EFFECTS OF FAMILIARITY AND COMPLEXITY ON FREE RECALL

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At this very moment you, the receiver, are taking part in a process which has interested psychologists, sociologists, speech therapists and communication scholars for decades: the comprehension of written and oral discourse. What happens, for example, when we read a passage, a story, or a text? What processes are involved when we listen to an oral message? Although this paper, by no means, can address such broad topical questions as these, it does focus on one specific area within the overall comprehension process: retrieval of information from memory as a function of a familiar versus unfamiliar stimulus. Specifically, the purpose of this paper is three-fold: following a brief discussion of the overall comprehension process and a concise statement concerning similarities and differences between listening and reading comprehension, the paper will (1) present an argument concerning the place of such a study in the area of listening research; (2) review two pertinent areas of literature with emphasis on the ways in which comprehension, in this case retrieval of information, may be assessed, and (3) present an initial pilot study concerning the topic.

The Comprehension Process: Listening and Reading

As one begins to read or to listen to a written or oral message, several steps in the overall comprehension process must take place. Frederickson (1975) describes these processual steps as follows:

1. A speaker or writer selects from his store of conceptual knowledge (or semantic memory) some organized set of information for transmission.

2. The speaker or writer encodes the conceptual knowledge into a string of well formed natural language patterns.

3. The natural language is physically transmitted either through speech or written text.

4. The listener or reader transforms the natural language productions actually received into some semantic form or conceptual message.

5. The listener or reader incorporates the interpreted semantic information into his/her semantic memory or general knowledge store.

Although these five steps represent a very broad description of the comprehension process as a whole, the reader should have noted the necessity of at least two major components: input--a text or an oral message--and output--or constructed representations of meaning.

Indeed, comprehension processes in both listening and reading require both input and output. Yet, interestingly enough, the two are similar in other ways. Kintsch, for example, in 1976 noted that the comprehension process presumably is the same whether a receiver reads or listens to a message, after the initial perceptual analysis. In essence, "from the point where words are treated as abstract entities rather than as visual or phonemic representations, differences between modalities are presumed to vanish (pp. 33-34.)." Although some scholars disagree with regard to specific details of such a conclusion, most agree with regard to general similarities between the two processes.

Differences between listening and reading, however, have likewise been noted by researchers. Although all of these will not be presented in this discussion, Smiley, Oakley, Worthen, Campione and Brown (1977) have described what may be the most significant differences. As these authors note, the differences between spoken and written messages lie in the essential features of the modes of presentation. Spoken messages rely on extralinguistic factors to determine the overall significance of a message (for example, voiced intonation, stress, gestures and shared contextual knowledge) while written statements must be "explicit and context free (p. 383)." Indeed, most of an oral message need not be explicitly conveyed by words, for the sender and receiver of this type of message depend on "speaker coherence factors" as well as pre-

supposed general knowledge to "disambiguate utterances (p. 383)." Conversely, the reader is removed from the writer in both time and space and, therefore, is incapable of asking questions to further his knowledge and understanding.

Although the preceding introduction may seem out of place, hopefully, the reader will have gained a general sense of the breadth of comprehension research. Indeed, many studies in the disciplines of communication and psychology have focused on the processes as a whole as well as have compared listening and reading with regard to their component parts. As we stated earlier, however, it is not within the scope of this paper to discuss these studies. We now turn to a discussion of listening comprehension and the role which information retrieval plays in the listening process. Due to time and space limitations, the study will not specifically deal with reading comprehension.

Listening Comprehension: The Function of Information Retrieval In the Overall Process

As Barker (1971) notes, listening may be defined as "the selective process of attending to, hearing, understanding, and remembering aural symbols (p. 17)." Discussing listening as a function of these four "separate but interrelated processes," Barker makes an important point concerning both the overall processual nature of comprehending aural messages as well as the role which memory plays in the listening process.

Although Barker and others discuss the importance of remembering in the process of listening comprehension, remembering, however, is defined as involving "the storing of meaningful information in the mind for the purpose of recalling it at a later time (Barker, 1971, p. 17)"--with little attention focusing on the role which information retrieval plays in the comprehension process. Much as memory, indeed, aids in our abilities to "isolate and recognize sound," to "assign meaning to symbols" and to "evaluate a message" once it has been perceived (pp. 32-35), information storage is quite useless if we do not have a way of retrieving that knowledge. Indeed, several studies have focused on the loss of information which occurs in memory (e.g., Klatzky, 1980). However, in our own field

of listening, we need look no further than present testing procedures in the area of listening to determine that students are tested on ability to retrieve information--not solely on ability to store information in memory.

