relate what was being narrated to what had happened previously. For example, in "The Farmer," while the second episode was being narrated--when the farmer goes to get his dog--it was common for children to look back to where the donkey and barn were. Presumably, by seeing them they

could have been reminded of what the farmer wanted the dog for. Likewise, in Story 2, when Lamby meets the fox--second episode--children could have been reminded of who Lamby had met before by turning to the lion, and so forth.

Finally, the hypothesis that VA's provided during retelling aided recall is supported by the superior recall of kindergarten children with VA's than without them. Third graders did not seem to need the aids; amount of recall for this grade was just as high without them. Since VA's at this phase were presented in order, they also seem to provide some cues into the sequence of events, at least for younger children. For example, kindergarten children receiving VA's at this phase only performed significantly better than children in the control group, although they did not perform nearly as well in the Sequencing Task as children receiving VA's at presentation. Presumably, these children took advantage of the ordered presentation of the models at retelling, when subsequently ordering the cards.

Although present analyses permit documentation of developmental differences, and throw some light on the loci of these differences, they do not provide clear conclusions concerning whether such differences are only quantitative or also qualitative. This is partly due to the preliminary nature of some of the more fine-grained analyses. For example, if the failure of the kindergarten children to apply independently appropriate strategies is because those strategies, although in their repertoire, were simply not applied to given tasks or in given contexts, we would be dealing with a "production deficiency" (see Kendler, 1972). This, in turn, would represent mainly a

quantitative difference according to Paris (1975), if the older and younger children's strategies were similar when applied. The data, however, do not furnish sufficient information to evaluate the degree of similarity between the operations applied by the two grades in the present tasks, and there is no reason to believe that they would be similar, even if products were. If the operations were similar, the differential level of understanding achieved by applying or failing to apply appropriate strategies or operations, would, according to Paris (1975), represent a qualitative change. Unfortunately, we do not have appropriate instruments to measure "level of understanding."

With respect to the ability to draw inferences, it does not appear that children completely lack the ability before the onset of concrete operations and possess it afterwards. Instead, there seems to be a substantial increase in this ability over the age-span investigated. Whereas a shift from complete inability to ability would represent a qualitative change, an increase per se does not indicate the nature of the change. Once again, we need to know more about the particular operations involved in drawing inferences from prose at each developmental level. Data from the Geneva School have shown rather convincingly that qualitative changes are involved in these and other operations in the age-span under investigation.

In conclusion, this study furnished evidence that children develop the ability to apply independently more adequate and effective strategies for abstracting information from narratives, during both acquisition and in subsequent use of such information to solve tasks like those used here. Since VA manipulations applied at each phase

had an observable effect on performance across tasks, there is good reason to believe that the operations performed during both phases contribute to the process of information abstraction. A more thorough account of developmental changes (as opposed to differences) could be achieved only through longitudinal research.

This study also provides evidence that an important source of difficulties exhibited by children in the end of early childhood, at least in tasks like those used in this study, resides in their failure to apply appropriate strategies during both acquisition and subsequent use. These children, however, do show a capacity to capitalize on logical relations in solving these tasks. This evidence does not imply that the logical concepts of these youngsters are mature or complete, but it does suggest that children of kindergarten age may be less bound by conceptual limitations (e.g. lack of conservation) than has commonly been argued. The evidence may indicate that some psycholinguistic capabilities of these youngsters are better developed than has been claimed. In short, the literature in the area is weighted toward deciding what "pre-operational" or "pre-conceptual" children are unable to do, and it is time for us to tilt the balance in order to discover what these children can do in appropriate contexts.

B. Linguistic (and Other) Factors Contributing to Information Abstraction

In the recent literature on discourse processing, there are several controversies concerning the variables, processes, or factors that are most important in accounting for which information will be

abstracted from discourse. While some authors (e.g. Meyer, 1977) attribute a preeminent role to text-structure variables, others (e.g. Craik and Lockhart, 1972; Craik and Tulving, 1975) give priority to the "encoding" process and propose that "level of processing" determines degree of recall. Still others (e.g. Omanson et al., 1978) argue for a different relation between the above processes: namely that retention precedes, and in fact, may be independent of comprehension. Finally, other researchers (e.g. Mandler and Johnson, 1977) have suggested that memory is less strictly determined by encoding processes than claimed by Craik and that retrieval processes (among others) play an important part.

In the present study, Story Type effects interacted in many subtle ways with variables related to all of these factors. Unlike consistencies found for all other factors, Story Type seems to exhibit subtle factor- and task-specific effects. Results of story comparisons show that, in general, the more loosely structured story posed special problems on all tasks, although these effects were sometimes apparent only after qualitative analyses. At the same time, attributes of texts other than structure also proved important.

With regard to the Retelling Task, interpreting Story Type effects on amount of recall requires consideration that Story 2, although more loosely structured, also has an underlying pattern that is fairly regular; beyond certain "complications," events repeat themselves in slightly modified form. Kindergarten children did not seem to appreciate or take advantage of these regularities on their own. When provided with no help, most of them were apparently

overwhelmed by the complications, since they generally said little or nothing about the story. Unaided third graders, on the other hand, seemed to have perceived these regularities and overcome the complications, since they recalled this story about as well as the more tightly structured one.

Providing VA's at presentation only and at retelling only might have "standardized" to some degree certain aspects of the stories relevant to retelling, since performance between stories did not differ significantly under either of these conditions, for either grade. For both grades, VA's at both phases particularly enhanced the retelling of Story 2. This could be partly attributable to their success (in combination) in reducing the organizational burden of Story 2 (a major problem), while at the same time highlighting its underlying regularities.

Beyond these observations, number of units recalled is too global a measure to reflect the subtle effects of different types of event relations. Some of these effects were uncovered by a more fine-grained analysis which, although preliminary, was revealing.

The significantly greater numbers of Inferences, Expansions and Semantic Integrations present in the protocols for Story 1 may be primarily a product of the cohesiveness of story structure. At the same time, children produced fewer Role Changes for this story, and the few they did produce were of the Transfer and Transformation type (as opposed to the Transfer-only type). They also made fewer mistakes (INC), and Node Inversions were nearly all non-violations. These last

three findings seem to reflect particularly the causal/logical organization of the story.

In contrast to such findings for Story 1, the significantly greater number of Additions in the recall of Story 2 may be primarily a product of the looseness of story structure; children appeared (in many cases) to be "filling in gaps." At the same time, for Story 2 children produced more statements which were Incorrect, Role Transfers, and Node Inversions representing Violations. These findings seem to reflect the temporal/arbitrary sequencing of events in Story 2 and the arbitrary way in which characters were assigned to roles.

Thus, even if amount of recall did not reveal many differences, the above results suggest that children were sensitive to structural variations in the stories as reflected in the quality of their retellings. In general, more changes and transformations distorting the original information were observed for the more loosely and arbitrarily organized story.

The story grammarians' prediction (e.g. Stein, 1979) that causally connected events and episodes are more readily remembered than those connected by weaker ties, was confirmed for unaided kindergarten children but not for unaided third graders. The underlying regularities of Story 2 may partially compensate for the weaker ties in the case of the older children. Qualitative analysis did reveal, however, that events related by weaker ties tend to be inverted, changed and/or distorted more than those causally or logically connected. Thus, weaker ties might lend themselves to more such transformations of events.

Whether events are remembered or reported less readily might be determined by structure as well as by factors such as content, regularity of pattern, redundancy of information, degree of difficulty, task demands, etc. Qualitative analyses of the recall protocols (including data not reported here) indicate that all of these factors affect which information is reported during retelling. If this is the case, these factors will have to be considered more closely in future research. Some of the effects attributed to structure alone might also be due to these other factors, or to a combination of them and structure.

On the Question-answering Task, all experimental groups answered more questions correctly about Story 1 than Story 2. For this task, there is a confounding of effects, which prevents clear interpretation of results. The significant effect of Story Type could be due to differences between the stories per se, or it could be due to, or augmented by, differences in the degree of difficulty of the questions developed for each story. Although questionnaires were matched in format (i.e. they contained the same type and number of questions) they could not be matched in content and/or degree of difficulty, since the stories differ in these respects. It is important to remember, however, that the particular structural characteristics of a story may correlate with the types of questions that can be asked about it. Thus a more logical story might lend itself to questions which permit more logical answers. If this is true, it is possible that logical, cohesive and tightly organized relations between events facilitate

the abstraction and derivation of information required to answer questions similar to the types used here.

