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# HUMAN PERFORMANCE CENTER DEPARTMENT OF PSYCHOLOGY

The University of Michigan, Ann Arbor

## An Investigation of Paraphrasing: The Effects of Memory and Complexity

KELYN HOWE ROBERTS

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This report reviews the literature to date on paraphrasing, and demonstrates the effect of memory load and sentence complexity on the production of paraphrases. The literature, while incomplete and not focused, points toward an explanation of the effects of 'similar meaning' on performance in terms of extra-grammatical factors such as reference and disposition as well as grammatical factors. That is, a theory of paraphrastic activity must take into account cognitive relations imposed by the Ss as well as general relations describable in linguistic terms. The experiment tested the effects of a memory load versus a non-memory load and the effects of sentence complexity on the production of paraphrases. As memory load and complexity increased, performance, as measured by rated performance, decreased. In general, Ss generated good paraphrases by changing active target sentences into passives. However, this behavior represented only 40% of the paraphrases, and a much smaller percentage of the paraphrases were transformations of the target. Poor paraphrases were characterized by more changes in toto as well as proportionately more deletions. Additional findings are reported.

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AN INVESTIGATION OF PARAPHRASING: THE EFFECTS  
OF MEMORY AND COMPLEXITY

Kelyn H. Roberts

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## PREFACE

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## ABSTRACT

An investigation of the relevant literature was conducted. Philosophers, linguists and psychologists have argued from different premises about the nature of synonyms and paraphrases, and about the behavior of individuals who produce them. The evidence in the psychological literature at the present appears to be congruent with several different theories. Occasionally this is due to contradictions in the data, occasionally due to the lack of specificity of the theories, occasionally to the generality of the data. Many of the studies reviewed are congruent with a transformational account of paraphrasing. However, additional factors such as association, prior habits and other semantic relations appear necessary to give a complete account of the facts.

The above generalizations refer to studies in which paraphrases have been scaled, recognized or recalled. There is a paucity of facts concerned with the production of similar or paraphrastic sentences. Some of the data indicate surface structure interactions with some measures of paraphrasing; other data indicate individual differences among paraphrasers.

The present experiment attempts to relate "radical empiricist" methodology to the study of paraphrases or similarity of meaning between two sentences. Numerical taxonomic techniques are used to assess the surface similarity of paraphrases produced by Ss instructed to paraphrase a sentence. These physical similarities are related to judged meaning similarities of the paraphrases to the sentence. The experimental questions are what kinds of paraphrases do Ss produce and how do these relate to constraints in the experiment and target sentences.

In this experiment the effects of surface complexity and immediate memory are explored. Both variables are found to have significant effects on the aptness and type of paraphrasing. Increasing surface complexity and memory load decreases the judged "goodness" of a paraphrase. The Ss appear to shift both the type and number of sentence alterations as surface complexity and memory load increase. However, the types of alterations do not appear to be, in the main, "linguistic" in nature; rather, they seem to involve psycholinguistic relations that relate pragmatic and semantic information to particular syntactic forms.

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## CHAPTER I

### BACKGROUND

This chapter is concerned with the theoretical and experimental results about paraphrases and sentences with similar meanings. Intuitively, these appear crucial to a theory of language behavior. In general, philosophers have been concerned with these questions while linguists have been mainly concerned with syntax. Since the current interest in psycholinguistics derives primarily from linguistic considerations, research into what people do with language has been mainly concentrated on the reality of syntactic units and automatic syntactic decoding. Recently, linguists have begun to explore semantics. In general the various attempts to handle this problem have lacked coherence and agreement. Much of the data obtained from psychological research on the effects of syntax seem equally amenable to interpretations involving "meaning" as an explanatory concept. Moreover, the effects of purely syntactic manipulations in themselves have not been that powerful. A fuller exploration of the concept "meaning" appears to be in order to understand how individuals process language. Certainly the problem itself is inherently interesting: Data have accumulated to indicate the importance of "meaning" and semantic features in a wide range of tasks. It is

a common observation that individuals must understand or grasp the "meaning" of instructions for a task in order to perform that task. And what does it mean for a psychologist to say that someone "understands" language?

Ordinarily we accept as evidence for "understanding" statements or requests certain phatic responses, such as continued attention, "uh-huh" responses appropriately placed, nods of the head, etc. Alternatively, looks of puzzlement, requests to repeat a phrase, the "wait-a-minute" response, "uh-huh" inappropriately placed would seem to indicate lack of "understanding." At a deeper level, the ability to appropriately carry out some set of instructions or requests, to appropriately act on the basis of certain previous statements also count as evidence for "understanding." Both of these sources of evidence are inconclusive in themselves, and do not encompass all the possible sources of "checking" interpretations. Although the use of the term "appropriate" helps resolve certain difficulties, it creates its own problems for behaviorists. Bartlett (1932, p. 227 ) discusses the problems of meaning as response and meaning as context, synthesizing these notions through the use of the term "psychological situation" which possesses some of the same problems as the term "appropriate." The above assessments of meaning essentially involve some comparison of a statement or request with some

extra-linguistic conditions. Additional assessments involve intra-linguistic comparisons (although the boundaries between extra- and intra-linguistic modes are often unclear.)

#### PHILOSOPHICAL APPROACHES

Morris (1938) attempts to categorize language (sign) functions into three levels: the syntactical, the semantic, and the pragmatic. In this taxonomy "understood" is a term in the pragmatic domain and relates syntactic and semantic information to the usages of the speaker and hearer. More practically, while including the above evidence for "understanding," this view would additionally relate "sense relations," i.e., relations that are essentially intra-semantic, and conventional usages apropos of particular speaker-hearer-situational interactions as evidence for "understanding."

Almost always, it seems, we connect with the main thoughts expressed by us subsidiary thoughts which, although not expressed, are associated with our words, in accordance with psychological laws, by the hearer. And since the subsidiary thought appears to be connected with our words of its own accord, almost like the main thought itself, we want it also to be expressed. The sense of the sentence is thereby enriched, and it may well happen that we have more simple thoughts than clauses. In many cases the sentence must be understood in this way, in others it may be doubtful whether the subsidiary thought belongs to the sentence or only accompanies it...Frege (1952, p. 75)

Wittgenstein (1953; see also Hartnack, 1965) develops the notion of language as a game with players abiding by certain conventions or rules. Meaning, for him, is language as it is played, each player assuming certain responsibilities about its use. "Understanding" is not an allowable concept per se; it is only a name for a certain set of behaviors like the ability to paraphrase a statement, to act upon a statement, to answer questions about what was said and so on. Austin (1962) and Alston (1964) have attempted to delineate some of these rules, predispositions or presuppositions which players use in doing language.

Quine (1960, 1963, 1964) develops a stricter empiricist approach to these problems. For him these are only two questions relevant to this problem area: (i) Is the sequence of words significant?; (ii) Are two sequences synonymous? Both questions are concerned with meaning, but avoid problems having to do with reference, truth value, analyticity etc. These two questions are the linguists' provinces. Areas closer to psychology and anthropology are the two procedures Quine prescribes for answering these questions: paraphrasing and translation. Neither procedure is foolproof, unless comparisons are carried on intra-subjectively which would seem to weaken a certain radical empiricism Quine would like to espouse. However, if we agree with Wittgenstein and Austin that language is a set of conventions held in common

by native speakers and bilinguals then presumably some degree of verification could be obtained about the significance and synonymy of sequences. Such an assumption does not imply species-specific competence or the referential specificity of language; if anything it may say something about the essential vagueness and lack of concept specificity in natural languages. Quine (1964) does speak to some of the inherent difficulties in the use of informants such as extra-situational cues and too-complex sentences, recognizing difficulties in a verification theory.

Implicitly, three related positions on paraphrases have developed. One is that if two verbal utterances lead to the same extra-linguistic response they are paraphrases; a second is that if two speakers agree (presumably on the basis of use, presuppositions, and predispositions) that two sentences are the same, they are paraphrases by definition; thirdly, and closely related to the second, is the position that if a speaker or bilingual agrees that two utterances are the same, they are, but we cannot demonstrate necessarily that this is indeed the case.

The activity or task of paraphrasing obviously possesses interesting possibilities philosophically. Psychologically, it allows one to ask how individuals obtain or interpret the "meaning" of a sentence and perform psychological operations on it such as recalling that meaning, recognizing it,

judging its similarity to other meanings, verifying it in relation to other events, etc. Presumably the convergence of these operations will lead to a functional understanding of "understanding."

### Linguistic Approaches

Descriptive linguistics tends to agree with the above analysis of equivalence of expression. (Quine in effect assumes a "pure" descriptive linguistic stance.) Equivalence is defined in terms of use and production of linguistic utterances in "situationally equivalent" contexts. Modern generative linguistics, on the other hand, tends to define the syntax and lexicon a priori, assigning semantic features to lexical items, and semantic interpretations to grammatical utterances in keeping with a "generative" notion of grammar, i.e., a grammar that will generate any possible grammatical sentence independent of extra-linguistic contexts.

Chomsky (1957) attempted to develop a coherent account of metagrammar and the grammar of English by proposing certain abstract features of language that (i) were hypothesized to be universal, (ii) were hypothesized to be crucial to a theory of grammar, and (iii) were hypothesized to account for regularities in grammar in an elegant fashion. Basically, this account related certain abstract syntactic relations to a surface form through a series of transformations. This system had the advantage of relating many diverse surface forms

to relatively fewer "deep" forms, integrating in certain fashions the multiplicity of grammatical forms discovered by the descriptionists. Since this integration took place on a syntactic level, certain regularities of sentences that meant the same thing were handled in two ways: (i) certain transformations preserved the meaning and others did not; (ii) sentences that involved lexical insertion (synonyms) or changes dependent upon situations (yet remaining subjectively paraphrastic) belonged to the domains of semantics or pragmatics. Semantics as developed by Katz and Postal (1964) consisted of a lexicon and certain transformational rules that assigned semantic readings to the base syntactic structures. Katz and Postal argued that transformations must be "meaning-preserving" and therefore certain kinds of information must be represented in Chomsky's base structure, not inserted through transformations in the surface. In this system of semantics, paraphrases are defined as any two base structures that possess identical semantic readings. There is some question whether in this system any two base structures with different lexical items can be called a paraphrase, assuming each lexical entry has a different reading. This could be resolved by adopting criteria or cut-off boundaries on the degree of similarity of two items, and assuming that sentences that met the criteria could be called paraphrases. This solution would fall

outside the scope of this theory of semantics, however. Secondly, it should be noticed that two sentences that differ in surface features might well possess the same deep structures and thus be assigned the same set of semantic readings.

Chomsky (1965) essentially incorporates this theory but points out certain difficulties that must eventually be resolved: (i) The problem of "reference", i.e., what sorts of information should be included in the lexicon? Does the statement "The moon is made of green cheese" violate linguistic constraints or empirical fact? In the sentences "John likes John" and "John likes himself," what is presupposed about "John" and "himself"?; (ii) The problem of multiple lexical entries standing as seeming synonyms for single items, e.g., "The boy hit the woman" and "The woman received a blow from the boy." Since these would be represented by different base structures the possibility of having the same semantic reading would be minimal without modifications in the Katz and Postal Theory.

Chomsky (1969) writes the following:

These cases suggest that the standard theory (1965) is incorrect, and that it should be modified to permit these rules (related to surface structure). These considerations may not affect the weaker hypothesis that the grammatical relations represented in deep structure are those that determine semantic interpretation. However, it seems that such matters as focus and presupposition, topic and comment, reference, scope of logical elements and

perhaps other phenomena, are determined in part at least by properties of structures...other than deep structures, in particular by properties of surface structures.

Bierwisch (1970) attempts to deal with some of these problems by augmenting the theory with a class of operators which "specify the referential arguments  $X_1, X_j$ , etc." He hypothesizes that the "...semantic components are abstract theoretical entities representing complex psychological structures and mechanisms." His approach represents a surface sentence such as "The boy kills the dog" as first a syntactic analysis "((the boy) NP<sub>1</sub> (kills (the dog) NP<sub>2</sub>) VP )S" and then as a semantic structure "HUMAN  $X_1$  and MALE  $X_1$  and not ADULT  $X_1$  and  $X_1$  cause ( $X_2$  CHANGE TO (not ALIVE  $X_2$ )) and ANIMATE  $X_2$  and DOG  $X_2$ ." This approach does not restrict one to a formal lexicon or dictionary, allowing one to represent relations between elements in other than purely lexical systems. Certain problems remain to be solved: the fact that two sentences may say the same thing but with different stylistic connotations, etc.

Olson (1970) offers the additional suggestion that not only are referential rules known and utilized, but that information about the implied negative set of alternatives is also conveyed in a communication situation. If this condition is added to the class of operators, it would make their purely semantic function problematical, since

often the negative set of alternatives is given by perceptual and cognitive functions, that is, if one were to say that "the boy" broke the window, one would imply no more than one reference for that term.

Generative semanticists, while in general differing with the above theorists on the necessity of Chomsky's 1965 deep syntactic level, claim a transformation relation between the semantic structures and the surface, but probably do not differ empirically with the above theories on the essential nature of the paraphrase at the present. Still, Gruber (1967) introduces a notion that is suggestive for further theoretical analyses.

Since it is claimed that the base component is the semantic language, and since the underlying categories and relations among these categories implied by the base trees have both semantic and syntactic significance, the task of discovering the base structure of some surface sentence or phrase is related to the task of discovering a paraphrase of it in which each of its underlying categories is expressed as nearly as possible by one word. Such paraphrases we may term as more or less representationally significant. A representationally significant paraphrase, then, is one in which the underlying structure is more overtly revealed. That is, the monocategorical conditioning between underlying categories and words is more closely adhered to. (p. 61).

For example, "... 'He rolled the ball down the hill' is probably significantly paraphrased by the sentence 'He caused the ball to roll down the hill'." Gruber goes on to say:

...Discussing sentences in terms of representationally significant paraphrases is a convenient shortcut, since it enables one to overtly express those categories which one is postulating as present in the underlying structure, while not omitting, but including within the word used, every other category that is relevant, yet unknown or unexpressible by itself...

Except for the description linguists who espouse a relatively strict empiricism, the basic positions discussed here are concerned with the abstract nature of meaning and equivalence of meaning. Basic problems that must be handled are concerned with the relation of the surface structure to the underlying meaning. Within limited domains, these analyses appear adequate. But in the cases of lexical changes, situational constraints and reference, theoretical problems still remain.

#### Psychological Evidence

Although Honeck (1969) has thoroughly and critically reviewed literature on paraphrasing and understanding, there are additional data that bear on the issues. By no means do they fault his original conclusions. Basically his review and this one are concerned with the semantic relations between stimuli used in psycholinguistic experiments. The problem is to discover the functional relations between the input conditions and to summarize these relations in some coherent form. Much of the recent literature has been concerned with the effect of syntactic form of the stimulus

sentence on recall, recognition, and problem-solving. The focus of this review will be to look at sentences and sentence forms that preserve each other's meaning in order to discover whether semantic rather than syntactic factors may be operating. Some recent studies have been concerned with the interpretation and evaluation of both normal and anomalous sentences; and finally a few studies have concerned themselves with paraphrasing itself.

#### Qualitative Studies

Richards (1929) issued printed sheets of four poems to mostly undergraduates usually at the University of Cambridge and asked for interpretations of the poems. Subjects were given a week. After extensive informal protocol analysis, he reached the conclusion that the interpretations were in general very poor. This he attributed to the following difficulties: (i) "...the difficulty of making out the plain sense of poetry...The (Ss) would travesty it in a paraphrase"; (ii) "...the difficulties of sensuous apprehension."; (iii) the idiosyncrasy of imagery; (iv) the idiosyncrasy of experience and associations; (v) "stock responses" or tyranny of habits; (vi) "Sentimentality"; (vii) "Inhibition"; (viii) "Doctrinal adhesions"; (ix) "technical presuppositions" or, in Campbell's (1958) terms, "assimilation to prior input and output"; (x) "general critical preconceptions." This list in general bears

a remarkable resemblance to Campbell's (1958) sources of error in man as a communication link in man-machine systems.