If one, then, believes in the basis of such an assertion, two major questions for scholars in the field of listening comprehension emerge: first, what is the nature of the information retrieval process and how does it impact on the process of listening comprehension? More specifically, what variables affect the degree to which we are able to retrieve information from memory? It is with the latter question that this author is concerned. Although much literature exists concerning the nature and function of information storage and retrieval (Shiffrin , 1970; Shiffrin, 1975; Keele, 1972), we will focus on two specific issues which have recently emerged from the literature, and which seemingly impact on the nature of listening comprehension: (1) the ways in which we integrate information in order to understand or learn (i.e., what is the relationship between old and new information and how does it function in our ability to retrieve information?)and (2) the ways in which we might go about designing comprehension studies which may tap such information. Although other variables than familiarity, indeed, impact on both overall comprehension and information retrieval abilities, few seem quite as interesting as our ability to integrate experiences as reflected in our abilities to specifically retrieve this information. Thus, the proceeding sections will attempt to address the literature concerning the two aforementioned issues in comprehension literature. Following a brief review of the literature concerning the impact of familiarity on integration of new information, an indepth review will be given concerning one methodological approach to determining possible solutions.

The Integration Process: The Function of the Relationship Between the "Old" and the "New"

As Durso (1980) states, "In order to understand or to learn, we must be able to integrate new information with the knowledge with which we entered the situation. If we are unable to make, or to not make, the appropriate cognitive contributions, the

event will pass as meaningless or as partially understood (p. 1)." When we acquire new information, then, "that information is modified by existing knowledge and our existing knowledge can be modified by the new information (p. 1)."

This 1980 dissertation concerning the retrieval of information presents important information concerning the integrative nature of cognitive processing. Using response latency times for verification of old and new facts, created and validated in an earlier norming study, Durso found that:

(1) the more information already known about a concept, the more quickly subjects were able to verify either old or new facts (p. iv).

(2) experimentally acquired information can be viewed as a distinct ensemble of information grafted onto the preexperimental knowledge structure (based on a structure for pre-experimental knowledge which was proposed to account for the facilitative effects of knowledge about a topic (p. iv)).

Such information concerning the relationship between old and new information is likewise central to the theoretical positions of several investigators in the fields of learning and memory (see Durso, p. 1980, for a complete review of these theoretical positions).

Despite the importance of the relationship between old and new information in our abilities to integrate information, few studies other than these few have been designed to focus on the ways in which we integrate new information into what we know. Indeed, without the work of such notables as Bartlett (1932), Piaget (1952), the series of research by Bransford, Barclay and Franks (1972), Bransford and Franks (1976), Johnson, Bransford and Solomon (1973), and the works of Loftus and Palmer (1974) and Schank (1972), little would be known at all concerning our abilities to retrieve information, particularly when focusing on varying amounts of pre-experimental or "familiar" information. Though some of the early transfer studies (see Postman, 1971) focused on effects of previously learned lists on acquisition of new ones, old information, oddly enough, was equally under the control of the respective experimenters (Durso, p. 2). Again, it was only

these few researchers, and others such as Tulving (1972), Anderson (1974) and Anderson and Bower (1973), who contributed new information to the research knowledge base.

For this reason and two specific other reasons, the author was interested in this subject. First, if storage of information is important to the process of listening, then retrieval likewise must be of special importance. Second, if retrieval of new information is effected by the existence of old information which we have concerning a topic, such variables also would affect the listening process. The major question which remains: the means by which one may study such human phenomena.

Listening Comprehension: A Structural Approach to the Comprehension Process

One way to focus on the nature of comprehension is to look at the materials which are processed by the "receiver." This conceptualization allows the researcher to concentrate on the particular behaviors which are manifested during their consumption by the listener or reader. Interestingly enough, such a focus has fostered several approaches to studying the comprehension process. This paper will focus on one specific approach--what here will be termed as a "structural" approach to comprehension. By providing such a framework for the dicussion of comprehension, the reader may begin to understand the true complexity of comprehension research and methodology.

The Structural Approach: An Overview

In reviewing the literature concerning the structural approach to comprehension, several major foci have emerged. These may be categorized into two major areas:

(1) those which focus on the higher organizational structure of the text, such as the macrostructural properties of a text (Kintsch, 1976; VanDijk, 1976), the themes represented in a discourse (Jones, 1977; Kieras, 1978; Brown and Smiley, 1977), and gist or summaries of a text (Kintsch and Kozminsky, 1977; Reder and Anderson, 1980); and

(2) those which focus on units, ideas and propositions, or the lower level of organization of texts or discourse (Kintsch, 1976; Bransford, Barclay and Franks, 1972; Rubin, 1978; McKoon and Ratcliff, 1980; Bock and Munro

1979; Buschke and Schaier, 1979).*

As Buschke and Schaier (1979) have observed, both of these foci are important for an understanding of comprehension. Without an identification of the cognitive units recalled in semantic remembering, analysis of the cognitive processing of narrative discourse as well as of text based stories would be fruitless.