Concerning the Sequencing Task, it is significant that the widespread differential effects between sequence types found for the loosely structured story (i.e., significantly poorer performance in the "Reverse" than in the "Forward" sequence) were not found for the tightly structured story. The common tendency, among children ordering this "Reverse" sequence incorrectly, to ignore the reversal and match event order to that previously encountered, is relevant to the interpretation of these results. Two possible factors contributing to the differences found between stories are:

1. Differences in types of relations among events. Temporal/arbitrary relations appear to lend themselves to more inversions, including those resulting from overgeneralization of sequences encountered previously. Causal/logical relations, on the other hand, might in themselves be a very salient cue for ordering a sequence regardless of previously encountered sequences. In fact, although the second sequence of Story 1 represents a kind of "reversal" of the previous order, this reversal is much less salient than for Story 2 and there is no evidence that children actually perceived or were affected by this particular aspect of the sequence.

2. Differences in the degree of similarity/regularity of events. The observed tendency to follow the initial order for Story 2 might have been further induced by the repetitiveness of events throughout the story. Alternatively (or additionally), the greater distinctiveness of the different events in Story 1 might have hindered the tendency to follow the initial order.

Although at present it is not possible to evaluate the separate contributions of these two factors to the observed effects, results for the Retelling Task indicate that both are important. More research using a larger number of passages which vary systematically along several relevant dimensions (e.g. structure, regularity, content, conceptual difficulty, etc.) should prove fruitful in clarifying which text-factors were responsible for which effects. Admittedly, some of these variables are hard to measure and match so that the development of more sensitive tools for evaluating text (and performance after exposure to text) than those available at present is also needed.

In conclusion, it appears that the information an individual abstracts from prose, and the way he/she goes about it depends on the interaction of many factors. Practically every variable considered here was associated with distinct effects. These variables include: the nature of the text (including not only structure and event relations, but other aspects such as content, regularity of pattern, redundancy of information, "conceptual" difficulty of some information, etc.); manipulations performed during story presentation; manipulations performed during retelling; developmental level; specific task demands; and the specific dependent variable considered (including those resulting from quantitative and more fine-grained analyses). It is undoubtedly the case that many other factors, including non-linguistic ones, are important.

Experimental results also depend on the research methodology and data analyses employed. For example, it may not be coincidental that support for Craik and Lockhart's (1972) argument that level of

comprehension attained determines recall comes from a study in which inferential questions about presented passages preceded assessment of recall (Paris and Upton, 1976). The opposite claim, that retention precedes and may in fact be independent of recall, was reached after administering similar tasks but in the inverse order (Omanson et al., 1978). Although conceptually separable, these processes may interact in ways which render isolation impossible or irrelevant. The question of which process comes first, or has primacy, may be a fruitless one to pursue. Single-factor explanations appear too shallow to embrace the complexities of information abstraction, and only by considering the many relevant factors simultaneously will a more complete picture emerge.

C. Methodological Implications

Measurement Issues

Several measures were used in this investigation to assess information abstraction. The high degree of intercorrelation among the various measures when all factors were pooled could be interpreted as resulting from task similarity, or from the fact that there was a high degree of contamination with prior tasks affecting subsequent tasks. Although neither of these alternatives can be ruled out, a third interpretation appears more likely. Present data suggest that the consistency of results is due to similarities in the effects produced by the various independent variables investigated in the study. The evidence for this interpretation includes the finding that while Grade, Experimental Condition and Achievement Level effects were

fairly consistent across tasks, Story Type produced many task-specific effects. The fact that tasks were not measuring the same behaviors is further supported by the substantial reduction in many of the correlation values produced by further partitioning of factors and their combinations.

Each of the tasks used is associated with particular problems and limitations. In the case of free recall, for example, analysis of recall protocols is very involved and time consuming. In addition, resultant data are unsatisfactory for many purposes, especially when only the amount of recall is considered. Problems associated with asking questions have long been acknowledged. A sequencing task is limited to testing depictable events, at least for kindergarten children (a written rendition is a potentially viable substitute for older children).

In view of these limitations, several measures are likely to produce a more complete picture than relying on one, through the use of a converging operations paradigm. Although it may not be possible to avoid some degree of contamination of subsequent tasks by prior ones, such effects should be negligible, especially if the pattern of results is used to assess the phenomenon as a whole.

In conclusion, subtle differences and interactions associated with the various independent and dependent variables used in this study should warn us of the misleading picture that could result from looking at only one or a few isolated variables or measures. All of the independent variables investigated affected performance, and each measure used was associated with them in somewhat different ways.

In addition, gross quantitative analyses produced findings that were too global to reveal subtleties in the data with many effects only uncovered by more fine-grained analyses. Thus, consideration of several independent and dependent variables appears to be a particularly promising approach to the investigation of psycholinguistic phenomena such as information abstraction.

Motivational Factors

A separate assessment of the effect of presenting tasks as a game wherein "Kermit the Frog" told the story to the child, asking him/her to tell the story to the experimenter later, was not undertaken. The procedure was used because numerous standardization, attentional, task-perception and motivational problems were encountered in pilot trials, particularly with younger children. Introducing this procedure resulted in an apparent reduction in many of these difficulties, an effect which persisted throughout the study.

Among the greatest benefits of this procedure is that it allows for standardization of the testing sessions (including the instructions and, most importantly, the presentation of the stories), without sacrificing the child's apparent interest, participation, motivation and/or enjoyment. Indeed, the interest, etc. of many children was apparently enhanced, and children generally participated actively in the session and appeared to enjoy it. Such enjoyment was particularly apparent when "Kermit" talked to them. It was common for children, particularly young ones, to answer his questions, to smile and/or laugh as he "talked," to sit up when he asked them if they were ready

to listen to his story, and in general to make positive remarks. The procedure may also have contributed to the relatively good overall level of performance observed and to the general willingness and enthusiasm with which children attended and returned to the sessions.

It would seem that one of the greatest challenges to the developmental investigator is that of developing procedures which allow for control of some important variables but which are also attractive and motivating to children. Only under these conditions is it possible to assess what children can do under favorable circumstances. The present procedure appears to meet this challenge and could be adopted by other researchers.

Educational Relevance

The VA procedures used in this study, particularly those applied during story presentation, were quite successful in improving performance on subsequent tasks. Thus, although the specific objects and manipulations of this study might not be suitable for other learning contexts such as the classroom, these procedures could be adapted to serve as "imposed" methods, as well as "induced" strategies, to facilitate learning. With appropriate adaptations, present procedures might prove useful for enhancing performance in both listening and reading contexts.

If "imposed" methods were derived from present procedures (the most direct adaptation), materials could be presented in an organized, piecemeal but coherent fashion (with or without some visual referent), after the organization of the materials had been carefully and soundly analyzed.

The derivation from the present procedures of a set of strategies to deal effectively with certain types of prose, which could be taught to and used by learners (i.e., "induced" strategies), represents a more challenging, important and potentially fruitful endeavor than development of "imposed" methods (cf. Levin, 1971). This task has not yet been undertaken, and much work will have to be done before a picture of suitable strategies emerges. The derived procedures would aim at teaching children independent strategies to operate on information in ways which prove appropriate and effective--for example, by selecting and concentrating on relevant incoming information, by relating it to new information sharing the same arguments, and by organizing it in adequate units. A legacy to children (at least those who need it) of a more ample and effective repertoire of strategies for dealing independently with prose, "beyond the confines of the well-organized textbooks, the optimally sequenced teaching machine, and the multitalented teacher" (Levin, 1971, p. 6), might be among the most significant contributions of developmental psychologists and educators to future generations.

BIBLIOGRAPHY

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Bartlett, F. C. Remembering: A study in experimental and social Psychology. Cambridge, England: University of Chicago Press, 1932.

Bransford, J. D., Barclay, J. R., and Franks, J. J. Sentence memory: A constructive versus interpretive approach. Cognitive Psychology, 1972, 3, 193-209.

Bransford, J. D., and Franks, J. J. The abstraction of linguistic ideas. Cognitive Psychology, 1971, 2, 331-350.

Bransford, J. D., and Johnson, M. K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 717-727.

Bransford, J. D., and McCarrel, N. S. A sketch of a cognitive approach to comprehension: Some thoughts about understanding what it means to comprehend. In W. B. Weimer and D. S. Palermo (Eds.), Cognition and the symbolic processes. Hillsdale, N.J.: Lawrence Earlbaum Assoc., 1974.

Brown, A. L. Recognition, reconstruction and recall of narrative sequences by preoperational children. Child Development, 1975, 46, 156-166.

Brown, A. L. The development of memory: knowing, knowing about knowing, and knowing how to know. In H. W. Reese (Ed.), Advances in child development and behavior (Vol. 10). New York: Academic Press, 1975(b).

Brown, A. L. Semantic integration in children's reconstruction of narrative sequences. Cognitive Psychology, 1976, 8, 247-262, (a).

Brown, A. L. The construction of temporal succession by preoperational children. In A. D. Pick (Ed.), Minnesota Symposium of Child Psychology (Vol. 10). Minneapolis: Univ. of Minnesota Press, 1976(b).