Further observations were that when Ss were asked to paraphrase poetry, they were either able to capture the sense or the feeling but rarely both. It's almost as though two forms of paraphrase were called for. This point is reiterated in Bartlett (1932) where Ss recalled the sense of the story but rarely the mood; and also relates to Honeck's (1969) theoretical point about "intrinsic" or semantic meaning versus "extrinsic" or pragmatic and semantic meaning. Richards says about the two kinds of paraphrases: ".....the first requires only an intelligent use of the dictionary, logical acumen, a command of syntax, and pertinacity. The second demands qualities of sensitiveness and imagination, the power to use remote experience and to create metaphors..."

Bartlett (1932) examined prose recall in terms of cross-cultural relations as well as actual recall. He found that Ss generated the sense of the stories at the time of recall, although with certain reservations mainly concerned with prior experience and cultural expectations. Bartlett hypothesizes that Ss remember certain details and on the basis of experience and expectations generate a "sensible" story. Depending on the details and their

order. This may lead to a recall of the meaning or it may not. This interpretation has also been offered by Martin Roberts and Collins (1968), Roberts (1968) and others in more detailed analyses of recall.

The major import of these two studies, Richards and Bartlett, taken in conjunction with Campbell's extensive review, is that while people seem to be able to interpret, paraphrase, and remember the gist of material, there are extensive limitations in the processing system primarily due to expectations, prior habits and affective states.

#### Rating studies

Clifton and Odom (1966) had Ss rank according to similarity sentences that were simple active affirmative declarative (SAAD) sentences, passives (P), negatives (N), questions (Q), PQ, NQ, PNQ, and PN. The similarity ratings and recognition tests seemed to indicate three subsets: (i) SAAD and P; (ii) N and PN; (iii) Q, PQ, NQ, PNQ. Although their data were congruent with syntactic explanations (see Katz & Postal, 1964), an explanation involving paraphrasing is clearly applicable, that is, each of the subjects are paraphrastic.

Heneck (in press) devised a taxonomy for paraphrases:

1. Transformational changes (T), e.g., "The lad hit the woman" is changed to "The woman was hit by the lad."
2. Lexical substitutions (L), e.g., "The lad hit the woman" is changed to "The boy struck the lady."

3. Both changes (F), e.g., "The lady was struck by the boy."
4. Parasyntactic changes (Pa), e.g., "The woman received a blow at the hands of the lad."
5. Syndetic changes (Sy), e.g., "The lady received a blow at the hands of the boy."

Rating on a scale of one to seven, one being identical to the target, 18 Ss judged T, L and F paraphrases. Mean ratings were 1.97, 2.59 and 3.10 respectively. These were all significantly different. The Ss were asked to paraphrase any constructions rated over 3.00 on the scale. These data were not analyzed. The Pa and Sy types were not included in the study.

One further rating study deserves mention. Martin (1965) used the error data collected from Martin et al. (1968). Each presented sentence was paired individually with each of its most frequent errors. There were 280 sentence pairs. Two conditions were run: (i) auditory presentation of each pair, and (ii) visual presentation of the pairs in a booklet. The Ss rated each pair on a 7-point scale according to how substitutable for each other the two members of each pair were. Which pair member occurred first, the original or the error, was balanced evenly, and the Ss had plenty of time to make their ratings. A rating of one indicated no relationship while a rating of seven indicated perfect substitutability. Errors

were collected from an experiment in which active and passive sentences of mean depths ( $\bar{d}$ ) 1.00 and 1.86 were presented. Recall was obtained at 0, 10, 20 or 40 seconds. The visual and auditory rating conditions resembled each other so the results will be presented together. Errors made to active sentences were more substitutable than errors made to passives except at 0 second retention where they were approximately equal. Median ratings for passives decreased over the retention interval from ratings equal to 5 at 0 second retention to a median rating of 4 at 40 seconds. There was no effect of retention interval for actives. Mean depth 1.86 sentences were judged higher than  $\bar{d} = 1.00$  sentences for all retention intervals except 0 seconds where  $\bar{d} = 1.00$  sentences were judged higher. The range of median rating here was also between 4 and 5. Errors then were judged as relatively close to the target sentences even though there are complex interactions with sentence kind, mean depth and recall interval. Both structural and semantic information may be lost immediately, but in general semantic information is not affected by recall interval in the range 0 to 40 seconds while structural information is lost rapidly. This loss is primarily due to the loss of adjectives in the 1.00 sentences and adverbs in 1.86 sentences (see Martin et al., 1968).

The rating data are not completely clear yet concern-

ing the relationships that exist between sentences. A semantic interpretation accounts for some of the observed relationships; certain physical characteristics or surface structures seem to account for some similarities; lastly, it appears that there are similarity relations that are more continuous in nature, that parts of the nominal stimulus or surface are also seen as related to more complete underlying structures.

#### Recognition of Paraphrases

English et al. (1934) examined the recognition of information in several experiments through the use of two types of true or false questions: (i) exact repetitions of a statement, and (ii) a "paraphrase" of a sentence or paragraph. Throughout many experiments and conditions paraphrase recognition was consistently worse than the repetition condition. However, while repetition recognition declined over time, paraphrase recognition scores either did not decline or they increased. The increase was gradual and extended over 55 days.

While the first recognition interval for the English et al. studies was 10 minutes, Sachs (1967a, b) explored recognition for paraphrases and non-paraphrases for intervals 0, 20, 40, 80 and 160 syllables of interpolated material, maximum time of about 46 seconds. She employed several different changes of material in her study. (1) Semantic changes in which the meaning was changed; (2) changed from

active to passive and vice versa (this change presumably is a change in the deep structure but not in the "intrinsic" meaning of the sentence); (3) formal changes in which the surface changed but the deep structure was unchanged; (4) lexical changes in which synonyms were introduced; (5) no change, the target sentence was reproduced. Subjects were asked to indicate whether the sentence is one they have seen before and if it had changed, to indicate the change. At 20 syllables (3 seconds), Ss can clearly recognize (1), (2) and (3) but do not distinguish (4) from (5), i.e., they confuse these two conditions. By 40 syllables (7.5 seconds), Ss could only say that (1) had occurred, the other conditions were confused with the repetition. She concluded that while surface form may be lost very rapidly, the information seems to be not stored as either a deep structure or a semantic representation but perhaps as even more abstract non-linguistic structure. The results obtained by Clifton and Odom (1966) for recognition are also consistent with both the obtained data and the hypothesis of a psychological as opposed to a linguistic representation.

Bregman and Strasberg (1968) used a forced-choice recognition with a second guessing procedure. They presented for 4 seconds each four related SAAD, P, N and Q sentences. Then Ss were given the transformations of each and asked to choose which sentences had been presented. There was no

response bias toward any particular transformational type. Secondly, the only significant effect of the second guess was that Ss exceeded chance only for the active-passive confusion (which was symmetrical). This too would support minimally a notion of semantic encoding. However, questionnaire data indicated Ss using word order, salience, imagery, affective response, truth value, etc. These are cues that belong at least to "extrinsic" meaning if not to the general cognitive capacities of the individual.

Fillenbaum (1966) showed that Ss are poor at recognizing lexical substitutions such as "open" for "not closed" in sentences. Subjects were better at recognizing changes such as "cold" for "not hot." This evidence is congruent with Sach's data but shows that certain semantic distinctions affect recognition, namely the differences between contraries and contradictories. (See also Johnson-Laird, 1970)

Myers (1969) related the associative constraints between subject-verb-object to the paraphrase Ss chose in a forced-choice situation. Two conditions are of interest for recognition studies. The high associative condition contained sentences of the form "The slave hated the cruel master" while the low associative condition replaced "cruel" with "old; for example. Subjects were presented with choices such as "The slave hated the master. The master was cruel," "The slave hated the master who was cruel," "The slave hated

the master and the master was cruel," and "The slave hated the master because he was cruel." When asked to choose the best paraphrase from the set, 70% chose the last choice, the one not related to the target. Conversely when given "The slave hated the old master," none of the Ss chose "The slave hated the master because he was old."

Wearing (1969b) used a recognition procedure and tested at intervals of approximately 45 minutes and 48 hours. The aspect of interest of this study is the type of distractor sentences used: either a word change (replacement with a synonym of the logical subject, verb, logical object or the noun from the adverbial phrase) or a position shift (moving the verbal adverb to the front of the sentence, or changing the adverbial phrase to an adjacent, intermediate or extreme position in the sentence.) While the distractor types did not affect the correct recognition of old sentences, they did have a significant effect on the recognition of new sentences. Changes in the object produced significantly higher, and changes in the verb produced significantly lower detection scores, with changes in the subject and the adverbial phrase noun intermediate. Position shifts were a simple function of the amount of shift, the greater the shift the more detectable. The detectability of word changes did not change over 48 hours; however the detectability of position shifts declined markedly. While Sachs' findings are in good agreement with the results for old sentence detections, the detection of new paraphrases of the old sentences appears

to be more complex.

Fodor et al. (1968) report a Fodor, Jenkins and Saporta study in which three types of sentences were used:

- (a) John swims faster than Bill swims.
- (b) John swims faster than Bill.
- (c) John swims faster than Bill does.

Generative syntax theories (with modifications) predict increasing difficulty in recognition from (a) to (c). Recognition latencies indicated that (a) took longer to recognize than either (b) or (c). Results obtained from similar experiments with displaced particles and particles in an "untransformed" position indicated no difference in difficulty for the various transformations, implicating extra-syntactic factors.

It would appear from the above studies, that in recognition tasks, the surface structure of the sentence has little to do with the errors observed. The errors appear to be confusions of stored meanings, with certain semantic distinctions contributing differentially to the confusions, as well as associative relations leading to technically erroneous choices.

#### The Recall of Paraphrases

Clark and Clark (1968) showed that in a situation where Ss studied six sentences and noun cues for ten seconds each, and then recalled a sentence given its noun cue, that semantic and surface features of the sentences affected the recallability of the sentences. The semantic features cited are the temporal

order, order of mention and main-subordinate relation of the two described events, in the paraphrases. If subordinate clauses were mentioned first, it seemed that there were also detrimental effects on recall which could be due to a mean depth effect.

Clark and Card (1969) showed marked differences within and between two paraphrastic sets, again using cued recall. One important finding was a sizeable number of sentences recalled as antonyms or changed from "greater-than-or-equal to" to "greater than" relations. They conclude:

...For the loose criterion of correct recall of one noun and the underlying adjective or its opposite, the eight sentences of the present experiment were about equal. For the stricter criterion of whole or partial synonymy, sentences that were positive or that contained unmarked adjectives were better recalled. For the tightest criterion, that of verbatim recall, sentences that were positive, that contained unmarked adjectives, or that meant "greater than" were better recalled. Each of these levels is accounted for by the simplification of semantic features. Thus the strength of the present theory is that it accounts for memory at many levels-- from remembering the gist of a sentence to recalling the sentence verbatim.

Contrary to Sacks, this theory and experiment does find loss of "meaning" in the sense that Ss will recall diametrically opposed conclusions to what they in fact heard. Certain of the transposed meanings were due, it was speculated, to foci of meaning and standard ordering of subject-object in the surface. One set of factors alluded to in the discussion was the influence of real-world knowledge on the effect of nouns influencing adjectival markedness. This theory does not account

for partial retention of the meaning, less than quanta leaps, that is, it proposes loss of meaning in a discrete fashion.

Roberts (1968) using short-term memory procedures, as well as free recall demonstrated for synonymous actives and passives of the form (a) "Soldiers were usually watching the men carefully" and (b) "Men were usually watched by soldiers carefully," that equal recall scores were obtained. There was some tendency for passives to be recalled as actives, but this could be completely attributed to associative asymmetries between the subject and object. Curiously this tendency to "transform" the sentence failed to preserve the meaning of the original. Namely, Ss did not transform the sentences (a) or (b); they instead preserved the surface order of the subject and object of (a) and (b) while changing the sentence kind in 67% and 69% of the cases. Although actives and passives cannot be compared in terms of semantic equivalence in another mean depth condition, the error pattern was equally striking: 36% of the actives which were changed to passives failed to reverse the subject and object; for the passives, 54% of the sentences were changed to actives without concomitently changing the noun order. These results would not appear to be congruent with a semantic feature loss interpretation: in the symmetrical associative cases the same error pattern of results emerges without any greater tendency to change passives to actives or vice versa. The Ss are reconstructing, based perhaps on the extra-linguistic contingencies in the

stimulus set, sentences that preserve order of nouns 1 and 2 rather than a more abstract semantic relation of subject and object when they make this type of error.

The same errors appear, with less frequency, in Prentice (1966). The fact that surface structure is interacting with the interpretation or recall of the information has been discussed by Chomsky, Katz and Postal, and Clark in terms of foci or associative connectors (see Prentice, 1966; Prentice, et al., 1966, 1967; Clark, 1965). Additional evidence is offered by Roberts (1968) in that error patterns of recall of the adverb inserted in the verb phrase differed between the two forms, active and passive. Subjects recalling actives tended to omit the adverb, while Ss recalling the passive tended to substitute for that adverb. This would relate other parts of the sentence organization to agent-verb-object interpretations or surface semantic organizations.

Slobin (1968) found that while 75% of his Ss changed the form from passive to active when full passives were used, only 40% changed the form of truncated passives. He concludes the following:

...In the case of truncated passives, at any rate, the syntactic form is not totally irrelevant to the meaning of the sentence, and frequently tends to be retained (or to serve as a ready receptacle for the underlying semantic content of the sentence, in whatever manner such content may be retained). The semantic part of a sentence coded in memory, thus, need not always correspond to "the representation of the simple active declarative sentence underlying the stimulus sentence (Mehler, 1964)."

Honeck (in press), in a complicated recall experiment, showed some validity for his taxonomy discussed in the section on scaling (see pages 14 and 15). He presented two sentences and word lists to his Ss: a "base" sentence, and a repetition (RE) of it or a paraphrase, and then a word list. Comprehension scores were computed by measuring the number of propositions retained in both sentences. Recall was best for RE and T, next best in L and worst in F. However, comprehension scores were equal in the "base" sentence for RE, T, and L. Conditions RE and T were better than L and F on unordered content word recall. Ordered word recall data was more complex; ordered word recall performance was better in RE and T than in L and F for the base sentence. However, for RE and L no difference was noticed for ordered word recall in the base and paraphrase, while for T and F the second sentence was depressed on this measure.

King and Russell (1966) used eleven measures of accuracy in assessing recall of a 200-word passage. Two instructional sets were used, remember the passage verbatim or remember the meaning of the passage. The measures used were the following: total number of words; total number of letters; number of identical words; number of identical content words; number of idea units; number of predictable words (based on a cloze procedure); number of sentences; number of sequences five words long; number of sequences eight words long; scaled

accuracy word for word; and, scaled accuracy of the idea units. Recall was better under the instructions to recall the meaning on all measures except the number of ideas which was better on rote instructions.

Finally, Rothkopf and Coke (1966) report greater retention for both repetition and altered phrasing of a sentence if the second presentation is delayed rather than immediate. Also, immediate presentation results in greater generalization of the critical response to sentences which differed in phrasing from the original sentence.

In summary, the retention of meaningful material appears to depend on many factors. Studies not reviewed here have demonstrated that the syntax of the sentence influences recall (e.g. Martin & Roberts 1966 ; Mehler 1963). However, the import of the present studies is that factors such as semantic features determined by the surface structure and underlying relations interact with purely surface attributes such as associations and word order to also determine the recallability and the form of "errors" for sentences.

#### Miscellaneous Studies of Paraphrasing

Gough (1965, 1966) showed that while it took longer to verify statements couched in the passive than in the active, this could not be attributed to an automatic decoding process of the syntax since a pause before verification led to the same differences. A frequency analysis of the occurrence of passives could account for these results, or alternatively,

Ss may not have attempted any decoding until it became necessary. Gough also found a significant interaction between the truth and falsity of the statements and the syntactic of form. This variable is definitely semantic in nature.