Although use of this categorization scheme concerning the structural approach is useful, theory and research have revealed a major common denominator between the two. This commonality is the use of a corresponding "grammar" which attempts to identify the structural constituents of texts and discourse at both levels of organization. As Cirilo and Foss (1980) point out, these grammars are "organized bodies of rules that represent the multidimensional structure of a story or discourse, showing the relationship under the sentences that compose it." Thus, it is the underlying organization that identifies a sequence of sentences as something more than "a random amalgamation" (p. 96), and not merely its structural components.

Much of the work with existing "grammars" varies widely with regard to complexity and range of application. However, each of these grammars have two striking similarities: representation of structural components within a hierarchy (with the more abstract levels placed at the top of the hierarchy, and the more elaborative details placed at the lower levels) and the use of the grammar as a partial description of the comprehender's representation of knowledge of a text or story. Cirilo and Foss (1980) emphasize the latter as particularly important. As they explain:

> the descriptive systems referred to are generally meant to do more than just describe the structure of texts.... It is usually assumed that when a reader or listener has processed a discourse adequately, the structure of the discourse, and not just the structure of its individual sentences, has been extracted from the text (pp. 96-97).

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*The reader should note that research in these two areas are, in fact, both dependent and overlapping. The categorizations used here are useful only in that they allow for a more organized discussion of the approach.

Thus, a description of the structure of the discourse should act as a description of the comprehender's knowledge representation. However, it should again be emphasized that the description is only partial. First, the comprehender may need to make a series of inferences from implicitly stated propositions, or to make connections among explicitly stated propositions. Second, the comprehender's representation may not include all of the structures represented in the text. In either case, the comprehender's knowledge would be less than complete.

The Structural Approach: Macro- and Micro- Propositional Analysis of Discourse

As was stated earlier, in reviewing the literature concerning structural analyses of listening and reading comprehension, two major levels of analysis may be identified: those which focus on the higher levels of the text, and those which focus on the smaller propositional units. Research in the area of the structure of texts is perhaps best exemplified by the work of Walter Kintsch (1974; 1975; 1976) and of Teun A. VanDijk (1976) who worked closely with Kintsch. Described by Kintsch and VanDijk as "the levels effect", or semantic macro- and micro- processing, the model focuses on story text comprehension, although its methodology has been used in both listening and reading research. The components of the model may be described as follows:

1. At the level of microstructure, an ordered list of micropropositions represents the individual ideas in the text. Virtually everything stated in the text (and possibly unstated implications as well) is represented by these detailed micropropositions.

2. At the level of macrostructure, the main ideas are represented by an ordered list of propositions, essentially an abstract or precis of the text. The macrostructure is the text's global or molar structure, as opposed to the molecular microstructure. Intuitively, macrostructure and its associated macropropositions (e.g., main topic sentences in the speech) correspond to the gist of the text (see Vipond, 19 , p. 277).

Both the macropropositions and the micropropositions in the work of Kintsch are composed of a predicate, or relation, and one or more arguments which are represented by either a concept or another proposition. For example, the sentence "Lincoln opposed slavery" would be represented by the proposition (OPPOSE, LINCOLN, SLAVERY), where LINCOLN and SLAVERY represent the arguments that stand in a certain relationship to the predicate OPPOSE. Kintsch's model then organizes some of these propositions at higher levels in the text structure or hierarchy, while he represents others at lower levels. Depending on the context of the passage which the researcher chooses as stimulus materials, the preceding Lincoln example could represent a higher order proposition (i.e., the gist or summary of the passage), or could be used as a supporting statement for a more broad-based discussion of Lincoln's moral and ethical beliefs (i.e., a lower order proposition).

As a result of Kintsch's seminal work with propositional analysis, and with the macro- and microprocessing model, in general, research and theory have revealed several major conclusions which have impacted on our understanding of the comprehension process. Examples of such conclusions would include the following major findings:

1. Main points are best remembered, while subordinate detailing sentences which are low in the hierarchy are less remembered during recall (Kintsch, Kozminsky, Streby, McKoon and Keenan, 1975; Meyer and McConkie, 1973).

2. Less skilled readers are especially sensitive to microstructure while skilled readers are sensitive to macrostructure (Vipond,).

3. Adults' recall of superordinate or macropropositions is typically greater than that of subordinate propositions (Waters, 1978).

4. Recalled macropropositions cue the recall of associated micropropositions through commonly shared arguments (Waters, 1978).

5. In hierarchical representations of texts, details can be retrieved only by first retrieving the higher level points (Reder and Anderson, 1980).