Brown, A. L., and French, L. A. Construction and regeneration of logical sequences using causes and consequences as the point of departure. Child Development, 1976, 47, 930-940.

Brown, A. L., and Murphy, M. D. Reconstruction of arbitrary versus logical sequences by preschool children. Journal of Experimental Child Psychology, 1975, 20, 307-326.

Bruner, J. S. Studies in cognitive growth. New York: Wiley, 1966.

Bruner, J. S. The growth of representational processes in childhood. In J. Anglin (Ed.), Beyond the information given. New York: Norton, 1973.

Carpenter, P. A., and Just, M. A. Integrative processes in comprehension. In D. LaBerge and S. J. Samuels (Eds.), Basic processes in reading: Perception and comprehension. Hillsdale, N.J.: Lawrence Earlbaum Assoc., 1977.

Clark, H. H. The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. Journal of Verbal Learning and Verbal Behavior, 1973, 13, 335-359.

Clark, H. H. Discussion of Wike and Church's comments; reply to Wike and Church. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 257-261.

Clark, H. H. Inferences in comprehension. In D. LaBerge and S. J. Samuels (Eds.), Basic processes in reading: Perception and comprehension. Hillsdale, N.J.: Lawrence Earlbaum Assoc., 1977.

Colby, B. N. A partial grammar for Eskimo folktales. American Anthropologist, 1973, 75, 645-662.

Craik, F. I. M., and Lockhart, R. S. Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 671-684.

Craik, F. I. M., and Tulving, E. Depth of processing and the retention of words in episodic memory. Journal of Experimental Psychology: General, 1975, 104, 268-299.

Cromer, W. The difference model: A new explanation for some reading difficulties. Journal of Educational Psychology, 1970, 61, 471-483.

Denner, B. Representational and syntactic competence of problem readers. Child Development, 1970, 41, 881-887.

Flavell, J. H. Cognitive development. N.J.: Prentice-Hall, 1977.

Fraisse, P. The psychology of time. N.Y.: Harper and Row, 1963.

Franks, J. J., and Bransford, J. D. Memory for syntactic form as a function of semantic context. Journal of Experimental Psychology, 1974, 103, 1037-1039.

Golinkoff, R. M. A comparison of reading comprehension processes in good and poor comprehenders. Reading Research Quarterly, 1976, 11, 623-660.

Haviland, S. E., and Clark, H. H. What's new? Acquiring new information as a process in comprehension. Journal of Verbal Learning and Verbal Behavior, 1974, 13, 512-521.

Hunt, I. (Introducer). Great children's stories. The Classic Volland Edition. Northbrook, Ill.: Hubbard Press, 1972.

Johnson, M., Bransford, J., and Solomon, S. Memory for tacit implications of sentences. Journal of Experimental Psychology, 1973, 98, 203-205.

Kendler, T. S. An ontogeny of mediational deficiency. Child Development, 1972, 43, 1-17.

Keppel, G. Discussion of Wike and Church's comments. Words as random variables. Journal of Verbal Learning and Verbal Behavior, 1976, 15, 263-265.

Kintsch, W. On comprehending stories. In M. A. Just and P. Carpenter (Eds.), Cognitive processes in comprehension. Hillsdale, N.J.: Erlbaum, 1977.

Kintsch, W., and van Dijk, T. A. Toward a model of text comprehension and production. Psychological Review, 1978, 85, 363-394.

Kirk, R. E. Experimental design: procedures for the behavioral sciences. Belmont, Ca.: Wadsworth, 1968.

Levi-Strauss, C. The structural study of myth. In R. T. deGeorge and F. M. deGeorge (Eds.), The structuralists: From Marx to Levi-Strauss. Garden City, N.Y.: Anchor Books, 1972. (Original published in 1955.)

Levin, J. R. Comprehending what we read: An outsider looks in. Journal of Reading Behavior, 1971, 4, 18-27.

Levin, J. R. When is a picture worth a thousand words? Theoretical paper No. 36, Issues in imagery and learning: Four Papers, Center for Cognitive Learning, Univ. of Wisconsin, Madison, Wisconsin, 1972.

Mandler, J. M., and Johnson, N. S. Remembrance of things parsed: Story structure and recall. Cognitive Psychology, 1977, 9, 111-151.

Meyer, B. J. F. What is remembered from prose: A function of passage structure. In Freedle, R. O. (Ed.), Discourse production and comprehension (Vol. 1). Norwood, N.J.: Ablex Publishing Co., 1977.

Neilsen, A. The role of macrostructures and relational markers in comprehending familiar and unfamiliar written discourse. Paper presented at the annual meeting of the International Reading Association, Houston, Texas, 1978.

Oakan, R., Wiener, M., and Cromer, W. Identification, organization and reading comprehension for good and poor readers. Journal of Educational Psychology, 1971, 62, 71-78.

Omanson, R. C., Warren, W. H., and Trabasso, T. Goals, themes, inferences and memory: A developmental study. Paper presented at the Annual Meeting of the American Educational Research Association, 1978.

Paris, S. G. Integration and inference in children's comprehension and memory. In F. Restle, R. J. Castellan, H. Lindman, and D. Pisoni (Eds.), Cognitive theory (Vol. I). Hillsdale, N.J.: Erlbaum, 1975.

Paris, S. G. The development of inference and transformation as memory operations. In P. Ornstein (Ed.), Memory development in children. Hillsdale, N.J.: Lawrence Erlbaum Assoc. (in press).

Paris, S. G., and Carter, A. Semantic and constructive aspects of sentence memory in children. Developmental Psychology, 1973, 9, 109-113.

Paris, S. G., and Lindauer, B. K. The role of inference in children's comprehension and memory for sentences. Cognitive Psychology, 1976, 8, 217-227.

Paris, S. G., Lindauer, B. K., and Cox, G. L. The development of inferential comprehension. Child Development, 1977, 48, 1728-1733.

Paris, S. G., and Mahoney, G. J. Cognitive integration in children's memory for sentences and pictures. Child Development, 1974, 45, 633-642.

Paris, S. G., and Upton, L. R. Children's memory for inferential relationships in prose. Child Development, 1976, 47, 660-668.

Pearson, P. D. The effects of grammatical complexity on children's comprehension, recall and conception of certain semantic relations. Reading Research Quarterly, 1974/75, 10(2), 155-192.

Pearson, P. D. Research in reading comprehension, an interpretive perspective. Paper presented at the annual meeting of the International Reading Assoc., Houston, Texas, 1978.

Piaget, J. The language and thought of the child. London: Routledge and Kegan Paul, 1960. (First published in 1926.)

Piaget, J. The child's conception of time. London: Routledge and Kegan Paul, 1969.

Piaget, J. Piaget's theory. In P. H. Mussen (Ed.), Carmichael's manual of child psychology. New York: Wiley, 1970.

Piaget, J., and Inhelder, B. Memory and intelligence. New York: Basic Books, 1973.

Propp, V. Morphology of the folktale. Austin: Univ. of Texas Press, 1968. (First published in 1928.)

Rumelhart, D. E. Notes on a schema for stories. In D. Bobrow and A. Collins (Eds.), Representation and understanding: Studies in cognitive science. New York: Academic Press, 1975.

Rumelhart, D. E. Understanding and summarizing brief stories. In D. laBerge and S. J. Samuels (Eds.), Basic processes in reading: Perception and comprehension. Hillsdale, N.J.: Lawrence Erlbaum Assoc., 1977.

Schmidt, C. R., and Paris, G. Children's understanding of causal sequences. Paper presented at the biennial meeting of the Society for Research in Child Development, New Orleans, 1977.

Simons, H. Reading comprehension: The need for a new perspective. Reading Research Quarterly, 1971, 7, 338-363.

Stein, N. L. How children understand stories: A developmental analysis. In L. Katz (Ed.), Current topics in early childhood education (Vol. 2). Hillsdale, N.J.: Ablex Publishing Co., 1979.

Stein, N. L., and Glenn, C. G. A developmental study of children's recall of story material. Presented at the Society for Research in Child Development, Denver, Colorado, 1975.

Stein, N. L., and Glen, C. G. The role of structural variation in children's recall of simple stories. Paper presented at the Society for Research in Child Development Meeting, New Orleans, 1977.

Stein, N. L., and Glen, C. G. An analysis of story comprehension in elementary school children. In R. Freedle (Ed.), Discourse processing: Multidisciplinary perspectives (Vol. 2). Norwood, N.J.: Ablex Publishing Co., 1979.

Thorndike, P. W. Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 1977, 9, 77-110.

