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CHILDREN'S MEMORY FOR COMPARATIVE SENTENCES: AN INQUIRY INTO OBJECT-DIMENSION RELATIONSHIPS OR IF DINOSAURS AREN'T AS SMALL AS ELEPHANTS, ARE ELEPHANTS SMALL?

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CHILDREN'S MEMORY FOR COMPARATIVE SENTENCES:

An Inquiry into Object-Dimension Relationships

or

IF DINOSAURS AREN'T AS SMALL AS ELEPHANTS, ARE ELEPHANTS SMALL?

by

RUTH S. MECHANECK

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

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Abstract

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An Inquiry into Object-Dimension Relationships
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Ruth S. Mechaneck

Adviser: Professor Virginia Valian

Determinants of the markedness asymmetry frequently found for pairs of antonymous adjectives in comparative constructions were explored as illustrative of the more general problem of the influence of contextual variables on the processing of linguistic information. Memory for relational terms was considered to be based on several factors: the structure of the relative adjective; the linguistic context in which the adjective occurred, and the form in which the comparison relation was expressed. Linguistic context was defined specifically in terms of the location of the compared items on the dimension specified by the relative adjective, operating as a function of an individual's semantic knowledge of the object-dimension relationship inherent in the comparison. Contrary to semantic feature complexity theory, both marked

and unmarked adjectives were considered to have neutral as well as contrastive interpretations, the particular interpretation dependent upon the syntactic form in which they were expressed. Psychologically, the markedness distinction was considered primarily in terms of a positive meaning component associated with unmarked adjectives in contrast to a negative meaning component associated with marked adjectives. Developmental differences were anticipated in the utilization of semantic knowledge necessary for the operation of linguistic context.

A recall task was administered to children in first, third and fifth grades, consisting of sentences which varied the polarity value of the two compared nouns, the markedness of the adjective, the syntactic form and the underlying dimension. Results supported the importance of linguistic context in remembering relative adjectives and suggested that the markedness assymetry varied as a function of the degree of attribution of the quality designated by the adjective to the compared nouns. Contrary to expectation, no developmental differences were evident in patterns of recall involving contextual information, although recall increased monotonically with age, leading to the conclusion that once semantic knowledge of the object-dimension relationship in a comparison is present, linguistic context operates regardless of age differences. A reformulation of the markedness distinction in the psychological processing of comparative adjectives was offered.

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CHAPTER 1

INTRODUCTION

The comparison relation and the terms which comprise it have been the focus of several recent studies concerned with semantic development, and the utilization of semantic information in the psychological processing of linguistic structures. Many investigations dealing with comparison have concentrated specifically on the structure of relational terms and their underlying dimensions, relying on semantic feature theory and linguistic concepts of "markedness" to account for differences in the psychological processing of pairs of antonymous adjectives and the acquisition rate of different dimensions (Donaldson and Balfour, 1968; Donaldson and Wales, 1970; Clark and Card, 1969; Clark, 1969a, 1969b, 1970a, 1970b; Clark, 1971, 1972, 1973a). Most such studies have considered relational terms in a neutral or context-free setting, without reference to the dimensional properties of the objects being compared. As such, they have largely tended to ignore the significance of contextual information in understanding and utilizing dimensional terms. While the evidence is limited, there appears to be some support for the conception that one psychologically important semantic of conceptual component of

a comparative expression is the object-dimension relationship which inheres in the comparison. The relative importance of this component to the ones which have already been studied in some detail, namely the marked-unmarked distinction regarding pairs of antonymous adjectives; properties of underlying dimensions, and the syntactic form in which the comparison is expressed, remains to be explored.

It has been suggested (Huttenlocher and Higgins, 1971) that the choice of a relative adjective in a comparison may well depend on contextual information, namely, the location of the nouns on the dimension along which they are being compared. Some support for this argument stems from a paper by Clark, Carpenter and Just (1972), in which an attempt was made to define a number of conceptual, non-linguistic principles underlying comparison which affect linguistic coding. It was found that variables such as intrinsic dimensional properties of objects, and reference points of comparison were of importance in determining the nature of comparative judgments, in addition to previously considered properties of dimensional terms and antonymous adjectives.

Evidence supporting the importance of the noun-adjective relationship in forming comparative judgments is also provided in a study by Barrière, Mehler, Ruwet and Segui (in press). They attempted to determine whether the natural reference classes used by individuals in making comparative judgments were, psychologically, correlates of

linguistic ones posited by semantic theorists. It was found that the choice of nouns in comparative sentences was contingent upon the relationship of the nouns to an implicit class of objects on the underlying dimension along which they were being compared. Along similar theoretical lines, the question has been raised as to the nature of the child's acquisition of conceptual information about object-dimension relationships in the course of forming relative judgments (Nelson and Benedict, 1973). The type of information referred to here concerns the class hierarchies which form the norms or reference classes for objects on a dimension which serve as standards for comparison; information which must be internalized before judgments can be made in the absence of perceptual contexts. This conceptualization of the course of acquisition of comparative judgments highlights the significant contribution that can be made to our knowledge of semantic development through a study of children's understanding of comparative terms, with emphasis on object-dimension relationships.

It is the intention here to explore the relationship between the various components of a comparison, as they are reflected in memory for comparative sentences. It is assumed that individuals tend to code and reconstruct linguistic information on the basis of the important underlying semantic or conceptual components of a linguistic message, and therefore a memory task should be sensitive to variations

in the relationship between terms of comparison, namely nouns, adjectives, dimensions and syntactic form. This approach to memory for linguistic information follows a long and well-established tradition in psycholinguistic investigations (Sachs, 1967; Fillenbaum, 1973; Miller, 1972; Johnson-Laird, 1970; Clark and Card, 1969). It is hoped that such an approach will add not only to our understanding of the interdependent relationship between objects and their underlying dimension in the psychological processing of relational expressions, but to our knowledge about the organization and utilization of such semantic information by children as well. We will first review the theoretical and experimental literature dealing with relational terms as relatively independent lexical terms in a context-free setting. This will include the study of antonymous pairs of adjectives in terms of semantic feature theory and linguistic markedness, as well as the nature of adjective classes and their underlying dimensions. Next, we will explore relational terms in a wider context, considering what is known about the relationship between adjectives and nouns in comparative expressions. A semantic theory of relative adjectives which incorporates the dimension-noun relationship will be discussed, along with reference to pertinent psycholinguistic investigations of the noun-adjective (object-dimension) relationship. The formal expression of comparative judgments, i.e. the syntactic form

of comparative sentences, will then be analyzed as another factor determining or influencing the psychological interdependence of adjectives and nouns. Finally, the relationship between polarity and relativity of adjectives and nouns will be considered, leading to the proposal of a hypothesis about memory for comparative sentences, incorporating all of the previously mentioned components of comparisons.

1.1 Relational Terms in Context-Free Settings.

1.1.1 Antonymous Adjectives: Markedness and Semantic Feature Theory.

Consider the following sentences:

(1) John is taller than Bill

(2) John is shorter than Bill

Sentences of type (1) have been shown with great regularity to be easier to process than sentences of type (2). Clark (1970) has succinctly summed up these findings:

> "the data of Burt (1919), Hunter (1957), DeSoto, et. al. (1968), Huttenlocher (1968) and Clark (1969a) show that the positive adjectives 'better', 'faster', 'warmer', 'higher', 'deeper', 'more', 'farther', 'taller', 'happier', and 'older' are comprehended more easily respectively, than their negative counterparts . . . I have not found a single exception to this in the psychological literature or in my own unpublished studies with various adjectives."

In order to account for this finding, Clark extended the theory of linguistic marking (which was initially used to explain the neutralization, i.e. disappearance of sound contrasts in certain contexts) to antonymous pairs of relative adjectives. This was basically an attempt on his part

to give the linguistic notion of markedness cognitive significance. Clark reasoned that, given an adjective pair (for example, "high-low"), one member of the pair ("high") was the unmarked term, in that it could be neutralized in certain contexts. First, it referred to the name of the dimension (height). Second, it covered the entire range of the dimension when it occurred in questions such as "How high is it?", for in answering this question, one could either say "very high," or "very low." Third, a measure phrase can be accepted by the unmarked adjective, as in the phrase "five feet high," where "high" carries the neutral sense of the dimension, height, rather than the contrastive sense of the upper portion of the dimension. The marked adjective, on the other hand, ("low") could not refer to the name of the dimension, nor could it cover the entire range of the dimension. Likewise, it could not accept measure phrases, so that in answer to the question, "How low is it"? an answer such as "very high" would be unacceptable, because the question seems to presuppose that the object in question is low, and the speaker is inquiring about the degree of lowness.

Clark further hypothesized that the "nominal" meaning of the unmarked adjective was distinct from the "contrastive" meaning of the adjective, in that the latter term had an additional semantic feature to its meaning. This semantic feature, which was adopted from Bierwisch (1967), was one

which assigned a polar value to the adjective; +Pol in the case of the unmarked term, and -Pol in the case of the marked term. Clark further assumed that the additional feature of the contrastive terms should make them psychologically more complex. Clark and Card (1969), starting with a theory of memory which posited that information was stored in the form of semantic features, hypothesized that unmarked adjectives would be coded in their nominal form, whereas marked adjectives would be coded in contrastive form, therefore the unmarked adjective would be stored with one less semantic feature than the marked adjective. They reasoned that the additional feature would tend to be lost in memory, and as a result the marked adjective should be recalled as its unmarked counterpart. To test this hypothesis, subjects were presented with several sets of comparative sentences, and given a cued recall task after all the sentences had been presented. Four different sentence constructions were used: positive and negative comparatives, and positive and negative equatives, each with either a marked or an unmarked adjective. They found that the unmarked adjective was better recalled than the marked adjective. When subjects forgot the initial sentence, they would reconstruct it, changing the marked adjective to its unmarked counterpart significantly more than changing from the unmarked to the marked form of the adjective, as they had predicted.

Notice that there are three separate assumptions being made. First, that antonymous adjectives can be classified as marked-unmarked pairs; second that the nominal sense of the unmarked adjective has one less semantic feature than the contrastive sense, and third that people tend to code unmarked adjectives in their nominal rather than their contrastive sense. It is the latter two assumptions which attempt to account for psychological differences between marked and unmarked adjectives, and both have been challenged (Huttenlocher and Higgins, 1971).

Evidence exists contradicting the assumption that unmarked adjectives are coded in their nominal form, while marked adjectives are coded in their contrastive form. When subjects were presented with questions of the sort "How wide is X?", "How narrow is X?", and were asked to indicate whether "X" was wide or narrow, they made over twice as many entailment assumptions for questions with the marked adjective compared to questions with the unmarked adjective (Perfetti, 1973). With comparative constructions, however, as in "X is wider than Y," "Y is narrower than X," both adjectives seemed to be treated neutrally as apparent nominals representing the entire dimension and not just one end of it. This would therefore also call into question the assumption of greater feature complexity of the marked term compared to the unmarked term. Furthermore, as Huttenlocher and Higgins note, there is no logical reason to assume that a term with

two meanings would be semantically simpler than a term with one meaning. The antonym errors in the Clark and Card study, therefore, do not seem to be explained by the semantic theory they invoke.

The marked-unmarked distinction does seem to be applicable to pairs of antonymous adjectives using the neutralization criterion for unmarked adjectives. Only one of the neutralization tasks, though, seems to have general applicability, and that is in the context of a "how" question, the unmarked adjective represents the entire dimension whereas the marked adjective represents only one portion of the dimension. The other tests of neutralization are more limited in their applicability. First, there are numerous dimensions in which the unmarked member is not the name for the dimension. A few examples would be "fast:speed; good: evaluation; big:size; old:age." Second, only those spatial adjectives belonging to a ratio scale can accept measure phrases, in that there are units of tallness, fastness and width, but not of shortness, slowness and narrowness. Ratio scales have a true zero point at one end and extend upward indefinitely. Therefore, there is no corresponding fixed upper reference point from which to measure shortness, narrowness, etc. (Clark, 1969; Huttenlocher and Higgins, 1971). In fact, Clark, Carpenter and Just (1973) have elaborated upon and shifted the focus of this aspect of spatial dimensions and standards of comparison to explain preference for

the unmarked spatial adjectives. The asymmetry in favor of unmarked adjectives is considered the result of an underlying cognitive principle, i.e. people prefer to code extent rather than lack of it, because they can deal conceptually with extension more easily than lack of extension on a dimension. In comparing positive extension, one scans from the point of origin (which acts as the standard) to the item with greatest extension, in contrast to comparing an item with relative lack of extension where it is necessary to first determine the item with greatest extension, use this as the standard, and double back to find an item with less extension. While this is a plausible explanation, and has received some empirical confirmation (Klatsky, Clark and Macken, 1973), it is of limited applicability. Carey and Considine (1973) have observed that it applies only for full comparative forms, and not for stem adjectives or superlatives, and only when there isn't some contextual reason to choose one or the other of two objects as a standard (reasons such as which term is the current topic of conversation, or, for that matter, comparative statements made in the absence of perceptual judgments). Furthermore, it does not account for the greater ease of processing non-spatial unmarked adjectives.

There is another reason for questioning the neutralization aspect of unmarked adjectives as the psychological basis for their greater processing ease, and that is a

developmental one. Measure phrases are undoubtedly late in appearing ontogenetically. Sapir (1944) pointed out that "grading as a psychological process precedes measurement and counting. Judgments of quantity in terms of units of measure, or number, always presuppose, explicitly or implicitly, preliminary judgments of grading." Along similar lines, Givon (1970) claims that developmentally, measuring is a capacity which logically appears later than qualitative judgments of difference in quantity, extent or amount. For example, centuries ago "fast-slow" had no measure unit; one would also not expect the very young child to have a measure unit for speed. Young children, nevertheless, seem to comprehend and produce unmarked spatial adjectives more easily than marked ones (Wales and Campbell, 1970; Wepman and Hess, 1969; Donaldson and Wales, 1970; Ehri and Ammon, 1972). In fact, as Carey and Considine (1973) have pointed out, there is no reason to assume that children acquire the nominal sense of the unmarked adjective before the contrastive sense since, on the one hand, there has been no attempt to test for comprehension of nominal vs. contrastive use in children. On the other hand, it is conceivable that the marked adjective could be acquired with an incomplete feature representation at the same time as the nominal sense of the adjective, if the nominal sense were acquired in its complete representation first. (For example, the marked adjective "low" might initially have the same feature

structure as the adjective "small," i.e. [+measurement; n-space; -Pol], with no specification of a vertical marker, while the nominal meaning of the adjective "high" might have the feature structure [+measurement; +Vertical; 1 Space]).

A final explanation linking the neutralization aspect of unmarked adjectives to the fact that they are easier to understand, produce, and are generally preferred to marked adjectives is that unmarked adjectives may simply occur in a wider variety of linguistic contexts than their marked counterparts. Therefore, there would be many more opportunities to initially hear unmarked adjectives used, and in time, to use them. The power of this frequency/usage theory in accounting for the markedness asymmetry, however, has been brought into question (e.g. Klatsky et al., 1973), and requires further documentation before it can be accepted or rejected with some degree of certainty.

We have seen that the neutralization criterion may be adequate for a linguistic distinction between marked and unmarked adjectives, but does not seem to account in itself for the psychological distinction between them. One theoretical approach, which is gaining increasing acceptance is the view that unmarked terms possess an implicit positive quality or feature, while marked terms possess a negative quality or feature to their meaning. The greater difficulty with the marked adjective, therefore, would be analogous to

the processing complexity of negatives in general. The issue of negativity is discussed in some detail by Wason and Laird (1972).

One of the earliest observations along these lines was that of Sapir (1944) who noted that, in an ascending series of seriated and graded terms, a,b,c,...n, where a<b, b<c, etc., even though logically and mathematically "b" increased from "a" is equal to "b" decreased from "c,"

> "psychologically . . . and therefore also linguistically, the explicit or implicit trend is frequently in a specific direction. It is this tendency to slip kinaesthetic implications into speech with the complicating effects of favorable affect linked with an upward trend and of unfavorable affect linked with a downward trend, that so often renders a purely logical analysis of speech insufficient or even misleading . . . we find that the more closely we study actual linguistic forms, the more we are driven to realize that they never express merely static, affectively neutral, concepts, and judgments, but classes of concepts and judgments in which nuclear notions, capable of logical definition, are colored by unavowed dynamic and affective determinants."

Such "affective" properties have been found to be connected with marked and unmarked adjectives (Hamilton and Deese, 1971). Naive Ss, asked to sort adjectives into two piles on the basis of evaluative judgments, differentiated between the marked and unmarked members of an antonymous pair, grouping them as "negative" and "positive" respectively.

A careful documentation of arguments in favor of this position is given by Huttenlocher and Higgins (1971), who present evidence drawn from three sources: definitions of

adjectives and their antonyms; internal linguistic evidence, and comprehension difficulty:

(1) Definitions. a) Ss asked to define adjectives which were, on the whole, drawn from ordinal scales, defined marked adjectives as denials of the presence of the quality of the unmarked adjective. Ss later rated the same adjectives as being favorable or unfavorable, and these ratings corresponded to previous definitions of marked and unmarked adjectives (Mann, 1968). b) Dictionary definitions of 20 pairs of adjectives from ratio and ordinal scales revealed that no unmarked adjective was defined as the negation of its antonym, whereas twelve out of twenty marked adjectives were so defined (Huttenlocher and Higgins).

(2) Internal linguistic evidence. a) Some marked adjectives function as inherent negatives (Klima, 1964) since they are acceptable in sentences with "any" which require a negative element, as in (3). b) Negative prefixes are

(3) He was sad (*happy) to see any conflict.

rarely attached to marked adjectives suggesting that they incorporate an implicit negative (Zimmer, 1964).

(3) Comprehension difficulty. Marked adjectives increased comprehension difficulty in a way similar to the addition of an explicit negative, whereas the addition of an unmarked adjective to a negative sentence did not increase comprehension difficulty (Sherman, 1969).

On the basis of this evidence, Huttenlocher and

Higgins conclude that:

> "the use of either polar adjective does not simply negate the contrastive sense of its polar opposite . . . [rather] marked adjectives are the opposite of their unmarked counterparts; that is, contrastive use of an unmarked adjective indicates that some property is present to an extent that is worthy of note, whereas the marked adjective indicates that that property is absent to an extent that is worthy of note . . . the meaning of a marked adjective seems to be based on the meaning of the unmarked adjective plus a logical operation of opposition. Thus, 'John is short', seems to mean 'John is the opposite of tall'.

This formulation tends to give the unmarked term a superordinate status, in that it is the standard against which the marked term is compared. Katz (1972) and Bierwisch (1971) on the other hand, rather than seeing the unmarked adjective itself as the standard, regard both the marked and unmarked adjectives as containing a semantic feature indicating their positive or negative directionality on the dimension. The unmarked adjective contains the logical marker "greater than" (>) the norm, and the marked adjective would contain its inverse "less than" (<) the norm. The norm, in this case, is some standard on the dimension to which the head noun is compared. A description of the sentence "John is big" might read, therefore, "John exceeds the standard or norm" (the norm defined by the superordinate class (men) of the head noun (John) on the size dimension). A more detailed account of these theories can be found in Appendix 1.

In summary, a semantic feature complexity theory

accounting for processing differences between marked and unmarked adjectives does not seem to withstand critical analysis. The cognitive principle invoked to explain differential processing requirements of marked and unmarked adjectives, namely that people prefer to code extent rather than lack of it along perceptual dimensions, is a plausible but limited explanation, and seems to be a corollary of the most cogent argument to date, namely that marked adjectives are more difficult because they function in a way similar to negative terms, while unmarked adjectives function as positive terms do. That unmarked adjectives have a nominal as well as a contrastive meaning also allows them to appear in more linguistic contexts than marked adjectives, a fact which has been used in part to explain their greater ease of comprehension and their preference in language use, although this frequency/usage theory has little empirical justification.

1.1.2 Properties of Adjective Classes and their Underlying Dimensions. Semantic classes of adjectives can be distinguished on the basis of their underlying dimensions (Huttenlocher and Higgins, 1971). Classes which fall on a single continuous dimension and allow for ordering along the dimension are called relative adjectives. Absolute adjectives are those which fall either into more or less dichotomous classes (adjectives such as "dead"; "flat"; "closed") or those which refer to particular qualities (such as "red,"

"pigmented," "spotted"). Absolute adjectives can ordinarily be ordered along a dimension through association with an intensity scale attached to the adjective, for example "redder," "very spotted." (See Appendix 1, Footnote 2 for a more detailed discussion of this point).

There are a number of different types of continuous dimensions: the first uses a ration scale, i.e. has a metric and true zero point, and describes quantitative properties of physical objects, space and time. Relative adjectives of speed, depth, height, etc. are found in this category and only these adjectives can take measure phrases. A second type of dimension has an interval scale with the metric being relative distances such as in temperature or intelligence. A third type of continuous dimension entails an ordinal scale with no metric or zero point, and describes evaluative and qualitative properties of objects. Adjective pairs which fall on the latter dimensions (for example, happy-sad; good-bad) have been labeled "contrastive" rather than antonymous by Nelson and Benedict (1973) in that the marked adjective is not a low value of the dimension, but rather seems to represent a separate quality. Contrastive adjectives seem to share properties of both absolute and relative adjectives, as do extreme adjectives from ratio scales (e.g. tiny, miniscule, huge).

While we do have some information pertaining to performance differences with adjectives from different types

of dimensions, it comes predominantly from studies concerned with semantic development in children. Both different adjectives from the same type of dimension (e.g. different spatial adjectives) as well as adjectives from different types of dimensions (e.g. absolute vs. relative vs. contrastive adjectives) have been studied, and each of these will be considered in turn.

It has been found that within the domain of spatial adjectives, the earliest acquired dimension is overall size, represented by the adjective pair "big-small," followed by adjectives with underlying dimensions of one, two and three extensions (Wales and Campbell, 1970; Clark, 1972; Carey and Considine, 1973). Carey and Considine have explained the order of acquisition of spatial adjectives in terms of the number of semantic features which are shared between adjectives. They predict that the child would have the "most general, domain-specifying lexical representation of each word before he has specific dimension-specifying features." Thus, at some point, "big" and "little" should be synonymous with all dimensional terms. In fact, they suspect that adjectives might be marked for "measurement" before they are specified for "physical extent" so that measurement adjectives such as "fast-slow" and "old-young" might be initially synonymous with terms such as "big" and "little."

Nelson and Benedict (1973) studied comprehension of absolute, contrastive, and relative adjectives in children

four, five and six years of age. They found, as predicted, that contrastive terms appear to be processed similar to absolute adjectives, while relative terms were processed relationally. This conclusion was based on the fact that the "-er" morpheme increased the difficulty of responding to both absolute and contrastive adjectives, but not to relative adjectives. Furthermore, while absolute terms were the least difficult, relative terms the most difficult, and contrastive terms in-between for the error data, there seemed to be a greater processing complexity associated with the use of contrastive and absolute adjectives in their comparative forms, as indicated by the latency data. In addition, the marked spatial adjectives were more difficult than the unmarked spatial adjectives, but there was no difference between pairs of antonymous adjectives for contrastive terms. The general pattern of response to contrastive terms, therefore, indicated that they are learned as discrete attributes of objects, rather than as relative qualities. (This distinction has also been made by Huttenlocher et al. [1970] to account for performance differences with negative-equative sentences containing the adjectives good/bad, and those containing the adjectives high/low).

We can thus see that the dimensions which underly different semantic classes of adjectives are psychologically as well as theoretically distinct; absolute, contrastive and relative adjectives are not processed in the same way,

while a subset of relative adjectives, spatial terms, also seem to have a hierarchy of difficulty associated with them, at least for younger children.

1.2 Relational Terms in Context-Dependent Settings: The Relationship Between Adjectives and Nouns in a Comparative.

1.2.1 The structure of relative adjectives. Relative adjectives have been viewed in semantic theory (Katz, 1972; Bierwisch, 1971; Fillmore, 1965) as two-place terms entailing an underlying comparison (see Appendix 1 for a complete account). Thus, in sentences such as (4), the adjective "big" contains a semantic marker which

(4) Elephants are big

specifies that the head noun phrase (elephants) is big in relation to a characteristic of the class of things of which it is a member (in this case, animals). This class is the reference set, or class norm, which serves as the standard for comparison. A relative adjective, therefore, establishes the dimension along which objects are compared, and selects the dimensional feature of the noun it modifies. The noun in turn contains in its semantic representation the class for comparison specified by the relative adjective. Dimensional features in the noun must therefore correspond to features in relative adjectives which specify the different dimensions (for example, the noun "line" must in its semantic representation have one dimensional object specified

as must the adjective "long" specify that it applies to objects with one dimension). According to Bierwisch, these features in the noun function like selection restrictions (i.e. one cannot say "this is a shallow cigarette"). In non-generic terms (e.g. a small elephant) the comparison class will consist of items corresponding to the nominal subject (elephant), while in a generic term (elephants are big) the class will be that of the next highest category in the taxonomic structure of the subject (animals). The average position of the comparison class on a dimension serves as the implicit reference point in a positive comparative construction (e.g. "John is tall"), while it is replaced by the compared noun phrase in an explicit, full comparative construction (e.g. "John is taller than Bill").

As mentioned earlier, Barrière, Mehler, Ruwet and Segui attempted to test the psychological validity of reference classes for generic terms to see whether they were, in fact, determined by the superordinate class for the modified noun as well as by selection restrictions imposed on adjectives by the nouns being compared. They first determined whether subjects accepted the truth or falsity of such assertions as (1) elephants are big; (2) fleas are small; (3) monkeys are big. They reasoned that people tend to use themselves as a primary reference point for the evaluation of relative judgments, so that for the dimension of size, for example, objects which are measurably greater or

smaller than oneself would tend to be accepted as possessing that quality. Secondly, the greater the internal variation within a class, the more likely would individuals be to divide the class into sub-classes. A sentence such as "monkeys are big," therefore, would tend to be judged neither true nor false consistently, since the range of size within the class is large, and the class of monkeys is not as different from man as more extreme classes of animals on the size dimension might be. After finding that Ss accepted the validity of (1) and (2), they then set up four types of comparative constructions in which the noun in the predicate phrase was left blank, to be completed by the subject. The sentences contained either the "more" or "less" comparative which modified one of a pair of antonymous adjectives.

The underlying dimension was related to the subject noun such that the item represented by the noun occupied an extreme position on the dimension, in relation to its intuitively determined reference class. Examples of the sentences they presented would be:

(5) the elephant is bigger (plus grand) than_____
(6) the elephant is less big (moins grand) than__
(7) the flea is bigger (plus grand) than_____
(8) the flea is less big (moins grand) than_____

Sentences (5) and (7) contain a positive adverb (more); while sentences (6) and (8) contain a negative adverb (less). Therefore, (5) and (7) were predicted to be easier to complete (i.e. would have fewer errors and faster reaction time)

than sentences (6) and (8). Sentences (6) and (7), however, were predicted to be more difficult than sentences (5) and (8),since the semantic requirements for completion were more difficult in the former case. There are few things which are bigger than elephants, or smaller than fleas, unless one is willing to consider objects which are not within the boundaries of the natural reference classes. The differences due to semantic requirements of completion were predicted to be greater than those due to the factors of positivity and negativity in the degree adverb. This prediction was confirmed, both for reaction times and for errors. An analysis of the completion responses indicated that the classes of items which made up the reference set (i.e. the items filled in by the Ss) were frequently polarized along the dimension. They seemed to be at the same time more specific and more complex than the superordinate reference classes postulated by Katz and Bierwisch. For example, in response to sentence (9) Ss would either complete the

(9) The antelope is faster/less fast than_____

sentence with animals which were very fast (gazelle), or very slow (turtle). Furthermore, the animals were generally restricted to four-legged zoo animals, hence the specificity of the reference class. Even at the risk of giving a completely false answer, their subjects would not substitute an item outside the boundary of the natural reference class (i.e. an item such as a jet plane). They concluded that

"the subject's performance seems to be determined by a self-imposed constraint to operate within a relatively restricted conceptual domain," and that ". . .we must take into account not only the basic conceptual (i.e. concrete/abstract, animate/inanimate, and the like) or perceptual dimensions, but also functional ones, as well as dimensions pertaining to the subject's world view" in determining the natural reference classes for comparison.

Although there is no comparable information available pertaining to reference classes in children, Nelson and Benedict (1973) have charted a theoretical course of development of relative judgments of size which include the acquisition of class norms. This would proceed from a non-verbal understanding of a global perceptual dimension of size or extent, to the ability to judge relative size, after which labels would be acquired for the direction of size differences. Finally, class norms would be internalized (presumably both for generic and non-generic terms) so that relational terms could be applied in the absence of a direct perceptual comparison. The age at which class norms are internalized, and class hierarchies are learned, however, remains to be determined. Presumably, a similar pattern would also hold for the internalization of class norms for dimensions other than size.

1.2.2 <u>The influence of nouns on adjective selection</u>. We have examined a semantic theory stating that the

internal structure of the noun restricts the choice of the adjective used in a comparison. The location of the object referred to by the noun in the larger class of objects of which it is a member, will also psychologically govern the reference set or norm with which it is implicitly or explicitly compared. One factor which may govern the selection of the adjective used in making the comparison may, therefore, be the location of the items to be compared on the dimension (Huttenlocher and Higgins, 1971). Although the comparative with "more," "-er," or "as . . . as" degree elements does not entail the notion that the compared items possess the quality on which they are being compared (an assumption erroneously made by Clark and Card, 1969, based on an analysis of the deep structure of comparative sentences. See Appendix II for an elaboration of this point), such an entailment is present when extreme adjectives (e.g. tiny, obese) are used, or when polar adjectives from ordinal scales which involve absolute standards are used (e.g. beautiful, homely). In these cases, the use of the adjective does seem to require items which possess the quality in question. When the compared items do possess extreme qualities (polar values) however, such as "elephants" on the dimension of size, or "rockets" on the dimension of speed, the choice of the adjective might be governed by the polar value of the item. This could be on the basis of conversational usage, i.e. maximizing the information conveyed

by providing both attributive as well as relative information, even though semantically, the adjectives from ratio scales are neutral in comparative constructions with regard to the portion of the scale referred to.

Some indirect evidence does exist that compared nouns influence selection of the adjective. In the Clark and Card memory study previously described, there were instances in which antonym errors which were not in the predicted direction (i.e. from the unmarked to the marked adjective) were consistently found. Such cases were ascribed by them to possible biasing factors in the nouns, erroneously referred to as "lexical presuppositions." Examples of "lexical presuppositions" would be that midgets are inherently short, or that geniuses are inherently intelligent. The nouns in question, howerver, were "carpenter," "plumber," "Ford," and "Chevy," on the dimension of cleanliness--all of which might have a pragmatic, but certainly not an inherent "feature" of "dirtiness." This finding was minimized, however, since most of the lexical items were considered neutral with respect to their dimensional location. A closer look at the examples given by Clark and Card, i.e. "pie," "cake," "hamburger," "hot-dog" on the evaluative dimension, leaves doubt as to whether these nouns were truly neutral. In fact, judging from a pilot study conducted by this author, in which nouns were rated for polarity or neutrality on a dimension, it was distinctly more difficult to find terms which were polarized

at the negative end of a dimension than at the positive end of a dimension, and it was even more difficult to find terms which were considered neutral, especially for the evaluative dimension. In any event, Clark and Card preferred to view the antonym error bias in recall as due to feature complexity, rather than to the influence of nouns on adjective selection.