As one can see, the Kintsch model as a heuristic has been an exceptionally fruitful model for research concerning both higher and lower order organization of texts. It is for this reason that the model has been chosen for use in this study (for details concerning the construction of a propositional text base see Turner and Greene (1977).

Research Questions

In light of the questions which were raised in the earlier sections of this paper, two research questions were formulated concerning the effect of familiarity/unfamiliarity on subjects' ability to recall new information:

(1) Is there a difference in the total number of propositions recalled when presented with information concerning a familiar versus an unfamiliar stimulus?

(2) When presented with new information, does familiarity/unfamiliarity affect the number of propositions recalled at specific levels of the propositional hierarchy?

In addition, two further research questions were constructed concerning subjects' ability to recall information, given varying levels of complexity of stimulus materials. Holding familiarity constant,

(3) Is there a difference in the total of propositions recalled given two different levels of complexity?

(4) Does a difference exist concerning number of propositions recalled at different levels of the propositional hierarchy?

In order to assess the potential effects of familiarity and complexity on recall ability, the Kintsch model was used both (1) to develop a propositional textbase through which information concerning a stimulus could be presented orally, and (2) as a means of analyzing subjects' recall data.

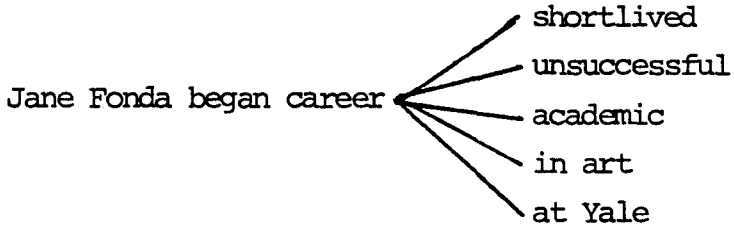
Experimental Materials

In order to gather information concerning the preceding questions, four videotape presentations were made. Each videotape consisted of three parts: (1) a short introduction and instructions concerning the viewing of the tape (see Appendix A); (2) one of four stimulus messages concerning the careers of two personalities, designated as either WELL KNOWN/COMPLEXITY 5, UNKNOWN/COMPLEXITY 5; WELL KNOWN/COMPLEXITY 3; UNKNOWN/COMPLEXITY 3; and (3) instructions concerning the method by which recall data would be collected (see Appendix B). The decision concerning the choice of personalities for use in the "well known"

versus "unknown" conditions was based on norms derived by Durso in his 1980 dissertation focusing on "the verification of old and new facts." In addition, each stimulus message contained "unknown" information (i.e., propositions) about the careers of each personality, likewise derived in Durso's norming study, or by use of false information (contrived by the author). As a result, it was assumed that all information was "unknown" to the subjects, and that use of such information would facilitate a more precise investigation of the effects of familiarity with a given personality on subjects' free recall ability. Complexity was designated as either COMPLEXITY 5 or COMPLEXITY 3 as a function of the maximum number of propositions fanning from any primary node in the respective textbases (for a complete discussion, see Turner and Greene, 1977). A sentence designated as COMPLEXITY 5 was one in which 5 propositions fanned from any node (maximum: 5). An example of such a construction might be:

> Jane Fonda began a short-lived and unsuccessful academic career in art at Vassar,...

Thus, the propositional fan would be represented as follows:



(taken from stimulus)

The coordinating sentence at COMPLEXITY 3, which contained no greater than three propositions fanning from one node, and its representative fan might be:

> Jane Fonda began her academic career in art at Vassar,...

Fan:

Likewise, sentences were constructed verbatim concerning the unknown personality, Paul Craggs. Using a deletion process such as that demonstrated above and the addition of two propositions at Level I of the hierarchy for all COMPLEXITY 3 stimulus materials, the overall "complexity" was controlled, as well as were

number of propositions and number of words in the overall textbase. Based on these procedures, the four videotapes were constructed as follows:

Videotape #1: focused on a message concerning the career of Jane Fonda, the WELL KNOWN celebrity chosen among those normed in Durso (1980). The message concerning Fonda contained propositional fans consisting of no greater than three propositions per node. This videotape represented the stimulus materials for the WELL KNOWN, COMPLEXITY 3 condition.

Videotape # 2: differed from the first only in familiarity to subjects (normed as UNKNOWN in Durso (1980)). This tape likewise contained propositional fans of no greater than three from any node.

Videotapes #3: constituted respectively the WELL KNOWN/COMPLEXITY
#4: 5 and UNKNOWN/COMPLEXITY 5 stimulus materials. These two stimulus tapes likewise concerned the careers of Fonda and Craggs but contained propositional fans of up to five propositions per node, yielding much more complex stimulus messages.