Slobin (1966) found that the passive construction is no more difficult to verify than the active when the semantic relations are unique, e.g., "The dog ate the cookie" took the same amount of time as "The cookie was eaten by the dog." On the other hand, sentences with both animate subjects and objects did display the asymmetry, arguing for some sort of order effect in the surface and recognition of semantic features prior to or simultaneous with syntactical analysis. Turner and Rommetveit (1967) have demonstrated this phenomenon in children. This restriction on animacy conditions may not be totally semantic however (see Tolkien, 1947), but results from pragmatic and contextual factors.

Miller's (1962) matching data, and Miller and McKean's (1964) findings on changes in recognition latency for transformed sentences also could be interpreted as showing some evidence for semantic organization. Except for the anomalous condition of SAAD to N in Miller and McKean, SAAD to P has the shortest latency, N to PN the next shortest, with non-paraphrases slowest.

Ambiguity is an interesting case of paraphrasing in that two mutually exclusive paraphrases may represent the meaning of some target sentence. MacKay (1966), MacKay and Bever (1967)

and Bever (1968) have presented interesting data on this topic. MacKay (1966) showed that time to completion of ambiguous fragments depended on the number of ambiguities and the level of the ambiguity, whether surface or "deep" structure. "Deep" structure here might well be a semantic level. Grammaticality and relevance of the response also appeared to be affected by the same factors. MacKay and Bever (1967) studied the amount of time necessary to perceive the two meanings of ambiguous sentences. They defined three types of ambiguities, lexical, surface and deep. Perception time is a function of the type of ambiguity, lexical being fastest, surface next and deep structure ambiguity slowest. Perception time is also increased when one meaning is more likely than another (this would appear to be a non-linguistic variable). Bever (1968) reports the time to paraphrase an ambiguous sentence like "The shooting of the hunters was silly" was significantly shorter than to paraphrase an unambiguous sentence like "The shooting at the hunters was silly."

#### Production of Paraphrases

Besides the observation by Bever (1968), there have been relatively few studies on the production of paraphrases per se. The attempts to analyze errors (Martin, 1966; Honeck, 1970; King & Russell, 1966; etc.) might shed light on this area, but clearly these studies were not carried out with the intention nor the instructions to paraphrase. Myers (1969) included a

condition where Ss were asked to paraphrase "The slave hated the cruel master," "The slave hated the old master," "The slave hated the master. The master was cruel," etc. Most paraphrases for the first two sentences fell into a category called "other" and were not analyzed. He reports that Ss created "... a short story, which proved a context for the test sentence." Subjects paraphrased the substrings 70% to 80% of the time by combining them into a single sentence. Sentence relatedness did not seem to affect the production patterns.

Pever (1968) reports that Ss had difficulty paraphrasing sentences of the form "The editor authors the newspapers hired liked laughed" even after practice. The Ss did not have as much difficulty with sentences of the form "The editor the authors the newspapers hired liked laughed". Fodor et al. (1968) similarly used sentences of the forms (a) "The pen the author the editor liked used was new" and (b) "The pen which the author whom the editor liked used was new." Two measures of paraphrasing were used: latency and number of subject-object relations recovered. Groups of Ss served under either an expressive reading or a non-expressive reading condition. Sentences of the form (a) produced longer times to be paraphrased and fewer correct propositions when the sentences were read in a monotone. When read expressively, Ss recovered as many correct propositions for both sentences but still took longer for (a).

The results of these studies indicate that when the structure of the sentence is more explicitly marked in the surface of the sentences, relational markers, ambiguity resolvers and intonational contours, Ss can process the sentences faster and more accurately and produce more representationally significant paraphrases.

Gleitman and Gleitman (1970) in a major work on the production of paraphrases studied the ability of Ss to paraphrase nominalizations of the form "black bird house." Stimuli consisted of two constant words, "bird" and "house" and twelve additional words — three verbs, three adjectives, two nouns, and four words of mixed categories. Two stress patterns with permutations in the order of words resulted in 144 stimulus items. The groups of Ss were all monolingual white female English speakers between the ages of 19 and 36. There were three groups of Ss: (a) graduate students; (b) undergraduate students; and (c) secretaries. No other personality characteristics were mentioned, and it is presumed that the selection of Ss was random. Subjects were instructed to give a phrase that "meant about the same thing," and were given examples such as "milkman means a man who delivers milk," There was no time limit and the Ss could rehearse any stimulus, thus minimizing performance difficulties. Subjects were scored for number correct and type of error: order, stress, chaos (error of stress and order), and format (errors not attributable to order or stress).

Results indicated significant differences between all

three groups which were ordered (a), (b), and (c), group (a) obtaining the greatest number correct. There were virtually no overlaps among the three groups. Further, the types of errors shifted significantly between the three groups, e.g., secretaries obtained more format errors than the other groups. Semantic plausibility and familiarity with some features also determined some responses, i.e., Ss went against order or stress patterns occasionally.

In order to investigate the hypothesis that secretaries could understand (in a competence sense) the nominalizations, but not produce them, a forced choice recognition procedure, using Ss and paraphrases from the first study, was run. Only graduate students and secretaries were used. The mean errors per item were for group (a), .05; for group (c), .70. In addition, Ss preferred their own errors rather than correct alternatives.

One further study was performed. Group (c) Ss were trained on the stimulus list used previously with the experimenter showing the Ss which paraphrases were correct. Errors were reduced from 64% to 35% but this is still far above the worst S in group (a) who had 22% errors.

Their conclusions were that Ss do not possess a universal competency in the grammar of English, but perhaps some subset of the crucial rules and either a semi-grammar (see Katz & Postal, 1964) or some set of strategies that enable Ss to arrive at semantic interpretations.

### Conclusions

While linguistic considerations have primarily motivated the studies above, the value of the obtained data for the verification of those theories is unclear. The concept of "explanatory adequacy" for linguistic theories is important but it does demand a coherent account of the speaker and hearer. One aspect of a real speaker and hearer is that he produces and understands ungrammatical utterances, that he errs in transmission. Traditionally, this aspect has been dismissed as a congeries of "performance" variables (unless the experiments are carried out on young children), and therefore of little relevance to linguistic investigation.

Evidence from the above studies and related fields of investigation such as the interpretation of deviant sentences (see Downey & Hakes, 1968; Chapman, 1967; Danks, 1968) indicate that it may be difficult to distinguish performance from competence. Heuristic strategies SS employ may simulate grammatical rules in some cases and at some times. Additionally, SS appear to rely on semantic and pragmatic cues as much as syntactic cues. Whether "understanding" or "interpretation" depends on a syntactic analysis at this stage of research is uncertain. It seems possible to construct plausible theories of the speaker and hearer at a semantic or pragmatic level and certainly any complete theoretical account will include these levels.

Further research should explicate the conditions under

which lexical, syntactic, and semantic information is retained, and given the particular condition, what temporal parameters describe forgetting. Also while the hearer-performer has been described in many studies, the dispositions of the speaker-performer have not been well characterized. The latter applies to studies of understanding and situational context determining productive language behavior rather than the replication of inputs, and would presumably involve a thorough understanding of the conventional nature of language as well as the internal generating devices for language.

General trends in this literature would seem to be the following: Subjects perceive the surface structure of a sentence presumably in the context of previous sentences and environmental (i.e., extralinguistic) events and the particular situation, including both presentational and instructional conditions. They utilize certain strategies and expectations concerned with order, stress, emphasis, etc. in this perceptual act. By concentrating on nouns and verbs, presumably discovered through either context or primitive linguistic processing or both, they initially, in English, assume an agent or "focus" function of the first noun. This assumption of these relationships occurs within the first few seconds after reception or may occur as the sentence is entering the information-processing system. Essentially a trial-and-error semantic analysis (guided by situations) is postulated. Without extensive computation, this is probably

as close to "intrinsic" meaning as Ss normally get.

The primitive semantic analysis is integrated with "extrinsic" meaning characteristics such as word associations, prior expectations, perhaps "dominant details" in Bartlett's sense and affective responses. This structure is what is stored in memory, and the structure utilized in recalling, recognizing, or utilizing the sentence.

Subjects, in other words, actively secure interpretations, even from anomalous strings, by utilizing linguistic, logical and psychological processes. Studies to date seem to indicate that in Ss without special training in linguistics and logic, the psychological processes predominate. Although a simple associative model is probably inadequate to account for the diverse observations, the assumption of a universal competency for syntactic analysis is also not necessary nor adequate to account for the empirical evidence.

## CHAPTER II

### Experiment

The following experiment was designed to investigate the production of paraphrases. Scattered observations (Bever, 1968; Fodor et al., 1968) have shown that surface cues such as explicit marking of phrases and intonational contours ease the recovery of meaningful relations within the sentence. They also decrease the latency of responding with a paraphrase of the sentence. Myers (1969) showed that atomic meaningful relations, e.g., "The slave hated the master. The master was cruel.",  $S_s$  tend to combine them into single sentences, e.g., "The slave hated the cruel master." The converse was not true and these paraphrases were left unanalyzed.

Gleitman and Gleitman (1970) showed that individuals differ in their ability to produce paraphrases of nominalizations. This difference appeared even when correct alternatives were presented, and remained even after extensive training. Furthermore, error distributions differed over the three groups of individuals studied. Four types of errors were studied: error of order, error of stress, error of chaos, error of format. (For the stimulus "bird-house boot" with a correct response of "a boot you wear in a bird-house," "a bird-house that has a boot in it" would be an error of order; "a boot for birds in houses" would be an

error of stress; both order and stress errors in a paraphrase were considered errors of chaos; "someone is booting the bird house" would be considered an error of format.)

Two basic problems exist in this problem area: (i) what functional relationships exist between psychological variables known to affect cognitive activities and paraphrasing, and (ii) what are the appropriate methods needed to assess and classify the paraphrases generated under different conditions, or alternatively how to measure meaning on many levels at once. The principle methods have concerned themselves with ratings (Martin, 1966) and number of logical relations recovered (Bever, 1968) .

The present study examines the effect of aural versus aural-plus-visual presentations of target sentences and the effect of mean depth (Martin & Roberts, 1966) on the ability of Ss to paraphrase seven word sentences. Rating procedures are used to judge physical and semantic similarity and their intercorrelations. Coding procedures attempt to characterize dominant strategies of the Ss in this task.

#### Procedure

Ninety-six Ss, demale undergraduates at the University of Michigan between the ages of 18 and 22, served as paid volunteers (\$1.50) for the experiment. Each S was randomly assigned to one of two experimental conditions: M--in which Ss were asked to generate paraphrases from immediate memory;

and NM--in which Ss were asked to generate paraphrases without a memory load. The complete instructions to these groups are reproduced in Appendix A.

Subjects first heard a set of instructions containing the key phrases "paraphrase," "rephrase," "relay the meaning of a statement without repeating it verbatim," "to re-express that statement in your own words," "put into your own words.. while... preserving the original meaning." The instructions also encouraged the Ss to work rapidly. They were next given five practice sentences read aloud by E, all of which differed from the experimental sentences in terms of content, length and mean depth ( $\bar{d}$ ). The Ss then were either given the first of the 48 experimental sentences via a tape recording of E reading the sentence, or they turned over a card with the sentence typed on it and heard the sentence via the recording. At the end of the sentence E stopped the presentation recorder and the S paraphrased the sentence. When S had completed the spoken paraphrase, the next sentence was presented, and so on. From the initial presentation, the entire session was recorded. Even though the session was self-paced, no S took longer than 20 minutes to complete the 48 sentences.

There were two within-S manipulations:  $\bar{d}$  was varied over three levels; and length was varied over two levels, seven and ten words. Both variables have been shown to have important effects in sentence recall (Martin & Roberts, 1966 1967). For the seven word sentences, the  $\bar{d}$  levels were 1.00,

1.43, and 1.86; for the ten-word sentences, they were 1.30, 1.40, and 1.70. Order of presentation was counter-balanced over the 48 Ss within a condition. Each S began on a different sentence and continued through the list of sentences. The list was constructed such that in each block of six sentences there was one exemplar of each of the length and depth combinations in random order. There were eight blocks of such sentences, all of which were active, and semantically not related to each other in the opinion of E.

In summary, there were one between-Ss condition and two within-Ss conditions with 48 Ss in the M condition and 48 in the MM condition. There were eight replications of each memory, d, and length combination, giving potentially<sup>2</sup> 4,608 paraphrases.

Responses were transcribed verbatim by E (including false starts, repetitions, partial words, etc.). Factors such as filled and unfilled pauses and stress were not included in the transcription. These responses were then "cleaned up." That is, repetitions, false starts, and partial words were deleted and the resultant sentences and semi-sentences were used in the analysis.

For the purposes of this particular study, only the seven-word sentences were considered and three exemplars of each d level were randomly chosen from the eight replications for this analysis. (The sentences labeled Target, used in

this study, as well as the "cleaned up" paraphrases, are listed in Appendix B. Thus the data analyzed in the present study are represented by one between-Ss condition (M vs MM) and one within-Ss condition ( $d = 1.00, 1.43, \text{ and } 1.86$ ).

Basically the analysis of the data was aimed at evaluating the paraphrastic behavior of Ss through the use of "physical similarity" (PS) and "meaning similarity" (MS) measures. Secondary analyses attempted to characterize the overall structure of the paraphrastic sets dependent upon the experimental variables, and to characterize the particular behaviors Ss adopted in this task.

#### Method of Analysis

The first scale constructed was based on "physical" characteristics of the paraphrase relative to the target. The rationale and computational techniques for determining the coefficients of similarity were adapted from Sokal and Sneath (1963). They claim that the only empirical method for determining similarity is to make no a priori assumptions about the importance of any given physical characteristic. Although central to the definition of a paraphrase is the notion of identity or similarity of meaning, different linguistic and philosophical theories predict different necessary degrees of physical similarity. Further, several learning theory approaches predict similarity effects in the recognition and recall of material. Thus the following scale

was established.

Physical similarity was assessed by comparing the number of identical (and in some cases, similar) attributes between the target sentence and its paraphrase. It was assumed that a "natural" weighting function would result, given that certain of the attributes are redundant. Given that we have no a priori rationale for weighting one physical attribute over another, i.e., for assuming what is most important in the determination of physical similarity, one gives each attribute equal weight. If there does exist some more basic or important attribute (e.g., gene type, in the determination of species), then one might expect additional correlated or redundant attributes almost by the definition of "important." Post hoc tests for correlations of features can then be used to determine central or important factors. (Factor analysis would determine more exactly the obtained weighting function of clusters of attributes.) Since the structure of the sentences at each  $\bar{d}$  level varied, and since lexical elements in each sentence varied, certain attributes and acceptable ranges of particular attributes varied. Variation between  $\bar{d}$  levels in scale attributes will be indicated below.

Attributes were scored as either 1, 0, or NC (non-comparable), e.g., if a particular presented word did not occur in the paraphrase, its placement in the serial order could only be scored as "NC." Physical similarity coef-

ficients were then given by the sum of positive ("1") attributes divided by the sum of positive and negative ("1+0") attributes.

For  $\bar{d} = 1.00$ , fifty-three attributes contributed to the physical similarity coefficient:

(1) Seven attributes: Did each of the seven words in the target sentence occur in the paraphrase?

(2) Seven attributes: Did each of the seven words, if they occurred in the paraphrase, occur in the same target sentence position?

(3) One attribute: Did the length of the paraphrase fall within the range five to eight words?

(4) One attribute: Did the average number of syllables (syllables/word) of the paraphrase fall within a range<sup>3</sup> around the average number of syllables in the target?

(5) One attribute: Was the sentence "active" in kind?

(6) One attribute: Did the mean depth ( $\bar{d}$ ) of the paraphrase fall within a range around the mean depth of the target?