A more recent paper by Clark, Carpenter and Just (1973) did, however, change the emphasis from semantic features, to properties of objects being compared. More specifically, three major constructs are considered to underly comparatives such as (9), namely: 1) reference points (B as in [9]),

(9) A is taller than B

2) underlying dimensions (height or tallness as in [9]); and 3) polarity of certain dimensions (the antonymous adjectives "tall-short" represent different poles of the height dimension). These concepts are used in detailing three hypotheses concerning strategies for perceptual or semantic coding. Hypothesis A states that in a context-free setting, there are certain preferred codings arising from an a priori conception of perceptual space. Hypothesis B states that a previously presented sentence will determine the perceptual coding of the event, and Hypothesis C states that in certain cases salient intrinsic properties of a picture will determine the coding of an event, even given a preceding sentence with a conflicting interpretation.

It is evident that many of the ideas suggested by Huttenlocher and Higgins have been embraced in their paper, namely that non-linguistic concepts enter into the coding of perceptual and linguistic events, concepts such as the topic of the comparison, the quality of the objects being compared, the standard for comparison, etc. A secondary role is given to markedness (although the position of feature complexity in the present theory is not clear), while the primary role is given to intrinsic properties of objects, previous contexts, etc. in determining coding.

After reviewing the available evidence, it is still unclear as to which lexical items in a comparative sentence will determine the coding and retrieval of the information contained in the comparison, and under what conditions: for example, when would the property of the adjective (its markedness) take priority over the compared items in influencing recall, comprehension, or perceptual coding?; when would nouns select adjectives?; would there be different types of interactions between adjectives and nouns in a comparative for different underlying dimensions, such as relative vs. contrastive adjectives, or for different semantic classes of objects? We also have no information about any of the above-mentioned noun-adjective-dimension relationships in comparatives from a developmental perspective, as there have been no studies using children as subjects comparable to the ones discussed above.

1.2.3 Nouns, adjectives, and syntactic form.

There are many ways of expressing comparisons in language: the terms "more" and "less" can be used by themselves to compare items, or they can be conjoined with other adjectives. Variation in the syntactic form of comparative expressions allows similar information to be expressed while changing the emphasis of the comparison. In making a comparison between two terms, "X" and "Y," for example, one can use the comparative form "X is better than Y" where X is the topic, or theme, or one can use the negative equative form "Y isn't as good as X" where Y is the topic. The decision as to which item will serve as the subject will, in part, be determined by the conversational context, or the salience of the object. The decision about the grammatical subject will also govern adjective choice, if the items are not neutral with respect to the dimension. Consider, for example, (10)--(14), four ways of expressing the same relationship

(10) X is more heavy (heavier) than Y
(11) Y is less heavy than X
(12) X is less light than Y
(13) Y is more light (lighter) than X

(from Flores d'Arcais, 1970). The "-er" form of the comparative is equivalent to the "more than" form if the degree adverb modifies the same adjective. Thus, choice of expression between "more heavy" and "heavier"; "more light" and "lighter" would be a purely formal one. The choice, however, between "less heavy" and "lighter," or "less light"

and "heavier" is based on more than formal considerations. In the former case, emphasis is on one or the other sub-dimension and a choice of one depends on the properties of the objects. If both X and Y were heavy, but differed in weight, to say "X is less light than Y" would be grammatically correct, but conversationally inappropriate, whereas to say "Y is lighter than X" would be quite appropriate. In the former case the "light" sub-dimension is emphasized, and we assume the purpose of conversation is to convey the maximum amount of information to the listener.

In a reciprocal fashion, the choice of adjective may determine the item to be the topic or theme. Given items "X" and "Y" where "X" was light and "Y" was either neutral or heavy in weight and one chose to use the adjective "light" to compare the two items, the choice of expression might be "X is lighter than Y" rather than "Y is less light than X."

D'Arcais (1970) in a study of free recall for "more" and "less" comparatives, found as predicted that in "more" comparatives, in which the topic and focus of comparison were the same the subject and adjective were better recalled than in "less" comparatives; whereas in "less" comparatives, in which the focus of comparison was in the complement, the adjective and its complement were better recalled than in "more" comparatives. He concluded that the source of difficulty of "less" comparatives was not linguistic, but cognitive, in that the "less" construction had greater

complexity, the complexity residing in the fact that the adjective is a predicate of one noun while referring to a characteristic of the other noun. This results in a lack of congruence between topic and focus of the comparison.

While this explanation of the difficulty of "less" comparatives is a compelling one, there are reasons to question whether it is the primary one. For example, we have no information about the interaction between the adverbs "more" and "less," and marked and unmarked adjectives. If, in addition to being more psychologically complex, the negative quality of the "less" adverb were responsible for its greater difficulty, we would expect such an interaction. Furthermore, if attribution were lessened, i.e. the relationship between adjective and noun diminished, thereby reducing the topic-focus congruence effect, as in sentences (14) and (15) (where the underlying dimension of height is attributed

(14) John's height is more than Bill's
(15) Bill's height is less than John's

to both John and Bill) would differences still exist between "more" and "less" comparatives?

In any event, the "less" comparative must stress the attribute of the compared noun rather than the topic noun, since in order to express a similar idea a different adjective would have to be used (i.e. less tall:shorter). This is not the case with the "more" comparative, since the attribute of the topic noun can be retained by adding the

"-er" morpheme (i.e. "more tall":"taller").

Another decision about the form of the comparative construction to use, in this case a choice between the simple comparative or the negative-equative, might depend jointly upon the topic of conversation and the location of the lexical items along the dimension (Huttenlocher and Higgins, 1971). If one were to compare two criminals on redeeming attributes, one of whom were somewhat less sinister than the other, it might be preferable to avoid the adjective "good," and instead say "criminal B isn't as bad as criminal A," or, in comparing the nation's poor, one might wish to avoid the adjective "rich," and say, instead, "migrant farm workers aren't as poor as the urban unemployed."

The equative form appears to be sensitive to variations in contextual meaning, which does not seem to be true of the simple comparative (Campbell and Wales, 1969). To say, for example, "this diamond is as small as my thumb" would be correct logically and grammatically, in that one would simply be stating that they are the same size, but there would be a strange conversational implication, namely that diamonds which are as big as thumbs are small. Therefore, the conditions of use of equatives and comparatives might differ, depending on contextual factors.

Campbell and Wales feel that synonymy of the negative equative and comparative constructions is conditional upon contextual information if the negative-equative contains the

"marked" adjective, but not if it contains the "unmarked" adjective (since the unmarked adjective can be used neutrally, whereas the marked adjective cannot). Therefore, they argue, if both "X" and "Y" are short, sentences (16) and (17) would

(16) X is shorter than Y
(17) Y is not as short as X

be synonymous, but if they are not both short, the sentences would not be semantically identical.

This view, however, is not entirely correct according to Langendoen (personal communication). He points out that the comparative and negative equative forms do not have the same meaning, but rather the conditions under which they are true overlap. For example, to say that (18) and (19) conversationally have the same truth conditions would be

(18) 2 is smaller than 10
(19) 10 is not as small as 2

correct. However, statement (20) is true, though counter-

(20) 2 is not as small as 10

intuitive, and synonymous with (19), since logically it negates the fact that 2 and 10 are equal, but does not state which term is the smaller one, as does (18).

Therefore, the notion that the quality of the adjective is asserted, or that the items in question possess the quality, in a negative equative sentence, and it is that which makes sentence (20) strange, is correct only if we talk about conversational usage, and how people pragmatically interpret the meaning of sentences.

To summarize the arguments regarding adjectives, nouns and syntactic form, there seems to be a strong psychological relationship between the properties of the items being compared, and the adjectives and syntactic forms used to compare items. These interrelationships are particularly evident for "less" comparatives and for equative and negative equative sentence types, but do not seem to be as strong for simple "-er" comparatives.

1.3 Polarity, Relativity, and Comparative Sentence Processing. Pairs of antonymous relative adjectives have been referred to as bi-polar adjectives (Bierwisch, 1967), where positive and negative pole markers were ascribed to the feature structure of relative spatial adjectives. Such an assignment of polarity to relative terms, however, is unwarranted, and no longer exists in later versions of Bierwisch's theory (1971). Nelson and Benedict also have noted (1973) that relative judgments are not polar, since polarity is contrastive. While relative adjectives such as "large" or "small" might apply anywhere within the range of the size dimension in a comparison, polar adjectives would be ones which are at an extreme position on the scale (adjectives such as "tiny," "miniscule," or "huge," "gigantic"). Polar terms can also be nouns which occupy an extreme position on a dimension in relation to their natural reference classes (i.e. elephants, dinosaurs, fleas, ants). Relative judgment

can, of course, be made between two or more extreme objects or classes of items. The question can be raised, however, as to whether a comparison between two extreme objects would involve both polar as well as relative features. In other words, would the quality or attribute possessed by an object, if it has a polar value on the dimension in relation to its reference class, be reflected in the choice of the relative adjective comparing two such objects with the same quality, even if the adjective itself was neutral regarding attribution. Take the following sentences suggested by Huttenlocher and Higgins:

(21) Jet planes are slower than rockets
(22) Migrant workers are not as rich as the urban unemployed

In (21), where the relative values of two items which have a positive polar value on the speed dimension are being compared with the marked adjective, the sentence seems perfectly acceptable. In (22) two items which have a negative polar value are compared on the dimension of wealth, with the unmarked adjective, and the sentence seems odd. We have seen that although the attribute is not entailed in either sentence, it is psychologically implied in (22), at least for the noun in the complement. In addition, the adjective in (22) is "contrastive" rather than relative, i.e. it is more similar psychologically to an absolute rather than a relative adjective, hence it would be more likely to attribute the property in question to the compared items.

The polar value of the noun does appear to restrict the portion of the dimension which underlies the adjective. In sentence (23), an implicit reference class seems to be

(23) The grain of sand is not as big as the speck of dust

involved for the scale of bigness, or size, namely that of size of "particles." In a sentence such as (24) the scale

(24) The dinosaur is not as small as the elephant

of "smallness" would be that for "large animals," referring to a different portion of the scale than, for example (25).

(25) The speck of dust is not as small as the grain of sand

Therefore, the polarity of the items being compared does seem to impose a range on the underlying scale of the dimension along which the items are being compared.

We could offer the hypothesis that people might prefer to express relative judgments between items which possess a certain quality with the adjective that most closely reflects that quality, in accord with the concepts underlying comparatives developed in the previous sections. There may be a pragmatic entailment of the attribute in a comparative sentence under the following conditions:

(1) The underlying dimension is a salient conceptual component of the compared nouns, either as an inherent property of the object, or as a functional relationship between the object and the dimension (size in the former case, speed of vehicles in the latter case).

(2) The polarity value for the compared nouns is the same, as well as their position in the class hierarchy, so that the reference set, or norm for the adjective comparing them is the same.

(3) If there is no set of perceptual stimuli which are referred to by the compared nouns (as in a perceptual comparison of two toy objects, a small elephant and a large mouse) so that entailment of "X is A" (the elephant is big) is false, whereas without such a perceptual array "X is A" would be true in relation to its class norm.

(4) The conceptual or pragmatic entailment of "X is A" would be stronger for the negative equative construction than for the simple comparative, since in the former case the property of the adjective is seen to be asserted.

Since it has been shown that the choice of noun in the complement of a comparison is determined in part by the polar value of the subject noun, and in part by the adjective, it seems plausible to assume that the choice of a relational term in a memory task, if the original term is forgotten and S must reconstruct the sentence, would also operate on a similar principle.

1.4 Proposal for Study. The present study proposes to examine the relationship between the components of comparatives detailed above, namely adjectives, underlying dimensions, nouns, and syntactic form, as well as possible developmental changes in the utilization of semantic knowledge

underlying comparative terms, by studying patterns of recall of comparative sentences in children.

Test sentences were constructed for recall which compared the relative value of two items on a dimension, where the two terms were located at one or another polar extreme of the dimension (for their reference class) or were neutral with respect to polarity. Recall was either immediate or delayed. The delay condition was introduced in an attempt to diminish immediate memory effects and to enhance the semantic processing of the conceptual relations between the terms. The adjective used to compare the items was either congruent with the polar value of the noun: an unmarked adjective with a positive polar value for the noun or a marked adjective with a negative polar value for the noun; or was not congruent: a marked adjective paired with nouns having positive polarity, or an unmarked adjective paired with nouns having negative polarity. For example, two nouns with positive polarity on the size dimension might be "hippopotamus" and "elephant." These could be compared either with the unmarked adjective "big," or the marked adjective "small." The former case would be the "congruent" condition, the latter case the "non-congruent" condition.

The form of the comparison was varied, so that it was either a positive comparative construction or a negative equative construction. The following chart illustrates the various types of sentences employed.

Category A +Pol Nouns	Category B -Pol Nouns	Category C Neutral Nouns
A. The elephant is bigger than the hippopotamus.	B. The mosquito is bigger than the ant.	C. The box is bigger than the package.
A'. The hippopotamus is smaller than the elephant.	B'. The ant is smaller than the mosquito.	C'. The package is smaller than the box.
A. The hippopotamus is smaller than the elephant.	B. The ant isn't as big as the mosquito.	C. the package isn't as big as the box.
A'. The elephant isn't as small as the hippopotamus.	B'. The mosquito isn't as small as the ant.	C'. The box isn't as small as the package.

The sentences in each noun category overlap in meaning. Sentences A, B and C are comparisons with the unmarked adjective, sentences A', B', and C' are comparisons with the marked adjective. Category A represents nouns with positive polar values, Category B represents nouns with negative polar values, and Category C represents nouns with neutral values on the dimension. Sentences above the middle line are comparatives, below the line are negative equatives.

Four dimensions were used: evaluation (good-bad); size (big-small); speed (fast-slow), and height (high-low). Thus, there were two pairs of spatial adjectives, one with an underlying metric (high-low) and one without (big-small), and two non-spatial adjectives, one with an underlying metric (fast-slow) and the other without (good-bad). Only the

evaluative dimension, however, had an underlying ordinal scale. Thus the adjectives good-bad are not truly antonymous, but are contrastive.

The nouns within a comparison were chosen so that they would be close in polarity value. They were also chosen so that there would be a potentially reversible relationship between them, i.e. one could say, without having an anomalous statement, both "X is bigger than Y," and "Y is bigger than X." Initially, to control for any differences in truth value of noun order in the above example, two conditions were intuitively set up by E. One condition presented a noun order which seemed to be closer to the actual average value of the classes on the dimension. For example, the average bee or class of bees might be larger than the average fly, or class of flies, although any particular fly could be larger than any particular bee. This variable turned out to be an important one in recall, however, so that the intuitive assignments of noun order within a comparison had to be subsequently validated with an independent group of children.

1.4.1 Hypotheses. It is predicted that:

(1) Sentence recall in which the polar value of the nouns and the positive or negative value of the relative adjectives are congruent will be higher than that for sentences in which they are not congruent. Thus, more sentences containing the unmarked adjective comparing positive

pole nouns should be recalled than those containing the marked adjective comparing positive pole nouns. Sentences with the marked adjective, likewise should be recalled more than sentences with unmarked adjectives for the negative pole nouns. For the neutral category, sentences containing unmarked adjectives should be recalled better than those containing marked adjectives as a function of the greater difficulty in processing negative (i.e. marked) terms. This should be true both within and between noun categories.

(2) Between categories, retention of the original adjective is predicted to have the following order, from highest to lowest retention: For unmarked adjectives, the order of adjective retention should be sentences with positive pole nouns > neutral nouns > negative pole nouns. For marked adjectives the order of adjective retention is predicted to be the reverse, i.e. negative pole nouns > neutral nouns > positive pole nouns.

(3) The direction of antonym errors is predicted to be from the unmarked to the marked adjective for the sentences with negative pole nouns, and from the marked to the unmarked adjectives for positive pole nouns. No directional errors are predicted for the neutral noun condition.

(4) Effects predicted in hypotheses 1 - 3 should be stronger for negative equative sentences than for positive comparative sentences.

Hypotheses 1 - 4 concern adjective recall as a function

of the polar value of the nouns and include, as such, both meaning-changing and meaning-retaining errors, as well as verbatim recall.

(5) Effects predicted in hypotheses 1 - 4 should increase as the time between presentation and test increases, due to a decrease in immediate memory for the exact sentence form, and an increase in processing time for semantic information.

(6) If the original sentence is forgotten, meaning-changing vs. meaning-retaining errors are predicted to be, in part, a function of the truth value of the comparison.

(7) An increase in the effects of the polar value of the nouns on recall of the adjective is predicted to occur with increasing age as a function of the more complete development of class hierarchies and class norms determining the range of the dimension along which items are being compared, particularly for the more completely developed dimensions.

(8) Differences between dimensions in recall patterns are expected as a function of the underlying scales, i.e. contrastive vs. relative. The contrastive adjectives should be easier to remember, particularly for the younger children. The most difficult dimension should be that of height, since it is acquired later developmentally than the more global spatial dimension (size).

There were two independent studies conducted, in addition

to the main recall study. The first study was conducted prior to the recall study, its purpose being the selection of the nouns to be used in the main study. The second study was conducted after the recall study for the purpose of validating the assignment of noun order to truth conditions. For expository purposes, however, the order of presentation of the studies will not follow the temporal order in which they were conducted, but rather will be presented as follows: I. Noun selection study; II. Validation study; III. Recall task, Main study.

CHAPTER 2

NOUN-SELECTION STUDY

2.1 Introduction. The purpose of this study was to obtain children's judgments of the relative positions of nouns (i.e. positive polarity, negative polarity, or neutrality) on each of four different dimensions. These judgments were necessary in order to assign noun pairs to comparative constructions which were to comprise the sentences to be used in the main study. It was obviously important to insure that the youngest children in the study were familiar with all the lexical items to be recalled, and that they spontaneously assigned them either a polar value, or a neutral value on a specified dimension. There was an underlying assumption in this study, which was corroborated by the data of Barrière, et al. (in press) that there are certain classes of objects whose polar value on a dimension is so well-established, that sentences asserting (1) or (2), where X refers to the object (e.g. the elephant),

(1) X is A

(2) X is A- (the antonym of A)

and A is the attribute reflecting X's relative position on the dimension, relative to the norm for that class (i.e. "big" in the case of the elephant), are perceived as either

True, False, or Neither, by a majority of individuals. Therefore, it was hypothesized that given a set of lexical items which were intuitively judged by the investigator to have either a positive or negative polar value on a dimension relative to the class norms or to be neutral with respect to polarity, young school-age children would be able to spontaneously and consistently make judgments of type (1), type (2), or to be able to determine "neither (1) or (2)."

2.2 Subjects. The subjects were 40 first-grade children, half male and half female, with a mean age of 77 months, selected from four classes in an upper SES private elementary school in Manhattan. Subjects were chosen randomly from a class list.

2.3 Materials. Two-hundred and sixty-one nouns were pre-selected by E to represent objects or events which had either a positive polar value, a negative polar value, or a neutral value in relation to their class norm on a specified dimension. The attributes for which the nouns were chosen were those of "big" or "small" size; "fast" or "slow" speed; "good" or "bad" evaluation, and "high" or "low" height. One restriction on the pre-selection of nouns was that in order to form a pair for comparison in a sentence in the main recall study, two items from the same semantic class had to be assigned the same polar value, and their position on the dimension was to be approximately equivalent. Thus, for

example, even though both "elephant" and "horse" might be judged as possessing the attribute "big" (for animals), they would not form a pair in the recall study, since their sub-classes on the dimension are clearly discrepant, and one is at the extreme of the dimension for the entire class, whereas the other is not. The pre-selection of nouns was based upon intuitive judgments made by E and E's associates, dictionary definitions, and thesaurus entries.

The first set of nouns to be evaluated consisted of 140 items: 34 for size; 37 for speed; 33 for evaluation, and 36 for height. The second set of nouns to be evaluated (which replaced those eliminated from set 1), consisted of 49 items: 10 for size; 16 for speed; 13 for evaluation and 10 for height. The third set of nouns to be evaluated consisted of 44 nouns: 0 for size; 10 for speed; 5 for evaluation, and 29 for height; and the fourth set of nouns consisted of 28 items: 0 for size; 7 for speed; 18 for evaluation and 3 for height.

Each set of items was administered to a different group of subjects, although there was occasional overlap, necessitated by the constantly changing requirements of the noun selection procedure. The items in each set were randomly assigned to positions on the list so that there was no long series of items from one dimension, or one pole of a dimension which was presented.

2.4 Procedure. Each subject was escorted into the testing room by E, and seated next to E. After a brief period of conservation, E administered the following instructions:

> I'd like to ask you some questions, because I'm interested in knowing what you think. Now, there are some things that you might think are big, and other things you might think are small. There are also things which you might think of as being sort of in-between; neither big or small; or sometimes big, and sometimes small. I'm going to name something, and then I'm going to ask you what you think about it. Sometimes I'll ask you if it's big, or small, or in-between; sometimes if it's fast, or slow, (or both, neither, or in-between); sometimes if it's good, or bad, (or both, neither, or in-between); and sometimes if it's high, or low, (or both, neither, or in-between). Let's try a question, and see if you understand. Do you think an elephant is big, small, or is it in-between; could it be both?

Subjects generally understood the question immediately. In that case, E proceeded with the entire list. In some instances, if S seemed puzzled, or hesitated for a particular item, E would inquire whether S knew the meaning of the term. There were a number of lexical items which were eliminated simply because several subjects did not understand their meaning (e.g., skyscraper, midget, curb).

After the initial set of nouns had been established for the size dimension, these were given as examples to the following subjects. Thus, to expedite the process of explaining the type of question to be asked, and to evaluate a child's understanding of the question, E would say, after the above instructions, "that's right," when S said that the elephant was big. In addition, when S said an "ant" was

"small," and that a "box" was "in-between," E said "that's right." These seemed to be considered unequivocally true statements by the children.

It should be noted that the general procedure for the selection study was somewhat more flexible than that of a standard experiment, since items were often tried with a few subjects, and then abandoned when it became clear that they were unfamiliar to the children.

2.5 Results. The final noun pairs were selected for the positive or negative polar categories for each dimension if 7 out of 10 consecutive subjects judged them as possessing the positive or negative attribute for that dimension. Selection criteria for nouns in the neutral category were slightly different, since it was very difficult to obtain 7 out of 10 judgments which were "both;" "neither" or "in-between." Therefore, neutral nouns were selected if 5 out of 10 consecutive subjects classified them as neutral, and if the remaining 5 subjects were approximately equally divided into judgments of the positive or negative attribute, or said they did not know. Appendix 3 presents the final selection of noun pairs for the main study for each noun category and dimension, with the number of subjects who judged them to be positively polar, negatively polar, or neutral on the dimensions, or who said they "didn't know."

2.6 Discussion. As hypothesized, young school-age

children are able to judge the polarity or neutrality of an item, presumably with reference to an implicit class norm. However, the relative difficulty of obtaining items for such judgments varied widely as a function of the type of judgment required (i.e., a negative or positive polarity judgment, or a judgment of neutrality), and as a function of the underlying dimension.

In general, it was more difficult to find items which were considered to be neutral than items with either positive or negative polarity, particularly for the evaluative dimension. Children generally considered objects or events to be "good" unless they had a specifically defined function or quality of "badness" as well. Thus, a knife, or a pair of scissors, were considered to be both good and bad; good in the sense that they could be used as an implement to cut food, or to cut paper, and bad in the sense that they could cut and injure someone. More abstract concepts, such as "news," or "telegram," which from an adult point of view could theoretically contain information which was good, bad, or neutral, were not grasped by the children in terms of the type of information that could be contained in the message, but rather in terms of an information-carrying source which in itself was considered to be "good."

Negative polarity items were more difficult in general to obtain than positive polarity items, notably for the dimensions of speed and height. In the former case, there were

very few items which seemed to have the concept of slow speed associated with them. In the latter case, many items which are considered to be "low" often have a quality of depth, i.e., they are below ground level. In such cases, children often used other criteria for the evaluation of "lowness" (see section 6.1.5 for a fuller discussion of this point), where the reference point was either themselves seen as standing within the object (e.g. a tunnel, or a subway), in which case the polarity judgment intuitively assigned by E was reversed (a tunnel was considered "high" in relation to themselves rather than "low" in relation to ground level of the earth); or the reference point was considered in relation to the object which contained the item; e.g., a crater was "high" because it was on the moon. Therefore, most items which had noticeable depth, or were not on the surface of the earth, were eliminated as possible candidates for the neutral category.

The cases with the clearest implicit reference classes appeared to be those for objects judged on the dimension of size, and for objects with positive and negative polar values on the evaluative dimension. In the latter case, items which possessed definite qualities of "goodness" or "badness" seemed to vary in the functional criteria assigned to what was "good" or "bad." For example, things that were considered "good" were those good to eat;

good to possess; good or bad human or mythical qualities, etc.

In conclusion, while the major goal of this study was achieved, namely obtaining noun pairs for the main recall study, the general issue of judgments concerning the truth or falsity of statements asserting that an object possesses an attribute, without a specific perceptual referent, is a complex one which requires more extensive investigation. We need to know a great deal more about what the implicit reference classes are for different objects represented by nouns; what the different requirements may be for judgments along different dimensions, as well as what developmental changes occur in these judgments, as, for example, concepts varying in their degree of abstractness.

CHAPTER 3

VALIDATION STUDY

3.1 Introduction. The original selection strategy for the noun-pairs entering into a comparative relationship in the sentences used in the main recall study was two-fold. First, as previously stated in chapter 2, noun-pairs were selected so that they were located at either the positive or negative pole on a dimension in relation to their implicit class norm on the dimension, or were neutral with respect to that norm. The second intent in selecting noun-pairs was that they be located at approximately the same position on the dimension, i.e., that the average range of items within the class represented by the two nouns overlap in such a way that any particular member of one class (i.e., the class represented by noun 1), could conceivably have a higher, or a lower value of the attribute on that dimension than any particular member of the other class (the class represented by noun 2). Furthermore, the overall range of internal variation within the classes was intended to be similar. In principle, therefore, a sentence such as (1) is potentially reversible, in that any

(1) The bee is bigger than the fly

particular bee could be bigger than any particular fly, with

the reverse also being probable, even though the class of bees as a whole, or the 'focal' concept of a bee might be larger for the dimension of size than the class of flies as a whole, or the focal concept of a fly. (See Rosch, 1973 for a discussion of focal concept.)

Since it was not possible to obtain measurements of any two compared classes so that they were identical in range of variation, or in the location of the average or 'focal' member of the class, noun-pairs were intuitively selected by E, and assigned to one of two probability conditions to control for possible effects of probable vs. improbable comparisons. Condition 1 (More Probable), assigned nouns within a comparative relation to locations on the dimension that E considered to be closest to the actual values of those classes on the dimension in the real world. Thus, sentences such as (1), as well as (2) and (3) would

(2) The sidewalk is higher than the ground
(3) The scissors are better than the knife

appear in Condition 1. Noun-pairs in Condition 2 (Less Probable) were assigned to the opposite locations of those in Condition 1, for example, sentences (4), (5) and (6).

(4) The fly is bigger than the bee
(5) The ground is higher than the sidewalk
(6) The knife is better than the scissors

The differences between the two nouns in location on the dimension for the above comparisons are obviously very small, and would seem to require very fine discriminations, possibly based upon subjective, qualitative decisions rather

than consensually validated ones. Nevertheless, initial analysis of the error patterns of these two conditions in the main recall study (which are presented in chapter 5), revealed substantial differences between the two probability conditions in the type of errors made. In Condition 1, subjects tended to make more meaning-preserving errors in recalling sentences, i.e. when they forgot the exact form of the sentence, they tended to reconstruct the sentence with the original relationship between the nouns held intact. In Condition 2, however, subjects tended to make more meaning-changing errors in recall, i.e. they reconstructed a sentence with the original relationship between the nouns reversed. It seemed possible, therefore, that when subjects forgot the original sentence in its exact form, they tended to forget the original relationship between the terms, and to reconstruct the relative locations of the two nouns on the dimension on the basis of their previous knowledge or preconceptions about the two classes of items represented by the nouns. This finding, and its tentative interpretation, necessitated the validation of the original assignment of noun-pair relationships to Conditions 1 or 2. Since the location of nouns relative to one another were intuitively assigned by E, it was possible that the children did not necessarily perceive differences between the two, but might have been responding on the basis of other factors unknown to E.

It was hypothesized, therefore, that young school-age children possessed, along with their internalized knowledge about the location of classes of items relative to their reference sets, knowledge of the range of variation along the dimension of those classes of items, as well as a 'focal' concept for the class, which could be compared to a 'focal' concept of another, closely related class. On the basis of this hypothesis, it was predicted that children would be able to answer, with some degree of uniformity, questions pertaining to the relative location of two items on a dimension in the absence of any perceptual array; i.e., on the basis of their knowledge of the distribution of objects and events in the world. Furthermore, it was hypothesized that the judgments of the children would conform closely to those of E, so that the patterns of meaning-preserving vs. meaning-changing sentences in recall which were observed in the main study, would be interpretable in light of the children's preconceptions of the relationship between the compared items. The intent of this study, therefore, was essentially to be able to analyze the recall patterns of Ss on the basis of judged relationships between nouns, rather than on the basis of intuitively assigned positions made by E.

3.2 Subjects. The subjects were 20 third grade children with a mean age of 106 months, drawn from two classes in a private school in New Jersey. The children

were selected from class lists on a random basis, with the restriction that half the children be male, and half be female.

3.3 Materials. 192 questions were constructed, and divided into four control sets of 48 sentences each. Each set of sentences consisted of one example of each of the 48 noun pairs which were used in the recall task (presented in Appendix 3), preceded by a question requiring a comparative judgment. The adjective in the question was one of the antonymous pairs of adjectives for the dimension, either the marked or the unmarked adjective. This combination of two possible comparative adjectives, in addition to varying the order of presentation of the nouns, yielded four sets of 48 sentences. The following example should illustrate the control conditions, using one noun-pair as it appeared in each of the four different sets.

Set 1. Which is bigger? The elephant or the hippopotamus?

Set 2. Which is smaller? The elephant or the hippopotamus?

Set 3. Which is bigger? The hippopotamus or the elephant?

Set 4. Which is smaller? The hippopotamus or the elephant?