In order to assess the degree to which the tapes might differ in variables other than content, five independent observers who were familiar with research in public communication were asked to rate the tapes on degree of similarity. Using a rating scale of one to seven, with one representing "very dissimilar" and seven representing "very similar," judges were first asked to rate the speakers on the tapes with regard to eight specific variables: pitch, rate, vocal quality, general fluency, conversational quality, clarity of language, facial expressions and eye contact, and to provide an overall rating of degree of similarity between the tapes. A broad inter-rater reliability was obtained by collapsing ratings of Five, Six and Seven given by the raters. Table 1 presents reliability coefficients which were obtained. An acceptable reliability coefficient was .60.

TABLE 1 ABOUT HERE

TABLE 1: RELIABILITY COEFFICIENTS FOR STIMULUS MATERIALS

	Reliability of Stimulus
Pitch	.80
Rate	.80
Vocal Quality	.80
General Fluency	1.00
Conversational Quality	.60
Clarity of Language	.60
Facial Expressions	1.00
Eye Contact	1.00
Overall rating	.80

Subjects

Subjects were students enrolled in the basic communication course at a midsized southwestern university. All subjects received course credit for participation in the study. In order to gather subjects for the study, an announcement was made in six classes that a member of the Department of Communication would be conducting a research study "in a special area of human communication" and that students were invited to participate in the study, which would take no longer than 10 to 15 minutes of their time." A sign up sheet which allowed for participation of four subjects per time slot, with each time slot forty five minutes in duration, and which designated the time and place where the study was to take place, was made available to those who were interested. Upon arrival to the experiment, subjects were asked: (1) to sign in (in order to receive credit); (2) to fill in a questionnaire concerning demographics (e.g., sex, age and school classification); and (3) to be seated until all four subjects had arrived. Of the 36 subjects who participated in the pilot study, propositional analyses were made of the recall data of 24. The twelve subjects who were omitted from the study consisted of those who failed to follow instructions concerning taping of the data and two international students whose native languages were other than English.

Procedures

Following arrival of each set of subjects to the room in which the videotape was shown, the videotaped stimulus materials were presented. In order to set up the four stimulus conditions, the four videotapes were labeled numerically (1-4) prior to their presentation, were pre-ordered for presentation using throws of a dice, and were then shown to each set of subjects who arrived for the experiment . Following presentation of the stimulus, which constituted Phase I of the task, subjects were given instructions to move to their designated rooms for Phase II of the study (rooms likewise were predesignated for subjects, and after the taping, subjects were escorted to them), to be seated at the tape recorder, and "to repeat as much of the information in the best way that they could," but not to talk about the film (i.e., not to summarize). Specifically, they were to "to repeat as much of the information given by the speaker in the film about the individual's career." Following Phase II, subjects were asked to return with their tape recorders

to the room in which the videotape was shown, and were then dismissed.

Coding and Data Preparation

Coding and data preparation of the tape recorded messages consisted of several steps. First, recall data were transcribed verbatim from the tapes, were coded into propositional form, and were placed into a macrostructural hierarchy (Kintsch, 1974). Second, each of the propositions was scored using the following scoring procedure: 2 = verbatim, 1 = paraphrased, 0 = miss, or misinformation. Third, tabulations were made concerning (1) score per hierarchical level; (2) number of facts, or propositions, in the correct place; (3) number of propositions downgraded (shifted downward in recall of the original macrostructural hierarchy of the stimulus message); (4) number of propositions upgraded (shifted up the hierarchy during recall); (5) number of propositions recalled and paraphrased; (6) number of propositions recalled verbatim; and (7) number of propositions which represented misinformation. Following this coding procedure, means ($\bar{X}$) were calculated for each of the above listed categories for each condition.

Data Analysis

Following the calculations of means for each of the categories per experimental condition, differences between cells were tested statistically. The test which was chosen was the z-test for proportions, which takes percentages or ratios from nominal level data and provides a significance level for two different groups (in this case for UNKNOWN vs WELL KNOWN conditions, COMPLEXITY 3 vs COMPLEXITY 5 conditions, etc.). The z-test was selected for several reasons. First, in several cases, the cell structure was not composed of equal numbers of participants in the experiment; second, denominators across comparisons contained unequal numbers of behaviors. As a result, all behaviors were changed from discrete, frequency type data to percentages or ratios. The differences were calculated using the following formula:

$$z = \frac{p_1 - p_2}{\sqrt{(p_t)(q_t)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

In all cases, the denominators used to derive these figures came from the total number of behaviors under examination in a specific cell. In this paper, z-values

and alpha values are provided for number of propositions given the specific comparison made. For those instances in which a cell contained no occurrences, the formula for the z-test would not suffice. These occurrences were assumed to be significantly different.