(7) Seven attributes: Did some word in the paraphrase derive directly from some word in the target? For example, "Residents" derives (identity derivation) from "Residents"; "persuasive" from "persuasively"; and "Resident" derives from "Residents."

(8) Fourteen attributes: Did labeled elements of the phrase

structure of the surface occur in the paraphrase as well as the target? For example, if  $N_2$  occurs in the hierarchical structure, does some  $N_2$  occur anywhere in the paraphrase?

(9) Fourteen attributes: Did labeled elements, in the sense of (8), if they occurred in the paraphrase, occur in the same hierarchical, relative to higher nodes, position in the surface?

For  $\bar{d} = 1.43$ , fifty-one attributes were used. The only difference is that class (8) and class (9) attributes contained one less item. Attributes for mean depth = 1.86 conformed to those for  $\bar{d} = 1.00$ . The hierarchical trees scored are given in Appendix C.

The second scale was intended to measure the meaning similarity of the paraphrases to the target sentences. The paraphrases from conditions M and MM were combined and randomly ordered. Two judges<sup>4</sup> were asked to sort the nine paraphrastic sets (including the target for a given set) into groups of sentences which meant the same. (A paraphrastic set given the combination consisted of potentially 96 sentences. Duplicate M and MM paraphrases when they occurred were included only as a single paraphrase.) Judges were instructed to pay attention to the "meaning" of the paraphrase not the form. Further they were instructed that they should use "common sense" about the identity of "meanings."

At the end of the sorting activity, E determined in which group the target sentence occurred and asked the judges to estimate on a scale of one to seven (seven being close to the meaning of the target group; one being very distant) how far away, in terms of meaning, groups of sentences that had been judged identical to each other were from group of sentences containing the target. Sentences judged to be identical with the target were arbitrarily assigned the value of eight. By averaging the judges' ratings, a scale of similarity of meaning (MS) between items in the paraphrastic set was established.

A third procedure was used to characterize Ss behaviors in terms of their produced sentences: Among the sentences that were changed the sentence was scored as to kind, i.e., active (A), passive (P), negative (N), etc. Then the type of alteration was coded: C --some word or words were changed; D --some word or words were deleted; or A --some word or words were added. More than one type of alteration could characterize a particular sentence, e.g., PAC scored for a sentence would indicate that the paraphrase was a passive with some words added and some words changed. Finally, some sentences were characterized as "other." Negative sentences were placed in this category because their incidence appeared to be dependent on particular lexical items,

e.g., "ignore" became "not pay attention to." Very few subjects contributed to this category other than this example of the negative and this category was not analyzed. Only the categories C, E, D, and A were examined; these accounted for the bulk of the responses (7% of the responses in M were coded as "other," 13% in NN).

### Results

The first set of results are given in Appendix B. Shown in the columns labeled MS and PS are the scale values for meaning similarity and physical similarity for each paraphrase. The paraphrastic sets are ordered according to values on the MS scale. The correlations between the two scales are shown in Table 1. All correlations were significant at at least the .05 level except one (degrees of freedom ranged from 31 to 46. Since the question at hand was the amount of correlation between physical and meaning coefficients of similarity, the number of Ss who contributed a particular paraphrase was not taken into account in the correlation. Correlations for  $\bar{d}$  conditions as a whole (either M, NN or the  $\bar{d}$  conditions) were thought to be inappropriate because judges' ratings were probably influenced by the range of sentences within a paraphrastic set.

TABLE 1

CORRELATIONS BETWEEN MS AND PS SCALES

$\bar{d}$	Sentence	Condition	
		M	NM
1.00	Drivers	.487*	.332***
	Lawyers	.602*	.344***
	Residents	.531*	.274
1.43	Managers	.600*	.385**
	Artists	.358*	.520*
	Pupils	.587*	.492*
1.86	Salesmen	.631*	.448*
	Mayors	.596*	.575*
	Writers	.588*	.429**

\*p .001

\*\*p .01

\*\*\*p .05

Although most of the correlations between "form" and "content" are significant, the highest correlation accounts for only 40% of the variance in the ratings. Further it should be noted that in eight out of the nine comparisons between M and NM, the correlations for the non-memory are lower (NM) conditions are lower, even though none of the differences are significant at the .05 level

Correlations for inter-judge reliabilities are given in Table 2. All the correlations are significant at at least the .01 level. Again in eight out of nine cases, NM

TABLE 2  
CORRELATIONS BETWEEN JUDGES' RATINGS

d	Sentence	Condition	
		M	NM
1.00	Drivers	.867*	.832*
	Lawyers	.902*	.835*
	Residents	.807*	.708*
1.43	Managers	.566*	.544*
	Artists	.828*	.740*
	Pupils	.813*	.733*
1.86	Salesmen	.671*	.404**
	Mayors	.749*	.875*
	Writers	.730*	.644*

\*p < .001

\*\*p < .01

correlations are lower than those for  $\bar{M}$  and again none of the differences are significant at the .05 level. Further there is some hint that judges were less reliable as  $\bar{d}$  increased.

These correlations can be summarized by stating that there exists significant correlations between physical similarity and judged meaning and that judges very strongly agree on the distance of the meaning of the sentences to be judged from the target.

In order to examine the accuracy of paraphrase as a function of memory ( $\bar{M}$  vs  $\bar{NM}$ ) and complexity ( $\bar{d}$ ), two categories of sentences were chosen, those for which the judges both agreed were identical in meaning to the target (rated 8) and those for which one judge rated them identical and one judge rated them 7 or highly similar (rated 7.5). Sentences

that were repetitions of the target were dropped from the analysis. Results are given in Table 3. Analysis of variance shows that both main effects are significant, the memory conditions,  $F(1,4) = 15.20, p < .05$ , and the complexity conditions;  $F(2,8) = 10.81, p < .01$ . Their interaction was not significant. Condition NM is clearly superior to condition

TABLE 3

PROPORTION OF SUBJECTS GENERATING SENTENCES RATES 8 AND 7.5

Sentences		Condition	
$\bar{d}$		M	NM
1.00	Drivers	.42	.60
	Lawyers	.43	.73
	Residents	.38	.56
	(Mean)	(.41)	(.63)
1.43	Managers	.16	.31
	Artists	.23	.41
	Pupils	.42	.43
	(Mean)	(.27)	(.38)
1.86	Salesmen	.33	.33
	Mayors	.27	.33
	Writers	.08	.24
	(Mean)	(.23)	(.30)

M and as  $\bar{d}$  increases the proportion of "good" paraphrases falls off sharply.

Table 4 and 5 show averages for some of the scales (scales 1, 3, 6, and 7) to derive PS measures. Table 4 depicts averages for the replacement or loss of the major meaning-bearing elements of the sentences. For example, in the upper left-hand corner of the table, in 77% of the

TABLE 4

PROPORTION OF PRIMARY-MEANING ELEMENTS RETAINED						
$\bar{d}$	Condition					
	M			NM		
	1.00	1.43	1.86	1.00	1.43	1.86
Exact subjects	.77	.72	.86	.87	.83	.94
Exact verbs	.13	.25	.20	.23	.48	.27
Exact objects	.79	.70	.68	.92	.78	.83
Exact and derived subjects	.80	.80	.88	.90	.89	.97
Exact and derived verbs	.61	.73	.71	.72	.83	.83
Exact and derived objects	.89	.79	.83	.92	.83	.93

paraphrases at  $\bar{d}=1.00$ , M condition, the exact subject of the target (scale 1) was retained in exactly the same word form in the paraphrase; in the lower right hand corner, in 93% of the paraphrases at  $\bar{d}=1.86$ , NM condition, the derived and the exact objects of targets (scale 7) were retained in the paraphrase. Although no general trends related to the major independent variables are observable, it is important to note that most of the paraphrastic activity is centered on the verb. This observation must be qualified somewhat: (i) it is likely that the loss of auxiliaries will change the form of the verb; (ii) passivization will also change the exact form of the verb. Even given these qualifications, it can be seen from the loss of derived verbs entries that these values still exceed those for either subjects or objects.

TABLE 5

AVERAGE  $\bar{d}$  AND LENGTH OF THE PARAPHRASTIC SETS

$\bar{d}$	Sentence	Condition			
		M		NM	
		$\bar{d}$	length	$\bar{d}$	length
1.00	Drivers	1.35	9.70	1.37	10.29
	Lawyers	1.22	8.67	1.27	8.60
	Residents	1.31	10.06	1.26	9.58
1.43	Artists	1.49	10.70	1.49	10.72
	Managers	1.47	9.91	1.48	10.06
	Pupils	1.44	9.19	1.44	9.57
1.86	Mayors	1.69	8.38	1.66	8.69
	Salesmen	1.44	7.92	1.43	7.60
	Writers	1.41	8.02	1.48	8.17

Table 5 shows the mean depth and average lengths derived for each paraphrastic set. There is some tendency for the most complex sentences to be slightly shorter. The more interesting effect, noticed in recall studies (e.g., Martin & Roberts, 1966), is the tendency for  $\underline{S}$ s to increase the complexity of low  $\bar{d}$  sentences and decrease the complexity of high  $\bar{d}$  sentences.

The remaining analyses attempt to characterize the type of behavior the  $\underline{S}$ s adopt when altering the target sentence. The four categories (change, passivization, deletion, and addition) were chosen because of the following factors: (i) it was possible for an  $\underline{S}$ , given that he altered something in a given sentence, to contribute to all four categories; and (ii) none of the categories chosen seem to display any idiosyncratic relationships to any particular sentence. Any particular  $\underline{S}$  could only contribute once

in a particular category in a given sentence. Results are shown in Table 6, where the maximum possible in any cell is 144.

TABLE 6

NUMBER OF Ss WHO CHOSE A PARTICULAR CATEGORY OF RESPONSE

	Conditions						TOTAL
	M			NM			
$\bar{d}$	1.00	1.43	1.86	1.00	1.43	1.86	
Change of words ( <u>C</u> )	120	132	127	87	109	126	701
Passification ( <u>P</u> )	64	38	27	67	34	30	260
Deletion of words ( <u>D</u> )	55	82	107	31	50	96	421
Addition of words ( <u>A</u> )	28	71	72	23	78	29	271

The pattern of response can be described as follows: for C and D, NM is less than M, and for P and A, M and NM are approximately even. C and D increase as  $\bar{d}$  increases while P decreases. The only non-linearity over  $\bar{d}$  is A, which increases at  $\bar{d} = 1.43$ . Clearly C is the most common response category employed, with D intermediate and P and A approximately equal and lower than the other two categories.

One further point of interest is the incidence of true passives, passives that were transformed without changes from the target sentence. For condition M, at  $\bar{d} = 1.00$ , 27 out of 64 passives were true passives; at  $\bar{d} = 1.43$ , 4 out of 38; and for  $\bar{d} = 1.86$ , 4 out of 27. For condition

NM, the corresponding numbers are 38 out of 67, 6 out of 34, and 7 out of 30.

In an effort to distinguish, in a simple way, the difference between "good" paraphrases and "bad" paraphrases, the paraphrases were subdivided into those in which elements were changed yet were rated 8.0 or 7.5 on the MS measure and those that were rated 5 or below. These were coded as to whether the paraphrase changed, deleted or added words, or created a passive. Each paraphrase could entail as many as all four response categories since it is the frequency distribution over these categories that is of interest, the frequency of each category was divided by the total frequency of all response categories. Results are given in Table 7.

TABLE 7

Mean Depth by Condition	MS Category Rating	PROPORTION OF CODED BEHAVIORS CONTRIBUTING TO A RESPONSE CATEGORY			
		C	P	D	A
1.00 M	8 - 7.5	.32	.48	.09	.11
	5 - 1	.32	.15	.31	.22
1.00 <u>NM</u>	8 - 7.5	.26	.52	.08	.14
	5 - 1	.35	.09	.37	.19
1.43 M	8 - 7.5	.24	.27	.19	.30
	5 - 1	.36	.11	.26	.27
1.43 <u>NM</u>	8 - 7.5	.18	.34	.16	.32
	5 - 1	.40	.05	.25	.30
1.86 M	8 - 7.5	.35	.11	.44	.10
	5 - 1	.34	.08	.36	.22
1.86 <u>NM</u>	8 - 7.5	.39	.13	.38	.10
	5 - 1	.41	.05	.36	.18

Subjects when paraphrasing sentences are more successful when they change a sentence to a passive relative to other changes than those Ss who do not. Poor paraphrases entail deletion of words relative to other categories. One point that may be more characteristic of the MS measure is that Ss who scored 5.0 or less employed on the average 2.32 codings while those who scored 7.5 or better employed 1.50 strategies.

TABLE 8

PROPORTION OF PARAPHRASES WHICH  
RETAIN PRIMARY-MEANING ELEMENTS

	Conditions											
	M						NM					
$\bar{d}$	1.00	1.43	1.86	1.00	1.43	1.86	1.00	1.43	1.86	1.00	1.43	1.86
MS category	8-7.5	5-1	8-7.5	5-1	8-7.5	5-1	8-7.5	5-1	8-7.5	5-1	8-7.5	5-1
Exact subject	.83	.58	.82	.50	.94	.73	.96	.52	.90	.63	.95	.91
Exact verbs	.11	.12	.34	.18	.29	.07	.09	.30	.59	.20	.12	.20
Exact objects	.86	.60	.92	.45	.74	.58	.98	.70	.94	.50	.98	.72
Exact and derived subjects	.93	.62	.82	.63	.94	.84	.98	.61	.94	.73	.95	.96
Exact and derived verbs	.80	.56	.92	.50	1.00	.51	.83	.44	.94	.53	1.00	.64
Exact and derived objects	.98	.75	.97	.55	.94	.76	.98	.70	.96	.60	1.00	.88
n	56	52	38	38	31	71	81	23	51	30	41	56

A more fine grain analysis of the retention of primary-meaning elements is given in Table 8. Again the paraphrases were divided into those rated 8 or 7.5 and those rated 5 and below. This table gives the proportion of paraphrases in the two MS categories that retained either the exact subject, object or verb, or a derived and exact subject, object or verb. (see PS subclasses 1 and 7.) For example, in the upper left hand corner of the table, 7% of the paraphrases, in the M condition,  $\bar{d} = 1.00$ , that received MS ratings of 8 or 7.5 retained the exact word that functioned as the subject of the target sentence. Neither memory conditions (Mvs NM) nor  $\bar{d}$  appear to relate to "good" and "bad" paraphrases differentially. Rather, the proportionate differences seem to be dependent on the number of losses or replacements, and on the word classes in which the loss or replacement took place. Again it can be seen that the major paraphrastic behavior takes place in the verb with little difference between the "good" and "bad" paraphrases. However, "good" paraphrases retain some derivation of the verb more often than do "bad" paraphrasers. Differences that appear to be more constant across "exact" and "derived" scales are found in the subject and object entries in the table. "Good" paraphrases consistently alter these categories less frequently. Additionally a "bad" paraphrase alters more elements than does a "good" paraphrase.

In summary, scales of physical and meaning similarity were established for a group of sentences produced under the instructions to paraphrase a target sentence. One group of Ss responded under immediate memory conditions while another group did not have a memory load. The target sentences varied in complexity. The scales correlated significantly, and the judges agreed reliably on the distance of the paraphrases from the target. Both the memory conditions and complexity had significant effects on the goodness of paraphrases. There were no interactions between the two conditions. The most common categories of responses chosen were the alteration and deletion of lexical items, primarily the verb. The passive category was used relatively infrequently, except at  $\bar{d} = 1.00$ , and the incidence of true passives was quite low.

#### Discussion

The present experiment clearly shows that performance factors such as memory and complexity influence the ability of Ss to construct paraphrases. Further, it shows that the strategies they adopt are contingent upon the particular surface structures of the target sentence. The incidence of transformationally related sentences produced is relatively low and appears to be contingent upon the target sentence. For all sentences, it is clear that Ss prefer to alter words, then to drop words as perhaps irrelevant to the

"significant" meaning in the target. For the behaviors that were investigated in detail, changing words, passivization of sentences and deletion are directly related to  $\bar{d}$ . Only the addition of words was non-linearly related to this variable. Whether the latter is related to some factor analogous to associative relatedness is not clear in the present context. Why clauses related to the subject of the sentence, which appears to differentiate  $d = 1.43$  sentences from the others, should produce this behavior is definitely unclear.