3.4 Design. Each subject received one of the four sets of 48 questions. Five subjects were assigned to each set, each subject within a set receiving a different random

order of the same questions. The order of question and presentation, however, was parallel between sets.

3.5 Procedure. Each subject was escorted by E into the testing room. After a brief conversation period, E instructed S as follows:

> "I would like to ask you what you think about some differences between things. I am interested in hearing what you have to say, and there is no right or wrong answer. Let me give you an example. If I say, "Who's older, a mother or a baby?", what would you say? (E waits for S to answer). That's right. Now, sometimes you may not think there is an answer, and then you could say, "they're the same, or don't know." For example, if I ask you "who's stronger? Superman or Batman?" what would you say?" (E waits for S to answer. If S replies with either of the two nouns, E says "yes, but sometimes it's very hard to tell, and you might not know"). Sometimes it will be harder to see the difference than other times, but I want you to try to choose one or the other if you possibly can."

3.6 Results. The responses of subjects to each noun pair were tallied, and sign tests were then performed for each pair to determine whether one relationship between the two nouns was significantly preferred than another relationship, i.e. whether one noun was consistently judged as possessing a greater (or lesser) degree of the quality than the other. The judged relationship between the noun pairs, and their respective significance levels, are presented in Appendix 4.

Of the 48 noun pairs, 17 were not judged to be consistently different in their position on the dimension; 7 noun pairs were marginally significant, and 24 pairs were judged

to be significantly one-directional in dimensional location ($p<.05$ to $p<.001$).

Of the 24 judgments which were significant, 21 were in the same direction as those assigned by E to Conditions 1 (More Probable) and Conditions 2 (Less Probable). Of the marginally significant noun pairs, 6 out of 7 had been similarly assigned by E. The major differences between E's assignment and the judgments of subjects (where differences were not significant, but noun pair order in the Table reflects the larger number of Ss making the judgment), were for noun pairs where differences were not significant in one or the other direction. It appears that items on the speed dimension were perceived as being located more closely together than items on the other 3 dimensions; 8 out of 17 non-significant judgments were on the speed dimension. Whether this is due to properties of the dimensions, to item selection, or to the isolation of the items from perceptual referents, cannot be determined from this data.

Thus, the assignments made intuitively by E to probability conditions, corresponded very closely to those made independently by the children.

3.7 Discussion. The original purpose of this study, which was to provide noun-pairs for purposes of assignment to more or less probable conditions, in order to evaluate the types of error responses made in the recall task, was

achieved. Judgments of the relative location of items from similar classes on a dimension were, as hypothesized, made with some consensus among children and substantiated E's assignment of noun pairs to more and less probable categories. The majority of cases in which the assigned order was not the same was for items which were judged by children to be equally reversible, i.e., whose locations did not seem to vary either in range or in focal concept on the dimension.

Often the children would give elaborate justifications for their answers, particularly for those on the evaluative dimension. Not all judgments, however, seemed to be made with the same degree of certainty, inferred from differences in response times to items. A more detailed study along the lines of the one described here, would benefit from having ratings of certainty of judgments, as well as precise reaction time data. In addition, a careful analysis of justifications for judgments would tell us something about the type of information children use to evaluate the relationship between items, similar to information about natural language concepts that Barrière et al., were attempting to ascertain. While the techniques mentioned above went beyond the intent and scope of the present study, they might prove interesting and valuable for future investigations.

CHAPTER 4

RECALL STUDY: METHOD SECTION

4.1 Subjects. The subjects for the main recall study were 96 elementary school children; 32 from grade 1, 32 from grade 3, and 32 from grade 5, with a mean age of 83 months, 101 months and 123 months respectively. The children were drawn from three upper SES private schools in Manhattan. Subjects at each age level were randomly divided into four subgroups, with the restriction that half the subjects in each subgroup were male, and half were female.

4.2 Materials. 192 target sentences were constructed on the basis of a combination of four factors: (1) 4 sets of antonymous adjective pairs (i.e., marked and unmarked pairs) each pair representing one of four different dimensions; (2) 3 noun categories, each with a different location of the noun pairs on a dimension: a) nouns with positive polarity for the dimension; b) nouns with negative polarity for the dimension; and c) nouns which were neutral with respect to their location on a dimension; (3) 48 noun pairs, 12 per dimension, 4 per noun category within a dimension; (4) 4 sentence types. The four sets of adjective pairs were Big-Small, for the Size Dimension; Fast-Slow for the Speed Dimension; Good-Bad for the Evaluation Dimension,

and High-Low for the Height Dimension. The noun categories were described in Chapter 1, and the reader is referred back to the chart on page 39 for a full description of the composition of these categories.

Sentences (1) to (4) represent the four types of sentence constructions which were used:

(1) X is bigger than Y
(2) Y is smaller than X
(3) Y isn't as big as X
(4) X isn't as small as Y

These sentences are partially synonymous for an adjective-noun pair combination. Sentence (1) is a positive comparative with an unmarked adjective; (2) is a positive comparative with a marked adjective; (3) is a negative-equative with an unmarked adjective; and (4) is a negative-equative with a marked adjective.

Twelve additional filler sentences were constructed, patterned after the SWI (semantically-well-integrated) sentences of Rosenberg et al. (1972). These sentences were of the type "The X is V-ing the Y." An example of such a sentence would be "The baby is drinking the bottle." The nouns and verbs in the filler sentences were chosen so that they would not interfere with recall of the items in the target sentences.

4.3 Design. Each subject received a total of 60 sentences, 48 target sentences and 12 filler sentences, subdivided into twelve blocks of five sentences each. Four dif-

ferent sets of sentences were constructed, with 8 subjects per grade receiving one of the four sets, to control for the possible effects of differences in recall between specific noun pairs. There were parallel sets of sentence types for each set of four sentences; with the identical adjective, noun category and construction type, but a different noun pair. For example, if the first block of sentences in Set 1 was (5) to (9), the first block of sentences in Set 2 was (10) to (14).

(5) The elephant is bigger than the hippopotamus
(6) The heat isn't as bad as the cold
(7) The turtle isn't as fast as the snail
(8) The rug is lower than the carpet
(9) The baby is drinking the bottle

(10) The castle is bigger than the palace
(11) The rain isn't as bad as the wind
(12) The worm isn't as fast as the caterpillar
(13) The floor is lower than the ground
(14) The waiter is serving the meal

The complete design for one set is listed in Appendix 5.

For each set of sentences the four factors of antonymous adjective pair, noun category, dimension, and syntactic form were balanced so that each adjective, noun category dimension and construction type appeared in each block of sentences. Within each set of 48 target sentences, each adjective was paired with every noun category and construction type, and every construction type appeared with every noun category. Thus, all combinations of the four factors (dimensions, noun category, construction type, antonymous adjective) were represented in each set of sentences.

A different noun pair was used with each adjective for the 12 different blocks with a set of sentences, so that no adjective-noun pair combination was repeated for a subject. There was one filler sentence in every block which followed the 4 target sentences, to control for short-term memory effects. The filler sentences differed between the different blocks within a set, but were equivalent across the four sets of sentences.

For each of the 48 sentences there was a matching group of sentences prepared, with the noun order reversed (Noun order 2). Sentences were assigned to one of these two conditions (i.e. Noun order 1 or Noun order 2) on the basis of the probability or improbability of the relationship between the nouns represented by the comparative judgment (see Chapter 3 for a fuller discussion of these assignments).

To control for serial position effects, two orders of sentences within each block in a set were constructed for each of the four sets, with half the subjects assigned to the set receiving one order, and half the subjects receiving the other order. Between blocks of sentences within a set, the order of adjectives was balanced, so that each adjective appeared in every position with the blocks for that set.

Two orders of presentation of blocks of sentences were randomly determined for each sentence order for a set, to control for warm-up and practice effects, yielding a

total of 16 different block orders over all sets. The first block of sentences for each set was a practice block. Each subject received the same practice sentences.

Half the subjects for each set of sentences received a delayed recall condition, and half the subjects received an immediate recall condition. Subjects in the delayed recall condition were asked to repeat a series of five numbers between the presentation of the last sentence of the block and recall of those sentences. To control for fatigue, or any other factors which may have been introduced by the number series, subjects in the immediate recall condition were asked to repeat the same series of five numbers immediately after they recalled the sentences for each block.

4.4 Procedure. Each subject was escorted by E from the classroom to the testing room. All testing was conducted individually. Ss responses were recorded on tape.

After S was seated, E engaged him or her in conversation for a short period of time, and explained the use of the tape recorder. After this, E gave the following instructions:

Immediate Recall Condition

> "We're going to play a sentence and number game. I'm going to read some sentences to you, and I'm going to read them twice. Please listen carefully to what I say. When I finish reading the sentences, I want you to tell them back to me exactly the way I told them to you. Try to tell me just what I said. If you can't remember exactly what I said, tell me as much as you can remember. Let's try some for practice."

E then read the first block of practice sentences through twice, and asked S to repeat them, urging S to remember parts of the sentences if he/she could not remember the entire sentence. After S had indicated that he/she had recalled as much as possible, E then said: "Now I'm going to read some numbers to you. Please say them back to me just the way I said them."

E then read a series of five random numbers, and asked S to repeat them.

Delayed Recall Condition

We're going to play a sentence and number game. I'm going to read some sentences to you. I'm going to read them twice. Listen carefully to what I say. When I finish reading the sentences, I'm going to read some numbers to you. After I finish reading the numbers, tell them back to me just the way I said them. Then I want you to tell the sentences back to me just the way I read them to you. Try to tell me exactly what I said. If you can't remember all of what I said, please try to tell me whatever you can remember. Let's try some for practice."

After every four blocks of sentences, there was a brief interval of rest, if the child seemed to be fatigued.

CHAPTER 5

RESULTS: RECALL STUDY

5.1 Introduction. The central questions to be addressed in this chapter can be briefly summarized as follows: 1) Does the polarity value of compared nouns on a dimension affect the markedness asymmetry so often found for antonymous adjectives in comparative constructions? 2) Does the syntactic form of the comparison interact with the noun-adjective relationship in determing adjective recall? 3) Are there differences in patterns of recall for different dimensions? 4) What variables influence retention of the original meaning of the sentence (i.e. the relationship between nouns on the dimension)? 5) Do we find differences in recall patterns for immediate compared to delayed recall? 6) Are there any developmental trends discernible in the data for the above variables?

In presenting the results, we will begin with a descriptive overview of some parameters of the recall data, followed by the main data analysis. Parametric F tests were used for most analyses. These were 3-way Analyses of Variance with Repeated Measures (Winer, 1962, p. 319) with Ss repeated across the variables and nested within grades. Nonparametric tests were used for various sub-analyses of

acceptable sentence error recall patterns, within and between noun categories.

5.2 Descriptive Overview of Recall Parameters.

5.2.1 Types of Sentences Accepted for Recall Data Analyses.

Two major categories of sentence recall were partitioned out of all recalled sentences, and analyzed separately for most variables: 1) Verbatim Recall (VR), where sentences were remembered exactly as they were presented; and 2) Acceptable Sentence Errors (ASE), i.e. recalled sentences which were partially synonymous or antonymous with the original sentence presented. The combination of all VR and ASE sentences comprised Total Acceptable Sentence recall (TAS).

Subjects tended to forget many of the sentences that were presented. Over all conditions and grades, only .46 of all presented sentences were recalled in some fashion. Of these, .18 of the sentences were eliminated because they did not meet the criteria for ASE recall (which are stated below). Of the remaining sentences, .57 were recalled verbatim, and .25 were ASE recall.

a) Criteria for Acceptable Sentence Error (ASE) recall. The criteria used for a sentence to qualify for the main data analysis if it was not recalled verbatim were that it 1) retain the original adjective or its antonym; 2) retain both nouns; 3) use either the positive comparative or negative equative form. Accordingly, adjective substitutions which

were semantically appropriate (e.g. substituting "big" for "high" or "tall" for "high"), but occurred with the correct nouns and syntactic form were not considered acceptable sentence errors; they were therefore not included in the main analyses, but analyzed separately. Stringent criteria were used for accepting nouns in recall, so that substitutions which were semantically appropriate but not exact (e.g. substituting "woman" for "old woman") were not included in the ASE data. Substitutions of similar syntactic forms, such as negative comparatives, or positive equatives, were also excluded from the ASE analysis, as they produced important changes in meaning.

b) Types of Acceptable Sentence Error (ASE) recall. In accord with the above criteria for ASE recall, for each of the four sentence types presented (i.e. positive comparatives with the marked or unmarked adjective, and negative-equatives with the marked or unmarked adjective), there were seven possible types of ASE recall. Table 1 presents a data matrix of all acceptable sentences which were recalled, with presented sentences listed on the horizontal axis at the top, and recalled sentences listed on the vertical axis at the side. Underneath each presented sentence are the numbers of sentences recalled, over grades, noun categories, dimensions and recall conditions, which were either verbatim recall, or ASE recall (either partially synonymous or partially antonymous with the presented

sentence). Sentences 1, 2, 3 and 4 preserve the meaning (i.e. are partially synonymous), in that they retain the original relationship between the terms of the comparison. Of these, the numbers in the diagonals represent sentences recalled verbatim. Sentences 1', 2', 3' and 4' change the meaning (i.e. are partially antonymous) in that the original relationship between the nouns is reversed. Column totals represent the number of sentences recalled for a particular sentence type presented, regardless of how it was changed in recall. Row totals represent the number of sentences of a particular type recalled, regardless of how it was presented. The full breakdown of this data matrix, by grade and noun category, can be found in Appendix 6.

Meaning-retaining and meaning-changing sentences of the same type, such as comparatives with the unmarked adjective (i.e. types 1 and 1' in Table 1) were combined for most data analyses, unless the analysis was specifically designed to examine differences between sentences which retained or changed meaning.

Frequencies of the seven types of ASE recall, over all sentence variables, recall conditions, and grades, are presented in Table 2. Subjects most frequently changed the syntactic form of the sentence (approximately .70 of all ASE recall involved a change in syntactic form). Another prevalent pattern of ASE recall was to retain the original surface order of nouns, but change either the syntax, the

adjective, or both. Preserving the order of nouns was much more prevalent than either preserving the adjective, or retaining the meaning. A comparison of error types 3 (preserve meaning), 5 (preserve noun order), and 6 (preserve adjective) in Table 2, suggested by Tieman (1972) indicates that .60 of these three error types are accounted for by sentences preserving the noun order; .20 by those preserving the adjective; and .20 by those preserving the meaning. Tieman attributes such a pattern to the type of information subjects attend to given a verbatim-recall set.

5.2.2 Dimensions, Noun Categories and Grades.

a) Noun Categories and Grades: Differences in magnitude of recall. The number of acceptable sentences in recall varied as a function of both age and noun category. The magnitude of sentence recall increased significantly and monotonically from first through fifth grades. The proportions of total acceptable sentence recall (TAS) out of total possible recall were .29, .36 and .48 for first, third, and fifth grades respectively. For noun categories, the proportions of TAS recall out of total possible recall were .39, .45, and .30 for the +Pol, -Pol and Neutral noun categories respectively. These differences in absolute magnitude of recall for both grades and noun categories were significant in all subsequent analyses.

b) Dimensions: Differences in patterns of recall. Table 3 presents the number of acceptable sentences recalled

for each dimension. Sentence recall for the height dimension appears to be sizably less than for the other three dimensions. This data is somewhat misleading, however, in view of the large number of unacceptable recall errors for the height dimension; errors which contained semantically appropriate adjective substitutions, while meeting the other criteria for ASE recall. In fact, when we combine the two types of sentence recall (i.e. sentences with semantically appropriate adjective substitutions and acceptable sentence errors), as seen in Table 4, differences in absolute magnitude of sentence recall between dimensions disappear.

Several aspects of the recall data suggested a different pattern of response to adjectives from the evaluative dimension compared to those from the other three dimensions: 1) the proportion of verbatim recall out of total acceptable sentence recall (VR/TAS) for each dimension was highest for the evaluative dimension (.77), and lowest for the height dimension (.59), with the dimensions of size (.66) and speed (.71) in-between. 2) the proportion of antonym errors (i.e. sentences recalled in which the adjective is changed) out of total acceptable sentence recall (AE/TAS) was approximately the same for the dimensions of size (.22), speed (.19) and height (.20), but was substantially lower for the evaluative dimension (.12); 3) differences between sentences recalled with the unmarked adjective are apparent for the dimensions of size and speed, and for the height dimension when seman-

tically appropriate adjective substitutions are included, but such differences are not apparent for the evaluative dimension.

Taken together, these findings provide some support for the view that contrastive adjectives such as "good" and "bad" are seen less as relative adjectives, and are more similar to absolute adjectives; as such they are confused less with one another in memory.

5.3 Immediate and Delayed Recall Conditions.

5.3.1 Overview.

The delayed recall condition was designed to diminish the effects of short-term memory for verbatim recall, thereby enhancing the effects of noun polarity on adjective recall for sentences which had to be reconstructed in memory. This condition, however, was not effective, and, in fact, did not differ in any way from the immediate recall condition. Table 5 presents sentence recall for immediate and delay conditions for VR and ASE recall separately by noun categories and adjective markedness over grades.

5.3.2 Verbatim Recall.

Tables 6, 7, and 8 present the summary tables for the analyses of variance conducted for immediate and delayed recall conditions. Three-way analyses of variance were conducted separately for each grade, with subjects repeated across noun categories and sentence types (CU, CM, NEU, NEM) and nested within recall conditions.

There were no significant main effects for immediate compared to delayed recall conditions for any grade (1st grade, $F[1,30] = <1$, n.s.; 3rd grade, $F[1,30] = 1.13$, n.s.; 5th grade, $F[1,30] = 1.36$, n.s.), nor were any of the interactions of recall conditions with sentence variables significant.

5.3.3 Acceptable Sentence Error (ASE) Recall. To test for differences between immediate and delayed recall conditions for the noun-adjective interaction for ASE recall, a χ^2 test was performed; cell entries, representing the number of Ss in each recall condition for each noun category for whom unmarked adjective recall was higher than marked adjective recall, were compared to cell entries representing the number of Ss for whom marked adjective recall was higher than unmarked adjective recall. All χ^2 were non-significant (+Pol noun category, $\chi^2[1] = 2.03$, n.s.; -Pol category, $\chi^2[1] = .004$, n.s.; Neutral category, $\chi^2[1] = .009$, n.s.).

In all subsequent analyses immediate and delayed recall conditions have been combined.

5.4 Effects of Nouns on Recall of Adjectives.

5.4.1 Overview. Subjects showed a general response bias in recall for sentences containing the unmarked adjective. There was, nevertheless, a strong interaction between noun category and adjective markedness, with sentences containing nouns with positive polarity (+Pol nouns)

showing the highest amount of unmarked adjective recall, and sentences containing nouns with negative polarity (-Pol nouns) showing the highest amount of marked adjective recall. This noun-adjective interaction was due almost exclusively to ASE recall, and not to sentences recalled verbatim. The tendency to change an adjective to its antonym consistently in one direction was significant only for the sentences containing +Pol nouns, where the marked adjective was recalled as its unmarked counterpart significantly more than the reverse. As predicted, no significant antonym error bias was found for the neutral noun category. Contrary to expectation, no differences in patterns of adjective-markedness-noun polarity recall were found as a function of age.

5.4.2 Total Acceptable Sentence Recall (TAS).

Table 9 presents the Summary Table for a three-way analysis of variance with subjects repeated across noun categories (+Pol, -Pol, Neutral) and adjective markedness (unmarked and marked adjectives) and nested within grades (first, third and fifth). All sentences which were recalled in some acceptable form (i.e. both VR and ASE) were included in this analysis. There was a significant main effect for adjective markedness ($F[1,93] = 17.51$, $p < .001$), with superior recall for sentences with the unmarked adjective. While there was a significant main effect for Grade ($F[2,93] = 16.56$, $p < .001$), where the amount of recall increased as a function of increasing age, none of the interactions between grade and

the other sentence variables were significant.

The two-way interaction between noun category and adjective markedness, however, was highly significant ($F[2,186] = 13.18$, $p < .001$). A test for Simple Effects revealed significant differences between marked and unmarked adjective recall in favor of the unmarked adjective for the +Pol noun category ($F[1,279] = 29.88$, $p < .001$) and the neutral category ($F[1,279] = 13.71$, $p < .01$) but not for the -Pol noun category ($F[1,279] = 1.31$, n.s.). A Newman Kuels analysis of means indicated significant differences between noun categories for recall of the unmarked adjective (+Pol > Neutral, q.99[r,372]; -Pol > Neutral, q.99[r,372]) and for recall of the marked adjective (-Pol > +Pol, q.99[r,372]; -Pol > Neutral, q.99[r,372]; and +Pol > Neutral, q.95[r,372[). Marked adjective recall for sentences containing -Pol nouns was significantly higher than for the other noun categories, whereas unmarked adjective recall for the +Pol nouns was significantly higher than for the neutral noun category, but did not achieve significance compared to the -Pol category. Recall for sentences with both marked and unmarked adjectives was lowest for the neutral category.

The differences between noun categories reported above do not present an accurate picture of the noun-adjective interaction, however. A closer inspection of the data indicates that this analysis between noun categories tends to obscure important aspects of the noun-adjective interaction in two respects, particularly for the neutral category. First, the

magnitude of the differences in absolute recall between noun categories overrides the relationship between marked and unmarked adjective recall within noun categories. Only proportional data, derived from within noun categories, and compared across noun categories would be sensitive to this disparity in magnitude of between-category sentence recall. Second, the major source of variance contributing to the noun-adjective interaction appears to be ASE recall and not verbatim recall, as seen in Table 10, and Figure 1. Combining these two types of sentences therefore (i.e. VR and ASE) depresses the actual magnitude of the noun-adjective interaction seen for sentences which are forgotten in their original form and which must be reconstructed in recall. In view of the considerations above, analyses were conducted separately for VR and ASE recall in assessing the noun-adjective interaction.

Before conducting these analyses, however, it was important to determine whether the noun-adjective interaction reported for TAS recall was due to differential attention paid to congruent noun-adjective relationships in the list of sentences presented for recall. In other words, did Ss selectively attend to sentences where unmarked adjectives were paired with +Pol nouns, and marked adjectives were paired with -Pol nouns? If this were the case, it would complicate the interpretation of patterns of noun-adjective recall. A three-way Analysis of Variance with Ss repeated across noun categories and adjective markedness and nested within grades was performed for the total number of presented

sentences, regardless of how they were changed in recall, to evaluate this question (i.e. the column totals of Appendix 6, collapsed over syntactic forms. See Table 11 for Summary Table). This analysis indicates that subjects did not selectively attend to congruent noun-adjective relationships in listening to lists of sentences. While the noun-adjective interaction was significant ($F[2,186] = 3.80$, $p < .05$), a test for Simple Effects indicated that this was primarily due to better recall of sentences containing the unmarked adjective in the Neutral Category ($F[1,279] = 10.89$, $p < .01$) since there were no significant differences between sentences containing marked and unmarked adjectives for the +Pol or -Pol categories ($F[1,279] < 1$, n.s., for both +Pol and -Pol categories). We can safely assume, therefore, that any patterns of congruent noun-adjective relationships found in recall were not a function of an initial attentional bias on the part of subjects listening to the list.

5.4.3 Verbatim Recall. A three-way Analysis of Variance with subjects repeated across noun categories and adjective markedness and nested within grades was performed for sentences recalled verbatim. This analysis is identical to the one reported above for TAS recall, except for the fact that acceptable sentence error recall (i.e. ASE) has been eliminated from the analysis. Table 12 presents the summary table. There was a significant main effect for adjective markedness ($F[1,93] = 13.64$, $p < .001$), with better

recall for sentences containing the unmarked adjective, but there was no significant interaction between noun category and adjective markedness ($F[2,186] = 1.86$, n.s.).

5.4.4 Acceptable Sentence Error Recall (ASE). Different procedures were followed, in analyzing the noun-adjective interaction for ASE recall, depending upon whether differences within noun categories or between noun categories were of interest. To assess differences in adjective recall within noun categories, the number of sentences containing marked and unmarked adjectives were compared directly to one another, whereas to assess differences in adjective recall between noun categories, proportional data were used. For each noun category, the proportion of unmarked adjective recall out of total ASE recall was computed for each subject. The use of proportional data to test for between-category differences seemed justified in view of the large differences found in absolute magnitude of recall between these categories.

a) Differences within noun categories. Chi-Square and Wilcoxon signed-rank tests were performed separately by noun category and grade to test for differences between sentences recalled with marked and unmarked adjectives. A subjects score consisted of the number of recalled sentences with the unmarked adjective, compared to the number of recalled sentences with the marked adjective, both summed over dimensions and syntactic form. It was first necessary to determine, by χ^2 tests of independence, whether differences existed between

grades for recall of the unmarked compared to the marked adjective by noun category. No grade differences were significant for any noun category (+Pol, $\chi^2[2] = 1.79$, n.s.; -Pol, $\chi^2[2] = 2.35$, n.s.; Neutral, $\chi^2[2] = .22$, n.s.). The observations for grades were then pooled, and χ^2 tests for correlated observations (Klugh, 1972) were run to test for differences between marked and unmarked adjective recall over grades. Sentences recalled with the unmarked adjective were significantly higher than those containing marked adjectives for the +Pol noun category ($\chi^2[1] = 19.56$, $p < .001$), and for the Neutral noun category ($\chi^2[1] = 4.91$, $p < .05$), whereas sentences containing the marked adjective were significantly better recalled than those with the unmarked adjective for the -Pol noun category ($\chi^2[1] = 5.47$, $p < .02$). Wilcoxon signed-rank tests to assess directional differences showed a similar pattern. Unmarked adjective recall was significantly higher than marked adjective recall for the +Pol ($z = 5.33$, $p < .001$) and neutral noun categories ($z = 2.53$, $p < .01$), while marked adjective recall was higher than unmarked adjective recall for the +Pol noun category ($z = 2.29$, $p < .05$).

b) Differences between noun categories. As mentioned previously, proportional data was used to compare differences between noun categories in recall of antonymous adjectives. A score for each subject was obtained, separately for noun categories, by computing the number of ASE sentences containing

the unmarked adjective (over dimensions and syntactic form) recalled by S and dividing by total ASE recall for S (over dimensions and syntactic form). To test for differences between categories, χ^2 tests of independence were first performed to determine whether different between-category patterns were evident for different grades. No significant grade differences were found for any pair of compared noun categories: (+Pol vs. -Pol, $\chi^2[2] = 1.19$, n.s.; +Pol vs. Neutral, $\chi^2[2] = 1.61$, n.s.; -Pol vs. Neutral, $\chi^2[2] = .20$, n.s.). Therefore, sign tests were performed to test for differences between noun categories over grades.

The proportion of sentences containing the unmarked adjective was significantly higher for the +Pol noun categroy compared to the -Pol noun category ($z = 3.70$, $p < .001$); the +Pol noun category compared to the Neutral category ($z = 2.59$, $p < .01$), and for the Neutral noun category compared to the -Pol noun category ($z = 2.59$, $p < .01$). The order of noun categories, from highest to lowest, for the proportion of unmarked adjective recall, was +Pol > Neutral > -Pol.

5.4.5 Adjective Retention and Adjective Change. In the preceding section, TAS recall data was partitioned into two categories; VR and ASE recall. Another way of partitioning the data is on the basis of whether the original adjective was retained in recall, or was changed to its antonym. This differs from the above division, in that the

adjective retention measure contains both VR and ASE sentences, while the adjective change measure is composed solely of ASE sentences. Table 13 presents the data matrix showing the relationship between presented and recalled sentences containing marked and unmarked adjectives, for each grade and over grades.

1. Adjective Retention. Two scores were computed for each subject separately by noun category; one for unmarked adjective retention, and the other for marked adjective retention. The score for unmarked adjective retention was obtained by dividing the number of sentences initially presented with the unmarked adjective, which were recalled with the unmarked adjective, by the total number of recalled sentences which were initially presented with the unmarked adjective. A similar procedure was followed for marked adjective retention.

a) Differences within noun categories. χ^2 tests of independence were first performed to test for within-category differences between grades in patterns of recall for sentences retaining the adjective (marked vs. unmarked adjective retention). No grade differences were significant for any noun category (+Pol Category, $\chi^2[2] = 2.06$, n.s.; -Pol Category, $\chi^2[2] = .91$, n.s.; Neutral Category, $\chi^2[2] = 1.83$, n.s.), therefore comparisons between marked and unmarked adjective retention for each noun category were assessed by sign tests performed over grades. Unmarked

adjective retention was significantly higher than marked adjective retention for the +Pol noun category ($z = 5.44$, $p < .01$), and for the neutral noun category ($z = 2.23$, $p < .05$), but differences were not significant for the -Pol noun category ($z = 1.56$, n.s.).

b) Differences between noun categories. The proportion of unmarked adjective retention, and the proportion of marked adjective retention were compared separately between noun categories. χ^2 tests of independence indicated that no different patterns of retention existed for different grades. For unmarked adjective retention, significance levels for grade differences for pairs of noun categories were: +Pol vs. -Pol, $\chi^2(2) = 2.94$, n.s.; +Pol vs. Neutral, $\chi^2(2) = 3.28$, n.s.; -Pol vs. Neutral, $\chi^2(2) = .49$, n.s. Therefore, sign tests were performed over grades to test for differences in adjective retention between noun categories.

The relationship between noun categories for unmarked and marked adjective retention separately is depicted in Figure 2. The order of recall, from highest to lowest, for unmarked adjective retention is +Pol > Neutral > -Pol, and for marked adjective retention it was the reverse, i.e. in descending order, -Pol > Neutral > +Pol. The individual comparisons are as follows: for unmarked adjective retention, +Pol > -Pol, $z = 3.60$, $p < .001$; +Pol > Neutral, $z = 2.68$, $p < .01$; Neutral > -Pol, $z = 2.60$, $p < .01$. For marked

adjective retention, -Pol > +Pol, $z = 3.90$, $p < .001$; +Pol = Neutral, $z = 1.18$, n.s.; -Pol > Neutral, $z = 1.90$, $p < .05$. Thus, even though adjective retention was generally quite high (.86 for the unmarked adjective over noun categories, and .77 for the marked adjective over noun categories), the effects of nouns on retention of the original adjective were still apparent.