Warren, W. H., Nicholas, D. W., and Trabasso, T. Event chains and inferences in understanding narratives. In R. Freedle (Ed.), Discourse processing: Multidisciplinary approaches. Hillsdale, N.J.: Lawrence Erlbaum Assoc. (in press).

Wike, E. L., and Church, J. D. Comments on Clark's "The Language-as-Fixed-Effect-Fallacy." Journal of Verbal Learning and Verbal Behavior, 1976, 15, 249-255.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1971.

APPENDICES

APPENDIX A

DIAGRAMMATIC REPRESENTATIONS OF PROCEDURES FOR PRESENTING VISUAL AIDS DURING STORY PRESENTATION AND RETELLING PHASES

Phase 1.1: Story Presentation/"The Farmer" Story

Episode Number	TN Involved in Movement	TN(s) During Which Arrangement Was Left	Word (from TN) at which Movement Was Done Word/Symbol of Model	Sketch of Specific Movements/ Arrangements of Models[1] Space of Rectangle 1	Space of Rectangle 2	Space of Rectangle 3	Number of Rectangle in Which Movement Was Done
Setting	1	1	farmer/fa	fa(i)			1
Setting	2	2-3	donkey/dk	dk(i) fa			1
I	4	4-8	barn/bn	ba(i) dk fa			1
II	9	9-13	dog/dg	ba dk	dg(i) fa(d)		2
III	14	14-18	cat/ct	ba dk	dg	ct(i) fa(d)	3
IV	19	19-22	went	ba dk	dg ct(d)	fa	2
End	23	23	bed	*	* *	*	All

[1]Double underscoring = model was moved; Single underscoring = model was left in place; (i) = model was first introduced; (d) = model was displaced; * = model was removed.

Phase 1.2: Story Presentation/"Lamby" Story

Episode Number	TN Involved in Movement	TN(s) During Which Arrangement Was Left	Word (from TN) at which Movement Was Done Word/Symbol of Model	Sketch of Specific Movements/ Arrangements of Models[1] Space of Rectangle 1	Space of Rectangle 2	Space of Rectangle 3	Number of Rectangle in Which Movement Was Done
Setting	1	1-3	lamb/la	la(i)			1
I	4	4-7	lion/li	la li(i)			1
II	8	8-11	fox/fx	li	la(d) fx(i)		2
III	12	12-17	snake/sn	li	fx	la(d) sn(i)	3
IV	18	18	barrel/ba	li	fx	*ba sn	3
IV	19	19-20	barrel	li	fx	* sn	3
IV/II	21	21	fox	li	ba(d) fx	sn	2
IV/I	22	22	lion	ba(d) li	fx	sn	1
End	23	23	home	* *	*	*	All

[1]Double underscoring = model was moved; Single underscoring = model was left in place; (i) = model was first introduced; (d) = model was displaced; * = model was removed.

Phase 2.1: Retelling/"The Farmer" Story

3. barn

1. farmer 2. donkey 4. dog 5. cat

Phase 2.2: Retelling/"Lamby" Story

5. barrel

1. lamb 2. lion 3. fox 4. snake

APPENDIX B

STORY QUESTIONNAIRES ADMINISTERED DURING QUESTION-ANSWERING TASK

QUESTIONNAIRE 1. THE FARMER

Not Included In Choice:	Q#:	QUESTION:	CORRECT ANSWER:
		A) 'EX-WHO' TYPE QUESTIONS: (The child selects one of 3 pictures, each representing one of the 4 characters of the story. There is a total of 4 pictures. The choices given every time are the 3 not included in the column 'Not included in choice').	
DOG	1.	WHO never did what he was told?	DONKEY
DONKEY	2.	WHO pushed the donkey?	FARMER
DONKEY	3.	WHO was lazy?	DOG
FARMER	4.	WHO was helpful?	CAT
DOG	5.	WHO scratched the dog?	CAT
DOG	6.	WHO got scared by the barking?	DONKEY
		B) 'I-WHO' TYPE QUESTIONS: (Same instructions as above. In addition, child is asked why? for every question).	
CAT	7.	WHO got the cat to scratch the dog? WHY?	FARMER;(Reason)
DOG	8.	WHO made the dog bark? WHY?	CAT;(Reason)
DONKEY	9.	WHO made the donkey jump into the barn? WHY?	DOG;(Reason)
CAT	10.	WHO was happy at the end? WHY?	FARMER;(Reason)
		C) 'I-YES/NO' TYPE QUESTIONS: (Child is asked why? for every question).	
	11.	At the beginning, was the farmer happy with the donkey?	NO;(Reason)
	12.	At the beginning, was the farmer happy with the dog?	NO;(Reason)
	13.	Was the farmer happy with the cat?	YES;(Reason)
	14.	At the end, do you think the dog was angry with the cat?	YES;(Reason)
		D) 'EX-YES/NO' TYPE QUESTIONS:	
	15.	At the beginning,did the donkey want to go into his barn?	NO
	16.	Did the donkey move when the farmer pushed him?	NO
	17.	Did the dog bark when the farmer asked him?	NO
	18.	The farmer asked the cat for help. Did the cat say that he could help him?	YES
	19.	Did the dog bark when the cat scratched him?	YES
	20.	Did the donkey jump when he heard the barking?	YES
		E) 'I-WHY?' TYPE QUESTIONS:	
	21.	Why did the cat scratch the dog?	
	22.	Why did the farmer want his dog to bark?	
	23.	Why did the farmer want to frighten the donkey?	
	24.	Why did the farmer want to put the donkey into the barn?	

QUESTIONNAIRE 2. LAMBY

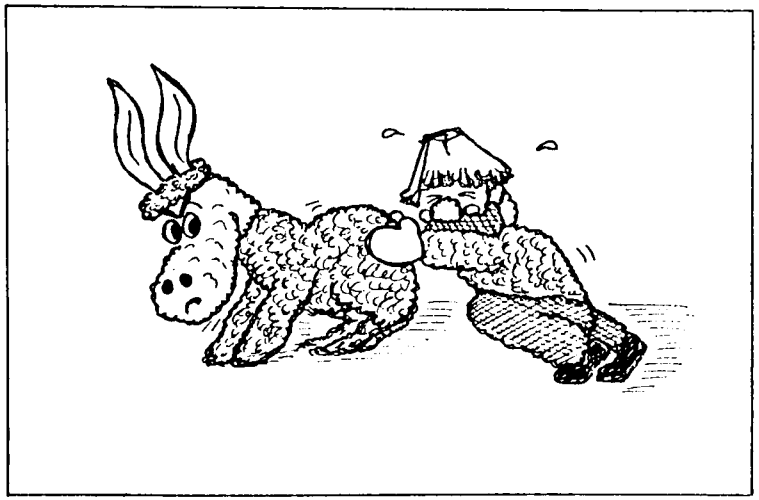
Not Included In Choice:	Q#:	QUESTION:	CORRECT ANSWER:
	A)	'EX-WHO' TYPE QUESTIONS: (The child selects one of three pictures, each representing one of the 4 characters of the story. There is a total of 4 pictures. The choices given every time are the 3 not included in the column 'Not included in choice').	
LION	1.	At the beginning, who was walking in the fields looking for food?	LAMBY
LAMBY	2.	At the beginning, who saw Lamby when Lamby was looking for food?	LION
FOX	3.	Who went to sleep?	SNAKE
LION	4.	Who got inside the barrel?	LAMBY
LION	5.	At the end, who saw the barrel, but didn't know Lamby was inside?	FOX
SNAKE	6.	Who went home?	LAMBY
	B)	'I-WHO' TYPE QUESTIONS: (Same instructions as above. In addition, child is asked why? for every question).	
LION	7.	Who was the smartest of these three animals? WHY?	LAMBY; (Reason)
LAMBY	8.	Who was the laziest of these three animals? WHY?	SNAKE; (Reason)
SNAKE	9.	At the beginning, who was <u>not</u> very hungry? WHY?	FOX; (Reason)
FOX	10.	At the end, who was happy? WHY?	LAMBY; (Reason)
	C)	'I-YES/NO' TYPE QUESTIONS: (Child is asked why? for every question).	
	11.	The fox told Lamby to be careful of the snake. Was the fox trying to help Lamby? How do you know?	NO; (Reason)
	12.	At the end, did the snake have good luck? Why?	NO; (Reason)
	13.	Did Lamby fool/trick the fox? Why?	YES; (Reason)
	14.	At the end, was the lion hungry? Why?	YES; (Reason)
	D)	'EX-YES/NO' TYPE QUESTIONS:	
	15.	At the beginning, did the lion <u>decide to wait</u>, before eating Lamby?	YES
	16.	At the beginning, when Lamby met the fox: Did the fox <u>try to eat</u> Lamby?	NO
	17.	Did the fox tell Lamby to <u>go near</u> the snake?	NO
	18.	Did Lamby roll on his way back home?	YES
	19.	When the snake woke up, did he find Lamby?	NO
	20.	When the lion saw the barrel, did he think it was empty?	YES
	E)	'I-WHY?' TYPE QUESTIONS:	
	21.	Why did the lion decide to wait until Lamby got fat?	
	22.	Why did the lion tell Lamby to stay away from the fox?	
	23.	Why did the snake tell Lamby there was alot of good grass nearby/around?	
	24.	Why did Lamby get inside the barrel?	