Results

With regard to the first research question concerning total number of propositions recalled when presented with information concerning a familiar versus an unfamiliar stimulus, five major totals were analyzed. These included total score*, total number of facts placed correctly in the macrostructural hierarchy as reflected in the stimulus materials, number of propositions paraphrased, number of propositions recalled verbatim, and number of misses, or misinformation. When comparing these totals, holding level of complexity constant, no significant differences emerged regarding effect of familiarity on free recall abilities of subjects. Thus, in answer to Q_1, no total or overall significance existed concerning effect of familiarity.

Although no significant differences were found to exist between total number of propositions recalled, Q_2 revealed several interesting results.

TABLE 2 ABOUT HERE

Again, when comparing WELLKNOWN/COMPLEXITY 3 (Fam = Wellknown, Unf = Unknown) with UNKNOWN/COMPLEXITY 3, no significant differences emerged. Likewise, no differences emerged at the first two levels of the more complex message. At Level 3 of the comparison between WELLKNOWN/COMPLEXITY 5 and UNKNOWN/COMPLEXITY 5, however, several significant differences emerged. Not only did subjects in the WELLKNOWN condition score significantly higher than those in the UNKNOWN condition ($z = 2.29$, $p < .05$), they also placed a greater number of facts in the correct place in the macrostructural hierarchy ($z = 3.44$, $p < .005$), used a significantly greater number of paraphrases ($z = 2.00$, $p < .05$) and were able to recall a significantly larger number of propositions verbatim ($z = 2.52$, $p < .05$). In addition, subjects in the WELLKNOWN/COMPLEXITY 5 condition produced a fewer number of misses than those in the UNKNOWN/COMPLEXITY 5 condition ($z = -5.20$, $p < .005$)

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*Score = number of propositions per level, calculated Verbatim (2) + Paraphrases (1).

TABLE 2

COMPARISON OF z-VALUES BY FAMILIAR/
UNFAMILIAR AND LEVEL OF COMPLEXITY

Level	Variable	3/Fam vs. 3/Unf	5/Fam vs. 5/Unf	3Fam vs. 5/Unf
1	Score	.64	1.17	1.05
2	Score	1.72	.31	.88
3	Score	-.16	2.29*	2.60**
Total	Score	.87	.95	1.51
1	Fact in Right Place	.33	1.29	1.50
2	Fact in Right Place	1.60	.00	1.29
3	Fact in Right Place	.37	3.44***	3.30***
Total	Fact in Right Place	.91	.78	2.10*
1	Paraphrase	.37	.80	1.17
2	Paraphrase	.85	-.17	.32
3	Paraphrase	1.89	2.00*	.63
Total	Paraphrase	.62	.69	1.30
1	Word-for-word	.56	1.06	.56
2	Word-for-word	.96	.60	.96
3	Word-for-word	-.37	2.52*	2.36*
Total	Word-for-word	-.38	1.00	1.00
1	Misses	-.20	-5.20***	-4.08***
2	Misses	-.73	-1.12	-1.67
3	Misses	-1.04	1.00	.19

*$p < .05$
**$p < .01$
***$p < .005$

When analyzing data concerning questions Q_3 and Q_4 which designated familiarity as the constant, two major comparisons were made: those between (1) overall totals, and (2) levels of the macrostructural hierarchy. As with Q_1 and Q_2, these calculations were made for total recall scores, number of propositions placed correctly in the macrostructural hierarchy, number of propositions paraphrased, number of propositions recalled verbatim and number of misses, or misinformation.

TABLE 3 ABOUT HERE

Again, when comparing totals, holding familiarity constant, no significant differences emerged with regard to any of these specific variables. Likewise, subjects did not seem to be affected (1) as long as they received information concerning a familiar personality, despite the level of the hierarchy, or (2) as long as the level of the hierarchy was either Level 1 or Level 2. However, several differences again emerged in Level 3 of the macrostructural hierarchy. Subjects who received the most complex message, COMPLEXITY 5, scored significantly lower in the recall task ($z = 2.75$, $p < .01$), placed fewer facts correctly in Level 3 of the macrostructural hierarchy ($z = 3.00$, $p < .005$), and produced significantly fewer numbers of propositions verbatim ($z = 2.68$, $p < .01$). Subjects who received the UNKNOWN/COMPLEXITY 3 materials, however, had a significantly fewer number of MISSES than those in the COMPLEXITY 5 condition.

Discussion

In looking at the data concerning research questions Q_1 and Q_2, several interesting patterns of information emerged. As the reader has noted, these two questions focused on subjects' ability to recall propositions, varying degree of familiarity with the stimulus, and holding level of complexity constant in both manipulations (WELL KNOWN/3 with UNKNOWN/3; WELLKNOWN/5 with UNKNOWN/5). Results of the tests showed that no significant differences emerged at Level 3 COMPLEXITY between subjects receiving recall information concerning a familiar personality, and those receiving information concerning an unknown personality. Such a finding suggests that simply structured messages are more easily recalled despite prior information concerning the topic.