2. Adjective Change: Antonym Errors.

a) Differences within noun categories. To test for differences in directionality of antonym errors within noun categories, a subjects score for the total number of sentences changed from the marked to the unmarked adjective was compared to his score for sentences changed from the unmarked to the marked adjective (over syntactic forms and dimensions), for each noun category separately. χ^2 tests of independence were performed to assess whether different patterns existed between grades for directional antonym errors. No grade differences were significant (+Pol Category, 1st vs. 5th grades, $\chi^2[1] = 1.84$, n.s.; 3rd vs. 5th grades, $\chi^2[1] = 1.84$, n.s.; 1st vs. 3rd grades, $\chi^2[1] = 0$. [It was necessary to run separate tests in this case, due to the need to incorporate a Yates correction for continuity.] For the -Pol Category, $\chi^2[2] = 4.86$, n.s.; and for the Neutral Category, $\chi^2[2] = .90$, n.s.). Wilcoxon signed-rank tests were then performed over grades, comparing the direction of antonym errors for each noun category. Changes from the

marked to the unmarked adjective were significantly greater than changes from the unmarked to the marked adjective for the +Pol category ($z = 7.11$, $p < .001$), but differences were not significant for either the Neutral or the -Pol noun categories ($z = 1.51$, n.s., and $z = 1.32$, n.s., respectively). Figure 3 presents the proportion of change to the unmarked adjective out of total adjective change for each noun category separately over grades.

b) Differences between noun categories. To test for noun category differences in recalling an adjective as its antonym, a proportional score was derived to control for absolute differences in magnitude of recall between categories. A subjects score was obtained, separately for each noun category, by computing the number of sentences which changed from the marked to the unmarked adjective (over syntactic forms and dimensions) and dividing by the total number of sentences in which the adjective was changed to its antonym, regardless of direction. χ^2 tests of independence were performed to determine whether grade differences existed in patterns of antonym error recall. No grade differences were significant between grades for any pair of noun categories ($\chi^2[2]$ for +Pol vs. -Pol noun categories = 2.94, n.s.; +Pol vs. neutral, $\chi^2[2] = 3.28$, n.s.; -Pol vs. Neutral, $\chi^2[2] = .49$, n.s.). Sign tests were then performed over grades between noun categories.

Differences between the +Pol noun category and the other

categories were significant: +Pol > -Pol ($z = 3.72$, $p < .001$); +Pol > Neutral ($z = 3.89$, $p < .001$); however, differences were not significant between the -Pol noun category and the Neutral noun category ($z = .70$, n.s.).

In summary, although adjective retention was higher for the unmarked adjective than the marked adjective in the neutral noun category, there was no difference in the direction of adjective change for that category, whereas the proportion of change to the unmarked adjective in the +Pol category was even higher than the proportion of unmarked adjective retention for that category. Although the proportion of marked adjective retention, and change to the marked adjective, was in the predicted direction for the -Pol category, neither of these measures achieved statistical significance.

5.5 Syntactic Form, Noun Category and Adjective Markedness.

5.5.1 Overview. Comparative sentences were generally recalled better than negative-equative sentences. The interaction between noun categories and adjective markedness was stronger, however, for negative-equative than for comparative sentences, although the same recall pattern was evident for both syntactic forms. This interaction between syntactic form, adjective markedness and noun category was only apparent for sentences which were not recalled verbatim (i.e. ASE recall).

Table 14 presents the data matrix of presented and recalled sentences for comparative and negative-equative sentences, over grades, noun categories, adjective markedness and dimensions. For all three noun categories, comparative and negative-equative sentences were responded to equally often. This was indicated by a three-way analysis of variance with subjects repeated across sentence types (comparative with the unmarked adjective [CU]; comparative with the marked adjective [CM]; negative-equative with the unmarked adjective [NEU]; and negative-equative with the marked adjective [NEM]) and grade, for the amount of recall of each sentence type presented, regardless of the way in which it was recalled. In this analysis, no significant main effect was found for sentence type ($F[3,279] = 1.61$, n.s. See Table 15 for the Summary Table). Negative-equative sentences, however, were changed into comparative sentences more frequently than the reverse, accounting for differences in row totals in Table 14. This means that there was no attentional bias in favor of a particular sentence type, such as only encoding positive comparative terms, but there was a response bias in favor of producing comparative sentences.

Despite the overall bias in favor of recalling sentences in their comparative form, there was an interaction between syntax, noun category and adjective markedness, depicted in Figure 4, and Table 16. Verbatim Recall and Acceptable Sentence Error Recall (ASE) are presented separately.

Due to the discrepancy between VR and ASE sentence recall, an analysis of total acceptable sentence recall (TAS) combining VR and ASE data, was considered to be uninformative, and was not conducted. Proportional data was used to test for between-noun category differences in recall of antonymous adjectives, due to differences in absolute magnitude of recall between noun categories and syntactic forms.

5.5.2 Verbatim Recall. For verbatim recall there is clearly no difference between negative-equative and comparative sentences in recall of the unmarked adjective for the different noun categories. Table 17 presents a three-way analysis of variance with subjects repeated across sentence types (CU, CM, NEU, NEM) and noun categories, and nested within grades. There was a significant main effect for sentence type ($F[3,279] = 9.88$, $p < .01$), but, more importantly, there was no significant sentence type x noun category interaction ($F[6,558] = 1.97$, n.s.

5.5.3 Acceptable Sentence Error (ASE) Recall. An inspection of Figure 6 indicates a stronger noun category x adjective markedness interaction for negative-equative sentences than for comparative sentences, although the same recall pattern is manifest for both syntactic forms (the order of noun categories for the proportion of unmarked adjective recall from highest to lowest, is +Pol > Neutral > -Pol).

To test for differences within noun categories between marked and unmarked adjective recall for comparative sentences, the total number of recalled sentences containing the unmarked adjective for comparative sentences was compared to the total number of recalled sentences containing the marked adjective, for each subject. Wilcoxon signed rank tests were then performed over Ss for each noun category separately, over dimensions. The same procedure was followed to assess the difference between marked and unmarked adjective recall for negative-equative sentences. Differences between marked and unmarked adjective recall for comparative sentences were only significant for the +Pol noun category with unmarked adjective recall higher than marked adjective recall ($z = 2.32$, $p < .01$). Differences were not significant for the neutral and -Pol noun categories ($z = .72$, n.s. and $z = 1.38$, n.s., respectively). Differences between marked and unmarked adjectives for negative equative sentences were significant, with the unmarked adjective higher than the marked adjective in the +Pol category ($z = 5.12$, $p < .001$), and the Neutral cateogy ($z = 3.02$, $p < .01$), and the marked adjective higher than the unmarked adjective for the -Pol category ($z = 1.89$, $p < .05$).

Differences between noun categories were determined by sign tests over grades by comparing the proportion of unmarked adjective recall for comparative sentences between each noun category. None of these comparisons were signifi-

cant (+Pol vs. -Pol, z = 1.18, n.s.; +Pol vs. Neutral, z = 1.62, n.s.; -Pol vs. Neutral, z = .40, n.s.). Differences between noun categories in the proportion of unmarked adjective recall, however, were significant (+Pol > -Pol, z = 4.27, p < .001; +Pol > Neutral, z = 2.39, p < .01; -Pol < Neutral, z = 2.11, p < .05).

5.6 Dimensions: The noun-adjective interaction. There appears to be a four-way interaction between dimensions, adjective markedness, noun categories and grade, as illustrated in Figures 4, 5, 6 and 7. A statistical test of this interaction would be difficult, as separate analyses of Verbatim recall and Acceptable Sentence Error Recall would be based on very few responses per cell, particularly for ASE recall (only four possible responses for the two adjective categories [marked and unmarked] per S for total acceptable sentence recall. However, given the substantial memory loss, large numbers of 0 frequencies per cell). We can, however, draw a few descriptive generalizations about this interaction, based on proportional differences computed over subjects (See Appendix 7 for the raw scores on which these proportions are based).

An inspection of Figures 4-7 indicates a similar pattern for all dimensions for the noun-adjective interaction, primarily for the +Pol and -Pol categories in ASE recall, although the interaction does seem to be strongest for the evaluative dimension. The dimensions of speed and size

appear to have the highest overall proportions of unmarked adjective recall (Size = .58; Speed = .61; Evaluation = .51; Height = .50), for TAS recall (i.e. VR and ASE combined), although there seems to be an increase in unmarked adjective recall with age for the size and height dimensions (primarily for the +Pol noun category), and a decrease in unmarked adjective recall with age for the speed dimension (in the neutral and -Pol noun categories).

5.7 Meaning-Retaining vs. Meaning-Changing Errors in Recall.

5.7.1 Overview. When subjects forgot the initial sentence, they tended to forget the presented relationship (i.e. the original menaing) between the nouns and, in reconstructing the relationship, they relied upon their own knowledge of the relative position of the two nouns on the dimension. If there was no preferred relative position, assignment of relative position for the nouns was random.

5.7.2 Overall Comparison Between Sentences Which Retain or Change Meaning. Out of the total number of acceptable sentence errors in recall, the proportion of sentences which either changed or retained the relationship between the terms was approximately equal (.49 for meaning-retaining and .51 for meaning-changing errors). The recall pattern within noun categories, reflecting the noun-adjective interaction, is similar for both meaning-changing and meaning-

retaining sentence errors, although the noun categories are somewhat more differentiated for sentences which retained the meaning. The proportion of ASE unmarked adjective recall for sentences which retained meaning was: +Pol = .80; -Pol = .42; Neutral = .58; and for sentences which changed meaning, +Pol = .67; -Pol = .42; and Neutral category = .62.

5.7.3 Determinants of Meaning Change. The major determinant of whether a sentence changed meaning or retained meaning in ASE recall was the congruence between the presented noun relationship and the judged noun relationship (see Chapter 3 for judgments of noun relationships). For the analysis, two categories of sentences (presented in Chapter 3) which (1) were judged to be significantly directional by Ss, e.g. "the bee is bigger than the fly," vs. (2) those which were not judged to be significantly directional by Ss, e.g. "the old man is faster/slower than the old woman," were first differentiated. Then, within each category of sentences, two subcategories were partitioned: (a) one in which the "true" relationship between the nouns was presented for recall (e.g. "the bee is bigger than the fly"), and (b) one in which the "false," or reverse relationship between the nouns was presented (e.g., "the fly is bigger than the bee"). Two subcategories were also partitioned for noun pairs which were not judged to have a significantly preferred direction: (c) one which had the larger number of subjects agreeing about a particular direction of noun-

relationship, and (d) the other with the smaller number of subjects judging a particular noun-relationship (even though these differences were not significant).

For each sentence recalled, the number of responses which retained the original relationship between the noun pairs, and the number of responses which reversed the noun-pair relationship was computed over all subjects. Sign tests were then performed within each subcategory between meaning-retaining and meaning-changing errors. For those noun pairs which were judged to be significantly different by Ss in directionality, there was a significant difference ($p < .01$) in favor of meaning-retaining errors, if the presented order corresponded to the judged order (e.g. if Ss judged "the bee is bigger than the fly" to be the correct relationship, and if that relationship were presented, Ss tended to retain the original relationship between the nouns). If the presented order did not correspond to the judged order (e.g. if "the fly is bigger than the bee" were presented), there was a significant difference ($p < .001$) in favor of meaning-changing errors. The proportion of meaning-changing to meaning-retaining sentences for each noun-relationship category x noun-presentation category is depicted in Figure 8. For noun pairs which were not judged to have significant directionality on the dimension, there was no significant difference between meaning-changing and meaning-retaining sentences for either presentation subcategory. These

proportions are also presented in Figure 8.

5.8 Sentence Errors Excluded from the Main Analysis: Noun Substitutions. Appendix 7 presents the list of nouns which were substituted in recall for the presented noun. As a rule, subjects tended to remain within the restricted reference class for the noun, substituting few anomalous or inappropriate lexical items. Occasionally, Ss would substitute a noun with the opposite polar value on the dimension. Another common type of substitution was to lose an important feature of a conjoined word, and as a result, change the meaning. Examples of such changes would be substitutions of "step" for "doorstep,' or "rabbit" for "rabbithole." Obviously, the latter substitution changes the meaning more radically than the former, although the former substitution results in a loss of the polarity value for the noun presented. This finding is of some theoretical interest, in that it is congruent with the findings of Barrière, et. al., that subjects tend to operate on the basis of self-imposed category restrictions when asked to provide a noun in a completion task, for a comparative sentence in which the first noun (polarized on the dimension) and the adjective have been provided.

CHAPTER 6

DISCUSSION

The results of this study strongly support the hypothesis that dimensional properties of nouns, as well as the adjectives used to compare them, jointly determine memory for comparative sentences. In keeping with the findings of previous studies, the role of adjective markedness as an independent factor in recall was observed, as indicated by generally superior recall of the unmarked adjective. Nevertheless, in accord with prediction, adjective selection in sentence reconstruction was clearly influenced by the polar value of the nouns on the dimension, as well as by their position relative to one another. The interaction between noun polarity and adjective markedness was most pronounced for negative-equative sentences, revealing the operation of a syntactic as well as a semantic component contributing to recall.

Contrary to expectation, the hypothesis that an increase in the magnitude of the interaction between noun classes and adjective markedness would occur with increasing age was not supported. Few age trends were discernible in the data, although error patterns in recall for the different dimensions were most easily explainable in developmental terms.

In the discussion which follows, we will first review the evidence in support of the various points summarized above. Next, we will examine the question of whether recall patterns reflected specific linguistic properties of the material being recalled, or were artifacts of the memory task itself. A hypothethical model of the reconstruction process in comparative sentence recall will then be offered. The results will be evaluated in light of the findings of related investigations in an attempt to draw an empirical generalization which integrates our current knowledge of the variables determining the processing of comparative relations. Finally, a re-formulation of the markedness distinction in psychological processing of relative adjectives will be offered.

6.1 Patterns of Recall.

6.1.1 Adjective Markedness.

There were several findings which indicated an overall tendency toward superior recall of the unmarked adjective. (1) Verbatim recall showed a general bias toward the unmarked adjective for all noun categories; (2) the unmarked adjective in the neutral noun category was recalled significantly better than the marked adjective for reconstruction (i.e. ASE) errors as well as for total sentence recall; (3) Reconstruction errors involving positive pole nouns paired with unmarked adjectives were more common than those involving negative pole nouns paired with marked adjectives.

6.1.2 Noun-Adjective Relationships. Despite the obvious bias toward the unmarked adjective, nouns with negative polarity reduced recall of the unmarked adjective and increased recall of the marked adjective. This tendency toward better recall of the marked adjective in the negative pole (-Pol) noun category was in the predicted direction for all measures except verbatim recall, although only the measure of total acceptable sentence errors achieved statistical significance. Thus, while the unmarked adjective bias undoubtedly depressed the influence of -Pol nouns on recall of the adjective, the fact that recall of marked adjectives can be significantly enhanced in the proper context, can be likened to the findings discussed by Wason and Johnson-Laird (1972), of contexts which facilitate the processing of negative statements, and to similar effects obtained in studies of perceptual comparisons, which will be considered at greater length below.

Further support for the noun-adjective interaction was provided by the finding that unmarked adjective recall for the +Pol noun category was significantly higher than for the -Pol noun category for every measure except verbatim recall. Furthermore, although patterns of recall in the neutral noun category resembled those in the +Pol noun category, the few differences which did exist between these categories were important ones. Unmarked adjective recall in the +Pol noun category exceeded that of the neutral noun category for acceptable sentence errors and adjective retention measures.

In addition, positive pole nouns influenced the extent to which marked adjectives were recalled as their unmarked counterparts, while there was no significant antonym error bias in the neutral or the -Pol noun categories. This result challenges the claim by Clark and Card (1969) that the bias in recalling the marked adjective as its antonym is due to a simplification of the feature structure of the adjective, and not to the influence of the lexical items being compared.

In lieu of semantic feature complexity theory proposed to distinguish between the psychological processing difficulty of marked compared to unmarked adjectives, we view both marked and unmarked adjectives as equally complex in their feature structure. Both can be given either a neutral or a contrastive meaning in their comparative ("-er") form. Neutral in this case, however, is not equivalent to nominal. In the negative-equative form, though, marked adjectives are ordinarily interpreted contrastively, while unmarked adjectives can be interpreted either neutrally or contrastively.

If an adjective is changed to its antonym in recall, we would expect the major determinant of whether or not it was recoded in its neutral or contrastive sense to be the location of the nouns on the dimension. When an unmarked adjective is changed in recall to a marked adjective, the change should be toward the neutral value of the marked adjective (i.e. toward a comparative sentence containing a marked adjective) if the nouns are positively polar, or

neutral. Correspondingly, there should be an increasing tendency to change to the contrastive value of the marked adjective (i.e. toward a negative-equative sentence containing a marked adjective) if the nouns are negatively polar. This, in fact, was precisely the case in the present study, as indicated in Appendix 9. This leads us to the conclusion that a relative adjective will ordinarily be used neutrally in a comparison unless there is some particular or compelling reason to use it contrastively.

It should be mentioned here that the prediction that the noun-adjective interaction would be enhanced in the delay condition was not confirmed. Since the hypothesized effects in the immediate recall condition were obtained, however, apparently a ceiling had been reached. A longer delay period might have reduced the amount of verbatim recall and correspondingly increased the number of reconstruction errors, but it probably would not have changed the magnitude of the noun-adjective interaction for reconstruction errors.

6.1.3 Syntactic Form. The hypothesis that negative-equative sentences entail (in conversational usage) that the items in question possess the quality on which they are being compared, and that they would thereby increase the magnitude of the noun-adjective interaction, was supported. Although for both comparative and negative-equative sentences identical recall patterns were evident between noun categories (i.e. +Pol nouns > neutral nouns > -Pol nouns,

for recall of the unmarked adjective, with the reverse order of categories for recall of the marked adjective), directional differences between marked and unmarked adjectives for all noun categories were significant only for negative-equative sentences. That this result was obtained for reconstruction errors but not for verbatim recall might further strengthen the hypothesis that there is an implicit attribution of the quality to the noun when negative-equative sentences are used conversationally, since the process of reconstructing sentences appears to resemble more closely what people actually do when they speak. This speculation, of course, should be subject to empirical test.

6.1.4 Contrastive vs. Relative Adjectives. The distinction between contrastive adjectives (i.e. "good" and "bad" in the present study), and relative adjectives was based on the finding that contrastive adjectives are learned and processed in a way similar to absolute adjectives, i.e. as discrete attributes of objects rather than as relative qualities (Nelson and Benedict, 1973). As such, a marked contrastive adjective would tend to be perceived not as a low value on a dimension of evaluation, but rather as a separate quality from that depicted by the unmarked adjective. We will first consider evidence from the recall study which corroborates the findings of Nelson and Benedict, in that contrastive adjectives seem to be easier to remember as well as to understand. We will then consider how this

fact bears on the adjective-noun interaction.

Recall for adjectives on the evaluative dimension was clearly superior to recall for the other three dimensions. First, the evaluative dimension had the highest proportion of verbatim recall, as well as the lowest proportion of antonym errors. The evaluative dimension also had the largest number of acceptable sentences recalled, and the overall difference between marked and unmarked adjective recall was smallest for this dimension. Taken together, these results support the contention that contrastive adjectives are easier to remember than relative adjectives.

An examination of acceptable sentence error recall indicated that the adjective-noun interaction seemed to be strongest for the evaluative dimension. The positive pole and negative pole noun categories were most clearly polarized for this dimension, with the proportion of unmarked adjective recall for the +Pol category = .84, and for the -Pol category = .29. This finding would be consistent with the view that contrastive adjectives are processed as discrete attributes of objects, and as such the selection of contrastive adjectives in sentence reconstruction would be strongly determined by the quality of the noun on the dimension.

6.1.5 Developmental Patterns in Adjective-Noun Recall. While the absolute amount of recall increased monotonically from first through fifth grades, the interaction between

adjective markedness and noun polarity values did not show any major developmental changes. Differences between noun categories were significant, and in the predicted direction, for all grades. The lack of developmental differences is difficult to interpret without further empirical data from a larger age range, and a variety of tasks, some of which might be more sensitive to any age-related differences in the noun-adjective interaction than the recall task.

It had been anticipated that older children would have more fully developed reference classes for nouns on a dimension, which would lead to a stronger influence of nouns on adjective selection. Although this was not the case, there were a number of indications in the data that reference classes which had not yet fully developed by first grade did influence the nature of adjective recall. First, the children in the noun-selection study did not appear to have a true concept of evaluative neutrality: they would only accept as neutral an evaluative item which had both negative as well as positive functions or features to their meaning (e.g. "news" was not considered a neutral item, i.e. an information-carrying source. Rather, it was considered to be positively polar, as were most other objects such as pots, pans, items of clothing, etc. A knife, however, was considered "neutral" because it was both "good" [because it can cut things], and "bad" [because it can hurt you]). Many of the neutral nouns in the recall study, as a result, seemed to function as negative pole nouns, in that the evaluative

dimension was the only one for which the unmarked adjective was less well recalled than the marked adjective in the neutral category for reconstruction errors. Second, the development of class norms for objects on the negative pole of the speed dimension also appeared to be incomplete for first grade children. It was extremely difficult to obtain items in the noun selection study which the children considered to be "slow," without having at the same time a perceptual referent. Clearly, these subjects are operating within very restrictive reference classes when they consider objects such as "cradles," "hammocks," and "baby carriages" to be capable of very fast motion. This appeared to influence the pattern of adjective recall in the main study, since the dimension of speed had the highest proportion of unmarked adjective recall of all the dimensions. There was, however, a decrease in overall recall of the unmarked adjective with age for this dimension, perhaps indicative of the fact that children were becoming increasingly more capable of abstracting the notion of slow speed by broadening the reference classes to which it applied, and narrowing the class to which fast speed applied.

It was also hypothesized that the noun-adjective interaction would be stronger for the size than the height dimension, since the height dimension has been shown to develop more slowly than the size dimension (Clark, 1971; Donaldson and Wales, 1970). As such, reference classes for objects on the height dimension might correspondingly be

less fully developed than for the size dimension. There was some support, although not particularly strong, for this hypothesis, in that differences between the polar noun categories for the proportion of unmarked adjective recall were smaller (+Pol = .65; -Pol = .49) than for any of the other dimensions for acceptable errors, including the size dimension (+Pol = .72, -Pol = .42). The overall pattern of recall for the height dimension was generally consistent with previous findings relating to the acquisition of dimensional terms. The height dimension was the most difficult of all the dimensions in the present study: 1) nouns with negative polarity value on this dimension were the most difficult to obtain, since "depth" had to be eliminated in all the selected items (e.g. children considered a "tunnel" to be "high" "because it's over your head"; a "crater" to be "high" "because it's on the moon"). Thus the reference classes for objects on this dimension were not fully established; 2) the height dimension had the lowest amount of absolute recall for sentences acceptable for the main data analysis. However, with the inclusion of semantically appropriate adjective substitutions, the amount of absolute recall was equal to the other dimensions, since there were almost as many adjective errors of this kind as there were acceptable reconstruction errors; 3) out of the sentences which were acceptable for the main analysis, the proportion of verbatim recall was extremely low (between .50 and .60) compared to over .70 for the other dimensions. There was

evidence that the vertical marker was gradually entering in as a factor in recall between first and fifth grades. An analysis of substitution errors showed that in the first grade there were no substitutions of the adjectives "tall" and "short" for "high" and "low"; all substitutions were either "big" or "small." The proportion of the substitution of "tall" (and, to a lesser extent, "short") increased gradually between third and fifth grades, so that by fifth grade it comprised 1/3 of the substitutions. There also appeared to be an increase from first to fifth grade in the proportion of unmarked adjective recall for the height dimension. This trend, along with the increase in substitutions of the adjective "tall," would suggest that the upward vertical marker for the unmarked adjective "high," was developing more rapidly, and was becoming easier to process psychologically, than the downward vertical marker for the marked adjective "low."

In retrospect, it is conceivable that the relative insensitivity of the recall task to developmental changes in the strength of the noun-adjective relation was a result of the fact that only those lexical items which already had established reference classes on a dimension for first grade children were selected. Substantial numbers of items were eliminated which were clearly polarized on dimensions, e.g. "midget," "skyscraper," "curb"; but which were unfamiliar to the children, while an even larger number of nouns were eliminated from consideration, as being inappropriate to the

vocabulary of a six-year old child. Moreover, some items may have been polarized on one dimension, but not yet on another (e.g. children might be able to classify a "feather" as "soft" before classifying it on the dimension of speed, with reference to a class of inanimate items that travel at a certain rate given an instigating force). The noun selection task in itself might provide important data about changes in object dimension relations with age, if one were to determine at what point the lexical items which either were eliminated, or not considered appropriate, did enter, and whether there was any pattern discernible in the clusters of lexical items that could be classified on a dimension. Such data might argue more strongly for a contextual approach to the acquisition of dimensional terms. (The importance of contextual factors, it should be noted, is beginning to be incorporated into the developmental literature, e.g. E. Clark, 1973b; Donaldson and McGarrigle, 1974.)

We can tentatively conclude, therefore, that once reference classes for nouns on a dimension are established, the general principles of noun polarity and adjective markedness tend to operate in sentence reconstruction, regardless of age differences.

To what extent, however, were the "general principles of noun polarity and adjective markedness in sentence reconstruction" referred to above truly a function of memory errors reflecting semantic properties of the material being

recalled, rather than being artifacts of the memory task itself? A satisfactory answer to this question will enhance the meaningfulness of the findings, so that we will temporarily digress to address this issue.

6.2 List-Processing Strategies vs. True Memory Errors. There seem to be two very general strategies employed when subjects memorize lists of sentences (Mehler, personal communication). One would be formal processing strategies, i.e. list-processing operations which result in immediate, faulty perception of sentences as a result of an attempt to minimize the information load. Thus, subjects, in listening to lists of sentences, quickly come to discern the structure of the list, and devise strategies which enable them to focus on what they consider to be the most important information, while ignoring or falsely categorizing, other information which they consider redundant, or unimportant. Mehler calls these "computation errors," errors which are due to general information processing strategies; strategies not specific to any particular list and as such not reflective of the nature of the linguistic material being studied.

It is obvious that general linguistic knowledge must be present in encoding and decoding sets of sentences, for example, recognizing differences between nouns, verbs and adjectives; or similarities between two lexical items from the same grammatical category; being cognizant of the overall syntactic structure of a sentence or a set of sentences;

recognizing positive compared to negative statements, or sentences in the active or passive voice, and so on. However, assuming the presence of general linguistic knowledge, subjects using list-processing strategies are impervious to the specific linguistic content of the list, for example, ignoring the information conveyed by syntactic form if it is not central to the requirements of the task.

The errors resulting from these formal processing strategies are contrasted with "true memory errors," i.e. errors which do reflect specific linguistic properties of the material being recalled. In this case, initial processing of the list results in an isomorphic representation of the original input, but, upon retrieval, there are intrinsic memory mechanisms (such as integration of information with previous knowledge) which will result in distortions in reconstructing the sentence.

6.2.1 List-Processing Strategies. Subjects in the present study clearly utilized list-processing strategies which were inferable from their recall patterns. Evidence for this showed up in a number of indirect ways: first, subjects seemed to quickly realize that the basic structure of the list contained four similar sentences, and one different sentence which was last: if they recalled the filler sentence, it was invariably correct. Furthermore, they seemed to know that in a sequence of four sentences, the same adjective was never repeated, and different

dimensions were used. Thus, if subjects forgot the particular adjective, their substitutions were minor ones (for example, semantically appropriate responses) while they almost never substituted another dimensional term, or repeated an adjective or its antonym in a block of sentences. They also appeared to realize that there were basically two syntactic forms of importance, and gave relatively few substitutions of other syntactic forms, aside from very similar ones, such as the equative or negative comparative. There were indications that the children also recognized, at least intuitively, that the nouns in the sentences fell into different classes related to the dimension in specific ways. This became evident in an analysis of noun substitution errors, which were frequently from the same semantic class as the noun which was substituted (e.g. substitution of "worm" for "turtle"), even though two nouns from the same semantic class for a dimension never appeared in the same block. Subjects rarely crossed categories in substituting nouns, and for the one or two instances in which they did, substitutions were made on the basis of a polarity principle (e.g. "the ant isn't as fast as the rocket"). Therefore, the children seemed to be implicitly aware of a polarity principle, even though they never verbalized it, and possibly would not have admitted to recognizing it even if asked.

One list-processing strategy applied to the main items

which seemed to be retained from sentences: the subject noun (more than 60% of the unacceptable reconstruction errors had the correct subject noun); the surface order of the two nouns, and the underlying dimension. Another list-processing strategy was to ignore both the original relationship between the terms on the dimension, and the original syntactic form. An analysis suggested by Tieman (1972) revealed that subjects preserve the surface order of nouns over preserving the relationship between the terms, or preserving the adjective. Tieman attributed this pattern to a verbatim-recall set, as he did not find it to be the case for recognition memory. Pairs of nouns in sentences whose original relationship was preserved were those which coincided with the children's preconceptions about the relative position of the terms, their judgments having been independently obtained in a separate study.[1]

6.2.2 True Memory Errors. For the following reasons, it is unlikely that list-processing strategies such as those detailed above accounted for the pattern of reconstruction errors due to the interaction between noun polarity and adjective markedness. 1) There were no noun category differences for verbatim recall, whereas if Ss had employed a strategy to attend only to congruent relationships between adjectives and nouns, or to misperceive an incongruent noun-adjective relationship, such differences would have been observed. 2) No attentional bias was seen

in the types of presented sentences which were remembered; i.e. there was no interaction between noun category and sentence type for presented sentences. 3) Even though there was a strong tendency to retain the original adjective, there were noun category differences between marked adjective retention and unmarked adjective retention for reconstruction errors. Since the selection of adjectives on the basis of the polarity of the nouns had to compete with an adjective retention set, the noun-adjective interaction, while operating within a very limited range, was all the stronger. 4) While absolute differences in recall were great between the three noun categories (a finding which will be discussed in a subsequent section), the patterns of marked vs. unmarked adjective recall within categories were as predicted. On the basis of the foregoing discussion, it seems reasonable to assume that subjects do use their knowledge about class norms and the position of objects on a dimension relative to these norms to select relative adjectives in recall, if the exact form of the original sentence has been forgotten. The results cannot be satisfactorily explained by invoking formal list-processing strategies alone.

Before considering the implications of the present findings for a theory of adjective markedness in comparative sentence reconstruction in particular, and the processing of comparative relations in general, one final aspect of the

data referred to above, requires explication. This was the unanticipated finding of sizable differences between noun categories in absolute amount of recall.

6.3 Recall Differences Between Noun Categories. If one were to predict any differences between noun categories at all, it would be plausible to expect nouns in the +Pol category to be better recalled, analagous to the unmarked adjective bias in recall, and the -Pol noun category to show the least overall amount of recall. This, however, was not the case. In fact, the negative pole noun category had the highest amount of absolute recall, while the neutral noun category had by far the lowest amount of absolute recall. We will examine four hypotheses which could be invoked to explain the recall differences between noun categories: 1) differences in word frequency counts for nouns in the three categories; 2) differences in the "semantic integration" of sentences from the three categories; 3) differential attention paid to some noun-adjective pairs in the three noun categories; 4) biasing factors in the original noun selection procedures, leading to a stronger relationship between adjectives and nouns for some noun categories.