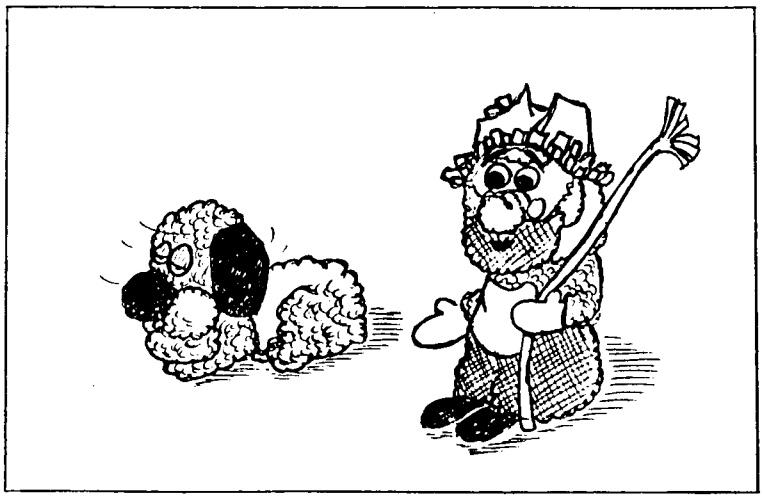
APPENDIX C

DRAWINGS USED IN SEQUENCING TASK

Sequence 1A. "The Farmer" Story/"Forward" Sequence

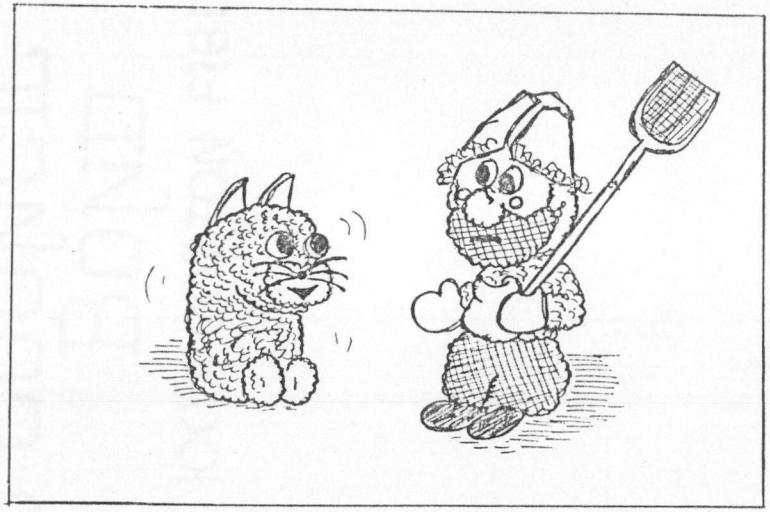
Card's Drawing (original 15 x 10 cm)

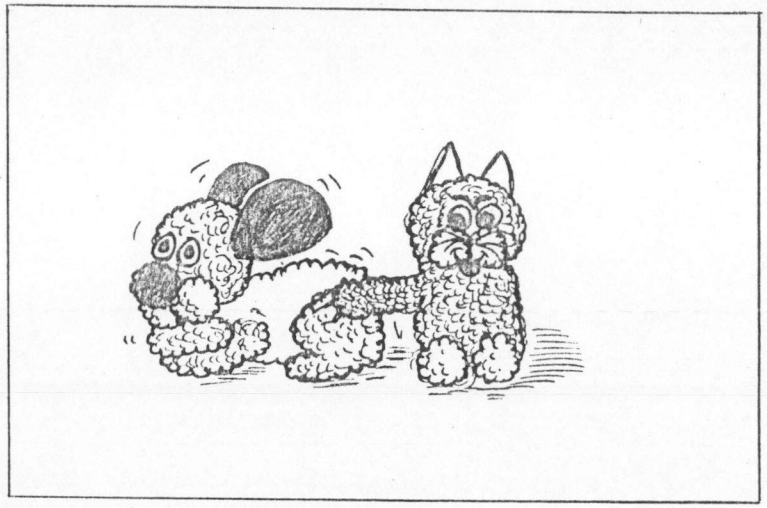




Standard Label	"the farmer pushed the donkey"	"the farmer went to get his dog"
Episode Number	I	II
Type of BN/TN#	Attempt/TN#6	Attempt/TN#9-10

Card's Drawing





Standard Label

"the farmer went to get his cat"

"the cat scratched the dog"

Episode Number

III

IV

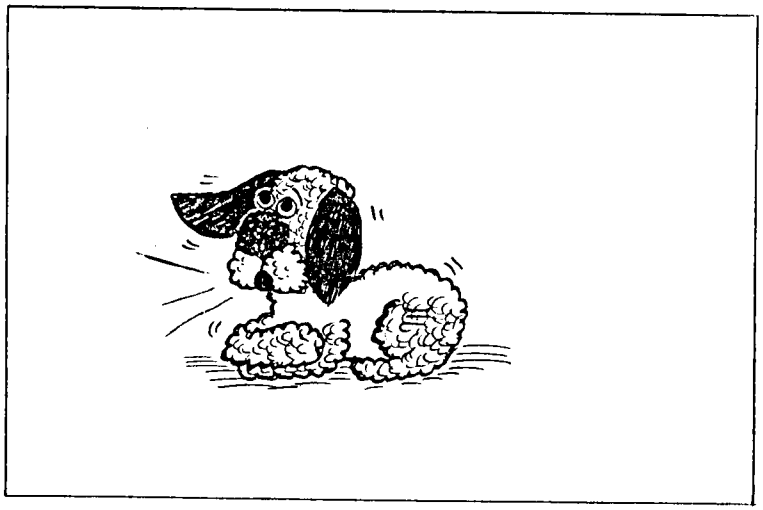
Type of BN/TN#

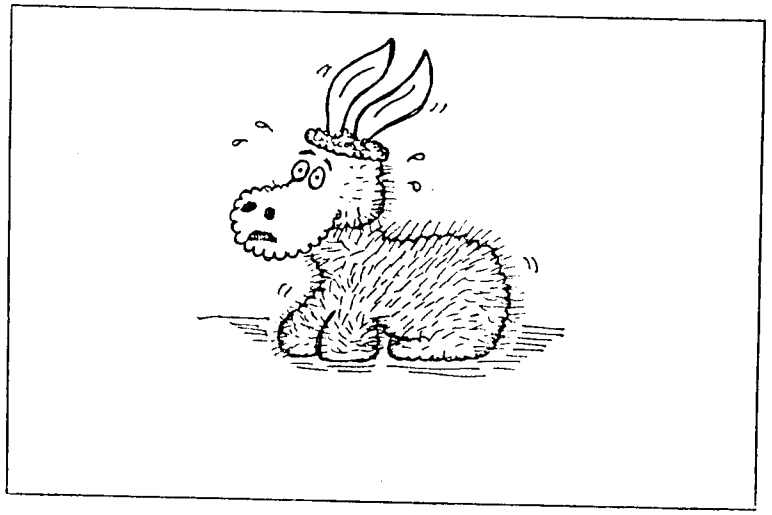
Attempt/TN#14-15

Attempt/TN#19

Sequence 1B. "The Farmer" Story/"Reverse" Sequence

Card's Drawing





Standard Label

"the dog barked"

"the donkey got scared"