TABLE 3

COMPARISON OF z-VALUES ACROSS LEVELS
OF FAMILIARITY AND COMPLEXITY

Level	Variable	3/Fam vs. 5/Fam	5/Fam vs. 3/Unf	3/Unf vs. 5/Unf	3/Fam vs. 5/Unf
1	Score	-.12		.41	1.05
2	Score	.58		-.85	.88
3	Score	.33		2.75**	2.60**
Total	Score	.57		.65	1.51
1	Fact in Right Place	.22		1.18	1.50
2	Fact in Right Place	1.29		-.32	1.29
3	Fact in Right Place	-.17		3.00***	3.30***
Total	Fact in Right Place	1.34		1.21	2.10*
1	Paraphrase	.37		.80	1.17
2	Paraphrase	.49		-.52	.32
3	Paraphrase	-1.41		-1.34	.63
Total	Paraphrase	.62		.69	1.30
1	Verbatim	-.51		.00	.56
2	Verbatim	.37		.00	.96
3	Verbatim	-.19		2.68**	2.36*
Total	Verbatim	.00		.63	1.00
1	Misses	1.41		-3.91***	-4.08***
2	Misses	-.56		-.95	-1.67
3	Misses	-1.18		-1.22	.19

*$p < .05$
**$p < .01$
***$p < .005$

However, as complexity increased, significant patterns did seem to emerge. Although degree of familiarity had little affect on recall ability at Level 1 and Level 2 of the macrostructural hierarchy, subjects' recall ability seemed greatly impaired at Level 3, the deepest level of the macrostructural hierarchy. Subjects who were familiar with the stimulus personality scored significantly higher on the recall task than those who had no prior information. Likewise subjects in the WELLKNOWN/5 condition placed a greater number of facts correctly in Level 3 of the hierarchy as given in the original stimulus, were able to paraphrase a significanly greater number of propositions, and produced a greater number of propositions verbatim. Such results would seem to suggest that (1) we are better able to completely integrate new information at deeper levels of the macrostructure if we have prior knowledge concerning the topic; and (2) it is particularly at deeper levels of the hierarchy that we are most affected by complexity and prior knowledge.

Another finding which emerged when asking Q_1 and Q_2 concerned the number of MISSES, or misinformation, which were given. Although this difference did not emerge in COMPLEXITY 3 conditions, it did emerge at Level 1 of the COMPLEXITY 5 stimulus conditions. Subjects who received highly complex information concerning an UNKNOWN personality produced a greater number of MISSES or misinformation concerning that personality than those who were familiar with the personality prior to the experiment. Such results also support the notion that we are better able to integrate new information given prior association with the topic being discussed. Had the new information been well integrated, it would seem logical to conclude that subjects would have produced less false information concerning the topic. Such a conclusion seems especially significant when viewing the level at which the misinformation was produced. Past research suggests that it is at higher levels of the macrostructure that we are better able to recall propositional items (Kintsch, Kozminsky, Streby, McKoon and Keenan, 1975; Meyer and McConkle, 1973). However, it was the highest level of the structure at COMPLEXITY 5 that the greatest amount of misinformation was produced. This conclusion suggests that the degree to which we are able to integrate new information may be related, in fact, to both familiarity and levels of complexity.

Although we may be better able to retrieve information concerning familiar, simple stimulus messages, how are we affected by level of complexity of a message when holding familiarity constant? Research questions Q_3 and Q_4 addressed

this issue. To answer these questions, comparisons were made (1) between the WELLKNOWN/ COMPLEXITY 3 and COMPLEXITY 5 conditions, and (2) between the UNKNOWN/ COMPLEXITY 3 and COMPLEXITY 5 conditions. Results of the analysis showed no significant differences between COMPLEXITY 3 and COMPLEXITY 5, holding the WELLKNOWN personality constant. Likewise, when comparing COMPLEXITY 3 and COMPLEXITY 5 in the unfamiliar condition, no significant differences emerged at the first two levels of the macrostructural hierarchy. Again, however, differences emerged at Level 3 of the hierarchy. Subjects who received the more complex structural information concerning an UNKNOWN personality scored significantly lower than those receiving the more simple structure (COMPLEXITY 3). In addition, they were much less able to place facts correctly in the macrostructural hierarchy as they were given in the stimulus, and were less able to produce propositions verbatim at this lower level of the hierarchy. Finally, as with the analysis of Q_1 and Q_2, subjects in the UNKNOWN/COMPLEXITY 5 condition produced a greater amount of misinformation than those who received the more simple stimulus message. Subjects simply seemed unable to produce correct information at this deep level of the hierarchy and, in fact, added information at retrieval.