An inspection of the Thorndike-Lorge word frequency count indicated that the category differences in absolute amount of sentence recall may have been the result of the differential frequency of words in one category compared to another, resulting in greater distinctiveness of the

least common words (see Appendix 3). The neutral words were far more common than were those in either of the other two categories, yet the neutral noun category had the lowest amount of absolute recall, while the nouns in the -Pol category were by far the least common, and showed the highest amount of recall.

A somewhat related explanation for noun-category recall differences might be based on the concept of "semantic integration" proposed by Rosenberg and Jarvella (1962). Semantically-well-integrated sentences (SWI) are those which contain lexical items that have many contextual features in common. Perhaps the neutral words in this study were less well recalled because their relation to the dimension was not as salient as that of the nouns in the other categories. The unit formed by the noun-adjective-noun triad, therefore, would be less semantically well-integrated in the neutral category than in the positive or negative pole noun categories.

This explanation still does not account for the differences found between the +Pol and the -Pol noun categories in absolute amount of recall. One could argue that the markedness asymmentry found in the +Pol noun category, where recall of the marked adjective was substantially decreased, was NOT found in the -Pol category as a function of differential attention to the sentences, leading to overall better recall in the latter noun category. This explanation is not

adequate, however, since an analysis of the presented sentences, i.e. all remembered sentences in their initially presented form, shows the identical pattern for each sentence type. That is, regardless of syntactic form, or adjective type, the order of absolute recall for noun categories was -Pol > +Pol > Neutral (see Table 16). Thus, superior recall of sentences in the -Pol category cannot be attributed to differential attention paid to marked adjectives in the negative pole noun category.

The above differences between noun categories in absolute amount of sentence recall can be explained, in part, as a function of the original noun selection procedure, leading to a more cohesive noun-adjective-noun triad for the -Pol category. If we examine the amount of absolute recall for the +Pol and -Pol categories for each dimension separately, the major between-category differences appear for the speed and evaluation dimensions, with small differences for the size dimension. The negative pole nouns were decidedly more difficult to obtain than the positive pole nouns in the speed dimension, so that when the nouns were finally obtained, their relationship to the dimension may have been more distinct, therefore better recalled. For the evaluative dimension, the negative pole nouns could have had strong affective connotations, and might have been better recalled on that basis. The small between-category differences for the size dimension may be accounted for by

the fact that positive and negative pole nouns were about equally easy to establish for this dimension.

Now that we have reviewed the major findings, and considered the possible memorial strategies employed by subjects, we are in a position to attempt to reconstitute the process by which the various components of comparative sentences (at least those which have been preserved for long-term storage, but not preserved in veridical form, and which have presumably been comprehended at a level sufficient to abstract out the important meaning-components), are reconstructed in recall.

6.4 The Reconstruction of Comparative Sentences in Recall. As a result of a list-processing strategy, the two nouns and their surface positions would be retained in memory fairly well, as would the dimension along which they were being compared. As a function of "intrinsic memory mechanisms," an implicit comparison of nouns with their reference classes on the dimension would be made, determining the polar or neutral value of nouns. Dependent on the subjects prior knowledge of, or expectations about the relative position of the two terms, the nouns would then be ordered in relation to one another on the dimension. The adjective would then be selected on the basis of the polar value of the nouns, operating conjointly with the preference for the unmarked adjective. Finally, the syntactic form would be selected which enabled the subject to best

express the previously determined relationships in the comparison.

It is the joint operation of adjective markedness and noun polarity value which still remains puzzling, however, particularly in terms of which component of a comparison will be strongest in determining the processing of comparative relations. What factors govern the relative importance of adjectives and nouns (objects and dimensions), not simply in memory, but in perceptual comparisons, or in attempts to communicate information about states of affairs? We will attempt to answer this question, in part, by considering the available literature which exists bearing on the subject.

6.5 Factors Governing Markedness Asymmetry.

6.5.1 A Comparison with Other Studies.

The results reported above (i.e. the noun-polarity adjective-markedness interaction, in conjunction with the general superiority of the unmarked adjective) can be related to several studies of perceptual discrimination, a parallel first noted by Clark et al. (1969; 1973). While these were not psycholinguistic investigations, per se, the subjects in these studies were required to compare two stimuli, given instructions containing either the marked or the unmarked adjective. In some of these studies, the markedness asymmetry was not found, while in others it was. A brief comparison of the results of these investigations with the present findings may shed some light on those conditions in

which the unmarked adjective remains dominant compared to those which must prevail for the markedness asymmetry to disappear completely.

In the earliest investigation of this kind, Shipley, Norris and Roberts (1946) reported that subjects responded faster when asked to choose the "least" preferred of two unpreferred colors in a paired comparison, than when the stimuli to be judged were two preferred colors. They concluded that subjects tended to react more rapidly when stimuli possessed the characteristic which they had been set to respond to. It was not possible to determine from their data, however, whether an independent bias existed for instructions with "more preferred" paired with the more preferred colors, compared to instructions with "less preferred" paired with the less preferred colors.

Audley and Wallis (1964) presented pairs of lights differing in intensity and asked subjects to choose the "lighter" or "darker" of the two lights. The lights were either absolutely bright or absolutely dark. While they found a "congruity" or "cross-over effect," namely, that it was easier to choose the brighter of two bright lights and the darker of two dark lights, the magnitude of this interaction depended on the background illumination. Differences between responses to the questions "which is darker?" (marked adjective) and "which is lighter?" (unmarked adjective) depended upon the relationship between the brightness of the

lights and the background illumination. Given a dark background, reaction times to the dark lights were equal for questions containing marked or unmarked adjectives, while both these reaction times were slower than reaction times to questions about the relative brightness of two bright lights. In this case the markedness asymmetry was not eliminated. However, given an even gray background a true cross-over effect was obtained, with no markedness asymmetry evident. With the gray background, presumably, the quality of "darkness" for the dark lines was as salient as the quality of "lightness" for the bright lines--i.e. the stimuli possessed the characteristic which subjects were set to respond to by the question. This finding of a cross-over effect was replicated for pairs of high and low tones (Wallis and Audley, 1964) and for judgments of relative age of pairs of children, or pairs of adults (Ellis, 1972).

Marks (1972) extended the above paradigm to judgments of the relative probabilities of either two probable or two improbable statements. He found both the cross-over effects as well as a markedness asymmetry. Subjects were asked questions of the sort "Which is most/least likely?" "It will snow in Sheffield next June - July" (low probability); or "It will snow in Sheffield next February-January" (high probability). Judgments with "least likely" questions were faster for improbable than probable statements, but not significantly so, while judgments with "most likely" questions

were faster for probable statements, as well as being faster, on the whole, than questions with "least likely." Great variation was found, however, depending upon the specific question asked, perhaps as a function of the type of knowledge required of Ss, the underlying dimensions involved the statement, and the actual polarity values of the probable and improbable statements (interpretations which were not considered by Marks).

In the present study, it will be remembered, the markedness asymmetry was eliminated for negative-equative sentences, and for contrastive adjectives. What is interesting, when all the studies are viewed together, is that whether or not the markedness asymmetry was eliminated, the gradient of the curve for the unmarked adjective was steeper than for the marked adjective, i.e. the interaction was more pronounced for the unmarked adjective. Therefore, we are still left with the necessity of accounting for the dominance of the unmarked adjective.

6.5.2 Markedness Asymmetry: An Empirical Generalization. We can propose the following empirical generalization about the presence or absence of a markedness asymmetry in the psychological processing of compared stimuli based on the above analyses:

> There is an inverse relationship between the degree of attribution of a quality designated by the marked adjective to a set of stimuli, and the presence of a markedness asymmetry in the processing of relative adjectives comparing these stimuli on that quality.

The variables which, to date, appear to increase attribution are: 1) perceptual comparisons of stimuli, which seem to allow for more effective manipulation of stimuli on a dimension than strictly linguistic comparisons; 2) contrastive adjectives which appear to be more effective than relative adjectives in attributing the quality to the object or noun; 3) syntactic forms, such as the negative-equative which emphasize the quality of the nouns being compared; 4) situations which allow subjects to code, construct, or reconstruct the comparison in their own terms. These are, undoubtedly, but a few of the important parameters governing the "cross-over effect" (for example, the topic of comparison; the larger conversational context being other possible variables of significance). Nevertheless, there is no question that unless conditions are such that the attribute designated by the marked adjective is clearly present in the stimuli being compared, the unmarked adjective will be easier to understand and remember. The following theory will be proposed to account for and to extend these observations.

6.6 The Markedness Distinction Reconsidered. Three aspects of the psychological distinction between marked and unmarked adjectives appear to be important in determining which term will be easier to process, or preferred in use. These are: 1) the neutral vs. the contrastive meaning of the terms; 2) the implicit positive or negative feature of meaning in the adjectives; 3) the context in which the

adjectives appear, which serves as a background for encoding or decoding the relative term.

We have seen that both marked and unmarked adjectives can be used neutrally when a relative judgment is expressed in the positive comparative ("-er") form (e.g. the elephant is bigger/smaller than the hippopotamus; the bee is bigger/smaller than the fly). Most likely, a relative adjective will be used neutrally in a comparison unless there is some compelling reason to use it contrastively. In neutral usage, unmarked adjectives will tend to be preferred, or easier to process, because of their implicit positivity; either representing greater extent along the dimension (or the relative presence of a property) in the case of spatial terms, or possessing a positive "affective" component in the case of contrastive adjectives (e.g. good/bad).

If, however, the items being compared possess the attribute depicted by the marked adjective to a notable degree, this may influence the extent to which a marked adjective is used or understood in its comparative form, since the context provides the "natural" setting for expressing the comparison in terms of "lesser extent along a dimension" (or the relative absence of a property). In such a case, the negative meaning component of marked adjectives has an appropriate setting in which to occur.

There are a number of ways of expressing relative judgments, however, in which the marked adjective can only

be interpreted contrastively, while the unmarked adjective can be interpreted either contrastively or neutrally, one example of which is the negative-equative sentence type. In such cases, the intent to convey contextual information derived from a perceptual array, or from knowledge of the position of the terms along the dimension of comparison if no perceptual array is present, may become the primary determinant of which term will be used, and in the case of the unmarked adjective, whether it will be used in its neutral or contrastive sense. The recognition of such communicative intent would presumably be important in understanding and evaluating the information. It is ordinarily difficult to determine whether an unmarked adjective in negative-equative forms is being used contrastively or neutrally unless the context provides predominantly one meaning for the unmarked adjective (as when comparing two negatively polar items).

In the case of a purely linguistic context, the use of a contrastive meaning may convey information about properties of the objects in addition to their positions relative to one another along the dimension (e.g. the speck of dust isn't as small as the grain of sand). However, the unmarked term can be used in its neutral sense with negatively polar nouns in the negative-equative form (e.g. "the fly isn't as big as the bee"), perhaps to specify the focus of the comparison as defined by the previous context of discourse.

6.7 Questions for Future Research. The problem studied here is obviously only part of a much larger concern with the influence of contextual information and knowledge about the world on language processing and language acquisition. We have attempted to illustrate the importance of a contextual approach to dimensional terms. We have no clarity as yet about the number, or contribution, of other potential contextual variables influencing the processing and acquisition of dimensional terms. One important area of exploration might be the specific situational requirements of comparative judgments. As Donaldson and Wales (1970) have commented, "comparative constructions can only be interpreted with reference to some attribute of a given context." Do speakers in using comparative terms employ strategies similar to the ones found here in recall and, if so, under what usage conditions? Are our findings specific to the recall task, or do they apply more generally to other types of tasks, such as recognition memory; memory for perceptual comparisons, descriptions of states of affairs, and comprehension, just to name a few.

The theoretical status of marked and unmarked adjectives remains unsettled. Further empirical support is needed for the position set forth in the introductory chapter, that unmarked adjectives possess a positive feature to their meaning, while marked adjectives possess a negative feature to their meaning. Developmental data is required

concerning the acquisition rate of contrastive vs. nominal meanings of unmarked and marked adjectives. We also need additional data about the parameters of the noun-adjective interaction in comparisons, i.e. under what conditions can we accurately predict the relative strengths of adjective markedness compared to noun polarity values when the two are in conflict (as, for example, the sentences in this study containing nouns from the -Pol category paired with the unmarked adjective, or sentences comparing nouns with different polarity values, such as "the elephant isn't as small as the mouse").

We have found that children by the age of six possess and make use of much semantic information inherent in comparative terms. Would any major developmental changes in recall patterns be evident, however, if we expanded the age-range under investigation? In what manner do children first acquire such knowledge of object-dimension relationships; for generic and non-generic terms, for different semantic domains, and for different types of dimensions? Are relational terms initially context-bound, for example, and if so, by what process does the concept of a dimension become abstracted out from its specific contexts? In spite of the numerous questions remaining, or, perhaps, in view of them, the study of comparative terms does indeed appear to promise to contribute substantially to our knowledge of semantic development, and to contextual influences on language comprehension and language use.

SUMMARY AND CONCLUSIONS

The present study has focused on three related issues concerning the determinants of relative adjective recall in comparative sentences: 1) the theoretical basis for the pervasive finding of a markedness asymmetry in processing relative adjectives; 2) the extent to which varied linguistic contexts can modify the markedness asymmetry; 3) developmental differences in utilization of the semantic information necessary for the operation of linguistic context.

Critical analysis of semantic feature complexity theory (Clark and Card) led to a rejection of the hypothesis that unmarked adjectives are semantically less complex in their feature structure than marked adjectives. Rather, marked and unmarked adjectives were both considered to have neutral as well as contrastive interpretations in comparative sentences. The primary empirical support for semantic feature complexity theory, namely that marked adjectives tended to be recalled as their unmarked counterparts significantly more than the reverse, was also challenged.

It was proposed that the linguistic context of relative adjectives in comparative constructions was important in determining the nature of antonymous adjective recall. Linguistic context was defined specifically as variation in the location of the two nouns being compared along the dimension

specified by the relative adjective. The operation of linguistic context was considered to be a function of an individual's semantic knowledge of the object-dimension relationship inherent in the comparison, in particular the determination of natural reference classes for objects which establish the locational value of the nouns on the dimension. It was expected that in a memory task, selection of the marked or unmarked adjective in sentence reconstruction would depend upon the polarity value of the compared nouns on the dimension (i.e. the extent to which the attribute designated by the adjective was a property of the object designated by the noun), since both attributive as well as relative information would be expressed with congruent adjective-markedness-noun polarity relationships. Aspects of comparison which further enhanced the attributive relationship, namely the negative-equative sentence form and contrastive adjectives were expected to magnify the effects of linguistic context. If the compared nouns were neutral with respect to a locational value on the dimension, it was predicted that the markedness asymmetry would be evident, in keeping with the theoretical position that marked adjectives possess a negative feature to their meaning and as such are more difficult to process psychologically than unmarked adjectives which possess a positive feature to their meaning. Contrary to semantic feature complexity theory, the antonym error bias in recall was anticipated only for the polar noun

categories but not for the neutral category, and the direction of adjective change was expected to be different for the +Pol and -Pol categories.

Developmental differences in the utilization of the semantic information requisite to providing for the operation of linguistic context were hypothesized, since reference classes for objects on dimensions which were not yet fully established were considered to be potentially less stable. As such, younger children were not expected to show the effects of linguistic context to the extent that older children were.

To test these hypotheses, children in first, third and fifth grades were presented with blocks of comparative sentences for immediate or delayed recall. Each sentence consisted of two nouns, independently judged to have positive polarity, negative polarity, or to be neutral with respect to a dimension, compared by a marked or an unmarked adjective, in a positive-comparative or negative-equative sentence frame. A separate study was conducted to determine children's preconceptions about the position of the two nouns relative to one another. These preconceptions were shown to be the primary determinant of whether the presented relationship between the nouns was retained or changed in recall.

The results, in general, confirmed the prediction that linguistic context would determine adjective selection in

sentence reconstruction. Recall of the unmarked adjective was highest for sentences containing +Pol nouns and lowest for sentences containing -Pol nouns, while recall of the marked adjective was highest for -Pol nouns and lowest for +Pol nouns, This finding was primarily due to sentence reconstruction errors, and not to sentences recalled verbatim: one indication that the effects were truly a function of intrinsic memory mechanisms and not an initial attentional bias.

As predicted, the neutral noun category showed overall better recall for the unmarked adjective. The effects of linguistic context were, as hypothesized, greatest for negative-equative sentences and for contrastive adjectives.

The empirical support for semantic feature complexity theory was rejected on the basis of the finding that a significant directional antonym error bias toward the unmarked adjective was apparent only for the +Pol noun category. When an adjective was changed to its antonym, however, the polarity value of the nouns determined whether it would be recoded in neutral or contrastive form (i.e. whether it would be recalled in a comparative or negative-equative form).

No developmental changes in patterns of recall were evident, even though the amount of recall increased monotonically with age, leading to the conclusion that once reference classes for objects on a dimension are established,

the operation of contextual information in memory is apparent regardless of age differences.

An analysis of related studies of perceptual comparisons, in conjunction with the findings of the present study, led to the formulation of an empirical generalization stating that an inverse relationship obtains between the degree of attribution of the quality designated by the marked adjective to compared nouns, and the presence of a markedness asymmetry in the relative adjectives comparing the nouns on that quality.

A reformulation of the theory of markedness as applied to psychological processing of antonymous adjectives was proposed. Three aspects were considered to be of importance in determining which terms would be easier to process, or preferred in use: 1) the neutral vs. the contrastive interpretation of relative adjectives; 2) the positive-negative feature of unmarked-marked adjectives; 3) the context within which the adjective appears, which serves as a background for encoding or decoding the relative adjective. The relationship between these three variables appeared to account for the major findings concerning marked and unmarked adjectives to date.

TABLE 1.--Data Matrix: Presented and Recalled Sentences for Sentence Types[1,2]: Absolute Number of Sentences Recalled Over Grades, Noun Categories and Dimensions[3]

	Recalled Sentence	Presented Sentence 1:CU X is bigger than Y	2:CM Y is smaller than X	3:NEU Y isn't as big as X	4:NEM X isn't as small as Y	TOTALS
Meaning Retained	1:CU X is bigger than Y	365	12	26	54	457
	2:CM Y is smaller than X	11	298	70	13	392
	3:NEU Y isn't as big as X	12	42	286	8	348
	4:NEM X isn't as small as Y	11	6	1	247	265
	SUBTOTALS	399	358	383	322	1462
Meaning Changed[4]	1':CU Y is bigger than X	13	31	44	5	93
	2':CM X is smaller than Y	12	14	3	42	71
	3':NEU X isn't as big as Y	20	2	5	34	61
	4':NEM Y isn't as small as X	1	28	15	5	49
	SUBTOTALS	46	75	67	86	274
	TOTALS	445	433	450	408	1736

[1]The adjectives 'big' and 'small' are used as examples representing unmarked and marked adjectives, respectively.

[2]There were 4 sentence types:
CU=Comparative, Unmarked Adjective (e.g., X is bigger than Y);
CM=Comparative, Marked Adjective (e.g., Y is smaller than X);
NEU=Negative-Equative, Unmarked Adjective (e.g., X isn't as small as Y);
NEM=Negative-Equative, Marked Adjective (e.g. Y isn't as big as X).

[3]Each subject received a total of 48 different sentences: 12 with the positive comparative with the unmarked adjective; 12 with the positive comparative with the marked adjective; 12 with the negative equative with the unmarked adjective and 12 with the negative-equative with the marked adjective. Therefore, the combined score for each sentence type has a total of 1152 possible data points, (12 x 96 subjects).

[4]The relationships between the nouns are reversed. For example, 1'CU, Y is bigger than X.

TABLE 2.--Types of Acceptable Sentence Errors (ASE): Absolute Number of Sentences Recalled Over All Conditions

Acceptable Sentence Error Recall

Type	Meaning-Preserving Errors	# Recalled	% ASE Recall
1[a]	Change Syntax, Adjective	177	.33
2	Change Syntax, Reverse Terms	57	.11
3[1][b]	Change Adjective, Reverse Terms	32	.06
	SUBTOTAL	266	
	Meaning-Changing Errors		
4	Change Syntax	134	.25
5[2][c]	Change Adjective	92	.17
6[3]	Reverse Terms	37	.07
7[d]	Reverse Terms, Change Syntax, Change Adjective	11	.02
	SUBTOTAL	274	
	TOTAL ERRORS	540	
Verbatim Recall		1196	
Total Recall		1736	
Total Possible Recall*		4608	

1 Type 3 represents Tieman's M-errors (preserve meaning)
2 Type 5 represents Tieman's NO-errors (preserve noun order)
3 Type 6 represents Tieman's A-errors (preserve adjective)

a,b,c,d represent ANTONYM errors

*Each subject received a total of 48 sentences. The total possible number of sentences, therefore, is derived by multiplying the number of Ss (96) by the total number of sentences per S (48).

TABLE 3.--Data Matrix: Presented and Recalled Sentences for Dimensions by Adjective Markedness and Grade. Absolute Number of Sentences Recalled Over Noun Categories[1]

Recalled Adjective	Size Dimension			Speed Dimension			Evaluation Dimension			Height Dimension		
	Presented		Adj.	Presented		Adj.	Presented		Adj.	Presented		Adj.
	Unmkd[2] BIG	Mkd[2] SMALL	Tot	Unmkd FAST	Mkd SLOW	Tot	Unmkd GOOD	Mkd BAD	Tot	Unmkd HIGH	Mkd LOW	Tot
1st Grade (N=32)												
Unmkd	43	16	59	62	18	80	54	5	59	31	9	40
Mkd	8	45	53	8	35	43	8	59	67	8	39	47
3rd Grade (N=32)												
Unmkd	61	19	80	78	17	95	79	4	83	40	14	54
Mkd	13	44	57	9	48	57	8	61	69	11	51	62
5th Grade (N=32)												
Unmkd	79	27	106	90	24	114	86	17	103	68	18	86
Mkd	10	59	69	14	71	85	15	83	98	12	58	70
Over Grades (N=96)												
Unmkd	183	62	245	230	59	289	219	26	245	139	41	180
Mkd	31	148	179	31	154	185	31	203	234	31	148	179
Total	214	210	424	261	213	474	250	229	479	170	189	359

[1]Each subject received a total of 48 different sentences; 24 with the unmarked adjective and 24 with the marked adjective. Therefore there were 6 sentences per subject for the unmarked adjective for each dimension, and 6 sentences for the marked adjective for eachdimension. The combined score for each dimension for the unmarked adjective has a total of 192 possible data points (6 x 32 Ss), and 192 data points for the marked adjective.

[2]Unmkd=Unmarked; Mkd=marked. These abbreviations will be used throughout the remaining tables.

TABLE 4.--Data Matrix: Presented and Recalled Sentences for Dimensions, Including Semantically Appropriate Adjective Substitutions, by Adjective Markedness. Absolute Number of Sentences Recalled Over Noun Categories and Grades.

Recalled Adj.	Size Dimension			Speed Dimension			Evaluation Dimension			Height Dimension		
	Presented		Adj.	Presented		Adj.	Presented		Adj.	Presented		Adj.
	Unmkd BIG	Mkd SMALL	Tot	Unmkd FAST	Mkd SLOW	Tot	Unmkd GOOD	Mkd BAD	Tot	Unmkd HIGH	Mkd LOW	Tot
Unmkd	185	65	250	230	59	289	219	26	245	169	67	236
Mkd	32	155	187	31	156	185	31	203	234	47	147	194
Total	217	220	437	261	215	476	250	229	479	216	214	430

[1]Substitutions were considered semantically appropriate if BIG-SMALL or TALL-SHORT was recalled for HIGH-LOW; or if HIGH-LOW was recalled for BIG-SMALL.

TABLE 5.--Verbatim Recall and Acceptable Sentence Error Recall: Absolute Number of Sentences Recalled by Recall Conditions (Immediate and Delayed), Noun Categories and Adjective Markedness over Dimensions and Grades[1]

Verbatim Recall

	Immediate Recall			Delayed Recall		
	+Pol	-Pol	Ntrl	+Pol	-Pol	Ntrl
Unmkd. Adj.	136	116	94	98	123	84
Mkd. Adj.	99	114	72	91	116	53

Acceptable Sentence Error Recall

	Immediate Recall			Delayed Recall		
	+Pol	-Pol	Ntrl	+Pol	-Pol	Ntrl
Unmkd. Adj.	64	50	51	62	41	40
Mkd. Adj.	27	66	37	19	60	23

[1]Each subject received a total of 48 different sentences; 16 sentences per noun category, 8 sentences with the unmarked adjective, and 8 sentences with the marked adjective. There were a total of 768 possible sentences to be recalled for each noun category for the immediate recall condition (16 x 48 Ss) and 768 possible sentences to be recalled for each noun category for the delayed recall condition (16 x 48 Ss). There were a total of 1152 sentences to be recalled with the unmarked adjective, and 1152 with the marked adjective for each recall condition.

TABLE 6.--Analysis of Variance Summary Table for Verbatim Recall for Immediate and Delayed Recall Conditions by Sentence Type[1] and Noun Category for First Grade

Source	SS	df	MS	F
Between Subjects				
A (Recall Condition)	0	1	0	n.s.
S w. groups	87.52	30	2.92	
Within Subjects				
B (Noun Category)	7.31	2	3.66	6.31*
AB	.59	2	.30	n.s.
B x Ss w. groups	34.68	60	.58	
C (Sentence Type)	3.07	3	1.02	1.28
AC	.72	3	.24	n.s.
C x Ss w. groups	71.29	90	.79	
BC	1.81	6	.30	n.s.
ABC	2.66	6	.44	n.s.
BC x Ss w. groups	90.05	90	1.01	

*$p < .01$

[1]There were four sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective;
NEU=Negative-Equative with the Unmarked Adjective; and
NEM=Negative-Equative with the Marked Adjective.

TABLE 7.--Analysis of Variance Summary Table for Verbatim Recall for Immediate and Delayed Recall Conditions by Sentence Type[1] and Noun Category for Third Grade

Source	SS	df	MS	F
Between Subjects				
A (Recall Condition)	2.19	1	2.19	1.13 n.s.
S w. groups	58.04	30	1.93	
Within Subjects				
B (Noun Category)	11.46	2	5.73	8.43*
AB	3.36	2	1.68	2.47 n.s.
B x Ss w. groups	40.98	60	.68	
C (Sentence Type)	18.68	3	6.23	8.20*
AC	1.59	3	.53	.70 n.s.
C x Ss w. groups	68.48	90	.76	
BC	8.62	6	1.44	1.01 n.s.
ABC	4.14	6	.69	n.s.
BC x Ss w. groups	127.44	90	1.42	

*$p<.01$

[1]There were four sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective;
NEU=Negative-Equative with the Unmarked Adjective; and
NEM=Negative-Equative with the Marked Adjective.

TABLE 8.--Analysis of Variance Summary Table for Verbatim Recall for Immediate and Delayed Recall Conditions by Sentence Type[1] and Noun Category for Fifth Grade

Source	SS	df	MS	F
Between Subjects				
A (Recall Condition)	3.57	1	3.57	1.36 n.s.
S w. groups	78.91	30	2.63	
Within Subjects				
B (Noun Category)	22.66	2	11.33	16.19**
AB	1.00	2	.50	n.s.
B x Ss w. groups	42.17	60	.70	
C (Sentence Type)	8.90	3	2.97	2.80*
AC	.15	3	.05	n.s.
C x Ss w. groups	95.20	90	1.06	
BC	4.84	6	.81	n.s.
ABC	2.88	6	.48	n.s.
BC x Ss w. groups	119.78	90	1.33	

*p<.05
**p<.001

[1]There were four sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective;
NEU=Negative-Equative with the Unmarked Adjective; and
NEM=Negative-Equative with the Marked Adjective.

TABLE 9.--Analysis of Variance Summary Table for Total Acceptable Sentence Recall (TAS) by Grade, Noun Category and Adjective Markedness

Source	SS	df	MS	F
Between Subjects				
A (Grade)	212.34	2	106.17	16.56**
S w. groups	595.99	93	6.41	
Within Subjects				
B (Noun Category)	142.63	2	71.32	40.29**
AB	6.0	4	1.5	.85 n.s.
B x Ss w. groups	330.04	186	1.77	
C (Adjective Mkdness)	57.62	1	57.62	17.51**
AC	9.27	2	4.64	1.41 n.s.
C x Ss w. groups	306.11	93	3.29	
BC	62.73	2	31.37	13.18**
ABC	12.10	4	3.03	1.27 n.s.
BC x Ss w. groups	443.17	186	2.38	

**= $p<.001$

TABLE 10. Verbatim Recall and Acceptable Sentence Errors: Absolute Number of Sentences Recalled by Noun Category, and Adjective Markedness over Subjects, Dimensions and Syntactic Form[1]

	Verbatim Recall			
	Noun Categories			
	+Pol	-Pol	Neutral	Total
Unmarked Adjective	234	239	178	651
Marked Adjective	190	230	125	545
Total	424	469	303	1196
	Acceptable Sentence Error Recall			
	Noun Categories			
	+Pol	-Pol	Neutral	Total
Unmarked Adjective	126	91	91	308
Marked Adjective	46	126	60	232
Total	172	217	151	540

[1]Each subject received a total of 48 different sentences; 16 sentences per noun category, 8 with the unmarked adjective and 8 with the marked adjective. There were a total of 1536 possible sentences per noun category to be recalled (16 x 96 Ss), and a possible total of 2305 sentences to be recalled with the unmarked adjective, and 2305 with the marked adjective.