Episode Number

IV/III

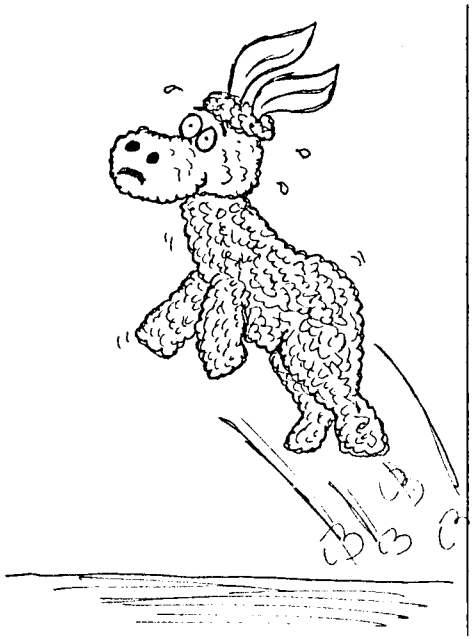
IV/II

Type of BN/TN#

Outcome/Ending/TN#20

Outcome/Ending/TN#21

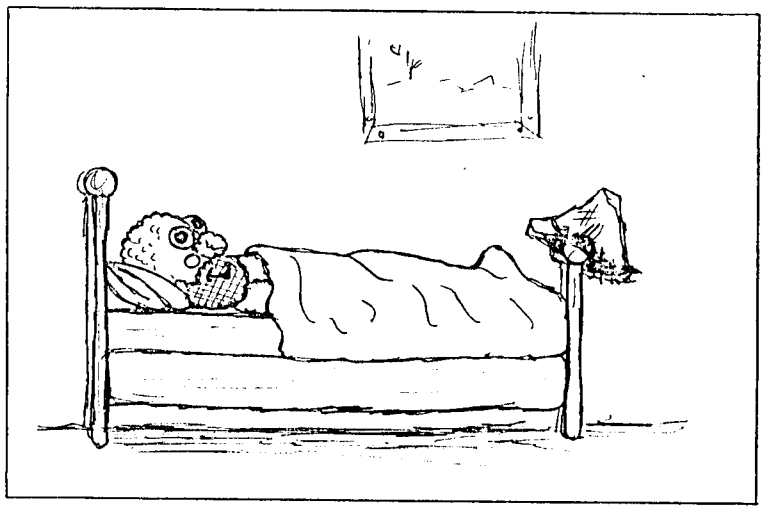
Card's Drawing



Standard Label "the donkey jumped into his barn"

Episode Number IV/I

Type of BN/TN# Outcome/Ending/TN#22



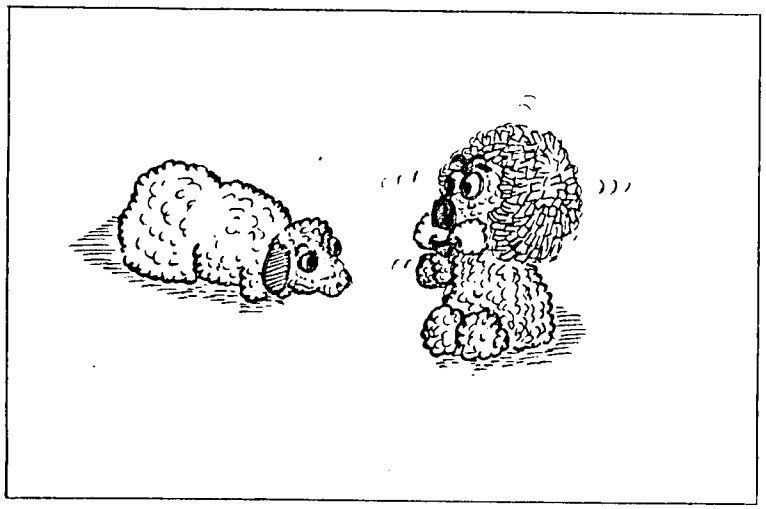
"the farmer went to bed"

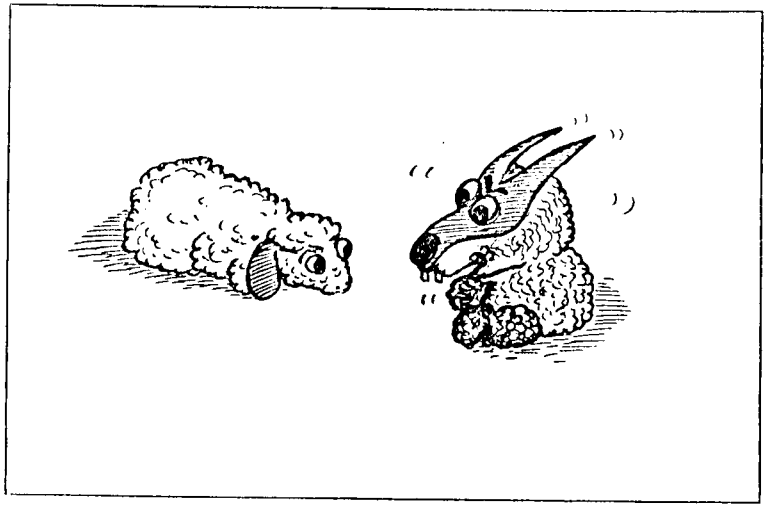
IV/END

Outcome/Ending/#23

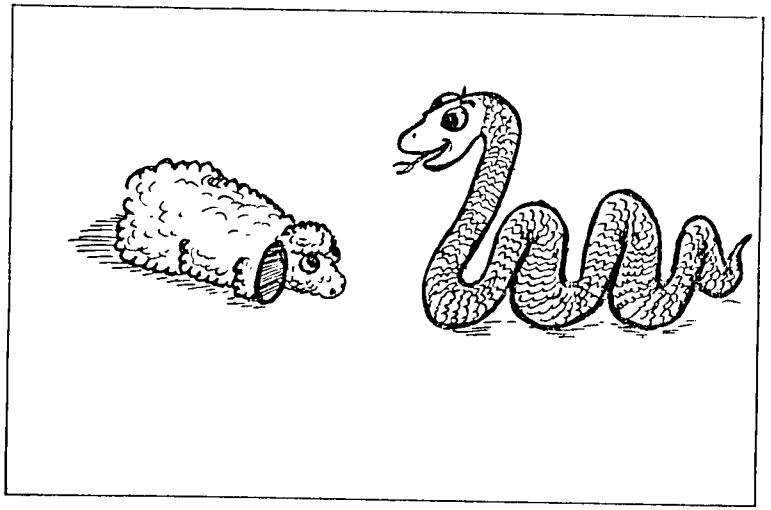
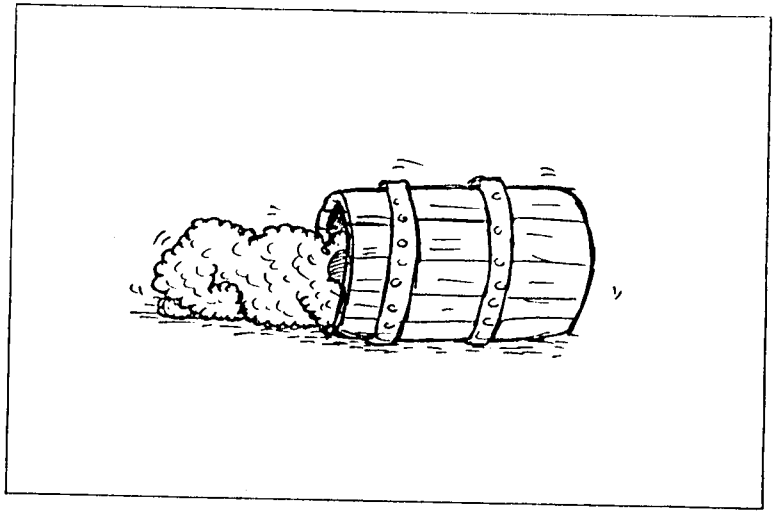
Sequence 2A. "Lamby" Story/"Forward" Sequence

Card's Drawing

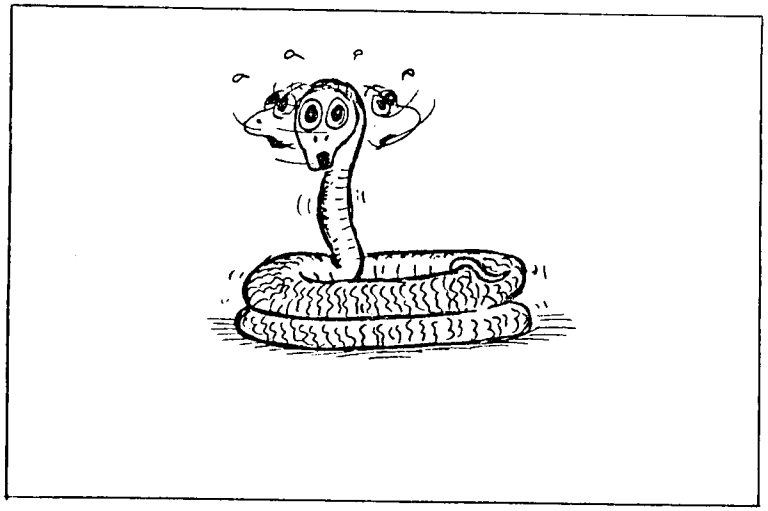
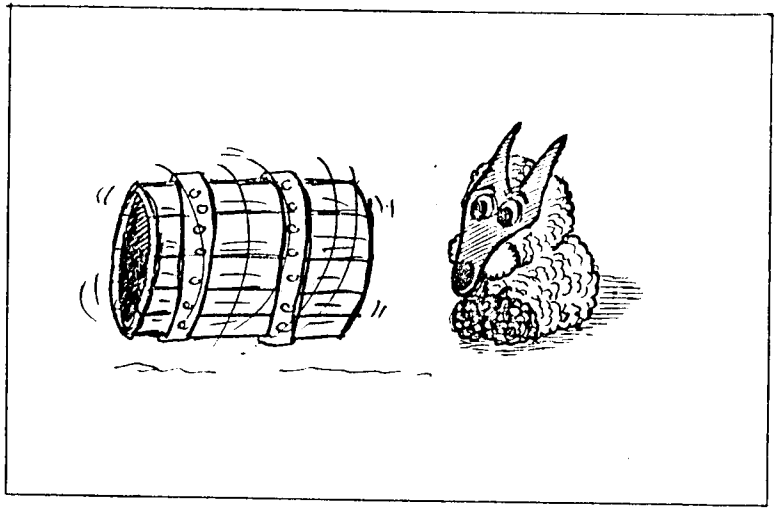