Subjects in the NM condition when they altered the sentence tended to be more accurate in paraphrasing the sentences, even though there was some greater tendency for the Ss in this group to repeat the target sentence.

The focus of the paraphrase for primary-meaning elements is the verb followed by the subject and object. The Ss tend to alter both the "exact" and "derived" forms of the verb more frequently for both M and NM conditions than either the subject or object of the target sentence. Sentences tend to increase in length on the average. Also, Ss tend to increase the surface complexity of low  $\bar{d}$  sentences while decreasing the surface complexity of high  $\bar{d}$  sentences.

"Good" paraphrases (those rated 8 or 7.5 on the MS scale) tended to be passives more often than "bad" paraphrases. "Bad" paraphrases were produced when Ss made many changes in the sentence, primarily deletions. Further Ss when producing

"good" paraphrases tended to alter fewer primary-meaning elements (subjects, objects and verbs), particularly subjects and objects.

It remains to be seen whether or not these result remain when sentences are increased in length. Wearing(1969a) has proposed some critical break point in terms of length that may be crucial to Ss' comprehension analogous to the concept of numerosity versus having to compute an interpretation.

Although most of the literature has been oriented toward passive reception of experimenter-designed variables defined a priori, very little is known about the conditions under which Ss generate or produce "meaningful" utterances. Obviously it is relevant to the available literature to relate the present data to the problems of recognition, recall problem-solving, etc., in order to show additional psychological validity for the obtained scales. The present study demonstrates functional effects for both stimulus and subjects variables. Further, it is shown that Ss and paraphrases may be distinguished in terms of "goodness" by the derived scales and coding procedures.

Psychologists have opined (e.g., Deese, 1968) that paraphrasing is crucial to understanding the "meaning" of utterances. This is obviously congruent with the opinion of empirically-minded philosophers. How psychologists can

give an account of the underlying information-processing mechanisms remains in some question. Clearly some theoretical approach is advantageous in terms of directing certain investigations. The literature review indicates that the evidence so far procured is divergent from rather than convergent on any specific viewpoint; and in general the questions remain: what interpretative mechanisms exist and what are the ways (procedures) that might specify those mechanisms. We lack specification or theoretical orientation in the ways that individuals interpret the world and more specifically the way that individuals interpret linguistic utterances.

We are discovering functional variables that indicate general predispositions, as well as task-specific constraints, to which individuals conform. We do know that Ss draw interpretations of sentences very rapidly; the idiosyncracies of this process have not been fully explored. Major questions remain about the ability of Ss to logically construe statements, to "handle" messages of length and complexity beyond some point. Given Gleitman and Gleitman's (1970) results, there is some real question about making any complete specification of processing-mechanisms; this remains an empirical question of essential interest, whether one can claim a competence for some broad spectrum of individuals without having to constrain the explanatory adequacy of one's theory.

## FOOTNOTES

1. "Meaning" is used here in its every day sense-- loosely. More specialized and technical notions of the term will be referred to as sense relations, presuppositions, usage, semantics etc.

2. Some Ss some of the time were unable to respond, some responses were not transcribable, etc. The incidence of such were very small.

3. The range was determined by the amount of variation of the paraphrastic set, approximately 33% of the obtained responses were included.

4. Both judges were female assistant professors at Eastern Michigan University, one in the Department of Philosophy, one in the Department of Fine Arts.

## APPENDIX A

### Instructions for Group M:

The following is an initial attempt to discover those variables that influence the abilities to paraphrase, or rephrase, statements. We know that people can do this sort of activity. Some do this gracefully, while others do not; this is immaterial to our purposes. In general, regardless of stylistic differences, people are able to relay the meaning of a statement without repeating it verbatim.

What I am going to do is read aloud to you a statement. When I have finished, I want you to try to re-express that statement in your own words. Usually people are able to do this quite rapidly. When you have finished I will go on to another statement. Your task is then to paraphrase, or put into your own words, the statement I read, while at the same time preserving the original meaning. We have tried to make sure that all the sentences are unrelated, or as unrelated as possible.

Further, I will only read the sentence to you once, so if you don't hear a word, guess at the meaning.

We will be recording your restatements of the sentences for later transcription, so please speak loudly and clearly into the microphone. Are there any questions?

### Instructions for Group NM:

The following experiment is an initial attempt to discover those variables that influence the abilities of people to paraphrase, or rephrase, statements. We know that people can do this sort of activity. Some do this gracefully, while others do not; this is immaterial to our purposes. In general, regardless of stylistic differences, people are able to relay the meaning of a statement without repeating it verbatim.

What we are going to do is the following: When I say "ready," you are to turn over the top card in front of you. It will have a sentence typed on it. I will then read the sentence aloud to you. When I have finished, I want you to try to re-express that statement in your own words. Usually people can do this quite rapidly. When you have finished, we will go on to another statement. Your task is then to paraphrase, or put into your own words the statement I read, while at the same time preserving the original meaning. We have tried to make sure that all the sentences are unrelated, or as unrelated as possible.

We will be recording your restatements of the sentences for later transcription, so please speak loudly and clearly into the microphone. Are there any questions?

APPENDIX B

Paraphrastic sets

<u>Condition: M Group: 7-1</u>	similarity indices	
	MS	PS
Target: <u>Drivers were ignoring the</u> <u>new road signs.</u>		
1. Drivers ignored the new road signs.	8.0	.812
2. The new road signs were being ignored by the drivers.	8.0	.760
3. The new road signs were ignored by drivers.	8.0	.740
4. The new road signs were ignored by the drivers.	8.0	.740
5. The new road signs had been ignored by the drivers.	8.0	.714
6. More recent road signs were ignored by drivers.	8.0	.696
7. Drivers were not paying any attention to the new road signs.	7.5	.780
8. Drivers were not paying attention to the new road signs.	7.5	.760
9. Drivers paid no attention to the new road signs.	7.5	.739

	similarity indices	
	MS	PS
10. The new road signs are being ignored by drivers.	7.5	.736
11. The drivers weren't paying attention to the new road signs.	7.5	.714
12. Drivers paid no attention to the road signs that were just put up.	7.5	.674
13. Drivers were not abiding by the new road signs.	7.0	.827
14. The new road signs were not acknowledged by the drivers.	7.0	.740
15. Drivers paid no attention to the new signs.	7.0	.721
16. The new road signs were not being heeded by the drivers.	7.0	.720
17. Drivers don't pay attention to new road signs.	6.5	.736
18. The new road signs didn't produce any effect on the drivers.	6.5	.714
19. Vehicle maneuverers were not paying any attention to the new directional signs.	6.5	.688
20. People in cars hadn't been following the road signs.	6.5	.659
21. The drivers did not pay attention to the road signs.	6.5	.652

	similarity indices	
	MS	PS
22. Drivers didn't look at the new road signs.	6.0	.802
23. The drivers didn't notice the new road signs.	6.0	.802
24. Drivers didn't obey the road signs.	6.0	.766
25. Drivers didn't use the road signs.	5.0	.766
26. Those who were driving on the streets don't seem to see the new road signs.	6.0	.765
27. Many drivers were not paying attention to the signs on the road.		.667
28. The drivers didn't pay any attention to the highway markers.	6.0	.591
29. Drivers either unaware of or for some reason failed to comply with the new road signs.	5.5	.766
30. The automobile operators refused to comply with the currently posted regulations.	5.5	.561
31. Drivers didn't want to see the new road signs.	5.0	.765
32. The new road signs were not noticeable to the drivers.	5.0	.673
33. Drivers were accustomed to the old road signs so they tended to ignore the new ones and pass them up.	4.0	.846

	similarity indices	
	MS	PS
34. The new road signs were not very affective.	4.0	.617
35. The latest signs put in the road often proved to be of little use.	4.0	.614
36. The new road signs weren't very good so the drivers ignored them.	3.5	.667
37. Road signs put in for the drivers' benefits were being cast aside as unimportant.	3.5	.636
36. The drivers were careless.	2.0	.514

## Paraphrastic sets

Condition: NM Group: 7-1

similarity indices

Target: Drivers were ignoring the

MS

PS

New road signs.

1. The drivers were ignoring the road signs which had just been put up.	8.0	.816
2. Drivers ignored the new road signs.	8.0	.812
3. The new road signs were being ignored by the drivers.	8.0	.760
4. The new road signs were being ignored by drivers.	8.0	.740
5. The new road signs were ignored by drivers.	8.0	.740
6. The new road signs were ignored by the drivers.	8.0	.740
7. The new road signs had been ignored by the drivers.	8.0	.714
8. The new traffic indicators were being ignored by drivers.	8.0	.667
9. Signs that had been recently put up for drivers were being ignored by them.	8.0	.619
10. Drivers were not paying any attention to the new road signs.	7.5	.700

	similarity indices	
	MS	PS
11. Drivers were not paying attention to the new road signs.	7.5	.760
12. Drivers weren't paying any attention to the new road signs.	7.5	.755
13. Drivers weren't paying any attention to the new signs put up along the road.	7.5	.745
14. The new road signs were not being paid attention to by the drivers.	7.5	.740
15. The new road signs were being ignored by the drivers when they were put up.	7.5	.740
16. Drivers weren't paying attention to the new road signs.	7.5	.736
17. Drivers didn't pay any attention to the new road signs.	7.5	.736
18. People who drove the cars didn't pay any attention to the additional new road signs.	7.5	.688
19. Drivers were ignoring the new signs that were put up.	7.0	.898
20. The new road signs were not being observed by drivers.	7.0	.720
21. The new road signs were little heeded by drivers.	7.0	.720

	similarity indices	
	MS	PS
22. The new signals on the road were being ignored by those people who drive.	7.0	.717
23. Drivers didn't pay any attention to the new signals on the road.	6.5	.696
24. Drivers were not aware of and probably ignored the road signs that were new.	6.0	.816
25. Drivers were not aware of the new signs on the road.	6.0	.776
26. Those people who operate cars were not looking at the newly constructed road signs.	6.0	.760
27. Drivers didn't even notice the new signs along the road.	6.0	.750
28. Drivers weren't paying attention to the road signs.	6.0	.717
29. The newly put up road signs were not being seen by the drivers.	6.0	.714
30. No one was paying attention to the new road signs.	6.0	.708
31. I guess some drivers were ignoring new road signs because they weren't really sure they were there because they hadn't seen them.	5.0	.723

	similarity indices	
	MS	PS
32. The new road signs didn't attract the attention.	4.5	.708
33. Drivers were just using their old habits without looking at new signs.	4.0	.766
34. The new road signs weren't real effective.	4.0	.601
35. The new road signs were hard to see.	3.5	.610

## Paraphrastic sets

<u>Condition: M Group: 7-1</u>	similarity indices	
	MS	PS
Target: <u>Residents were paying the</u> <u>new commuter fee.</u>		
1. Residents were paying the new commuter fees.	8.0	.988
2. Residents paid the new commuter fee.	8.0	.812
3. The new commuter fee was being paid by the local residents.	8.0	.760
4. The new commuter fees were paid by the residents.	8.0	.736
5. The new commuter fees were being paid by residents.	8.0	.736
6. The new commuter fee was being paid by residents.	8.0	.736
7. The new commuter fees were being paid by the residents.	8.0	.736
8. The new commuter fee was being paid by the residents.	8.0	.736
9. The new commuter fees were paid by residents.	8.0	.736
10. New commuter fee was being paid by residents.	8.0	.717

	similarity indices	
	MS	PS
11. The new commuter dues were being paid by the residents.	8.0	.714
12. The new commuter fee was paid by people who live in the area.	8.0	.688
13. People who lived there were paying the new commuter fee.	7.5	.788
14. The people who live there were paying the new commuter fees.	7.5	.784
15. The people who lived there had to pay a new fee for commuting.	7.5	.689
16. The newly organized commuter fee was paid by those who lived in the area to take the transportation.	6.5	.702
17. The new commuter fee is being paid by residents.	6.0	.736
18. A new commuter fee has been paid by residents.	6.0	.667
19. Residents are required to pay a new fee for commuting.	5.5	.761
20. The people living there were putting out the money for the new commuter fee.	5.5	.689
21. People that lived there were paying for the new fee to go elsewhere.	5.0	.729

	similarity indices	
	MS	PS
22. The people who lived in the place were taxed with a new fee for riding,	5.0	.681
23. Residents paid the commuter fee.	4.5	.750
24. The commuter fee was paid by the residents.	4.5	.717
25. The new fees for the bus were being paid by the residents.	4.5	.696
26. Inhabitants pay a different commuter fee.	4.0	.689
27. Those people who live in the area were paying commuter fees.	4.0	.682
28. People who lived there had to pay a commuter fee.	4.0	.636
29. People who rode the commuter train paid the new fee.	3.5	.682
30. The fee to travel from one city to another was being paid by the resi- dents.	3.5	.651
31. People in the surrounding area were charged the currently approved vote.	3.5	.644
32. People who lived in the town were paying for commuting.	3.5	.619
33. Citizens now have to pay a price to go on a bus or train.	3.5	.513

	similarity indices	
	MS	PS
34. The new commuter fee was being supported by the local townsmen.	3.0	.736
35. Commuters paid a new fee.	3.0	.698
36. People who live in the cities were paying a new fee.	2.5	.729
37. The fees were paid by the residents.	2.5	.698
38. Residents paid higher fees.	2.5	.605
39. Residents of the suburbs were paying a new fee because of where they lived.	2.0	.776
40. People who live in a certain area were paying the fees that not normally would have been paid by them.	2.0	.651
41. The new bus lines were supported by people who own houses in that area.	2.0	.617
42. The new computer fees were paid by the residents.	1.5	.708

## Paraphrastic sets

<u>Condition: NM Group: 7-1</u>	similarity indices	
	MS	PS
Target: <u>Residents were paying the new commuter fee.</u>		
1. The residents were paying the new commuter fee.	8.0	.868
2. Residents paid the new commuter fee.	8.0	.812
3. Residents had to pay a new commuter fee.	8.0	.796
4. The new commuter fee was being paid by the residents.	8.0	.736
5. The new commuter fee was being paid by residents.	8.0	.736
6. A new commuter fee was being paid by the residents.	8.0	.736
7. The new commuter fee was paid by the residents.	8.0	.736
8. The new commuter fee was paid by residents.	8.0	.736
9. The new fee for commuters were being paid by the residents.	8.0	.723
10. The new fee for commuting was being paid by the residents.	8.0	.717

	similarity indices	
	MS	PS
11. The new commuter fee was paid out by residents.	8.0	.714
12. Residents were also paying the new commuter fee.	7.5	.887
13. The new commuter fee was in effect and the residents were paying it.	7.5	.745
14. The new commuter fee was being paid by the people who lived in that area.	7.5	.708
15. The new commuter fee was generally paid by the residents.	6.5	.755
16. Residents have been paying the new commuter fee.	6.0	.865
17. New commuter fee is being paid by the residents.	6.0	.729
18. People living in the area paid a new price for transportation.	6.0	.667
19. The people who lived in the area were giving the money for the new fee for the people who lived in the suburbs to go to the city.	6.0	.659
20. The residents were required to pay a different fee for commuting.	5.5	.745
21. Residents had to contribute to the new fee for commuters.	5.5	.739

	similarity indices	
	MS	PS
22. There is a new commuter fee for the residents of that district.	5.5	.729
23. People of the area were paying a new fee for commuting.	5.0	.750
24. Residents were paying the commuter fee.	4.5	.898
25. There was a commuter fee for residents.	4.5	.698
26. The people that lived in the vicinity were the ones that were paying the fee for commuting.	3.5	.651
27. Those who lived in the town were paying the fee for commuting.	3.5	.723
28. The new commuter fee was in effect.	3.5	.600
29. Residents were paying the new fee.	3.0	.898
30. Those who lived here were paying the new fee.	3.0	.729
31. The new computer fee were being paid by residents.	1.5	.694
32. People who lived there were soaked for the new computer.	1.0	.659