TABLE 11. ANOVA Summary Table for Recall of Presented Sentences (Column Totals of Tables 1-3) by Grade, Adjective Markedness, and Noun Category

Source	SS	df	MS	F
Between Subjects				
A (Grade)	212.34	2	106.17	16.59**
S w. groups	595.66	93	6.40	
Within Subjects				
B (Noun Category)	142.63	2	71.32	39.62**
AB	6.0	4	1.5	n.s.
B x Ss w. groups	335.37	186	1.8	
C (Adjective Mkdness)	5.17	1	5.17	3.31 n.s.
AC	5.18	2	2.59	1.66 n.s.
C x Ss w. groups	144.98	93	1.56	
BC	13.43	2	6.72	3.80*
ABC	4.81	4	1.20	n.s.
BC x Ss w. groups	328.43	186	1.77	

**$p<.001$
*$p<.05$

TABLE 12. ANOVA Summary Table for Verbatim Recall by Grade, Noun Category and Adjective Markedness

Source	SS	df	MS	F
Between Subjects				
A (Grade)	84.5	2	42.25	8.28***
S w. groups	474.47	93	5.10	
Within Subjects				
B (Noun Category)	76.78	2	38.39	28.86***
AB	4.8	4	1.2	n.s.
B x Ss w. groups	247.59	186	1.33	
C (Adjective Mkdness)	19.51	1	19.51	13.64***
AC	3.55	2	1.78	1.24 n.s.
C x Ss w. groups	133.28	93	1.43	
BC	5.62	2	2.81	1.86 n.s.
ABC	3.82	4	.96	n.s.
BC x Ss w. groups	280.72	186	1.51	

***p<.001
**p<.01
*p<.05

TABLE 13.--Data Matrix: Presented and Recalled Sentences for Adjective Markedness by Noun Category and Grade. Absolute Number of Sentences Recalled Over Dimension and Syntactic Form

Recalled Adjective		Positive Pole Noun Category			Negative Pole Noun Category			Neutral Noun Category		
		Presented Adjective			Presented Adjective			Presented Adjective		
		Unmkd	Mkd	Tot	Unmkd	Mkd	Tot	Unmkd	Mkd	Tot
1st Grade (N=32)	Unmarked	63	21	84	68	15	83	59	12	71
	Marked	6	63	69	18	74	92	8	41	49
3rd Grade (N=32)	Unmarked	95	23	118	89	19	108	74	12	86
	Marked	9	66	75	26	91	117	6	47	53
5th Grade (N=32)	Unmarked	115	43	158	117	22	139	91	21	112
	Marked	4	88	92	29	118	147	18	65	83
Over Grades (N=96)	Unmarked	273	87	360	274	56	330	224	45	269
	Marked	19	217	236	73	283	356	32	153	185

*Each subject received a total of 48 different sentences; 24 with the unmarked adjective and 24 with the marked adjective. Therefore there were 8 sentences per subject for the unmarked adjective for each category and 8 sentences with the marked adjective for each category. Therefore, the combined score for each category for the unmarked adjective has a total of 256 possible data points (8 x 32 Ss); for the marked adjective there is also a total of 256 data points.

TABLE 14.--Data Matrix: Presented and Recalled Sentences for Syntactic Forms Over Grades, Dimensions, Noun Categories, and Adjective Markedness

Recalled Sentence	Presented Sentence		
	Comparative	Negative-Equative	Total
Comparative	756	257	1013
Negative-Equative	122	601	723
Total	878	858	1736

Each subject received a total of 48 different sentences; 24 with the comparative form and 24 with the negative-equative form. Therefore, there were 2304 possible data points for the comparative form (24 x 96 Ss), and 2304 possible data points for the negative-equative form (24 x 96 Ss).

TABLE 15.--ANOVA Summary Table for Recall of Presented Sentences by Grade, Noun Category and Sentence Type

Source	SS	df	MS	F
Between Subjects				
A (Grade)	106.11	2	53.06	16.58**
S w. groups	297.83	93	3.20	
Within Subjects				
B (Noun Category)	71.25	2	35.63	39.96**
AB	3.06	4	.77	n.s.
B x Ss w. groups	167.69	186	.90	
C (Sentence Type)	3.66	3	1.22	1.61 n.s.
AC	5.15	6	.86	n.s.
C x Ss w. groups	213.29	279	.76	
BC	7.59	6	1.27	n.s.
ABC	13.97	12	1.16	n.s.
BC x Ss w. groups	472.44	558	.85	

*p<.001

[1]There were 4 sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective;
NEU=Negative Equative with the Unmarked Adjective;
NEM=Negative Equative with the Marked Adjective.

TABLE 16.--Verbatim Recall and Acceptable Sentence Error Recall: Absolute Number of Sentences Recalled by Adjective Markedness, Noun Category and Syntactic Form Over Grades and Dimensions

Verbatim Recall

	Comparative			Negative-Equative		
	Noun Categories			Noun Categories		
	+Pol	-Pol	Ntrl	+Pol	-Pol	Ntrl
Unmkd. Adj.	126	140	99	108	99	79
Mkd. Adj.	101	133	64	89	97	61
Total	227	273	163	197	196	139

Acceptable Sentence Error Recall

	Comparative			Negative-Equative		
	Noun Categories			Noun Categories		
	+Pol	-Pol	Ntrl	+Pol	-Pol	Ntrl
Unmkd. Adj.	63	67	55	63	24	36
Mkd. Adj.	37	81	46	9	45	14
Total	100	148	101	72	69	50

[1]Each subject received a total of 48 different sentences; 16 sentences per noun category, 8 in the comparative form, and 8 in the negative-equative form, with four sentences containing the unmarked adjective and four containing the marked adjective for each syntactic form. There were a total of 768 possible sentences to be recalled for each noun category and syntactic form (8 x 96 Ss), and a possible total of 1152 sentences to be recalled with the unmarked adjective, and 1152 with the marked adjective for each syntactic form.

TABLE 17.--ANOVA Summary Table for Verbatim Recall by Grade, Noun Category, and Sentence Type[1]

Source	SS	df	MS	F
Between Subjects				
A (Grade)	41.75	2	20.88	8.42***
S w. groups	230.22	93	2.48	
Within Subjects				
B (Noun Category)	38.88	2	19.44	29.59***
AB	2.55	4	.64	n.s.
B x Ss w. groups	122.24	186	.66	
C (Sentence Type)	25.19	3	8.40	9.88***
AC	5.46	6	.91	1.07 n.s.
C x Ss w. groups	237.44	279	.85	
BC	7.39	6	1.23	1.97 n.s.
ABC	7.89	12	.66	1.05 n.s.
BC x Ss w. groups	348.38	558	.62	

***p<.001

[1]There were four sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective;
NEU=Negative Equative with the Unmarked Adjective;
NEM=Negative Equative with the Marked Adjective.

TABLE 18.--Absolute Recall of Presented Sentences: Sentence Types[1] by Noun Category Over Grades and Dimensions[2]

	Noun Category		
	A	B	C
	Positive Pole Nouns	Negative Pole Nouns	Neutral Nouns
Sentence Type			
CU	148	172	125
CM	152	176	105
NEU	144	175	131
NEM	152	163	93

[1]There were four sentence types:
CU=Comparative with the Unmarked Adjective;
CM=Comparative with the Marked Adjective
NEU=Negative-Equative with the Unmarked Adjective, and
NEM=Negative Equative with the Marked Adjective.

[2]Each subject received a total of 48 sentences; 12 for each sentence type, 4 for each sentence type and noun category. There were therefore, a total of 384 possible sentences to be recalled for each sentence type within noun categories (4 x 96 Ss).

TABLE 19.--Absolute Recall of Sentences by Noun Category and Dimension, Over Grades, Syntactic Form and Adjective Markedness[1]

	Noun Category		
	A	B	C
	Positive Pole Nouns	Negative Pole Nouns	Neutral Nouns
Dimension			
Size	168	156	100
Speed	142	198	134
Evaluation	160	199	120
Height	126	133	100

[1]Each subject received a total of 48 sentences; 12 for each dimension, and 4 for each dimension and noun category. There were, therefore, a total of 384 possible sentences to be recalled for each dimension within noun categories (4 x 96 Ss.).

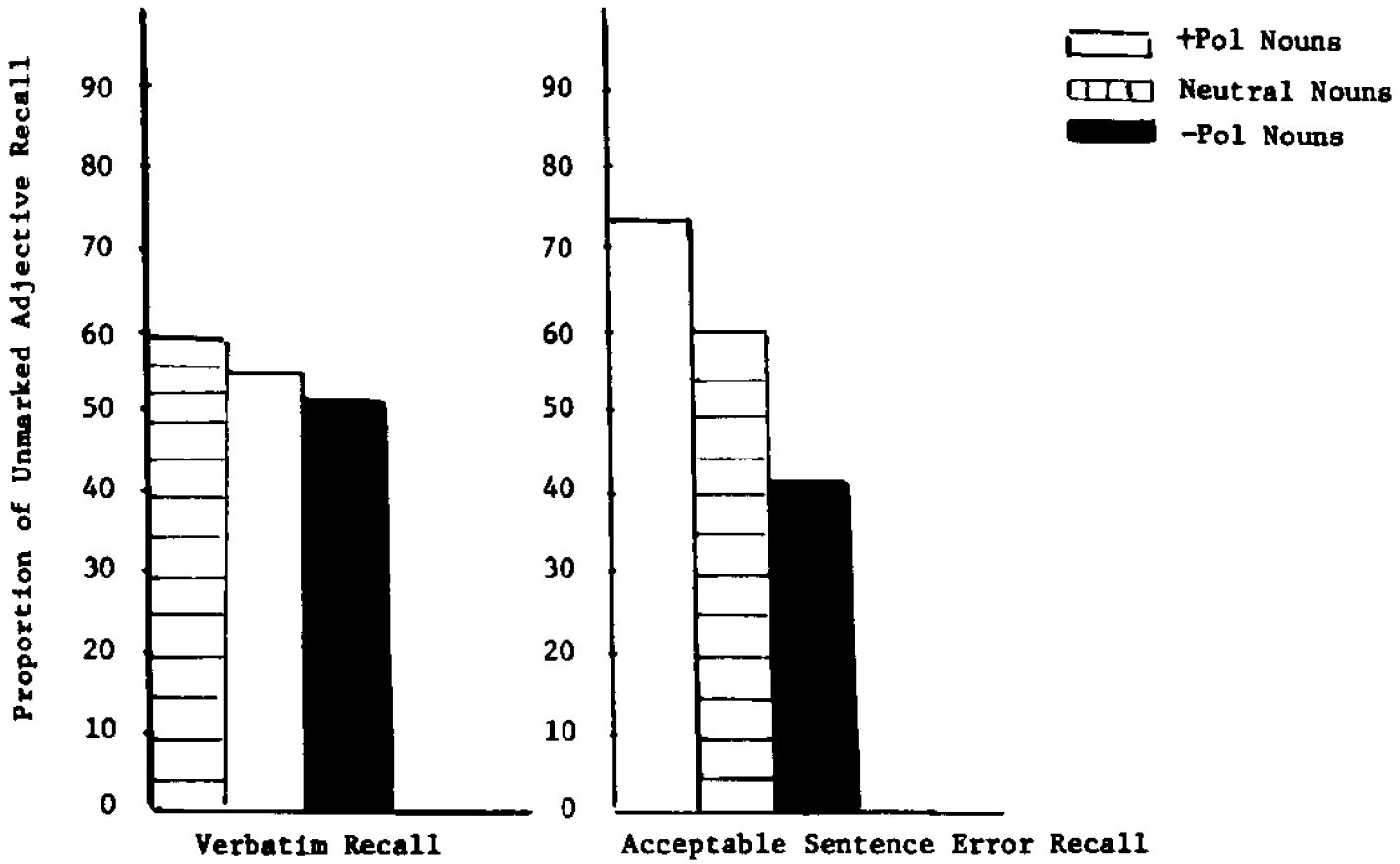


Fig. 1. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall by Noun Categories over Grades.

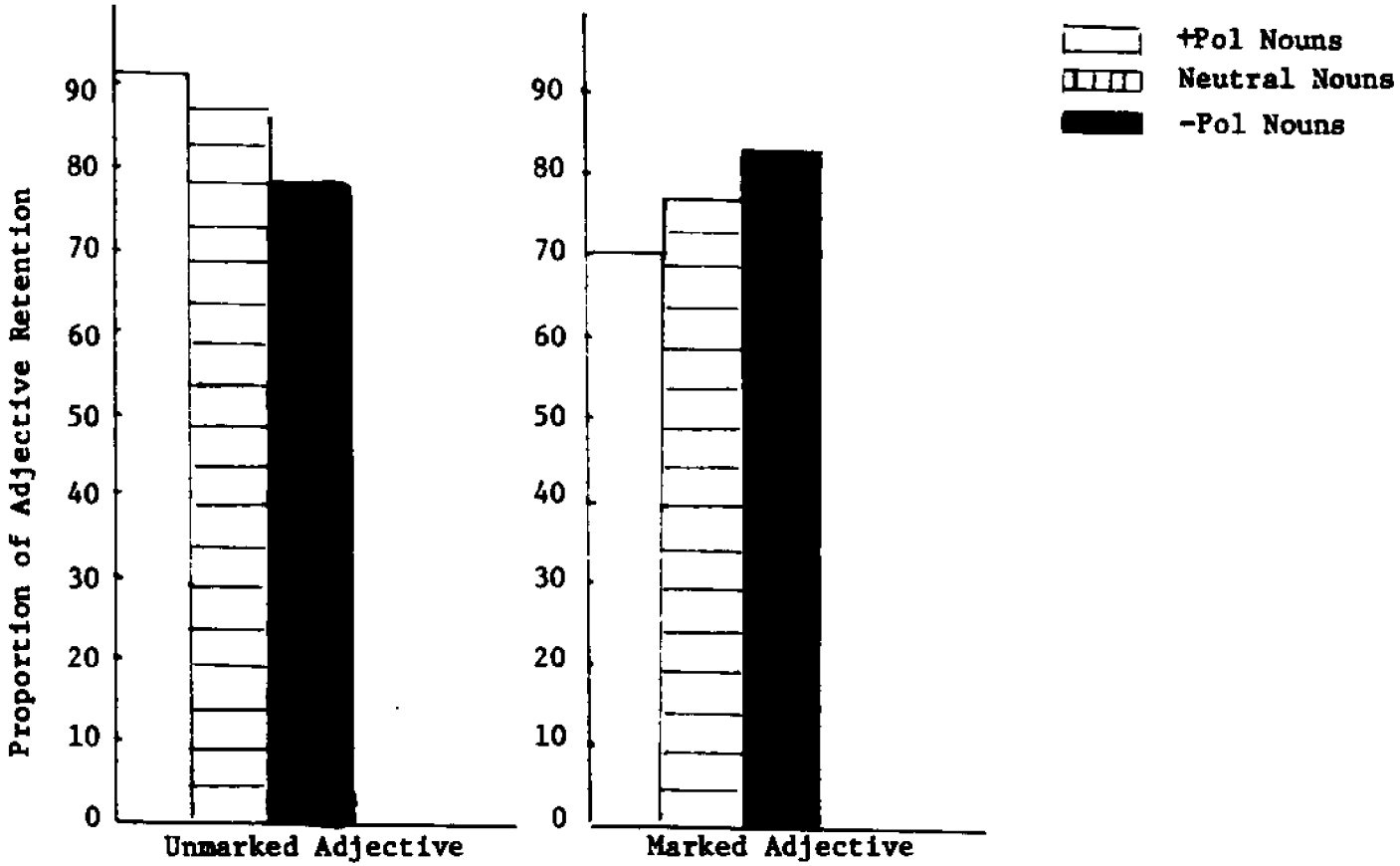


Fig. 2. Proportion of sentences retaining the original adjective: Marked and Unmarked adjectives presented separately by Noun Category over Grades.

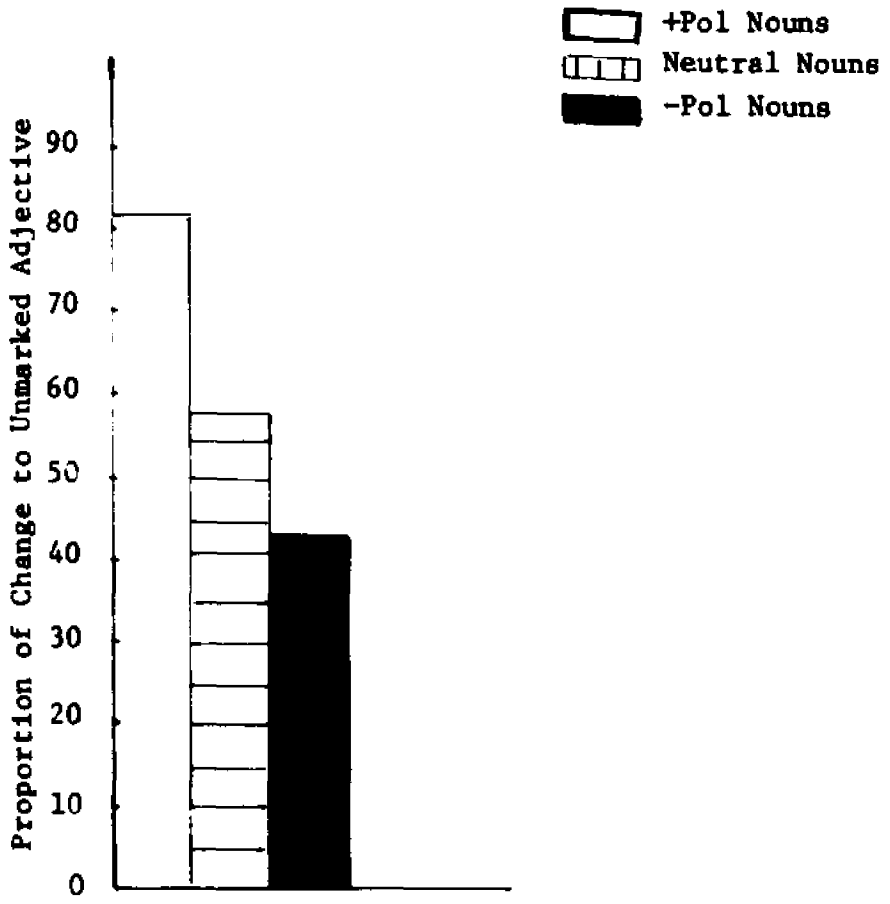


Fig. 3. Proportion of change from the Marked to the Unmarked Adjective out of all sentences in which the original adjective was changed to its antonym by Noun Categories over Grades.

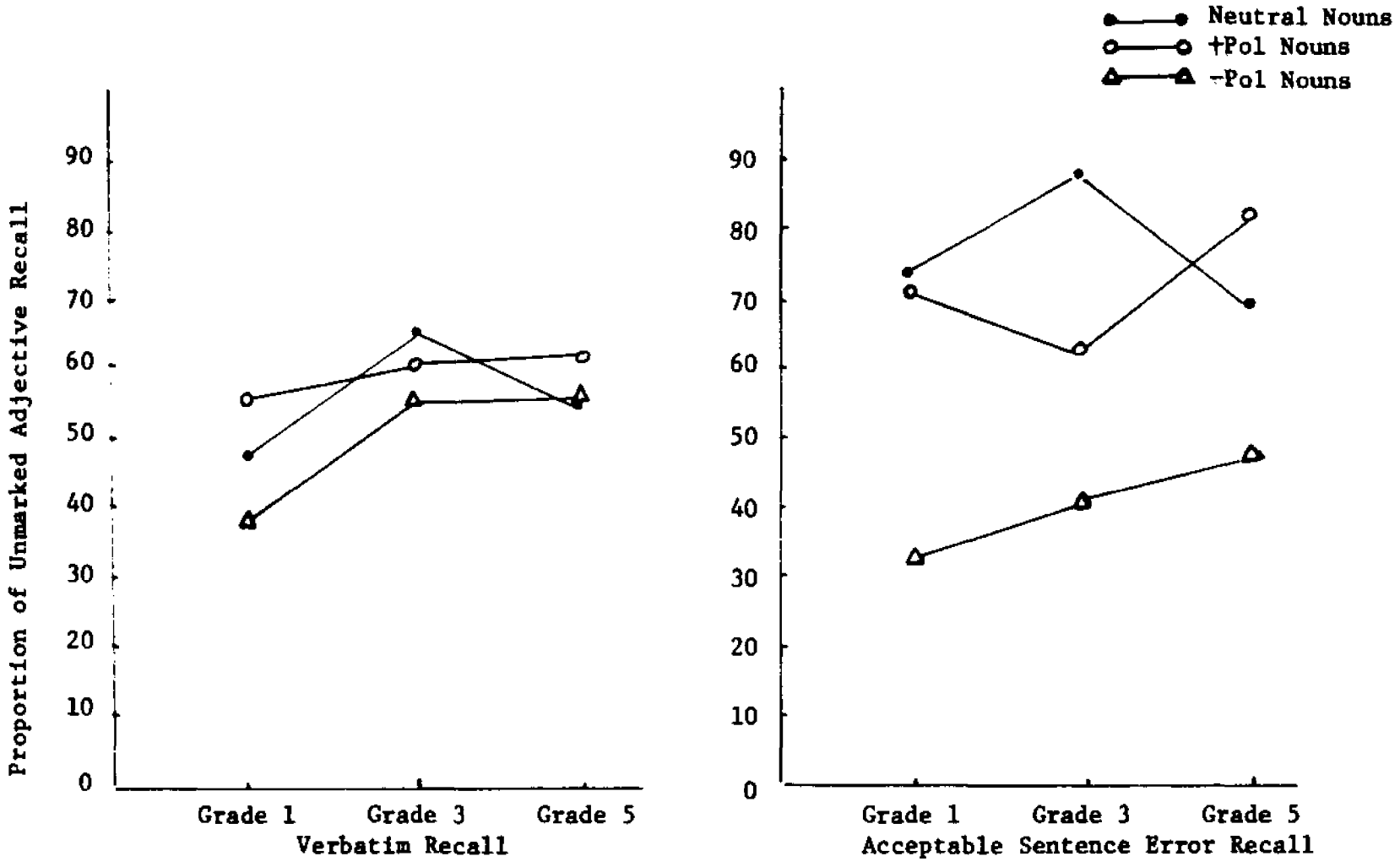


Fig. 4. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall for the Size dimension by Grade and Noun Category.

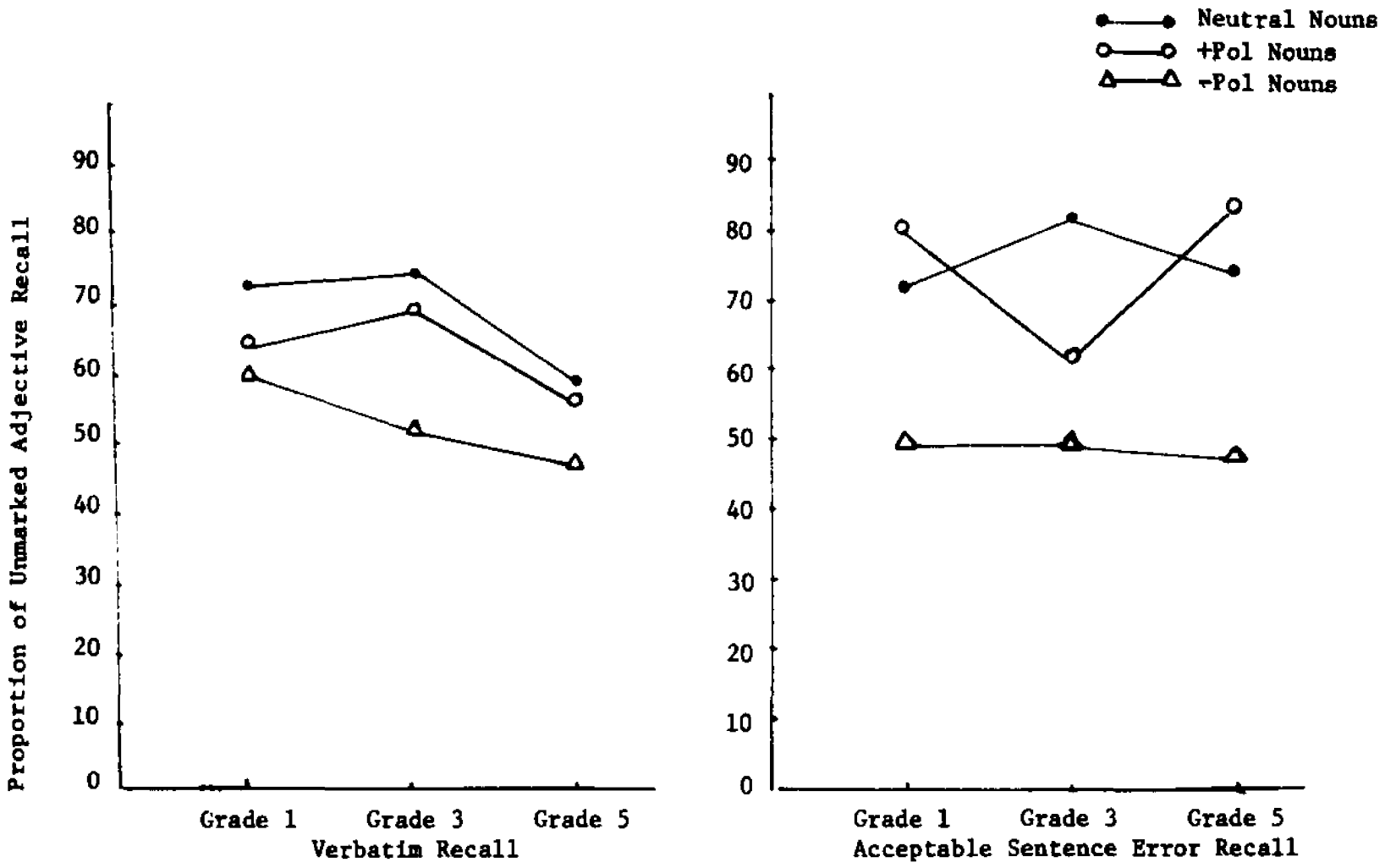


Fig. 5. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall on the Speed dimension by Grade and Noun Category.

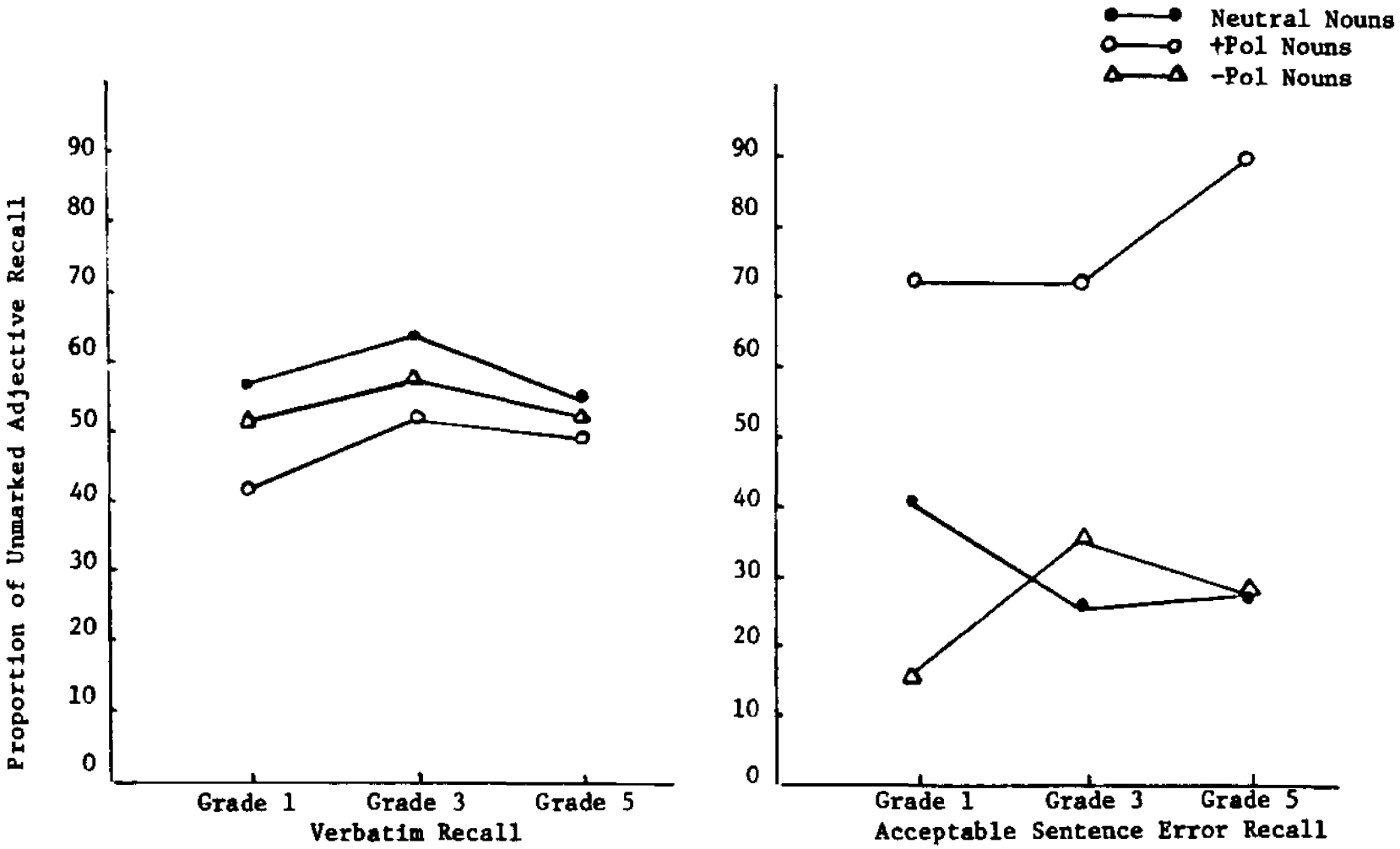


Fig. 6. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall on the Evaluation dimension by Grade and Noun Category.

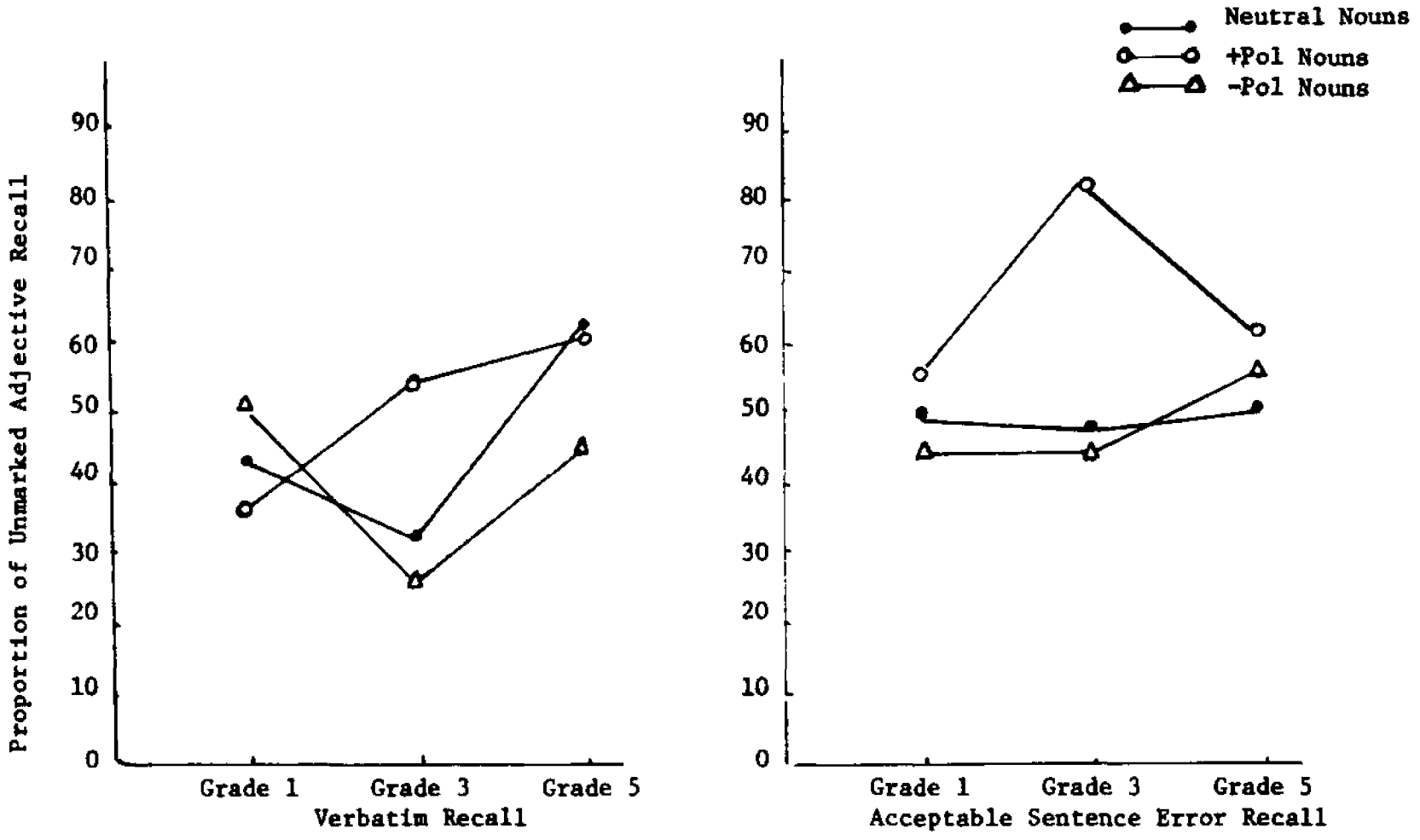


Fig. 7. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall on the Height dimension by Grade and Noun Category.