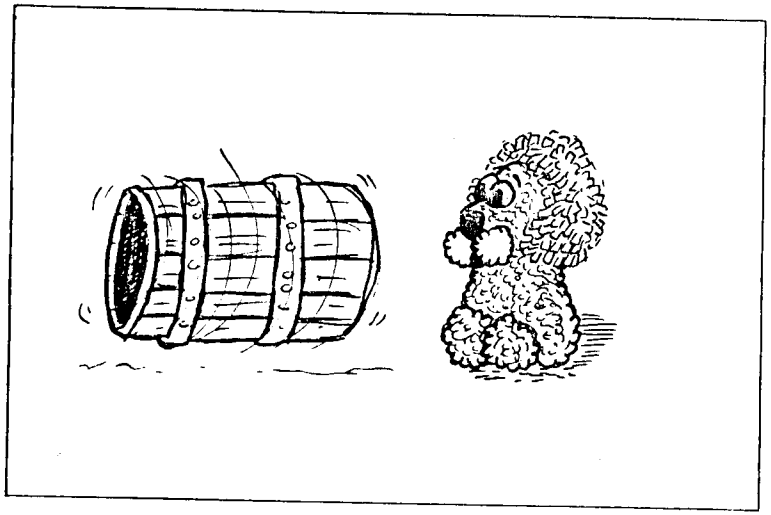
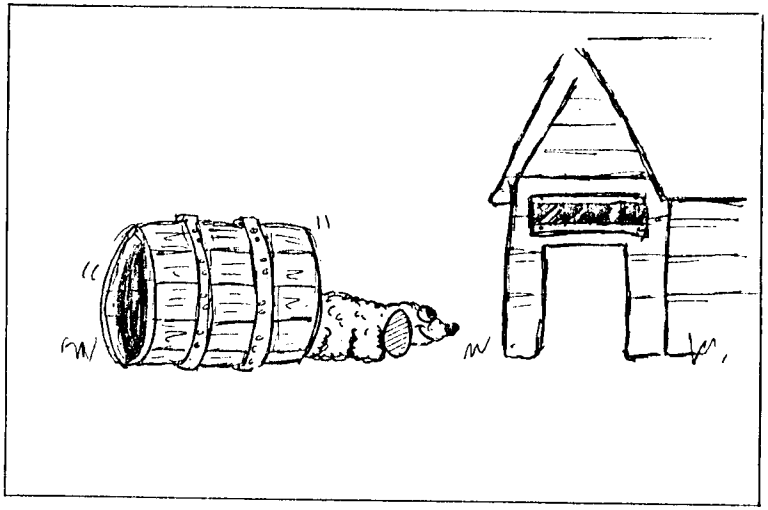


Standard Label	"the lion talked to Lamby"	"the fox talked to Lamby"
Episode Number	I	II
Type of BN/TN#	Attempt/TN#7	Attempt/TN#11

Card's Drawing		
Standard Label	"the snake talked to Lamby"	"Lamby got inside the barrel"
Episode Number	III	IV
Type of BN/TN#	Attempt/TN#15	Attempt/TN#18

Sequence 2B. "Lamby" Story/"Reverse" Sequence

Card's Drawing		
Standard Label	"the snake woke up and couldn't find Lamby"	"the fox saw the barrel and didn't know Lamby was inside"
Episode Number	IV/III	IV/II
Type of BN/TN#	Outcome/Ending/TN#20	Outcome/Ending/TN#21

Card's Drawing		
Standard Label	"the lion saw the barrel and thought it was empty"	"Lamby got home"
Episode Number	IV/I	IV/END
Type of BN/TN#	Outcome/Ending/TN#22	Outcome/Ending/TN#23

APPENDIX D

PROCEDURES FOLLOWED DURING TAPE PREPARATION AND INSTRUCTIONS PHASE OF TESTING SESSIONS

Preparation of tapes for testing sessions. The recordings of what was supposedly Kermit the Frog's voice were of a local male's voice with a high pitched tone accentuated slightly so that it resembled the voices used by T.V. puppeteers. A tape was prepared for each story, in which "Kermit" greeted the child, gave him/her instructions and then told the story (without a title). A duplicate tape was made for each story, beginning with a different greeting which was more appropriate for children receiving that story in their second session (see below). The two styles of greeting and the instructions were copied across stories so that "Kermit" gave the same instructions to all children regardless of story and experimental condition.

Steps followed in Instructions Phase of testing sessions:

1° After "introducing" Kermit, the experimenter (E) told the child that they were going to play a game in which Kermit would first tell a story to the child, and then the child would tell that story to E. E further told the child that he/she would later be asked questions and shown some pictures about the story.

2° E then fitted the puppet to her hand, placing her elbow on top of the tape recorder and said: "Now Kermit is going to talk to you." She started the tape recorder, and while "Kermit" greeted the child and gave him/her instructions, E coordinated the puppet's movements with the recording. The voice said the following:

i. If the child was there for the first time:

"Hello friend. You know me, don't you? I'm Kermit the Frog. I love telling stories to children like you. Today I'm going to tell you one of my stories. I want you to listen very carefully! Then, I would like for you to tell my story to my friend.* Now remember, listen carefully. Are you ready?"

ii. If it was the child's second session:

"Hello friend. You remember me, don't you? I'm glad to have you back again. This time, I'm going to tell you another

one of my stories. Like last time, I want you to listen . . . (and so on, as above) . . . ready?"

(*As the voice said "my friend," E turned Kermit's head and pointed towards her, then back towards the child.)

3° E gave an additional instruction depending on the experimental group the child belonged to:

i. For children not receiving VA's (Condition I), E said:

"Remember that you have to listen to the story very carefully so that you can learn it, and then tell me Kermit's story."

ii. For children receiving VA's during retelling (Experimental Groups II), during story presentation (Groups III), or during both phases (Groups IV), E gave the specific additional instructions already described under "Experimental Manipulations."

APPENDIX E

SCORING PROCEDURES, RULES AND CATEGORIES FOR SCORING PROTOCOLS FROM RETELLING TASK

Five "scorers" (E and four trained, local assistants who were psychology seniors) participated in the data analysis, usually independently. The scorers were familiarized with the stories' structures and units, and some basic concepts and terms of Story Grammars. The tapes containing the retellings of each story were transcribed verbatim into "recall protocols" by one of the scorers and checked by another. When there was disagreement on any segment, a third (and sometimes also a fourth) scorer listened to the segment repeatedly until an agreement was reached about what the child had said. Recall protocols were then scored independently by two scorers using the system described below, and their scores were compared afterwards to provide reliability estimates, prior to any changes. If there were any disagreements between the scorers, the protocol's item(s) was (were) then reanalyzed by a third (and if necessary a fourth) scorer, and the scores which fitted the established rules upon consultation/discussion, and/or for which there was a majority of agreement, were adopted for the final analysis.

The scoring system was developed and refined by four of the scorers in consultation with judges, mostly during pilot trials. The scoring procedure focused upon quantity and quality of information provided, both from the original text and changed or added by the child. Emphasis was on conveyed meaning as judged by the scorers, as opposed to exact wording from the original text.

The scoring procedure consisted of the following steps (rules and categories are provided in corresponding step):

1° DATA TRANSCRIPTION: The child's utterances were transcribed by writing each "unit" on a separate line. These units corresponded as closely as possible with the 24 units (Terminal Nodes) of each story. "Extra" information (not in the story) was written on separate lines.

2° ASSIGNMENT OF UNITS TO TERMINAL NODES (TN) IN TEXT: Each of the units corresponding to information in the original text was assigned a number from 1 to 24 corresponding to the number of the matched TN in the original text. The unit did not have to contain the same words nor be identical to the original text, but only be judged to convey the same or a similar meaning, whether completely or partially. Semantic and grammatical categories, as well as the TN in the text

were used as guides to matching--e.g. whether the unit described a character's actions, or his goals, thoughts, decisions, etc.