## Paraphrastic sets

<u>Condition: M Group: 7-1</u>	similarity indices	
	MS	PS
Target: <u>Lawyers were donating the tarnished bronze bust.</u>		
1. Lawyers were giving the tarnished bronze bust.	8.0	.962
2. Lawyers have donated the tarnished bronze bust.	8.0	.941
3. Lawyers donated the tarnished bronze bust.	8.0	.812
4. Lawyers donated the bronze bust that was tarnished.	8.0	.800
5. The tarnished bronze bust was donated by lawyers.	8.0	.755
6. The tarnished bronze bust was being donated by lawyers.	8.0	.736
7. The lawyers were giving the tarnished bronze bust.	7.5	.846
8. The tarnished bronze bust were donated by the lawyers.	7.5	.760
9. The tarnished bronze bust was donated by the lawyers.	7.5	.755
10. The tarnished bronze bust was being donated by the lawyers.	7.5	.755

	similarity indices	
	MS	PS
11. Tarnished bronze bust was donated by the lawyers.	7.5	.750
12. Lawyers gave an old bronze bust that was unpolished.	7.5	.717
13. The dull bronze bust was being given by the lawyers.	7.5	.688
14. The tarnished bronze bust was a gift by the lawyers.	7.5	.681
15. The tarnished bronze bust was a gift from the lawyers.	7.5	.681
16. The bronze bust which was coated with a cover of tarnish was being donated by the lawyers.	6.0	.717
17. The old bronze bust was donated by the lawyers.	6.0	.708
18. Members of the law profession were giving the bronze bust.	6.0	.723
19. The bronze bust was donated by the lawyers.	5.5	.717
20. The old bronze bust was donated by a group of lawyers.	5.5	.708
21. Lawyers were always donating the tar- nished bronze bust.	5.0	.887

	similarity indices	
	MS	PS
22. Men of the law profession were giving the old and tarnished statue made of bronze.	5.0	.780
23. Lawyers contributed a tarnished bust.	5.0	.674
24. Members of the judicial occupation were donating a small statue of bronze.	4.5	.702
25. The tarnished statue was given by the lawyers.	4.5	.702
26. The bust was donated by lawyers.	4.5	.674
27. The bust was being donated by a group of lawyers.	4.5	.651
28. The bust was a gift from the lawyers.	4.5	.650
29. The lawyers generously gave the antique bust.	4.0	.733
30. Lawyers were giving a bust to someone.	4.0	.721
31. The old bust was donated by the lawyers.	4.0	.689
32. Lawyers gave the rusty statue.	3.5	.667
33. Lawyers gave the old statue.	3.5	.643
34. The lawyers donated that piece of art.	3.5	.605

	similarity indices	
	MS	PS
35. The bust have been given to the group by some lawyers.	3.5	.595
36. The attornies decide to voluntarily give the famous structure of copper and tin.	3.5	.584
37. The aniqued bust was given freely by the businessmen.	2.5	.636
38. Lawyers were donating to something that happened in the past.	2.0	.744
39. Donaters gave a bronze bust without retribution.	2.0	.643
40. Lawyers were giving their time for the cause.	1.5	.698
41. The tarnished bust was being painted,	1.5	.631

## Paraphrastic sets

Condition: NM Group: 7-1

similarity indices

Target: Lawyers were donating the  
tarnished bronze bust.

MS

PS

1. Lawyers were giving the tarnished bronze bust.	8.0	.962
2. Lawyers donated the tarnished bronze bust.	8.0	.812
3. The present of the tarnished bronze bust was donated by lawyers.	8.0	.800
4. Those who work with the law were giving the tarnished bronze bust.	8.0	.784
5. The tarnished bronze bust was donated by some lawyers.	8.0	.755
6. The tarnished bronze bust was donated by lawyers.	8.0	.755
7. The tarnished bronze bust was being donated by lawyers.	8.0	.736
8. Lawyers gave the bronze bust that was tarnished as a gift.	8.0	.733
9. Tarnished bronze bust was donated by lawyers.	8.0	.717
10. The tarnished bronze bust was given by lawyers.	8.0	.714

	similarity indices	
	MS	PS
11. Lawyers were donating the tarnished bronze statue.	7.5	.962
12. The lawyers were donating the tarnished bronze bust.	7.5	.868
13. Lawyers gave a tarnished bronze bust to some donation.	7.5	.766
14. The tarnished bronze bust was being donated by the lawyers.	7.5	.755
15. The tarnished bronze bust was donated by the lawyers.	7.5	.755
16. The tarnished bronze bust was a donation from the lawyers.	7.5	.729
17. The bust tarnished and bronze was given by the lawyers.	7.5	.714
18. The tarnished bronze bust has been donated by the lawyers.	7.5	.714
19. The tarnished bronze bust was given by the lawyers.	7.5	.714
20. Tarnished bronze busts have been donated by the lawyers.	6.0	.708
21. Lawyers were donating the bronze bust.	5.5	.898
22. The bronze bust was donated by the lawyers.	5.5	.717

	similarity indices	
	MS	PS
23. The old bronze bust was a donation made by lawyers.	5.5	.702
24. Lawyers donated the old bronze statue.	5.0	.761
25. People who were involved in law were giving as a gift an old bronze figurine.	5.0	.708
26. An old bronze figure was donated by some lawyers.	5.0	.681
27. Lawyers were giving away the bronze statue.	4.5	.830
28. Lawyers were giving the already tarnished statue away free.	4.5	.761
29. The bust was to be donated by the lawyers.	4.5	.651
30. Lawyers were giving away a bust.	4.0	.721
31. The men who studied law were giving the dirty figure.	2.0	.667

## Paraphrastic sets

Condition: M Group: 7-2

similarity indices

Target: Pupils who studied slowly  
teach laymen now.

MS

PS

1. Pupils who studied slowly now teach the laymen.	8.0	.961
2. Students who studied slowly teach laymen now.	8.0	.960
3. Pupils who studied slowly are teaching laymen now.	8.0	.900
4. Pupils who studied slowly are teaching laymen.	8.0	.875
5. The pupils who had studied slowly are teaching the laymen now.	8.0	.800
6. Students who studied at slow speeds now instruct laymen.	8.0	.792
7. Laymen are being taught now by pupils who studied slowly.	8.0	.783
8. Laymen now are being taught by pupils who studied slowly.	8.0	.783
9. Those pupils while although they studied slowly are now teaching laymen.	8.0	.771
10. Students who were slow at studying teach laymen now.	8.0	.766

	similarity indices	
	MS	PS
11. Laymen are now being taught by students who studied slowly.	8.0	.756
12. Laymen are taught by pupils who studied slowly.	8.0	.733
13. Laymen are now being taught by students who once studied slowly themselves.	8.0	.733
14. Laymen are now taught by the pupils who took their time at their studies.	8.0	.727
15. Laymen are being taught by pupils who had studied slowly.	8.0	.721
16. Laymen are now being taught by students who studied at a slow pace.	8.0	.704
17. Laymen are being taught by pupils who studied slowly.	8.0	.704
18. The laymen were being taught by pupils who studied slowly.	8.0	.651
19. Students who studied slowly teach amateurs now.	7.0	.898
20. Slow studying pupils now teach laymen.	7.0	.795
21. Students who took their time learning teach laymen now.	7.0	.723

	similarity indices	
	MS	PS
22. Slow studying pupils are teaching laymen.	7.0	.703
23. Pupils who study slowly now teach laymen.	6.5	.920
24. Slow studiers teach laymen.	6.5	.619
25. Pupils who studied slowly are teaching now.	6.0	.933
26. Students who studied slowly are teaching now.	6.0	.872
27. Slow pupils often teach laymen now.	6.0	.744
28. Students who were slow learners are now teaching laymen.	6.0	.739
29. Slow learners were now teaching laymen.	6.0	.730
30. Laymen are now caught by slow learning pupils.	6.0	.658
31. Pupils who study slowly teach the ordinary people now.	5.5	.857
32. Slow pupils are teaching laymen.	5.5	.631
33. Beginning learners are being taught by learners who had studied slowly.	5.5	.619
34. Pupils who studied thoroughly teach laymen now.	5.0	.940

	similarity indices	
	MS	PS
35. Students who are slow in their learning are now teaching the common man.	5.0	.711
36. The laymen were taught by the pupils who studied diligently.	5.0	.674
37. Even though some pupils study slowly they can teach laymen.	5.0	.667
38. Pupils to whom knowledge comes to very slowly are often good at teaching laymen.	4.0	.745
39. The slower pupils are now instructing people who know nothing about facts.	4.0	.698
40. Remedial students now teach other people.	4.0	.594
41. Students who work slowly now tutor people outside the school.	3.5	.787
42. Those who were not students are being taught by the slow students.	3.5	.651
43. People who are retarded in their studying habits are usually retarded in their teaching practice.	2.0	.704
44. Students having difficulty in learning today give insight for teaching to their professors.	2.0	.571
45. The pupils are being taught at a faster rate.	1.5	.500

## Paraphrastic sets

Condition: NM Group: 7-2

similarity indices

Target: Pupils who studied slowly  
teach laymen now.

MS PS

1. Students who studied slowly teach laymen now.	8.0	.960
2. Pupils who studied slowly teach unprofessional people now.	8.0	.920
3. Pupils who once studied slowly now teach laymen.	8.0	.882
4. The pupils who studied slowly teach laymen now.	8.0	.863
5. Pupils who have done their studying slowly are now teaching laymen.	8.0	.857
6. Pupils who took a long time in studying teach laymen now.	8.0	.792
7. Laymen are now being taught by pupils who studied slowly.	8.0	.783
8. Often the students who themselves learned slowly are now teaching workers that are unacquainted with the topic.	8.0	.766
9. Laymen now are being taught by pupils who studied slowly.	8.0	.761

	similarity indices	
	MS	PS
10. Laymen are now taught by pupils who at one time studied slowly.	8.0	.761
11. Laymen are now being taught by those pupils who studied slowly.	8.0	.739
12. Laymen are taught by pupils who studied slowly.	8.0	.727
13. Laymen are now being taught by those pupils that studied slowly.	8.0	.711
14. Laymen are being taught by pupils who studied slowly.	8.0	.704
15. Laymen are now being taught by students who studied with no speed.	8.0	.682
16. The laymen are taught by the pupils who once studied slowly.	8.0	.682
17. Laymen are now sometimes being taught by pupils who studied slowly.	7.5	.761
18. Students who studied slowly in the past teach laymen.	7.0	.792
19. Pupils who took a long time to learn now teach laymen.	7.0	.771
20. Slowly studying pupils can now teach laymen.	7.0	.725
21. It seems that the pupils who were slower at learning are teaching the laymen.	7.0	.667

	similarity indices	
	MS	PS
22. Pupils who studied slowly teach most people now.	6.5	.940
23. Laymen are now being taught by pupils who are studying very slowly.	6.5	.778
24. The students that studied slower than the others now are the ones that teach the laymen.	6.5	.771
25. Laymen are now taught by pupils who study slowly.	6.5	.739
26. Pupils who studied in a slow way today teach beginners.	6.0	.833
27. Pupils who were not so quick in their studies now teach laymen.	6.0	.816
28. Pupils who were paced, cautious students are now in the position of teaching unprofessional men.	6.0	.804
29. Students who learned very slowly are teaching people now.	6.0	.766
30. Pupils who took time with their studies are now teaching other people.	6.0	.692
31. Slow pupils now teach laymen.	6.0	.684
32. Laymen are now learning from slow pupils.	6.0	.745

	similarity indices	
	MS	PS
33. Those pupils who were more attentive are now teaching laymen.	5.5	.745
34. The pupils who were slow are now teachers.	5.0	.739
35. Slow learners often teach laymen.	5.0	.650
36. Laymen are now being taught by people who studied for years.	4.0	.682
37. Laymen are taught by careful pupils.	4.0	.583
38. Some of the pupils are now teaching laymen.	3.0	.658
39. The slower learners now are the ones who are teaching the ones in charge.	3.0	.634
40. Slow learners are good teachers.	3.0	.531
41. Now laymen teach pupils who studied slowly.	2.5	.308

Paraphrastic sets

<u>Condition: M Group: 7-2</u>	similarity indices	
<u>Target: Managers who talk persuasively</u>	MS	PS
<u>receive promotions rapidly.</u>		
1. Managers who talk persuasively usually receive promotions rapidly.	8.0	.822
2. Promotions are received rapidly by managers who talk persuasively.	8.0	.761
3. Those managers who have a very persuasive manner in their speaking receive very rapid promotions.	8.0	.745
4. Promotions are rapidly received by managers who speak persuasively.	8.0	.733
5. Promotions usually go to those managers who are able to talk persuasively.	7.5	.733
6. Advanced positions are given to managers who are able to talk persuasively.	7.5	.698
7. Promotions are given frequently to managers who talk persuasively.	7.5	.650
8. Managers who talk successfully rapidly receive promotions.	7.0	.900
9. Managers who are able to talk convincingly are those who receive raises in their stature.	7.0	.771

	similarity indices	
	MS	PS
10. Managers who can talk well with other people, can convince other people, move up the ladder of success rapidly.	7.0	.771
11. A manager who can talk persuasively is likely to receive a promotion.	7.0	.750
12. If a manager speaks persuasively he will receive his promotion quicker.	7.0	.643
13. Promotions are given most quickly to those managers who talk persuasively.	7.0	.625
14. Persuasive speaking managers were those who most often receive promotion.	6.5	.762
15. Persuasive managers often receive promotions more rapidly than others.	6.5	.744
16. Persuasive managers usually receive more rapid promotions.	6.5	.737
17. Promotions are received by managers who talk persuasively.	6.5	.704
18. Persuasive managers receive promotions rapidly.	6.5	.692
19. Persuasive managers receive promotions often.	6.5	.684
20. Persuasive managers usually will be promoted faster.	6.5	.605

	similarity indices	
	MS	PS
21. Persuasive managers get raises fast.	6.5	.590
22. Convincing managers are promoted quickly.	6.5	.543
23. Managers who talk in a good selling manner receive promotions more quickly.	6.0	.833
24. Managers that were receiving promotions were those who talked persuasively.	6.0	.771
25. The managers who speak well get promotions faster.	6.0	.745
26. Managers who are able to talk well get ahead.	6.0	.717
27. Persuasive managers quickly received promotions.	6.0	.676
28. Convincing managers usually get ahead rapidly.	6.0	.583
29. Persuasive managers get ahead fast.	6.0	.543
30. Persuasion is a good quality for a manager to have. It will advance him.	6.0	.543
31. Promotion seems to be gotten more quickly if the manager uses persuasion.	6.0	.513
32. Managers who are good at persuasion often receive promotions.	5.5	.766

	similarity indices	
	MS	PS
33. Managers who can persuade people get promotions.	5.5	.733
34. If you are very persuasive then you should succeed in business as a manager.	5.0	.590
35. Promotions are most easily gained by those who can talk their way into them.	4.5	.628
36. The ability to persuade one with one's speech usually grants promotions.	4.5	.537
37. Managers who are able to deal in what we call fast talk are those who are promoted earlier than others.	4.0	.711
38. A manager with fast talk can often get a raise in the establishment.	4.0	.525
39. Managers who are very diplomatic usually receive promotions more often.	3.5	.771
40. Managers who can do a good con rise quite rapidly.	3.5	.717
41. Men in administrative positions that put forth their ideas quickly usually are placed in higher positions.	3.5	.553

	similarity indices	
	MS	PS
42. Rapid promotions were received by the sourceful management.	3.0	.513
43. An aggressive person will succeed soon- er than a nonaggressive one.	2.0	.441
44. Leaders with an easy way of communicat- ing with people are often successful.	2.0	.395

## Paraphrastic sets

Condition: MI Group: 7-8

similarity indices

Target: Managers who talk persuasively  
receive promotions rapidly.