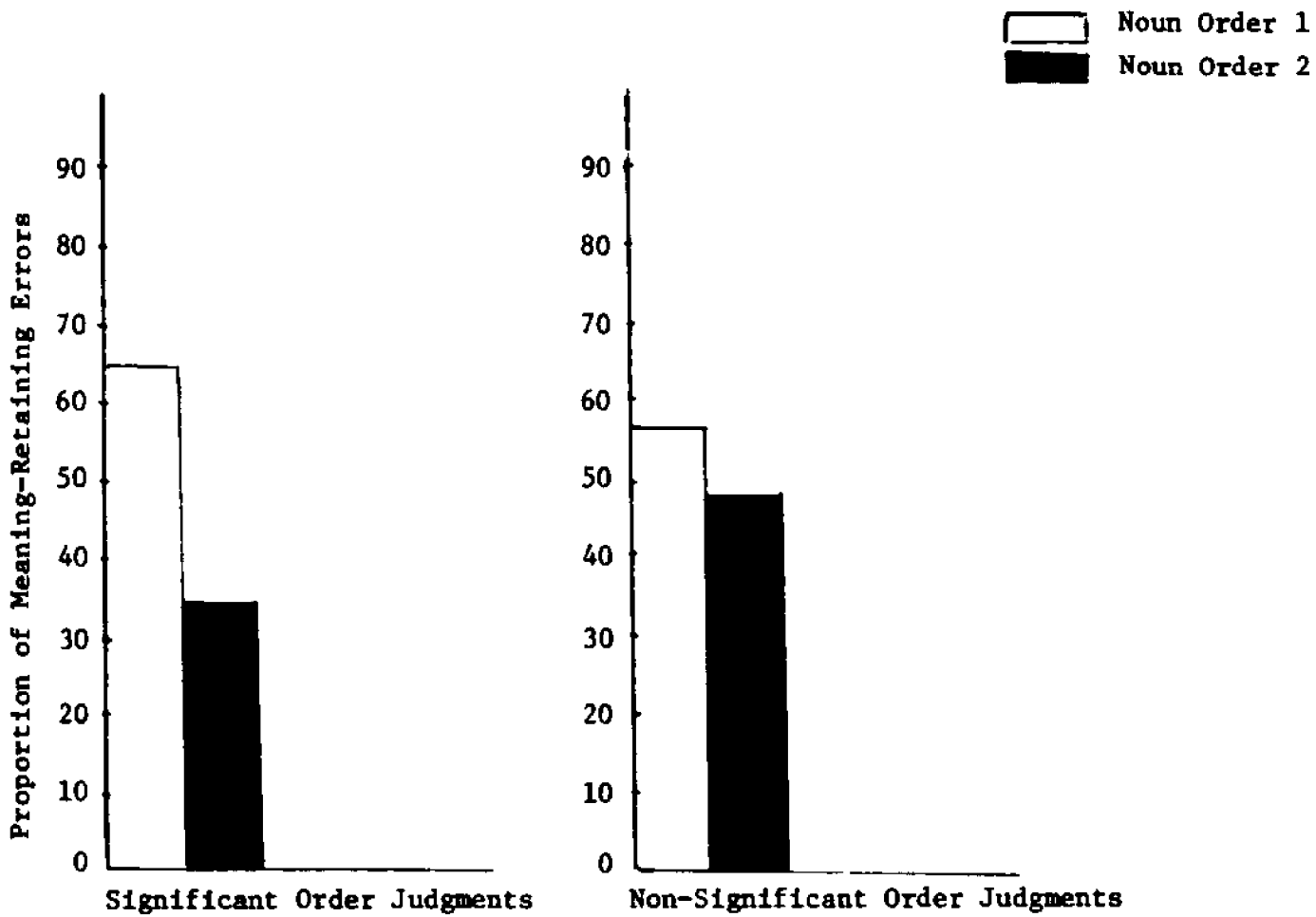


Fig. 8. Proportion of Meaning-Retaining Errors in recall for Noun Order 1 (Judged Noun Order) and Noun Order 2 (Reverse of Judged Noun Order) for Significant and Non-Significant Order Judgments.

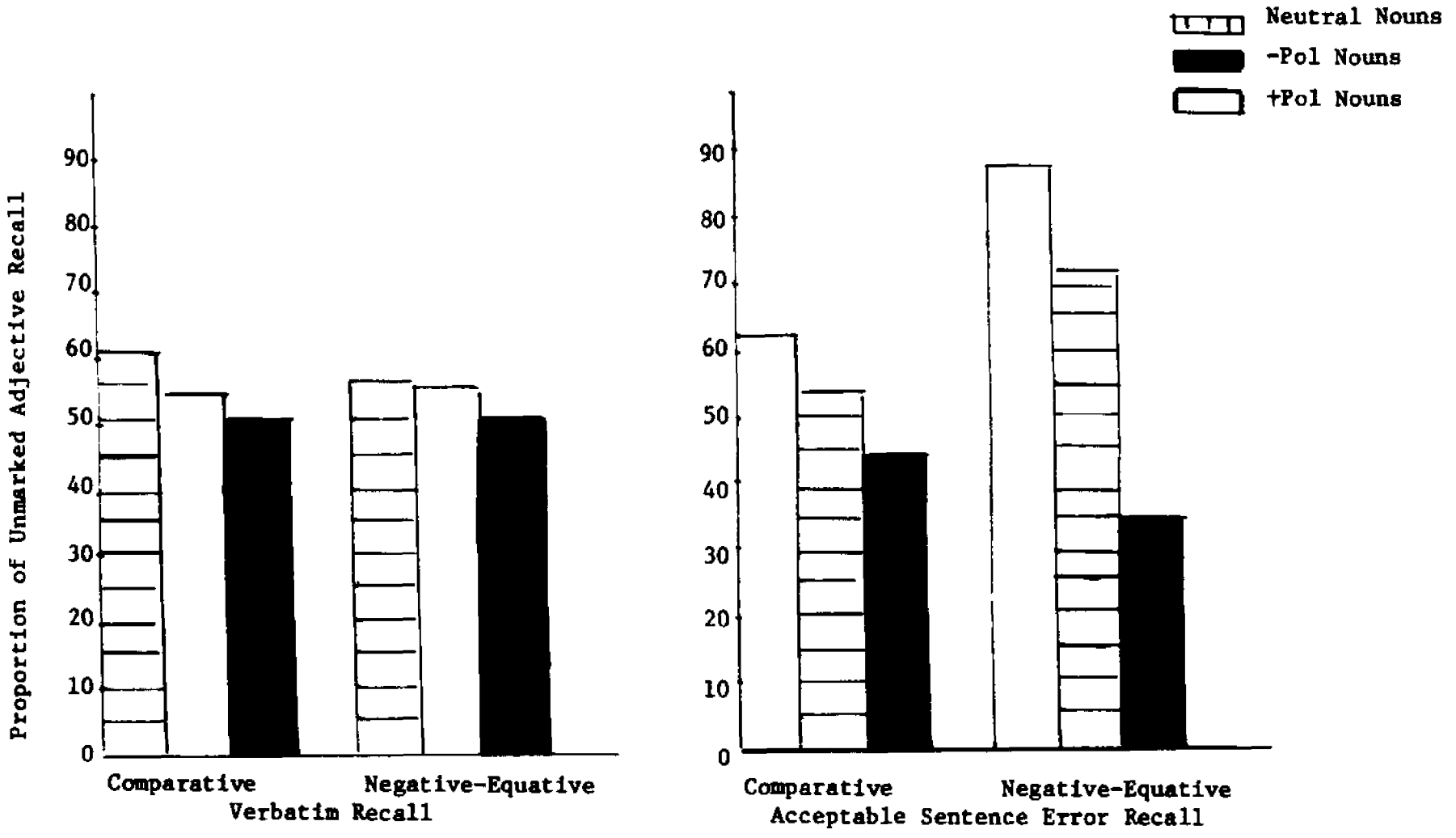


Fig. 9. Proportion of sentences recalled with the Unmarked adjective for Verbatim Recall and Acceptable Sentence Error Recall: Comparative and Negative-Equative sentences presented separately by Noun Category over Grades.

APPENDIX 1

SEMANTIC STRUCTURE OF RELATIVE ADJECTIVES

There have been a number of attempts to characterize the semantic structure of relative adjectives. However, the most comprehensive treatments of the subject, which will be discussed below (Katz, 1967, 1972; Bierwisch, 1967, 1970, 1971; Bartsch and Venneman, 1972) are remarkably similar in their general approach. The differences between them appear in the notational conventions used to represent the basic concepts described.[1] The issues all three deal with, albeit in different degrees of depth are:

(a) the need to differentiate between the semantic structure of absolute and relative adjectives, where absolute adjectives are seen as 1-place predicates, and relative adjectives as 2-place relational terms.

(2) the specification of a standard or norm of reference implied by a relative adjective, and the nature of the reference set, or comparison class specified by the compared NP. In addition, differences in reference classes dependent on generic vs. non-generic terms are considered.

(c) the postulation in the reading of the relative adjective of some function of extension on a dimension, either a measure function reflecting the general capacity of individuals for comparing, and/or a specific operation assigning classes of objects to positions or ranges on a

dimension.

(d) specification of the internal structure of a relative adjective (and of a compared noun), and its semantic representation.

(e) formal representation of the relationship between the positive and comparative sentences.

In these accounts, the relative adjective establishes the dimension along which objects are compared. The comparison class is set at the portion of the scale which is the average value of the property for the entire class being scaled on the dimension. The measuring function assigns the object to a position on the dimension, ordering it in relation to the comparison class (either greater than, less than, or equal to). The antonymous adjectives, therefore, are based upon the inverse relations (>) for the unmarked adjective and (<) for the marked adjective.

The distinction between absolute adjectives such as (1) and relative adjectives such as (2) has been drawn by

(1) red, spotted, dead, human

(2) tall, long, big, heavy, short, small, light

Katz, Bierwisch and Bartsch and Venneman independently. Adjectives in (1) are 1-place predicative terms, whereas adjectives in (2) are two-place relational adjectives. Absolute adjectives can be converted into functionally relative adjectives through association with an intensity scale, i.e. with the adverbials "more than," "er-than," as

quantifiers attached to the adjective, such as:

(3) redder, more spotted, very red

However, this relative secondary meaning is available in the positive form only with the presence of an intensifier.[2] Relative adjectives, on the other hand, as first pointed out by Sapir (1944) and then Fillmore (1965) entail an underlying comparision in which the second term of the relation is not expressed. Thus, "X is tall" is meaningful only in relation to some contextual characteristic of the reference set, i.e. tall in relation to a characteristic of a class of things of which it is a member.

Bierwisch (1971) incorporates Fillmore's conception of relative adjectives. The relative marker was not a formal part of the semantic structure of the adjective in his 1967 version, where the binary markers (+Pol) and (-Pol) indicated the direction of extension. The 1971 position holds that the positive forms of relational adjectives have readings similar to the comparative, where the missing term for comparison is provided by the average elements of a particular class. Thus, implicit in the structure of the relative adjective is the specification of a parameter, (i.e. a dimension for measuring) and the notion that 'X' as in "X is big" exceeds or falls short of a certain point within that parameter.

Katz (1972) provides two distinctions that differen-

tiate relative and absolute adjectives. The first concerns inferences which can be drawn from comparative sentences containing absolute and relative adjectives. The second concerns the simultaneous presence of antonymous adjectives within a comparative sentence, which is contradictory in the case of absolute adjectives but is not contradictory in the case of relative adjectives. Concerning inferences from comparative sentences (4) to (7), (7) is inferable

(4) The mountain is higher than the building

(5) The mountain is high

(6) The tablecloth is more spotted than the placemat

(7) The tablecloth is spotted

from (6), whereas (5) is not inferable from (4). Since (4) may be true, while (5) is false (i.e. the mountain in question may not be high in relation to mountains in general), a valid inference cannot be drawn. However, if (6) is true, it follows that (7) is also true. The second test of contradiction holds as follows: (8) is not contraictory since different reference classes are involved,

(8) A small elephant is big

(9) A sick elephant is healthy

whereas the adjectives in (9) are predicated of the same object in question.

What is the reference set, or class of comparison objects implicit in a relational adjective which account for the fact that (8) is not contradictory? Katz, Bierwisch,

and Bartsch and Venneman all distinguish between generic and non-generic terms in answer to this question.

(a) Non-Generic terms. Katz (1972) states that a relative adjective relativizes the judgment of 'X' in the sentence "a small X" to the appropriate features of things of the kind "X" in general. Thus, in expressions such as "a small elephant," or "this elephant is small," the judgment relates to the size of the referent of the nominal head (or subject NP, elephant), which is relative to the size of elephants generally. Bartsch and Venneman, citing Chafe, note that if the argument is non-generic, the reference set is determined as the immediate set to which the argument belongs, and Bierwisch (1971) also states that the reference class is that of the subject NP if the statement is not generic.

(b) Generic Terms. The most extensive discussion of comparison classes concerns the generic case, as in (10) to (15) where all three authors present similar arguments.

(10) Towers are high

(11) Elephants are big

(12) Fleas are little

(13) Texans are tall

(14) Oceans are large

(15) Compact cars are small

In this case, the comparision class is determined by the next higher set in a taxonomic hierarchy of the subject

(Bartsch and Venneman); the next larger class of the subject (Bierwisch) or the lowest order category in the reading of the subject, i.e. the one which "renders other semantic markers in the reading redundant, but is not itself rendered redundant by any semantic marker in the reading" (Katz, 1972). Thus, the relevant classes for (10) to (15) are (16) to (20), where (16) to (20) are part of the meaning of the subjects (10) to (15) respectively.

(16) buildings

(17) animals

(18) insects

(19) human beings

(20) bodies of water

Thus, "the reading of the subject will (therefore) contain the semantic marker representing the concept determining what the judgment is relative to" (Katz, 1972).

The next question concerns the function, residing in the relative adjective, which assigns the object in question to the dimension which is established by the adjective. It also determines the object's position relative to other objects in the set, or to the comparision class. Bierwisch, Katz, and Bartsch and Venneman all postulate some function, whether a "measure function" (Bartsch and Venneman) which assigns values of objects to a dimension; a relative feature allowing for extensions from the primary arguments (Bierwisch), or a function assigning an object to a position on

the dimension of greater than, less than, or equal to some reference point.

Bierwisch proposes that the extensions which are constituted by the dimensions underlying primary objects are represented in the structure of the nouns referring to the objects, as well as in the structure of the relative adjective. For example, the terms "line," "square" and "house" would have the semantic structure (21), (22) and (23) respectively, where X_i is the object, and Y_1, Y_2 and Y_3 are the dimensions with 1, 2 or 3 extensions.

(21) line = 1 dim object = (1 EXT) X_i Y_1

(22) square = 2 dim object = (2 EXT) X_i Y_1 Y_2

(23) house = 3 dim object = (3 EXT) X_i Y_1 Y_2 Y_3

These features are part of the marker (physical object), and provide the arguments substituted for the corresponding variables in the readings of the relative adjectives.

Footnotes

1. The formal semantic structure of the relative adjective takes the following form in the treatments of Bartsch and Venneman; Bierwisch, and Katz, in that order:

Bartsch & Venneman. $F_D^M(x) = Df\ F^M(x,D)$ if D is kept constant in a comparison. $F^M(x,D)$ indicates that there is only one measure function, F^M which is a two-place operator assigning to an object x, and a dimension, D, the values of X in D.

John is 5 feet tall	F_T^M (John) = 5 ft.
John is tall	F_T^M (John > N
John is short	F_T^M (John)< N
John is taller than Mary	F_T^M (John) > F_T^M (Mary)
John is shorter than Mary	F_V^M (John) < F_T^M (Mary)

N is the average value for the reference set. The semantic relations between these expressions obtain as a result of the fact that they all project their arguments onto the same dimension.

Bierwisch (1971). For Bierwisch the semantic structure of the relative adjective is represented as a relational function. A comparative such as "The table is high" would be represented as:

$$(\text{Def } X_1)\ ([\text{Table}]X_1 \cdot [3\ \text{Ext}]\ X_1Y_1Y_2Y_3 \cdot [\text{Gr}][\text{Vert}]'\ X_s\ [\text{Vert}]'\ X_n$$

The notation states, roughly, that the vertical extension of X, where Y is a measuring value associated with the object X by the function (Vert) exceeds that of the compared average object.

Katz (1972). The semantic markers for the readings of relative adjectives are called relative semantic markers. The relative adjective has the following notation:

(((size) (Vertical)
(Horizontal) Spatial orientation of [NP,S])
(. . .) X
< >

>

((size) (Vertical)
(Horizontal) Spatial orientation of (Average Σ)))
(. . .)

Σ is a dummy symbol which can be replaced by just the appropriate semantic marker from the reading of the subject. Σ is a special case of a categorized variable where

$\Sigma = [NP_X,S]$ & K where [NP,S] is the grammatical subject

(i.e. the value of Σ is one of the semantic markers in the reading of the subject of the sentence) and K is a function which yields the value of 'X', (i.e. the lowest order category) from the semantic marker of the subject.

For all three authors, the difference between a positive sentence such as 'John is tall' and a comparative such as 'John is taller than Mary', is that in the case of the comparative, the value for the compared NP replaces the variable X_n, N, or Σ, the symbols for the comparision class.

2. There seem to be at least three different meanings in usage of the comparative construction in relativizing absolute adjectives, depending on the particular class of absolute adjectives modified (Langendoen, personal communication).

The first use of the comparative construction would be the "degree" sense. Qualitative adjectives such as "happy," and color terms such as "red," would fall in this category. Thus, "happier," "very red" would indicate degrees of the attribute which nevertheless fall within the range designated by the adjectives "happy," and "red," respectively.

The second use of the comparative would be the "approximate" sense. Adjectives such as "flat" would be included in this category. Degrees of flatness approximate some "true" standard, or unique property designated by the adjective "flat," since there are no degrees of "flatness," but only degrees of approximation to "flatness."

The third sense in which the comparative construction is used is for adjectives which represent some unique point in semantic space; adjectives such as "dead;" "pregnant," "married." There is no possibility of approximation to the state designated by the adjective. While the comparative construction can be used with such adjectives, its interpretation would be non-literal; metaphoric. The interpretation would be available through implicature. For example, if Sally were 9 months pregnant, and Jane were 3 months pregnant, one could say "Sally is more pregnant than Jane," although the reading for this sentence would be something equivalent to "Sally is more advanced in her pregnancy than Jane is."

APPENDIX 2

SYNTACTIC STRUCTURE OF COMPARATIVE SENTENCES

A sentence such as (1) has been considered by Chomsky (1965), Doherty and Schwartz (1967) and others to be derived from two underlying propositions, (2) and (3). Although neither of these constituent sentences are implied by the

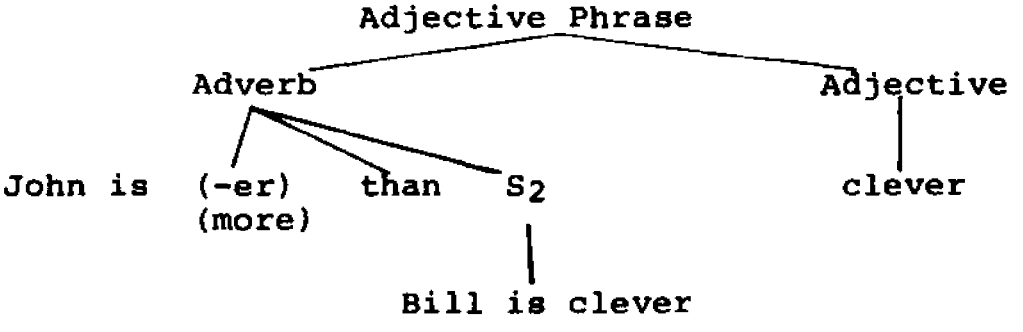
(1) John is more clever than Bill

(2) John is clever

(3) Bill is clever

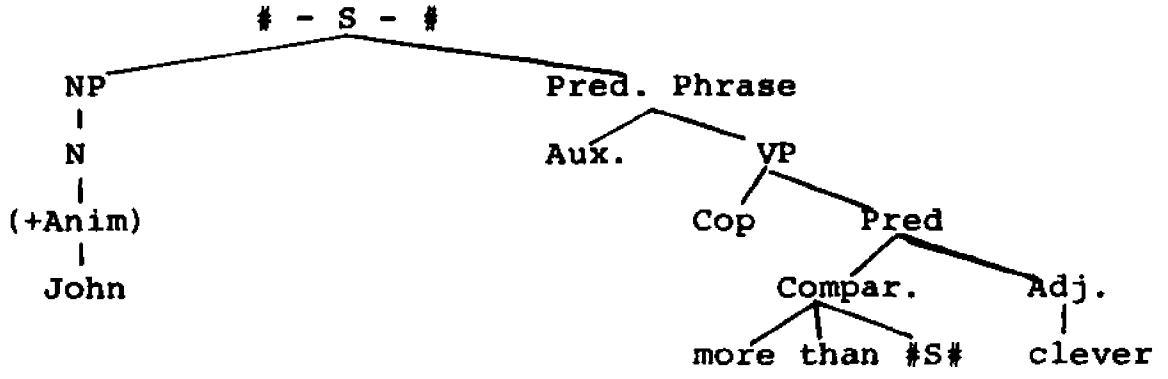
whole sentence, problems have been raised about their semantic interpretation.

These propositions have approximately the following kind of relation (from Hale, 1970):



The full derivation of the comparative (Chomsky, 1965) has the base phrase markers "John be clever" and "Bill be clever," with the degree marker in front of the adjective. To form the comparative, the degree marker is replaced by "more than," to form the equative, it is replaced by "as-as." Thus, the comparative element is a pre-adjectival adverbial

modifier. Through a series of transformations, these base strings are then conjoined. (5) represents the full derivation of (1). First the transformations apply to the most



deeply embedded phrase-marked, "Bill is clever," then to the full configuration "John is more than (#Bill is clever#) clever. Then the comparative transformation is applied, that is, an erasure operation deleting the adjective of the embedded sentence. A permutation transformation then gives "John is more clever than Bill is," after which "is" is deleted. The presence of an underlying sentence, S_2, is necessary to explain sentences such as (6i) to (6v). (6i) implies the constituent sentence "Bill is a man;" thus

(6) (i) John is a more clever man than Bill

(ii) The lake is deeper than the river is wide

(iii) *John is a more clever man than Mary

(iv) John is taller than he was (last year)

(v) *The boy is more amazed than the table

the deviance of (6iii) is due to selection restrictions (*Mary is a man), (Chomsky, 1965). In (iii) and (iv),

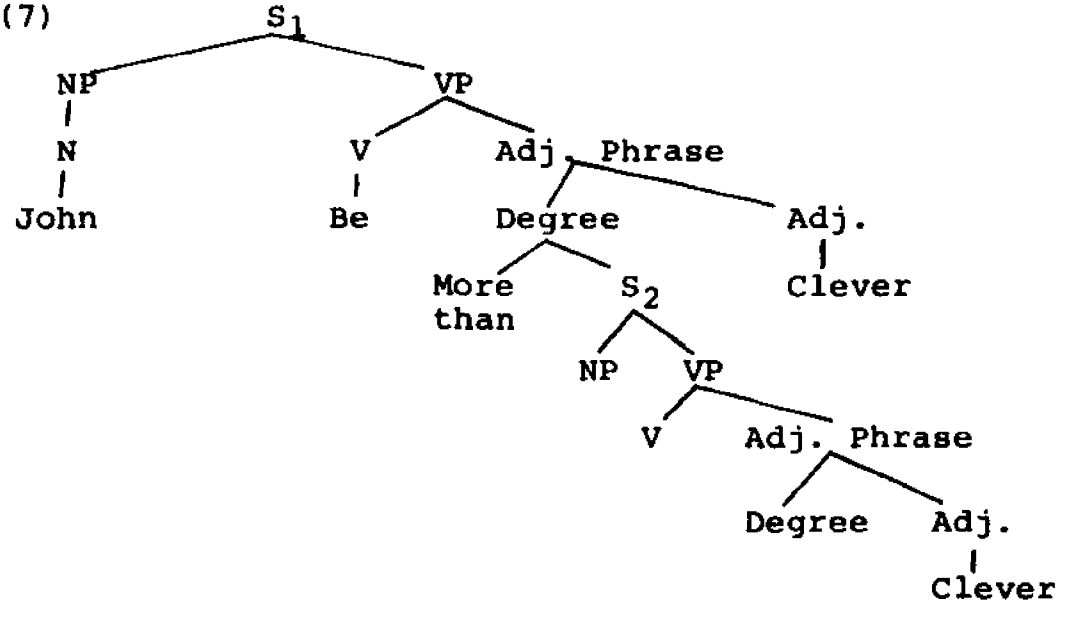
"more" or "as . . . as" is followed in surface structure by a constituent whose internal structure is that of a sentence, although these are not different from sentences of type (1). The deviance of (v) is related to the selection restriction in the constituent sentence *The table is amazed" (Lees). Chomsky (1965) argues that in simple comparatives such as (1), the underlying constituent sentence has been deleted through an erasure transformation such that "a term X of the proper analysis can be used to erase a term Y of the proper analysis just in case the inherent part of the formative X is not distinct from the inherent part of the formative Y" where "only those features of a formative that are inherent, either to its lexical entry or to the position in the sentence where it is inserted are to be considered in determining nondistinctness."

Arguments against this two-sentence analysis which have been raised are concerned with the semantic interpretation of the constituent sentences, (2) and (3).

Campbell and Wales (1969) argue that a distinction should be made between deep structures of simple comparatives such as (1) which should have one base string, and complex comparatives such as (6ii) which have two base strings. Huddleston (1971) points out, however, that because (1) is intuitively simpler than (6ii) it need not be simpler transformationally. Rather, he feels that this can be accounted for in terms of deep structure, where (1)

is a one-variable comparision, with one element in the constituent contrastive with a matrix element (John vs. Bill), whereas (6ii) is a two-variable comparision, with two contrasts, river vs. lake, and wide vs. deep. Huddleston proposes an abstract degree element (or abstract ordinator) in the adjective phrase which would account for the semantic fact that "Bill is clever" is not entailed in (1), but only that he has some degree of cleverness, i.e. the constituent sentence would read "Bill is '<u>Degree</u>' clever," as in (7). An abstract ordinator would account for the ungrammaticality of (8) where an abstract ordinator "more" is mutually

(7)



(8) *Mary has more records than Peter has 10 books

exclusive with a non-abstract ordinator "10."

Seuren (1973) argues that the comparative element itself has erroneously been treated in the above transformational accounts as a "primitive" (i.e. an unanalyzed deep

structure term). He proposes that adverbials such as "how," "so," "that," "er-than," "six feet," "too," can reasonably be expected to be derived from an underlying extent-phrase. In addition to the extent phrase, Seuren posits a negative element in the comparative so that the semantic representation of (1) would be (9).

(9) e (e is an extent and (the f [f is an extent and John is clever to f] is great to e and not the g [g is an extent and Bill is clever to g] is great to e)).

Seuren, however, has been accused of hiding the underlying comparative, in that "clever to f" and "great to e" are themselves comparisions (Bartsch and Venneman, 1972). They argue that in replacing a two-place predicate "greater than" by a one-place predicate "great to e" Seuren has had to account for two comparatives rather than one, since he does not allow two heights to be compared directly to each other.

Appendix 3A

Ratings of Noun Pairs for Noun Categories: Size Dimension

Nouns (BIG-SMALL)	Category	Unmarked Adj. BIG	Marked Adj. SMALL	Neutral	D.K.	Thorndike-Lorge Rating
	+Pol					
elephant		10	--	--	--	35
hippopotamus		8	--	2	--	1
castle		9	--	1	--	A
palace		10	--	--	--	A
jungle		10	--	--	--	16
forest		10	--	--	--	AA
giant		10	--	--	--	A
monster		9	--	1	--	20
ant	-Pol	--	10	--	--	38
mosquito		--	10	--	--	8
fly		--	10	--	--	AA
bee		--	9	1	--	A
greenpea		--	10	--	--	--
blueberry		--	10	--	--	4
raindrop		--	10	--	--	5
snowflake		--	7	3	--	2
mirror	Neutral	2	1	7	--	46
picture		--	--	10	--	AA
box		--	--	10	--	AA
package		--	--	10	--	38
game		--	1	9	--	AA
toy		--	1	9	--	49
sweater		2	--	8	--	8
shirt		3	--	7	--	47

[1]The numbers in the table represent the number of subjects in first grade who rated the noun as unmarked (big); marked (small), neutral, or didn't know (D.K.). There are 10 subjects for every noun unless otherwise indicated.

Appendix 3B

Ratings of Noun Pairs for Noun Categories: Evaluation Dimension

Nouns (GOOD-BAD)	Category	Unmarked Adj. GOOD	Marked Adj. BAD	Neutral	D.K.	Thorndike-Lorge Rating
ice-cream	+Pol	10	--	--	--	2
cake		8	--	2	--	A
friend		9	--	1	--	AA
helper		9	--	1	--	12
party		8	--	2	--	AA
picnic		10	--	--	--	16
gift		10	--	--	--	A
reward		10	--	--	--	43
devil	-Pol	--	8	--	2	A
witch		1	9	--	--	24
liar		--	10	--	--	8
cheater		--	9	--	1	6/4,000,000
thief		--	9	--	1	28
burglar		--	10	--	--	6
stomachache		--	9	1	--	11/4,000,000
toothache		--	10	--	--	2
heat	Neutral	2	1	7	--	AA
cold		1	3	6	--	AA
rope		2	1	7	--	A
strap		3	2	5	--	15
knife		2	3	5	--	A
scissors		3	2	5	--	8
wind		2	3	5	--	AA
rain		3	1	6	--	AA

[1]The numbers in the table represent the number of subjects in first grade who rated the noun as unmarked (high); marked (low); neutral, or didn't know (D.K.). There are 10 subjects for every noun unless otherwise indicated.