3° CREDIT ASSIGNED TO EACH UNIT: Once numbered, each unit was assigned either a whole point or half a point, according to a set of criteria established as follows: A minimum of four scorers decided which part of the information in each TN must be included in the retelling for the retelling of that unit to count as complete. When necessary up to five extra judges were consulted. Adjectives, and information judged redundant or of minor importance to the plot were disregarded. In addition, on the basis of actual recall protocols, particularly of statements frequently produced in them, points were assigned to specific utterances.

a) One point was credited if the unit was judged to be complete.
b) Half a point was credited if some of the basic information was missing, or if the information was only partially conveyed.

4° CATEGORIES ASSIGNED TO TRANSFORMED AND AUGMENTED INFORMATION: Information changed, added or compressed from the original text was further classified according to a category system based on previous systems in the literature and the types of information changes and additions found in the present recall protocols. The system was refined as new data was gathered. The categories and their definitions are described below, together with examples from recall protocols. For each example, the following are indicated: The story the utterance refers to ("F" = The Farmer, "L" = Lamby); the number of the corresponding Terminal Node (TN) in the original texts, and the child's utterance which was classified under that category. The definitions sometimes include reference to other categories, in which case the category symbols are used. The categories are grouped according to four types:

a. Accuracy of Information

1. CORRECT (C): A statement is correct when it is semantically congruent with that of the original text and it does not contain information which contradicts or is incongruent with the original meaning of the text. By definition any unit credited with one or half a point is correct. A statement is still correct when it is also assigned to one of the other categories, except those which contain erroneous information (INC and RC, see below), e.g.: F; TN #2; "the donkey never paid attention to the farmer."

2. INCORRECT (INC): A statement is incorrect if it contains information which contradicts or is incongruent with the text, e.g.: L; TN #23, "and Lamby walked all the way home."

b. Types of Augmentations

3. INFERENCE (+INF): This category is assigned to a statement part or all of which is not explicitly present in the original text but which is semantically congruent with the text, implied by the text, and which enriches and/or fills a gap in the plot of the story, e.g.: 1) F; TN #11 and 12; "The dog refused to bark because he was so lazy." 2) L; TN #23; "and finally Lamby was happy because he was home safe."

4. ADDITION (+ADD): Refers to information which is not in the original text. Although semantically congruent with the story (i.e. not incorrect), it is "neutral" to the story's plot in that it is not implicit and/or does not enrich or fill gaps in the text, e.g.: F; TN #19; "the cat scratched the dog's back" or "he scratched the dog really hard."

5. EXPANSION (EXP): Refers to information from the text which has already been expressed by the child, but which is later added to a given statement to explain further or clarify the reason for an event, e.g.: F; TN #15; "the farmer asked the cat if he would make the dog bark, in order to scare the donkey."

c. Transformations

6. SEMANTIC INTEGRATION (SI): Applies to a statement which represents a condensation and linking of information from two (or rarely three) Terminal Nodes, e.g.: 1) L; TN #5 and 6; "the lion decided to eat Lamby after Lamby got fatter," 2) F; TN #11 and 12; "but the dog was too lazy to bark"; 3) F; TN #15 and 19; "the farmer asked the cat if he could scratch the dog."

7. ROLE CHANGE (RC): Applies to an incorrect statement where a character is said to have a characteristic or to have performed an action which actually corresponds to a different character in the original text. Some information can simply be transferred from another character (called Role Transfer--RT), or not only be transferred but further transformed to fit the character to which the information is being allocated (called Role Transfer and Transformation--RTT). For some purposes, these last two categories (RT and RTT) were added together in the data analysis under RC. (Statements classified as RC are by definition INC, but not all incorrect statements are RC.) Examples of each type of RC are provided: a) RT: 1. L; TN #6 and 10; "the fox decided to wait until Lamby got fat"; 2. L; TN #20 and 22; "the snake thought the barrel was empty"; b) RTT: F; TN #19 and 20; "the cat meowed."

d. Changes in Sequence

8. NODE INVERSION (NI): Once numbers had been assigned to all units (see step 2° above), the order in which these numbers appear was inspected. Every alteration in the sequencing of these numbers, each in relation to the previous number, was marked NI. An exception was made when the alteration was accompanied by repetition (REP) of previous information, and the unit whose sequential location was altered was repeated in the proper location. That is, when there is evidence that the child self-corrected the order by repeating information, a NI is not marked.

Node Inversions are further classified as follows:

a) NI representing a VIOLATION OF ORDER (NI/V): Refers to cases where the alteration of order results in an actual violation of the original order of events, e.g.: L; TN #22, 21; "The lion saw the barrel and . . ., and then the fox saw the barrel and . . . ."

b) NI which does not represent a violation of order (NI/NV): This category includes the following sub-categories: i) The NI is accompanied by a certain transformation of the information (e.g. by SI) such that the change does not result in a violation of the original sequencing of events. In fact, many times the information provided in this way is more complete, including extra terms which fill gaps, e.g.: F; TN #9, 8: "the farmer went to get his dog so he could scare the donkey in the barn." ii) Cases where the original order provided is in itself interchangeable, i.e., the events are not ordered in time, e.g.: F; TN #12, 11; "the dog didn't bark, he was too lazy."

For each NI the scorer also noted whether it involved alterations within- (W) or across- (A) episodes, and the type of relation involved in the inversion, e.g. for above example: a) = temporal, b i) = causal, b ii) = possible implied cause.

In relation to step 4° (last), the contents of a statement could be classified as belonging to more than one category, according to whether it contained the characteristics of those categories. Common combinations were: C/+ADD; INC/RT; SI/+INF.

APPENDIX F

RULES AND STEPS FOR CALCULATING SCORES FOR SEQUENCING TRIALS

Each sequence seriated by the child in the Sequencing Trials (first trial of Sequencing Task) consisted of four cards. To evaluate performance, a score was assigned to each of the 24 possible combinations of 4 cards. To calculate it, the card which was first in the correct sequence was called #1, the second one #2, . . . and so on, for each sequence. Then each possible sequence was scored by considering the accuracy of each card's position in reference to the previous card. The following three steps were carried out for each of the 24 possible sequences, to yield a final score of from 0 to 10 for each:

1. The base score initially credited to each sequence is 6. (Six is the maximum number of points that could be discounted according to the rules described below. Thus if all possible points are discounted and no points are added, a score of 0 is obtained.)

2. Look at the first card in the sequence, and then consider each of the subsequent cards in relation to the card preceding it. Add points for "assets" as follows:
   a) Add 1 point if card #1 is in the first place.
   b) Then add 1 point for every card correctly following the preceding one (i.e., add 1 point if #1 is followed by #2; another point if #2 is followed by #3, and another one if #3 is followed by #4).

3. Now discount points for "mistakes" as follows:
   a) Look down the sequence for all pairs of adjacent cards of which it is true that the one which follows in the sequence has the higher number in the correct sequence (e.g. #2 followed by #4). For each such pair, discount one point for every card "missing" from between the two (i.e., in the above example discount 1 point for the missing #3).
   b) Look down the sequence for all pairs of adjacent cards of which it is true that the one which follows in the sequence has the lower number in the correct sequence (e.g. #4 followed by #1). For each such reversal pair, discount 1 point for every "step" in the reversal (i.e. if #4 is followed by #3, 1 point is discounted; if it is followed by #1, 3 points are discounted).

c) If the sequence consists of only 3 cards (i.e., 1 card was not placed by the child), discount .2 points for the missing card. (This happened very seldom, and there was never an instance of more than 1 card missing.)

This system was finally adopted after trying many different ones, including correlational formulae. The chosen one was judged adequate because it took into account both "positive" and "negative" aspects of a given sequence (which turned out not to be redundant, as might be thought at first sight). The best evidence for the adequacy of the system might be that it yielded meaningful results.

VITA

Sylvia Margarita Rojas-Drummond was born in Mexico City, in May 1952. She attended elementary and high schools there from 1959 to 1970, and in 1975 she received a B.A. in Psychology from the National University of Mexico.

During her undergraduate training, she was a research assistant in an experimental school for one year, and a Faculty Research Assistant for another. She subsequently ran a non-profit kindergarten for one year. After a training course, she was certified as an English teacher by the Anglo-Mexican Institute in 1972, and taught English there for two years.

Her graduate training was in the Department of Psychology of the University of Tennessee in Knoxville, where she specialized in developmental psychology and received a Ph.D. in June 1980.

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Outside academia, she enjoys music, singing and playing guitar, as well as travelling, hiking, camping and other outdoor activities, and people with a good sense of humor. She is married to Hugh M. Drummond from London, England.