MS

PS

1. Managers who talk persuasively quickly receive promotions.	8.0	.920
2. Managers who are persuasive talkers receive promotions rapidly.	8.0	.875
3. Managers quickly receive promotions who talk convincingly.	8.0	.816
4. Those managers who can talk persuasively receive promotions quickly.	8.0	.780
5. Promotions are received rapidly by managers who talk persuasively.	8.0	.761
6. Persuasive talking managers receive promotions rapidly.	8.0	.744
7. A manager who is persuasive in his speech usually gets a rapid promotion.	8.0	.733
8. Rapid promotions are received by managers who talk persuasively.	8.0	.704
9. If managers can talk persuasively they will receive promotions readily.	8.0	.689
10. Rapid promotions are granted to those managers who are able to talk persuasively.	8.0	.682

	similarity indices	
	MS	PS
11. Promotions are granted rapidly to persuasive managers.	8.0	.658
12. Persuasive talking from managers can result in their rapid promotion.	8.0	.628
13. A way to receive promotions quickly is to talk persuasively in the line of management.	7.5	.631
14. Managers who know how to talk persuasively generally get promotions faster.	7.0	.796
15. People who are capable of influencing in talking in an influential manner often get business promotions quickly.	7.0	.717
16. Those who are in charge and know how to talk well get advancements quickly.	7.0	.696
17. Managers who have learned to talk persuasively receive the most rapid and fastest promotions.	6.5	.816
18. Managers skilled in the art of persuasion are the ones who usually receive the promotions the quickest.	6.5	.739
19. Persuasive managers receive promotions rapidly.	6.5	.692

## similarity indices

	MS	PS
20. Persuasive managers receive promotions quickly.	6.5	.684
21. Persuasive managers receive promotions quicker.	6.5	.684
22. Convincing managers get promotions quickly.	6.5	.658
23. Persuasive managers get promotions quickly.	6.5	.646
24. It is the managers who seem to have a persuasive appeal about them that rise more rapidly in the company.	6.5	.643
25. Managers who talk persuasively rise quickly.	6.0	.830
26. Managers who talk in a persuasive manner often get ahead.	6.0	.761
27. Persuasive talking managers were able to receive promotions with some rapidity.	6.0	.710
28. A manager can receive a promotion quicker if he is able to speak well.	6.0	.556
29. Managers are more often promoted when they can speak well.	6.0	.543

	similarity indices	
	MS	PS
30. Those managers who receive promotions rapidly are those who can talk persuasively.	5.5	.800
31. Those managers who can sway people tend to move much more rapidly through the company.	5.5	.644
32. The ability to talk persuasively was seen as one of the major influences in the managers receiving rapid promotions.	5.0	.658
33. Advancement is easier when you can persuade easily.	5.0	.500
34. Managers who talk intelligently receive promotions quickly.	4.5	.918
35. People who talk persuasively usually get promotions quickly.	4.5	.833
36. Managers who have the gift of gab receive better jobs sooner.	4.5	.717
37. Persuasive talkers receive more promotions.	4.5	.639
38. Managers who can fast talk succeed.	4.0	.700
39. If a manager wish to receive a promotion rapidly he should talk persuasively.	4.0	.674

## similarity indices

	MS	PS
40. The managers that succeed are those that talk persuasively.	4.0	.652
41. Managers who can persuade people into buying what ever they want them to often succeed in business.	3.5	.711
42. Slick managers receive rapid promo- tions.	3 5	.646
43. Slick managers work their way up quickly.	3.5	.556
44. The managers need to be able to converse to be promoted.	2.5	.452

## Paraphrastic sets

Condition: M Group: 7-2 similarity indices

Target: Artists who developed naturally MS PS  
dominated museums traditionally.

1. Artists that develop naturally can dominate museums traditionally.	8.0	.854
2. Traditionally those artist who develop naturally have dominated the museums.	8.0	.843
3. Traditionally artists who developed naturally have dominated museums.	8.0	.824
4. Traditionally it has been that artists who have developed naturally dominate the museums.	8.0	.783
5. Naturally developing artists dominate museums traditionally.	8.0	.769
6. Naturally developed artists usually have traditionally dominated museums.	8.0	.756
7. It has been the custom that artists who develop naturally have dominated museums.	8.0	.727
8. In years past museums were dominated by more naturally developed artists.	8.0	.675
9. Artists which develop naturally usually dominated the museums.	7.5	.851

	similarity indices	
	MS	PS
10. Throughout history artists who have worked on things themselves and developed their style naturally have been the most dominant in museums.	7.5	.776
11. Usually museums are dominated by artists who have developed naturally.	7.5	.717
12. Traditionally artists who developed on their own dominated museums.	7.0	.800
13. Museums seem to be dominated by artists who develop in a natural manner.	7.0	.721
14. Museums were being dominated by artists who developed naturally.	7.0	.689
15. Artists that develop naturally can dominate museums traditionally.	6.5	.812
16. Artists who developed naturally, their work appears more in museums.	6.5	.812
17. Artists who develop in a natural manner dominate museums.	6.5	.783
18. Artists who progressed at their own rate usually are most prominent in the museums.	6.5	.717
19. Natural artists dominate traditional museums.	6.5	.667

	similarity	indices
	MS	PS
20. Self taught artists in the past have dominated museums.	6.5	.605
21. Artists who developed their potential on their own through the ages have dominated the museums.	6.0	.816
22. Natural artists are dominators of museums.	6.0	.703
23. From the beginning of time artists that have had no training dominate in the museums.	6.0	.636
24. Natural artists dominate the museums.	6.0	.611
25. Artists who come by their talent naturally dominate the traditional museums.	5.5	.787
26. Artists who were allowed to make their progress uninhibited have a lot of their works in museums.	5.5	.745
27. Artists who have a natural ability used to dominate museums, their works used to dominate museums.	5.5	.733
28. Museums are dominated by those artists who create naturally.	5.5	.659
29. Self taught artists usually dominate museums.	5.5	.646
30. Those with intrinsic artistic abilities		

	similarity indices	
	MS	PS
dominated the museums with their work.	5.5	.625
31. Untrained artists dominate, usually had the most paintings in museums.	5.5	.622
32. People with creative talent inborn have stocked the museums.	5.5	.487
33. The self taught creator was predominately found in that particular museum.	5.0	.500
34. Museums have been dominated traditionally by the artists who developed rapidly.	4.5	.739
35. Well the artist that you usually find in a museum, or the traditional artist, is the one who has developed his talent along his own line, that is, he most likely hasn't gone to school, college and been trained there.	4.5	.717
36. Naturally developing artists produce the best works for museums.	4.5	.631
37. Artists who had trained themselves without any professional schooling were most popular at that time.	4.0	.704
38. Artists without formal schooling are the most prominent.	4.0	.553

	similarity indices	
	MS	PS
39. A natural talent rather than a forced one predominates through traditional art.	4.0	.529
40. Artists traditionally dominate museums who have developed artistically	3.5	.857
41. Artists who acquire this talent naturally usually are museum pieces.	3.0	.766
42. Usually the people best at art dominated the museums.	3.0	.625
43. Good artists dominated museums.	3.0	.594
44. The museums were dominated traditionally by artists who developed manually.	2.5	.761
45. Most often paintings found in museums were traditional artists.	2.5	.667
46. Traditionally art museums are being frequented by artists.	2.0	.605
47. Writers dominate museums traditionally who propose something.	1.0	.761.

## Paraphrastic sets

Condition: NM Group: 7-2

similarity indices

Target: Artists who developed naturally  
dominated museums traditionally.

MS

PS

1. Artists who developed naturally traditionally dominated museums.	8.0	.941
2. Traditionally artists who developed naturally dominated the museums.	8.0	.843
3. Traditionally naturally developed artists dominated museums.	8.0	.825
4. Traditionally artists who have developed naturally have dominated the museums.	8.0	.924
5. Traditionally museums have been dominated by artists who developed naturally.	8.0	.787
6. Traditionally the naturally developed artists dominated museums.	8.0	.780
7. Naturally developed artists dominated museums traditionally.	8.0	.780
8. Traditionally the naturally developed artist dominated museums.	8.0	.775
9. The museums have traditionally been dominated by artists who have developed naturally.	8.0	.766
10. Museums are traditionally dominated by those artists who developed naturally.	8.0	.766

	similarity indices	
	MS	PS
11. Traditionally museums were dominated by artists who have developed naturally.	8.0	.766
12. Traditionally museums are dominated by artists who have developed naturally.	8.0	.766
13. Traditionally museums were dominated by artists who developed naturally.	8.0	.766
14. Traditionally the museums were dominated by artists who were developed naturally.	8.0	.766
15. The museums have been traditionally dominated by artists who have developed naturally.	8.0	.745
16. The traditional practice has been that naturally developed artists have dominated the museums.	8.0	.704
17. Museums have been dominated by artists who have developed naturally.	8.0	.689
18. Those artists who develop naturally usually dominate museums.	7.5	.833
19. Artists who were allowed to develop their talent freely dominated museums traditionally.	7.5	.816

	similarity indices	
	MS	PS
20. Artists who have developed naturally usually dominate museums.	7.0	.857
21. Traditionally artists who developed on their own dominated museums.	7.0	.800
22. Traditionally the artists who have naturally attained their talent have dominated the museums.	7.0	.780
23. The museums' works are usually dominated by the artists who developed naturally.	7.0	.733
24. Natural artists dominated museums traditionally.	7.0	.718
25. Artists who developed by themselves have traditionally dominated museums.	6.5	.860
26. Artists who developed their skills naturally without the influence of forced teaching are usually more common and prevalent in museums.	6.5	.792
27. Artists with natural talents traditionally dominate museums.	6.5	.756
28. Artists who weren't pushed along but were able to go at their own speed were all seen in the museums traditionally.	6.5	.723

	similarity indices	
	MS	PS
29. Naturally developing artists dominate museums.	6.5	.703
30. It is the artists who have developed their talent on their own who seem to have their works displayed traditionally in the museums.	6.5	.682
31. The dominant artists in museums are those that develop their art naturally.	6.5	.667
32. The pictures of the artists who often teach themselves are often found in the museums.	6.5	.595
33. Traditionally those artists who have developed in a natural way and have not been taught have dominated museums.	6.0	.800
34. Artists dominate museums if they develop naturally.	6.0	.703
35. Natural artists usually dominate museums.	6.0	.676
36. The natural artist is the one who can be seen dominating in the museum.	6.0	.650
37. Artists who developed their work according to their own ability generally were in traditional museums.	4.5	.787

	similarity indices	
	MS	PS
38. The painters or sculptors who develop at a normal rate or along with the rest of the culture dominate the museums.	4.5	.689
39. The most easily developed artists have their work predominantly shown in museums.	4.5	.631
40. Self made artists aren't as well known in museums as natural artists.	4.5	.528
41. Artists who developed on their own were leaders in their field of art.	4.0	.787
42. Natural artists usually get the best places.	3.5	.583
43. It is a tradition that museums were usually run by artists who developed naturally.	3.0	.727
44. Natural art is the more successful.	3.0	.485
45. The natural development of artists dominate the museums.	2.5	.667

## Paraphrastic sets

Condition: M Group: 7-3

similarity indices

Target: Writers are commonly

PS

PS

accusing the critics vindictively.

1. Writers are often accusing the critics vindictively.	8.0	.952
2. Writers are commonly accusing critics vindictively.	8.0	.902
3. Writers very often accuse the critics revengefully.	8.0	.833
4. The critics are often accused by writers vindictively.	8.0	.784
5. The writers are vindictively accusing the critics.	7.0	.796
6. Writers are accusing critics vindictively.	7.0	.787
7. Critics are being accused vindictively by the writers.	7.0	.771
8. The critics are accused by writers vindictively.	7.0	.750
9. Writers accuse their critics vindictively.	7.0	.733
10. The critics are being vindictively accused by the writers.	7.0	.729

	similarity indices	
	MS	PS
11. The critics are being accused vindictively by writers.	7.0	.729
12. The critics are being accused vin- di ctively by the writers.	7.0	.729
13. Authors are often vindictive in their criticism of critics.	7.0	.689
14. The critics are being commonly abused vindictively by the writers.	6.0	.827
15. Writers are very often accusing critics in a very impolite manner.	5.0	.816
16. Authors were accusing the critics viciously.	5.0	.739
17. Writers furiously accuse the critics.	5.0	.733
18. Writers often attack the critics with some bitterness.	5.0	.729
19. Writers accuse their critics without any compassion.	5.0	.704
20. Writers often angrily blame critics.	5.0	.696
21. Authors sometimes bitterly talk about those who criticize their work.	5.0	.591
22. Writers are usually commenting on critics unfairly.	4.0	.787
23. Critics are being criticized by the writers.	4.0	.696

	similarity indices	
	MS	PS
24. Critics are often being accused by writers.	4.0	.689
25. Writers commonly accuse critics.	4.0	.682
26. Writers usually accuse those who criticize them.	4.0	.667
27. Writers criticize the critics.	4.0	.658
28. The critics are being accused by the writers correctly.	3.5	.723
29. Writers get really mad at the critics.	3.5	.651
30. Authors often get extremely angry at critics.	3.5	.512
31. Writers are reacting to the critics unfavorably.	3.0	.830
32. Writers, persons who put out material, generally don't like what the critics say about them violently.	3.0	.714
33. Critics are often rejected. What they're saying is rejected by the writers.	3.0	.702
34. Authors are known to usually cite errors in the words of their commentators.	3.0	.681
35. The writers don't think the critics are fair in their comments.	3.0	.674

## Paraphrastic sets

Condition: <u>NM Group: 7-3</u>	similarity	indices
Target: <u>Writers are commonly accusing</u> <u>the critics vindictively.</u>	MS	PS
1. Writers very often accuse the critics vindictively.	8.0	.878
2. Writers often vindictively accuse the critics.	8.0	.837
3. Writers are often accusing critics vengefully.	8.0	.833
4. Writers generally accuse the critics vindictively.	8.0	.816
5. The critics are commonly accused vindictively by the writers.	8.0	.808
6. Vindictively the critics are being accused by the writers commonly.	8.0	.808
7. Writers usually accuse the critics vindictively.	8.0	.796
8. Critics are frequently accused vindictively by writers.	8.0	.775
9. Writers commonly hurl vindictive accusations at critics.	8.0	.766
10. Writers commonly accuse critics in revenge.	8.0	.745

	similarity indices	
	MS	PS
36. Writers often disagree with their critics.	3.0	.619
37. Writers don't appreciate critics' criticisms.	3.0	.619
38. Writers do not agree with what critics have to say.	3.0	.584
39. Critics have been accused by the writers of undue criticism.	2.5	.674
40. People who publish, they're after the critics' necks because they're so snippy.	2.5	.585
41. Writers seldom can accept the critics' criticism well.	2.5	.792
42. Writers and critics don't get along.	2.0	.561
43. Writers are accused by the critics.	1.5	.783
44. The critics are being accused by the writers of publishing vindictive reports on the writers' publications.	1.5	.702
45. Writers are very cutting to the people they review.	1.5	.628
46. Some authors get vindictive reports.	1.5	.575

	similarity indices	
	MS	PS
11. Often writers accuse critics in order to gain vengeance.	8.0	.652
12. The critics are often vindictively criticized by writers.	7.0	.784
13. Critics are being accused by writers vindictively.	7.0	.761
14. The critics are being accused by the writers vindictively.	7.0	.745
15. The critics are being accused vindictively by writers.	7.0	.729
16. The writers in a vindictive manner accused critics.	7.0	.689
17. Writers accuse critics vindictively.	7.0	.682
18. Critics have been accused vindictively by writers.	7.0	.667
19. The critics have found themselves being criticized vindictively by the writers.	7.0	.659
20. Writers are expressing their own opinions about critics and using these opinions in a vindictive way.	6.5	.750
21. Critics are often being criticized severely by the writers that they criticize.	6.5	.740

	similarity indices	
	MS	PS
22. Many critics have been accused vindictively by many writers.	6.5	.652
23. Writers are commonly accusing the people who read their material.	5.5	.854
24. Writers are commonly accusing the critics with malice.	5.0	.942
25. Writers are commonly vindictive of the critics.	5.0	.756
26. The critics are being accused maliciously by the writers.	5.0	.750
27. Critics are criticized by the writers somewhat nastily.	5.0	.745
28. Writers retaliate on their critics.	5.0	.579
29. Writers are usually accusing the critics unwarrantedly.	4.0	.922
30. Writers are often accusing the critics.	4.0	.854
31. Writers are unjustly accusing critics.	4.0	.783
32. Writers very often accuse those who criticize their work vindictively.	4.0	.745
33. The people who do the writing put the blame on the critics unjustifiably.	4.0	.723
34. Writers accuse the critics often.	4.0	.711
35. Writers enjoy accusing their critics.	4.0	.683
36. Writers often accuse their critics.	4.0	.682

	similarity indices	
	MS	PS
37. Writers commonly accuse critics.	4.0	.682
38. The critics who are criticizing the books have been criticized by the writers.	4.0	.638
39. Writers accuse those who criticize them.	4.0	.605
40. Writers don't appreciate the way the critics criticize.	3.0	.667
41. The writers don't like what the critics say.	3.0	.600
42. Writers usually don't like critics and accuse them vindictively.	2.5	.702
43. Writers wounded by criticism frequently attack the critics only out of injury.	2.0	.729
44. The critics are becoming overly subjective and not very just in their comments on the writers and therefore the writers have been correct in criticizing the critics.	2.0	.708
45. Writers don't like critics.	2.0	.584
46. Writers and critics don't get along.	2.0	.548