Appendix 3C

Ratings of Noun Pairs for Noun Categories: Speed Dimension

Nouns (FAST-SLOW)	Category	Unmarked Adj. FAST	Marked Adj. SLOW	Neutral	D.K.	Thorndike-Lorge Rating
rocket	+Pol	10	--	--	--	4
spaceship		8	--	2	--	--
racecar		9	--	1	--	--
motorcycle		9	--	1	--	2
fire-engine		10	--	--	--	1
ambulance		10	--	--	--	8
fox		8	--	1	--	25
rabbit		8	1	1	--	43
worm	-Pol	--	10	--	--	37
caterpillar		--	10	--	--	19
turtle		--	9	--	1	13
snail		--	10	--	--	8
old man		--	10	--	--	--
old woman		--	10	--	--	--
blind man		--	10	--	--	--
crippled man		--	9	1	--	--
wagon	Neutral	2	2	6	--	A
carriage		1	3	6	--	46
rock		1	2	6	--	AA
stone		2	3	5	--	AA
sheep		3	2	5	--	A
pig		--	3	5	--	44
milkman		3	2	5	--	1
postman		3	2	5	--	4

[1]The numbers in the table represent the number of subjects in first grade who rated the noun as unmarked (fast); marked (slow); neutral, or didn't know (D.K.). There are 10 subjects for every noun unless otherwise indicated.

Appendix 3D

Ratings of Noun Pairs for Noun Categories: Height Dimension

Nouns (HIGH- LOW)	Category	Unmarked Adj. HIGH	Marked Adj. LOW	Neutral	D.K.	Thorndike-Lorge Rating
apartment house	+Pol	10	--	--	--	--
tower		10	--	--	--	A
mountain (N=8)		8	--	--	--	AA
cliff (N=8)		7	--	--	1	38
rainbow		10	--	--	--	17
cloud		9	1	--	--	AA
flagpole		10	--	--	--	6/4,000,000
telephone pole		9	--	--	1	--
rug	-Pol	--	9	1	--	40
carpet		--	10	--	--	24
ground		--	10	--	--	AA
sidewalk		--	10	--	--	18
rabbithole		--	9	--	1	--
mousehole		--	9	1	--	--
doorstep		1	8	1	--	6
doormat		1	8	1	--	--
table	Neutral	3	--	7	--	AA
chair		1	1	8	--	AA
fence		2	1	7	--	A
gate		2	2	6	--	AA
cabinet		2	2	5	1	26
bookcase		2	2	6	--	3
tire		2	2	6	--	AA
wheel		1	2	7	--	A

[1]The numbers in the table represent the number of subjects in first grade who rated the noun as unmarked (high); marked (low); neutral, or didn't know (D.K.). There are 10 subjects for every noun unless otherwise indicated.

Appendix 4

Significance Levels for Judgments of Relative Locations of Noun Pairs on a Dimension[1,2,3]

Perceived Relationship of Noun Pair	Significance Level
Significance Levels between .05-.001	
The scissors are better than the knife	.001
The elephant is bigger than the hippopotamus	.001
The witch is better than the devil	.001
The doorstep is higher than the doormat	.001
The bee is bigger than the fly	.001
The giant is bigger than the monster	.001
*The mirror is bigger than the picture	.001
The mosquito is bigger than the ant	.001
The game is bigger than the toy	.001
The rocket is faster than the spaceship	.001
*The stomachache is better than the toothache	.002
The blueberry is bigger than the green pea	.004
The reward is better than the gift	.004
The cheater is better than the liar	.011
The turtle is faster than the snail	.015
The fence is higher than the gate	.019
The cloud is higher than the rainbow	.021
*The wind is better than the rain	.021
The rope is better than the strap	.032
The tower is higher than the apartment house	.032
The party is better than the picnic	.048
The mountain is higher than the cliff	.048
The sweater is bigger than the shirt	.046
The table is higher than the chair	.006
Significance Levels between .06-.10 (Marginal)	
*The milkman is faster than the mailman	.059
The jungle is bigger than the forest	.059
The ice cream is better than the cake	.059
The bookcase is higher than the cabinet	.058
The tire is higher than the wheel	.073
The sidewalk is higher than the ground	.09
The box is bigger than the package	.09

[1]Significance levels were determined by sign tests. In each case the number of subjects evaluating the noun pair=20.

[2]Asterisks next to the sentences represent cases which were opposite to those intuitively assigned by E to categories in the main study.

[3]Under the category 'perceived relationships' for each case the relation judged to be more probable is represented in its simple comparative form with the positive adjective.

Appendix 4, continued

Significance Levels for Judgments of Relative Locations of Noun Pairs on a Dimension

Perceived Relationship of Noun Pair	Significance Level
Non-significance Differences[4]	
The burglar is better than the robber	n.s.
The sheep is faster than the pig	n.s.
*The blind man is faster than the crippled man	n.s.
*The rabbit hole is higher than the mousehole	n.s.
*The ambulance is faster than the fire engine	n.s.
*The raindrop is bigger than the snowflake	n.s.
The heat is better than the cold	n.s.
*The stone is faster than the rock	n.s.
*The worm is faster than the caterpillar	n.s.
The castle is bigger than the palace	n.s.
The rabbit is faster than the fox	n.s.
The racecar is faster than the motorcycle	n.s.
The old man is faster than the old woman	n.s.
The flagpole is higher than the telephone pole	n.s.

[4]The order of nouns for non-significant judgments is based on the largest number of subjects making that judgment of location.

Appendix 5

Design for Presentation of Sentences: Adjective, Noun Category and Construction Type for a Set[1]

Block 1	Block 5	Block 9
IaA	IIbC	IIIcC
IVdC	IaB	IaC
IIIcB	IIIcA	IIbA
IIbB	IVdA	IVdB
Block 2	**Block 6**	**Block 10**
IIaC	IVcC	IIaB
IIIbA	IIIbB	IVcA
IVcB	IdC	IIIbC
IdB	IIaA	IdA
Block 3	**Block 7**	**Block 11**
IIIdB	IIIdC	IVaC
IIcA	IVaB	IIcC
IbC	IIcB	IbB
IVaA	IbA	IIIdA
Block 4	**Block 8**	**Block 12**
IVbB	IcB	IcA
IcC	IIdC	IIIaB
IIdA	IVbA	IVbC
IIIaC	IIIaA	IIdB

[1] I=Size Dimen. big-small; II=Height Dimen. high-low; III=Speed Dimen. fast-slow; IV=Evalua. Dimen. good-bad
a=comparative, unmarked adjective;
b=comparative, marked adjective
c=negative equative, unmarked adjective
d=negative equative, marked adjective
A=Noun Category A, nouns located at positive pole of dimension;
B=Noun Category B, nouns located at negative pole of dimension;
C=Noun Category C, nouns neutral with respect to dimension

Appendix 6A

Data Matrix: Presented and Recalled Sentences for Sentence Types:[1,2] Absolute Number of Sentences Recalled by Grade for Positive Pole Noun Category over Dimensions

		Presented Form				
	Recalled Form	X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
	Meaning Retained	1 CU	2 CM	3 NEU	4 NEM	Totals
1st Grade (N=32)	1. X is bigger than Y (CU)	30	3	3	5	41
	2. Y is smaller than X(CM)	1	29	4	0	34
	3. Y isn't as big as X (NEU)	0	4	25	1	30
	4. X isn't as small as Y (NEM)	0	0	0	27	27
	Subtotals	31	36	32	33	132
	Meaning Changed					
	1. 'Y is bigger than X (CU)	0	2	2	0	4
	2. 'X is smaller than Y (CM)	0	0	0	6	6
	3. 'X isn't as big as Y (NEU)	3	0	0	6	9
	4. 'Y isn't as small as X (NEM)	0	1	1	0	2
	Subtotals	3	3	3	12	21
	Totals	34	39	35	45	153
3rd Grade: (N=32)	Meaning Retained					
	1. X is bigger than Y (CU)	44	1	3	7	55
	2. Y is smaller than X (CM)	3	34	4	1	42
	3. Y isn't as big as X (NEU)	2	4	39	3	48
	4. X isn't as small as Y (NEM)	0	0	0	24	24
	Subtotals	49	39	46	35	169
	Meaning Changed					
	1. 'Y is bigger than X (CU)	0	2	6	1	9
	2. 'X is smaller than Y (CM)	1	2	1	3	7
	3. 'X isn't as big as Y (NEU)	1	1	0	4	6
	4. 'Y isn't as small as X (NEM)	0	1	0	1	2
	Subtotals	2	6	7	9	24
	Totals	51	45	53	44	193

Appendix 6A, continued

Data Matrix: Presented and Recalled Sentences for Sentence Types:[1,2] Absolute Number of Sentences Recalled by Grade for Positive Pole Noun Category over Dimensions

		Presented Form				
	Recalled Form	X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
5th Grade: (N=32)	Meaning Retained	1 CU	2 CM	3 NEU	4 NEM	Totals
	1. X is bigger than Y (CU)	52	2	1	7	62
	2. Y is smaller than X (CM)	0	38	2	1	41
	3. Y isn't as big as X (NEU)	3	14	44	2	63
	4. X isn't as small as Y (NEM)	0	0	0	38	38
	Subtotals	55	54	47	48	204
	Meaning Changed					
	1. 'Y is bigger than X (CU)	2	8	7	1	18
	2. 'X is smaller than Y (CM)	1	1	1	5	8
	3. 'X isn't as big as Y (NEU)	5	0	1	9	15
	4. 'Y isn't as small as X (NEM)	0	5	0	0	5
	Subtotals	8	14	9	15	46
	Totals	63	68	56	63	250

[1]The adjectives 'big' and 'small' are used as examples representing unmarked and marked adjectives respectively.

[2]There were 4 sentence types:
CU=Comparative Unmarked Adjective; CM=Comparative, Marked Adjective; NEU=Negative-Equative, Unmarked Adjective; NEM=Negative-Equative, Marked Adjective.

Appendix 6B

Data Matrix of Presented and Recalled Sentences by Grade for the Negative Pole Noun Category, over Dimensions[1,2]

	Recalled Form	Presented Form: X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
1st Grade: (N=32)	**Meaning Retained**	1 CU	2 CM	3 NEU	4 NEM	Totals
	1. X is bigger than Y (CU)	33	0	1	5	39
	2. Y is smaller than X (CM)	0	31	11	1	43
	3. Y isn't as big as X (NEU)	0	5	31	0	36
	4. X isn't as small as Y (NEM)	3	2	0	28	33
	Subtotals	36	38	43	34	151
	Meaning Changed					
	1. 'Y is bigger than X (CU)	1	2	1	1	5
	2. 'X is smaller than Y (CM)	0	3	0	2	5
	3. 'X isn't as big as Y (NEU)	1	0	0	2	3
	4. 'Y isn't as small as X (NEM)	0	4	4	3	11
	Subtotals	2	9	5	8	24
	Totals	38	47	48	42	175
3rd Grade: (N=32)	**Meaning Retained**					
	1. X is bigger than Y (CU)	47	1	7	8	63
	2. Y is smaller than X (CM)	3	49	17	5	74
	3. Y isn't as big as X (NEU)	0	1	28	0	29
	4. X isn't as small as Y (NEM)	0	1	1	24	26
	Subtotals	50	52	53	37	192
	Meaning Changed					
	1. 'Y is bigger than X (CU)	2	5	2	1	10
	2. 'X is smaller than Y (CM)	3	0	0	6	9
	3. 'X isn't as big as Y (NEU)	3	0	0	3	6
	4. 'Y isn't as small as X (NEM)	0	6	2	0	8
	Subtotals	8	11	4	10	33
	Totals	58	63	57	47	225

Appendix 6B, continued

Data Matrix of Presented and Recalled Sentences by Grade for the Negative Pole Noun Category, over Dimensions[1,2]

		Presented Form				
	Recalled Form	X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
5th Grade: (N=32)	Meaning Retained	1 CU	2 CM	3 NEU	4 NEM	Totals
	1. X is bigger than Y (CU)	60	2	3	12	77
	2. Y is smaller than X (CM)	1	53	13	2	69
	3. Y isn't as big as X (NEU)	1	1	40	0	42
	4. X isn't as small as Y (NEM)	5	1	0	45	51
	Subtotals	67	57	56	59	239
	Meaning Changed					
	1. 'Y is bigger than X (CU)	3	1	8	1	13
	2. 'X is smaller than Y (CM)	3	1	1	9	14
	3. 'X isn't as big as X (NEU)	2	1	0	4	7
	4. 'Y isn't as small as X (NEM)	1	6	5	1	13
	Subtotals	9	9	14	15	47
	Totals	76	66	70	74	286

[1]The adjectives 'big' and 'small' are used as examples representing unmarked and marked adjectives, respectively.

[2]There were 4 sentence types:
CU=Comparative Unmarked Adjective; CM=Comparative, Marked Adjective; NEU=Negative-Equative, Unmarked Adjective; NEM=Negative-Equative, Marked Adjective.

Appendix 6C

Data Matrix of Presented and Recalled Sentences by Grades for Neutral Noun Category over Dimensions[1,2]

		Presented Form				
	Recalled Form	X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
1st Grade: (N=32)	**Meaning Retained**	1 CU	2 CM	3 NEU	4 NEM	Totals
	1. X is bigger than Y (CU)	30	0	3	1	34
	2. Y is smaller than X (CM)	0	18	6	0	24
	3. Y isn't as big as X (NEU)	2	3	16	2	23
	4. X isn't as small as Y (NEM)	0	1	0	17	18
	Subtotals	32	22	25	20	99
	Meaning Changed					
	1.'Y is bigger than X (CU)	0	4	6	0	10
	2.'X is smaller than Y (CM)	2	2	0	2	6
	3.'X isn't as big as Y (NEU)	2	0	0	2	4
	4.'Y isn't as small as X (NEM)	0	1	0	0	1
	Subtotals	4	7	6	4	21
	Totals	36	29	31	24	120
3rd Grade: (N=32)	**Meaning Retained**					
	1. X is bigger than Y (CU)	33	1	2	4	40
	2. Y is smaller than X (CM)	2	20	1	0	23
	3. Y isn't as big as X (NEU)	1	4	28	0	33
	4. X isn't as small as Y(NEM)	2	0	0	17	19
	Subtotals	38	25	31	21	115
	Meaning Changed					
	1. 'Y is bigger than X (CU)	1	2	6	0	9
	2. 'X is smaller than Y (CM)	1	3	0	4	8
	3. 'X isn't as big as Y (NEU)	3	0	0	1	4
	4. 'Y isn't as small as X (NEM)	0	3	0	0	3
	Subtotals	5	8	6	5	24
	Totals	43	33	37	26	139

Appendix 6C, continued

Data Matrix of Presented and Recalled Sentences by Grades for Neutral Noun Category over Dimensions[1,2]

	Presented Form				
Recalled Form	X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
Meaning Retained	1 CU	2 CM	3 NEU	4 NEM	Totals
1. X is bigger than Y (CU)	36	2	3	5	46
2. Y is smaller than X (CM)	1	26	12	3	42
3. Y isn't as big as X (NEU)	3	6	35	0	44
4. X isn't as small as Y (NEM)	1	1	0	27	29
Subtotals	41	35	50	35	161
Meaning Changed					
1. 'Y is bigger than X (CU)	4	5	6	0	15
2. 'X is smaller than Y (CM)	1	2	0	5	8
3. 'X isn't as big as Y (NEU)	0	0	4	3	7
4. 'Y isn't as small as X (NEM)	0	1	3	0	4
Subtotals	5	8	13	8	34
Totals	46	43	63	43	195

[1]The adjectives 'big' and 'small' are used as examples representing unmarked and marked adjectives respectively.

[2]There were 4 sentence types:
CU=Comparative Unmarked Adjective; CM=Comparative, Marked Adjective; NEU=Negative-Equative, Unmarked Adjective; NEM=Negative-Equative, Marked Adjective.

Appendix 6D

Data Matrix of Presented and Recalled Sentences over Grades for All Noun Categories Combined, over Dimensions[1,2]

	Recalled Form	Presented Form: X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
+Pol Noun Category: (N=96)	**Meaning Retained**	1 CU	2 CM	3 NEU	4 NEM	Totals
	1. X is bigger than Y (CU)	126	6	7	19	158
	2. Y is smaller than X (CM)	4	101	10	2	127
	3. Y isn't as big as X (NEU)	5	22	108	6	141
	4. X isn't as small as Y (NEM)	0	0	0	89	89
	Subtotals	135	129	125	116	505
	Meaning Changed					
	1. 'Y is bigger than X (CU)	2	12	15	2	31
	2. 'X is smaller than Y (CM)	2	3	2	14	21
	3. 'X isn't as big as Y (NEU)	9	1	1	19	30
	4. 'Y isn't as small as X (NEM)	0	7	1	1	9
	Subtotals	13	23	19	36	91
	Totals	148	152	144	152	596
-Pol Noun Category: (N=96)	**Meaning Retained**					
	1. X is bigger than Y (CU)	140	3	11	25	179
	2. Y is smaller than X (CM)	4	133	41	8	186
	3. Y isn't as big as X (NEU)	1	7	99	0	107
	4. X isn't as small as Y (NEM)	8	4	1	97	110
	Subtotals	153	147	152	130	582
	Meaning Changed					
	1. 'Y is bigger than X (CU)	6	8	11	3	28
	2. 'X is smaller than Y (CM)	6	4	1	17	28
	3. 'X isn't as big as Y (NEU)	6	1	0	9	16
	4. 'Y isn't as smallas X (NEM)	1	16	11	4	32
	Subtotals	19	29	23	33	104
	Totals	172	176	175	163	686

Appendix 6D, continued

Data Matrix of Presented and Recalled Sentences over Grades for All Noun Categories Combined, over Dimensions[1,2]

Neutral Noun Category: (N=96) Recalled Form	Presented Form: X is bigger than Y	Y is smaller than X	Y isn't as big as X	X isn't as small as Y	
Meaning Retained	1 CU	2 CM	3 NEU	4 NEM	Totals
1. X is bigger than Y (CU)	99	3	8	10	120
2. Y is smaller than X (CM)	3	64	19	3	89
3. Y isn't as big as X (NEU)	6	13	79	2	99
4. X isn't as small as Y (NEM)	3	2	0	61	66
Subtotals	111	82	106	76	375
Meaning Changed					
1. 'Y is bigger than X (CU)	5	11	18	0	34
2. 'X is smaller than Y (CM)	4	7	0	11	22
3. 'X isn't as big as Y (NEU)	5	0	4	6	15
4. 'Y isn't as small as X (NEM)	0	5	3	0	8
Subtotals	14	23	25	17	79
Totals	125	105	131	93	454

[1]The adjectives 'big' and 'small' are used as examples representing unmarked and marked adjectives, respectively.

[2]There were 4 sentence types:
CU=Comparative Unmarked Adjective; CM=Comparative, Marked Adjective; NEU=Negative-Equative, Unmarked Adjective; NEM=Negative-Equative, Marked Adjective.

Appendix 7A

Verbatim Recall, Acceptable Sentence Errors and Total Acceptable Sentence Recall: Absolute Number of Sentences Recalled by Noun Category, Adjective Markedness, Grade and Dimension. (Size Dimension)

Verbatim Recall

Grade	+Pol		-Pol		Neutral	
	U. Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	17	14	9	15	9	10
3	21	14	18	15	13	7
5	25	16	28	23	12	10
Total	63	44	55	53	34	27

Acceptable Sentence Error Recall

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	10	4	3	6	11	4
3	13	8	8	12	7	1
5	21	5	9	10	11	5
Total	44	17	20	28	29	10

Total Acceptable Sentence Recall

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	27	18	12	21	20	14
3	34	22	26	27	20	8
5	56	21	37	33	23	15
Total	107	61	75	81	63	37

[1]Each S received a total of 48 sentences: 12 per dimension, with 4 for each noun category within a dimension, 2 presented with the unmarked adjective and 2 with the marked adjective. There are therefore 384 possible sentences for each grade (12 x 32Ss), 126 possible sentences per noun category for each grade, and 1152 possible sentences over grades (12 x 96 Ss).

Appendix 7B

Verbatim Recall, Acceptable Sentence Errors and Total Acceptable Sentence Recall: Absolute Number of Sentences Recalled by Noun Category, Adjective Markedness, Grade and Dimension. (Speed Dimension)

Verbatim Recall

Grade	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	16	9	24	16	18	7
3	24	11	25	23	20	7
5	24	20	27	30	21	15
Total	64	40	76	69	59	29

Acceptable Sentence Error Recall

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	8	2	6	6	8	3
3	8	5	9	9	9	2
5	14	2	11	12	17	6
Total	30	9	26	27	34	11

Total Acceptable Sentence Recall[1]

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	24	11	30	22	26	10
3	32	16	34	32	29	9
5	38	22	38	42	38	21
Total	94	49	102	96	93	40

[1]Each S received a total of 48 sentences: 12 per dimension, with 4 for each noun category within a dimension, 2 presented with the unmarked adjective and 2 with the marked adjective. There are therefore 384 possible sentences for each grade (12 x 32Ss), 126 possible sentences per noun category for each grade, and 1152 possible sentences over grades (12 x 96 Ss).

Appendix 7C

Verbatim Recall, Acceptable Sentence Errors and Total Acceptable Sentence Recall: Absolute Number of Sentences Recalled by Noun Category, Adjective Markedness, Grade and Dimension. (Evaluation Dimension)

Verbatim Recall

Grade	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	15	21	23	21	12	9
3	22	20	26	19	23	13
5	24	25	29	26	23	19
Total	61	66	78	66	58	41

Acceptable Sentence Error Recall

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	5	2	2	11	2	3
3	5	2	6	11	1	4
5	16	2	7	18	4	8
Total	26	6	14	40	6	15

Total Acceptable Sentence Recall[1]

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	20	23	25	32	14	12
3	27	22	32	30	24	17
5	40	27	36	44	27	27
Total	87	72	93	106	65	56

[1]Each S received a total of 48 sentences: 12 per dimension, with 4 for each noun category within a dimension, 2 presented with the unmarked adjective and 2 with the marked adjective. There are, therefore, 384 possible sentences for each grade (12 x 32 Ss), 126 possible sentences per noun category for each grade, and 1152 possible sentences over grades (12 x 96 Ss).

Appendix 7D

Verbatim Recall, Acceptable Sentence Errors and Total Acceptable Sentence Recall: Absolute Number of Sentences Recalled by Noun Category, Adjective Markedness, Grade and Dimension. (Height Dimension)

Verbatim Recall

Grade	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	7	12	8	7	7	9
3	16	13	6	16	5	10
5	23	15	16	19	15	9
Total	46	40	30	42	27	28

Acceptable Sentence Error Recall

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	6	5	8	10	4	4
3	9	2	10	12	8	9
5	11	7	12	9	9	11
Total	26	14	30	31	21	24

Total Acceptable Sentence Recall[1]

	+Pol		-Pol		Neutral	
	U Adj.	M Adj.	U Adj.	M Adj.	U Adj.	M Adj.
1	13	17	16	17	11	13
3	25	15	16	28	13	19
5	34	22	28	28	24	20
Total	72	54	60	73	48	52

[1]Each S received a total of 48 sentences: 12 per dimension, with 4 for each noun category within a dimension, 2 presented with the unmarked adjective and 2 with the marked adjective. There are, therefore, 384 possible sentences for each grade (12 x 32 Ss), 126 possible sentences per noun category for each grade, and 1152 possible sentences over grades (12 x 96 Ss).

Appendix 8

List of Noun Substitutions by Dimension and Noun Category Over Grades[1]

	Positive Pole Noun Category		Negative Pole Noun Category		Neutral Noun Category	
	Presented	Recalled	Presented	Recalled	Presented	Recalled
Dimension: Size	hippopotamus	giant dinosaur	blueberry	berry	picture	window
			blueberry	strawberry	package	present
	hippopotamus	mouse	blueberry	stringbean	box	fox*
	palace	tower	greenpea	greenbean	mirror	picture-frame
	jungle	woods	raindrop	drop		
			mosquito	caterpillar	mirror	window
			ant	fly	box	gift
			bee	mosquito	shirt	coat
					package	bag
Dimension: Speed	racecar	car	old man	man	pig	dog
	racecar	bicycle	old woman	woman	stone	pebble
	rabbit	cat	worm	snake	stone	grass*
	fox	skunk	snail	worm	stone	boulder
	spaceship	(air)plane	turtle	worm	wagon	bike
	fire-engine	truck	turtle	caterpillar	sheep	goat
	spaceship	ship			sheep	lamb
	rabbit	wolf				
	rabbit	sheep				
Dimension: Evaluation	friend	guest	burglar	crook	scissors	fork
	ice-cream	icing	liar	lying	strap	string
	helper	workman	burglar	police	rope	belt
	party	birthday	cheater	being right		
	helper	servant				
Dimension: Height	apartment-house	building	ground	street	cabinet	pencil-case*
			doormat	floor	bookcase	bookshelf
	telephone-pole	thin pole	doorstep	carpet	tire	wood*
			ground	ice-cream*	bookcase	shelf
	apartment-house	house	rabbithole	rabbit	cabinet	shelf
			doorstep	step	fence	ground
	tower	church	doorstep	door	bookcase	stool
	tower	house	rabbithole	mouse	bookcase	table
	cliff	canyon	rabbithole	cat's hole		
	cliff	hill	doormat	carpet		
			carpet	floor		
			rug	floor		

[1]Only substitutions in sentences which retained the correct adjective, the correct second noun, and the correct syntactic form are presented. Not included in the table are pluralizations of the correct noun, which were counted as incorrect, or repetition of the same noun. Only one example of each type is presented, even though there were often a number of the same type of substitutions. * stands for anomalous substitutions.

Appendix 9

Matrix of Presented and Recalled Sentences for Directional Antonym Errors by Noun Categories and Syntactic Forms over Grades and Dimensions

Change from Unmarked to Marked Adjective

		+Pol			-Pol			Neutral		
		U Adj. Presented			U Adj. Presented			U Adj. Presented		
M Adj. Recalled		Comp.	Neg. Eq.	Tot.	Comp.	Neg. Eq.	Tot.	Comp.	Neg. Eq.	Tot.
	Comp.	6	12	18	10	42	52	7	19	26
	N. Eq.	0	1	1	9	12	21	3	3	6
	Total	6	13	19	19	53	73	10	22	32

Change from Marked to Unmarked Adjective

		+Pol			-Pol			Neutral		
		M Adj. Presented			M Adj. Presented			M Adj. Presented		
U Adj. Recalled		Comp.	Neg. Eq.	Tot.	Comp.	Neg. Eq.	Tot.	Comp.	Neg. Eq.	Tot.
	Comp.	18	21	39	11	28	39	14	10	24
	N. Eq.	23	25	48	8	9	17	13	8	21
	Total	41	46	87	19	37	56	27	18	45

Comp. =Comparative Sentence Form
N. Eq. =Negative Equative Sentence Form

Appendix 10

SAMPLE TEST BOOKLET

Deck 1 Order 1 S-O 2 Sex: F M Grade 1 : 3 : 5 Condition Immed: Delay

Name _____ Class _____ Age _____ Date _____

Block 10	Numbers
The ground is higher than the sidewalk	
The ice cream isn't as good as the cake	
The mailman is slower than the milkman	2 6 5 4 5
The palace isn't as small as the castle	
The doctor is curing the patient	

Block 11	Numbers
The strap is better than the rope	
The bookcase isn't as high as the cabinet	
The bee is smaller than the fly	9 3 3 7 6
The motorcycle isn't as slow as the racecar	
The waiter is serving the meal	

Block 2	Numbers
The gate is higher than the fence	
The rabbit is slower than the fox	
The cheater isn't as good as the liar	4 8 7 3 2
The raindrop isn't as small as the snowflake	
The carpenter is fixing the steps	

Appendix 10 (continued)

SAMPLE TEST BOOKLET

Name_____ Grade_____ p.2

D:1 O:1 S-O:2 Sex: F M Cond: Imm: Del

Block 2	Numbers
The hippopotamus is bigger than the elephant	
The knife isn't as bad as the scissors	
The crippled man isn't as fast as the blind man	8 6 7 8 5
The mousehold is lower than the rabbithole	
The baby is drinking the milk	

Block 3	Numbers
The old woman isn't as slow as the old man	
The cloud isn't as high as the rainbow	
The sweater is smaller than the shirt	7 6 1 0 4
The picnic is better than the party	
The plumber is fixing the sink	

Block 5	Numbers
The table is lower than the chair	
The ant is bigger than the mosquito	
The rocket isn't as fast as the spaceship	5 4 1 5 3
The helper isn't as bad as the friend	
The captain is sailing the ship	

Appendix 10 (continued)

SAMPLE TEST BOOKLET

Name_____ Grade_____ p.3

D:1 O:1 S-O:2 Sex: F M Cond: Imm : Del

Block 12	Numbers
The giant isn't as big as the monster	
The worm is faster than the caterpillar	
The rain is worse than the wind	6 2 8 4 9
The doormat isn't as low as the doorstep	
The nurse is giving the pill	

Block 6	Numbers
The heat isn't as good as the cold	
The turtle is slower than the snail	
The package isn't as small as the box	2 3 8 2 5
The cliff is higher than the mountain	
The cook is baking the pie	

Block 7	Numbers
The pig isn't as slow as the sheep	
The robber is better than the burglar	
The rug isn't as high as the carpet	3 1 1 5 0
The jungle is smaller than the forest	
The camper is lighting the fire	

Appendix 10 (continued)

SAMPLE TEST BOOKLET

Name_____ Grade_____ p.4

D:1 O:1 S-O:2 Sex: F M Cond: Imm Del

Block 8	Numbers
The blueberry isn't as big as the greenpea	
The wheel isn't as low as the tire	
The reward is worse than the gift	9 7 4 7 3
The ambulance is faster than the fire engine	
The fisherman is catching the fish	

Block 9	Numbers
The carriage isn't as fast as the wagon	
The picture is bigger than the mirror	
The tower is lower than the apartment house	6 3 8 5 7
The devil isn't as bad as the witch	
The pilot is flying the plane	

Block 4	Numbers
The toothache is worse than the stomachache	
The game isn't as big as the toy	
The telephone pole isn't as low as the flagpole	5 7 6 1 6
The stone is faster than the rock	
The maid is cleaning the house	

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