## Paraphrastic sets

<u>Condition: M Group: 7-3</u>	similarity	indices
Target: <u>Salesmen are often selling</u> <u>the candies happily.</u>	MS	PS
1. Often the salesmen sell the candy happily.	8.0	.857
2. The salesmen often sell the candies happily.	8.0	.837
3. Quite frequently salesmen are selling the candies happily.	8.0	.827
4. Salesmen often sell the candies happily.	8.0	.820
5. The candies are often sold by the salesmen happily.	8.0	.808
6. Generally salesmen sell the candies happily.	8.0	.776
7. Salesmen happily sell the candy.	8.0	.756
8. Salesmen are often selling candies happily.	7.5	.902
9. Men are selling the candies happily usually.	7.5	.843
10. Salesmen sell candy, often sell it happily.	7.5	.787
11. Salesmen are often cheerful while selling candies.	7.5	.771

	similarity indices	
	MS	PS
12. Salesmen often sell candy happily.	7.5	.766
13. Salesmen often sell this particular kind of candy in a happy manner.	7.5	.766
14. Salesmen usually sell candy very contented.	7.5	.689
15. A lot of the time men who sell the confections were doing so gladly.	7.5	.681
16. Salesmen sell the candy happily.	7.0	.778
17. The candies are sold happily by the salesmen.	7.0	.760
18. The candies are sold happily by salesmen.	7.0	.740
19. Candy is sold by salesmen happily.	7.0	.717
20. Salesmen gladly sell the candies.	7.0	.711
21. Salesmen frequently are selling the candies with enjoyment.	6.5	.882
22. The door to door sales people were usually presenting their sugar products in a contented manner.	6.0	.702
23. Salesmen who sell the candy wear a smile always.	6.0	.698
24. Happy salesmen often sell candy.	5.5	.721
25. The goods, the candies sold by the salesmen are usually done with a happy tone of voice.	5.5	.708

	similarity indices	
	MS	PS
26. The happy salesmen sell the candy.	5.0	.700
27. Salesmen who can sell candies often use happy techniques.	5.0	.689
28. Salesmen enjoy selling these candies.	5.0	.683
29. Happy salesmen sell the candies.	5.0	.683
30. Cheerful salesmen sell the candies.	5.0	.658
31. Salesmen try to make their sales by selling happily.	5.0	.651
32. Sales people like to sell candy.	5.0	.540
33. Happily many salesmen sell the candies.	4.5	.783
34. Salesmen often have the best results when they sell candies happily.	4.5	.780
35. Happy salesmen have better results in selling candy.	4.5	.690
36. The candy salesmen usually enjoy their work.	4.5	.682
37. Salesmen working in the candy depart- ment are generally happy.	4.5	.674
38. Salesmen who sell candies appear happy with their jobs.	4.5	.667
39. Salesmen are often trying to make people buy their candies happily.	4.0	.780
40. Candy salesmen are happy people.	4.0	.641
41. Salesmen sell the candies well.	3.5	.711

	similarity indices	
	MS	PS
42. Salesmen are often in a good frame of mind when they sell.	3.0	.717
43. Salesmen must like their products because they're selling them happily.	3.0	.714
44. Salesmen often sell candy.	3.0	.674
45. Many salesmen are happy with what they're selling.	2.5	.610

## Paraphrastic sets

Condition: NM Group: 7-3

similarity indices

Target: Salesmen are often selling  
the candies happily.

MS

SS

1. Salesmen often sell the candies happily.	8.0	.820
2. The candies are often sold happily by salesmen.	8.0	.808
3. The candies were sold happily often by salesmen.	8.0	.802
4. The candies are often sold happily by the salesmen.	8.0	.788
5. You can often find the salesmen selling the candies and enjoying the sellings.	8.0	.771
6. Salesmen often sell the candies in a cheerful manner.	8.0	.755
7. Usually salesmen sell the candies in a good mood.	8.0	.708
8. Those men who sell candies are often very cheerful about selling them.	8.0	.578
9. Salesmen are commonly selling their candies in good humor.	7.5	.840
10. With candies salesmen often sell them happily.	7.5	.771
11. Salesmen usually sell the candies with pleasure.	7.5	.771

	similarity indices	
	MS	PS
12. Salesmen often sell cheerfully candies.	7.5	.745
13. Salesmen are happily selling the candies.	7.0	.898
14. The salesmen enjoyed selling the candies. The candies he did sell in a joyful manner.	7.0	.755
15. Cheerfulness is expressed by the salesmen who are selling the candies.	7.0	.702
16. Many times people who sell candy do it happily.	7.0	.644
17. Salesmen are often happy selling the candies.	6.5	.804
18. Often salesmen enjoy selling their candies.	6.5	.761
19. Candies are sold happily by salesmen.	6.5	.750
20. Salesmen often are happy selling candies.	6.5	.733
21. Salesmen sell candies happily.	6.5	.698
22. Salesmen often enjoy selling candy.	6.5	.674
23. Salesmen appear to be in a good mood when they sell their candies.	6.5	.610
24. The salesmen with good natures are often selling the candies.	6.0	.755
25. Happy salesmen usually sell candies happily.	6.0	.702

	similarity indices	
	MS	PS
26. In many instances there are happy salesmen selling the candy.	5.5	.701
27. The salesmen are happy selling candy.	5.5	.651
28. Salesmen are happy when they sell candy.	5.5	.631
29. Candy salesmen sell happily.	5.5	.594
30. The candies are sold by salesmen who are happy.	5.0	.674
31. Because they enjoy selling candy the salesmen are happy.	5.0	.674
32. The salesmen are happy to be selling the candies.	5.0	.636
33. The salesmen like selling candies.	5.0	.625
34. It seems that candy salesmen sell more happily.	5.0	.590
35. Salesmen enjoy selling candy.	5.0	.553
36. Salesmen like to sell candy.	5.0	.540
37. There are often happy candy salesmen.	4.5	.631
38. Salesmen often sell the candies with satisfaction.	4.0	.796
39. Happily the salesmen quite often sell candy.	4.0	.792
40. These candies promote the salesmen to sell them happily.	4.0	.682
41. Often the salesmen sell their goods happily.	3.5	.776
42. Salesmen seem to like the candy.	2.5	.631

## Paraphrastic sets

Condition: M Group: 7-3 similarity indices

Target: Mayors are occasionally MS PS  
meeting the demands instinctively.

1. Occasionally the mayors are instinctively meeting the demands.	8.0	.868
2. Mayors occasionally instinctively meet the demands.	8.0	.860
3. The demands are being instinctively met occasionally by the mayors.	8.0	.827
4. The demands are being met instinctively occasionally by mayors.	8.0	.808
5. The demands are occasionally met instinctively by the mayors.	8.0	.808
6. Sometimes mayors meet the demands instinctively.	8.0	.776
7. Occasionally mayors meet their demands instinctively.	8.0	.776
8. Mayors meet the demands by instinct sometimes.	8.0	.771
9. Mayors occasionally meet demands instinctively.	8.0	.771
10. Once in a while the mayors meet the demands instinctively.	8.0	.755

	similarity indices	
	MS	FS
11. Mayors sometimes meet their problems instinctively.	8.0	.745
12. Once in a while mayors instinctively meet demands.	8.0	.702
13. People who run cities once in a while meet the demands by instinct.	7.0	.702
14. Only occasionally do mayors instinctively meet these demands.	6.5	.800
15. Only occasionally do mayors instinctively meet demands.	6.5	.776
16. Some mayors are meeting their problems instinctively.	6.5	.766
17. Sometimes mayors meet the demands of the people instinctively.	6.5	.755
18. Out of pure instinct mayors are meeting certain demands.	6.5	.696
19. Mayors are sometimes fulfilling the desires intuitively.	6.0	.837
20. Once in a while the head of the city can through his own intuitiveness solve the problem.	6.0	.681
21. Mayors are instinctively meeting the demands.	5.5	.898
22. Mayors sometimes meet the demands naturally.	5.5	.771

	similarity indices	
	MS	PS
23. Mayors sometimes meet the demands of people naturally without having to be told so.	5.5	.750
24. Sometimes mayors try to meet demands through instinct.	5.5	.739
25. Instinctively mayors meet the demands.	5.5	.739
26. Sometimes mayors can solve problems by instinct.	5.5	.674
27. Upon occasion demands are met voluntarily by the mayors.	5.0	.800
28. Mayors sometimes do the best thing instinctively.	5.0	.750
29. Sometimes mayors know what to do instinctively.	5.0	.674
30. The city's manager often works toward the desires of his area with an inner knowledge.	5.0	.631
31. Instinct figures in some mayors' decisions.	5.0	.540
32. The office of mayor quite often involves an instinctive response to the people's demands.	4.5	.702
33. On some occasions mayors or city servants know without being told what they have to do.	4.5	.622

	similarity indices	
	MS	PS
34. Mayors occasionally sense the needs of their people.	4.0	.689
35. Mayors often act instinctively.	4.0	.610
36. Mayors don't always meet the demands of their office instinctively.	3.5	.820
37. Occasionally the demands are met by the mayors.	3.5	.750
38. The demands are being occasionally met by the mayor.	3.5	.723
39. Sometimes mayors meet the people's demands.	3.5	.711
40. Mayors sometimes meet demands.	3.5	.628
41. Heads of the government have been using their instincts to combat problems of their cities.	3.5	.605
42. Mayors, they're aware of problems before they arise.	3.5	.595
43. The mayors are meeting the demands.	3.0	.787
44. Demands are being met instinctively.	3.0	.650
45. City rulers often make decisions without lack of previous education.	2.5	.591

## Paraphrastic sets

<u>Condition: NM Group: 7-3</u>	similarity indices	
Target: <u>Mayors are occasionally meeting the demands instinctively.</u>	MS	PS
1. Mayors are sometimes meeting the demands instinctively.	8.0	.988
2. Occasionally mayors instinctively meet the demands.	8.0	.840
3. Mayors occasionally meet the demands instinctively.	8.0	.820
4. The demands are occasionally being met by mayors instinctively.	8.0	.608
5. Instinctively the mayors occasionally meet the demands.	8.0	.800
6. Sometimes the mayors will meet the demands instinctively.	8.0	.800
7. Mayors sometimes meet the demands instinctively.	8.0	.796
8. Sometimes mayors meet the demands instinctively.	8.0	.776
9. Sometimes the mayors instinctively meet the demands.	8.0	.755
10. At times these demands are met instinctively by mayors.	8.0	.740
11. Mayors intuitively meet demands on occasion.	8.0	.739

	similarity indices	
	MS	PS
12. Once in a while mayors meet the demands instinctively.	8.0	.736
13. Political town managers sometimes meet the demands by instinct.	8.0	.702
14. Some mayors rely on instinct to occasionally meet demands.	7.0	.659
15. Occasionally the demands of the people are being met by the mayors instinctively.	6.5	.808
16. Every once in a while mayors meet the demands of the people by instinct.	6.5	.729
17. Demands which are made can sometimes be met by mayors through instinct.	6.5	.729
18. Mayors instinctively meet the demands but only occasionally.	6.0	.820
19. Demands are being met instinctively by the mayors.	5.5	.771
20. Sometimes mayors meet the demands naturally.	5.5	.750
21. The demands are being met instinctively by the mayors.	5.5	.723
22. Demands are being met instinctively by mayors.	5.5	.717
23. The demands have been met instinctively by mayors.	5.5	.702

	similarity indice	
	MS	PS
24. Mayors are very often meeting these demands completely on their own volition.	5.0	.300
25. The mayors sometimes meet the demands without thinking about them seriously, react instinctively.	5.0	.796
26. The demands are met instinctively by occasional mayors.	5.0	.771
27. Sometimes the mayors can meet the demands without too much thought.	5.0	.755
28. Sometimes the mayors meet the demands without thinking too much about them.	5.0	.750
29. Occasionally the mayors take the initiative at meeting the demands.	5.0	.736
30. The demands are being met in an instinctive manner by the mayors.	5.0	.723
31. Mayors often use instinct to meet the demands.	5.0	.711
32. Mayors quite often use instinct to meet the demands.	5.0	.689
33. Mayors sometimes come up with different ways of meeting their job without really having to think about them.	5.0	.674
34. Occasionally a mayor can easily meet the demands.	4.5	.816

	similarity indices	
	MS	PS
35. City leaders are sometimes reacting to demands on intuition.	4.5	.702
36. Some mayors don't always have to be prodded or something.	4.0	.474
37. Mayors will occasionally instinctively meet the demands.	3.5	.830
38. The mayors meet the demands on occasion.	3.5	.727
39. There's something in the nature of mayors in handling the demands.	3.5	.591
40. Sometimes a mayor knows what to do.	3.5	.571
41. Those governmental figures in charge of cities frequently know how to solve problems.	3.5	.524
42. Managers don't always follow the rules.	2.0	.689
43. Managers are getting better.	2.0	.553

## APPENDIX C

 $\bar{d} - 1.00$  $S \rightarrow NP_1 + VP_1$  $NP_1 \rightarrow N_1$  $VP_1 \rightarrow VP_2 + NP_2$  $VP_2 \rightarrow Aux + V$  $NP_2 \rightarrow Det + NP_3$  $NP_3 \rightarrow A_{j1} + NP_4$  $NP_4 \rightarrow A_{j2} + N_2$  $\bar{d} - 1.43$  $S \rightarrow NP + VP_2$  $NP \rightarrow N_1 + DP$  $DP \rightarrow rel + VP_1$  $VP_1 \rightarrow V + Adv_1$  $VP_2 \rightarrow N_2 + NP_3$  $VP_3 \rightarrow V + Adv_2$  $\bar{d} - 1.86$  $S \rightarrow NP_1 + VP_1$  $NP_1 \rightarrow N_1$  $VP_1 \rightarrow VP_2 + NP_2$  $VP_2 \rightarrow Aux + VP_3$  $VP_3 \rightarrow Adv_1 + VP_4$  $VP_4 \rightarrow Adv_2 + NP_2$  $NP_2 \rightarrow Det + N_2$ 

Three rules are employed:

- (1) expand the left-most element unless it leads directly to a lexical item.
- (2) if a lexical item is to be realized expand the next element.
- (3) discontinuous elements are allowed.

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