Although to this point we have addressed the specific research questions which were formulated, during the course of data analysis, several interesting trends seemed to emerge. For this reason, a fifth general research question was formulated. Although the timing of this question was post hoc in nature, it was believed that further analysis might reveal specific trends in recall ability given additional examination of the data. Thus, the question was asked: In what ways is recall affected given the covariation of familiarity with complexity. In order to examine this issue, two additional sets of comparisons were made : (1) WELLKNOWN/COMPLEXITY 5 with UNKNOWN/COMPLEXITY 3, and (2) a comparison concerning the 'hypothetical' range or WELLKNOWN/COMPLEXITY 3 with UNKNOWN/COMPLEXITY 5. The latter was considered to be the maximum range of difficulty across the four conditions. Results of these comparisons are listed in Table 4.

Following the calculation of the results of these two comparisons, the data were arrayed in the order represented in Table 4: (1) WELLKNOWN/3 versus versus WELLKNOWN/5; (2) WELLKNOWN/5 versus UNKNOWN/3; (3) UNKNOWN/3 versus UNKNOWN/5; and (4) WELLKNOWN/3 versus UNKNOWN/5. Although such an array does not directly examine ability to recall new information given increasing levels of familiarity and/or complexity, the trend of z-values should suggest

the presence or absence of increasing difficulty levels.

TABLE 4 ABOUT HERE

When one begins to look for patterns or trends in data, one place to begin is with comparison of the most extreme data points, in this case those reflected in the specific comparisons between conditions. Although Table 4 presents the comparison between WELLKNOWN/3 and UNKNOWN/5, perhaps considered to be the greatest distance between levels of difficulty, the decision was made to exclude the comparison from the analysis of trends, or patterns, of significance. This decision was made due to an interaction effect which is strongly suggested in the comparison between WELLKNOWN/5 and UNKNOWN 3, particularly when it is placed in a significance array (see discussion as follows for further details). It is for this reason that trends were examined by arraying z-values across the remaining three sets of comparisons given in Table 4.

Specifically, it was believed that if the two end points or z-values for columns 1 and 3 could be arrayed in some structure, excluding the fourth for the aforementioned reasons, the z-values should increase in significance. In addition, should these values be placed on a graph, these data points would form the end points through which a line might be drawn--if, in fact, the conditions represented by the comparisons increased in difficulty. As Table 4 shows, such was the case for every total and level of the macro-structural hierarchy, with the exception of z-values for each Level 2 of the hierarchy. Level 2 reflected an exactly opposite trend for every variable for which the trends were assessed, with significance values, or z-values, actually decreasing from column 1 to column 3 (looking only at this point at these two values). Whether this opposite trend resulted from (1) a low N size (N=24), (2) from the design of the textbase, or (3) the level and/or method of analysis, is unknown. Only through subsequent study could findings such as this be interpreted or explained.

A second pattern or trend which seemed anomalous to this researcher was the result of adding to the array the comparison between WELLKNOWN/5 and UNKNOWN/3, as is revealed in column 2 of Table 4. As is reflected in the conditions which were paired, familiarity and complexity were covaried.

TABLE 4

COMPARISON OF z-VALUES ACROSS LEVELS
OF FAMILIARITY AND COMPLEXITY

Level	Variable	3/Fam vs. 5/Fam	5/Fam vs. 3/Unf	3/Unf vs. 5/Unf	3/Fam vs. 5/Unf
1	Score	-.12	.76	.41	1.05
2	Score	.58	1.15	-.85	.88
3	Score	.33	-.49	2.75**	2.60**
Total	Score	.57	.30	.65	1.51
1	Fact in Right Place	.22	.11	1.18	1.50
2	Fact in Right Place	1.29	.32	-.32	1.29
3	Fact in Right Place	-.17	.54	3.00***	3.30***
Total	Fact in Right Place	1.34	-.43	1.21	2.10*
1	Paraphrase	.37	.00	.80	1.17
2	Paraphrase	.49	.35	-.52	.32
3	Paraphrase	-1.41	3.05***	-1.34	.63
Total	Paraphrase	.62	.00	.69	1.30
1	Verbatim	-.51	1.06	.00	.56
2	Verbatim	.37	.60	.00	.96
3	Verbatim	-.19	-.18	2.68**	2.36*
Total	Verbatim	.00	.38	.63	1.00
1	Misses	1.41	-1.61	-3.91***	-4.08***
2	Misses	-.56	-.17	-.95	-1.67
3	Misses	-1.18	2.19*	-1.22	.19

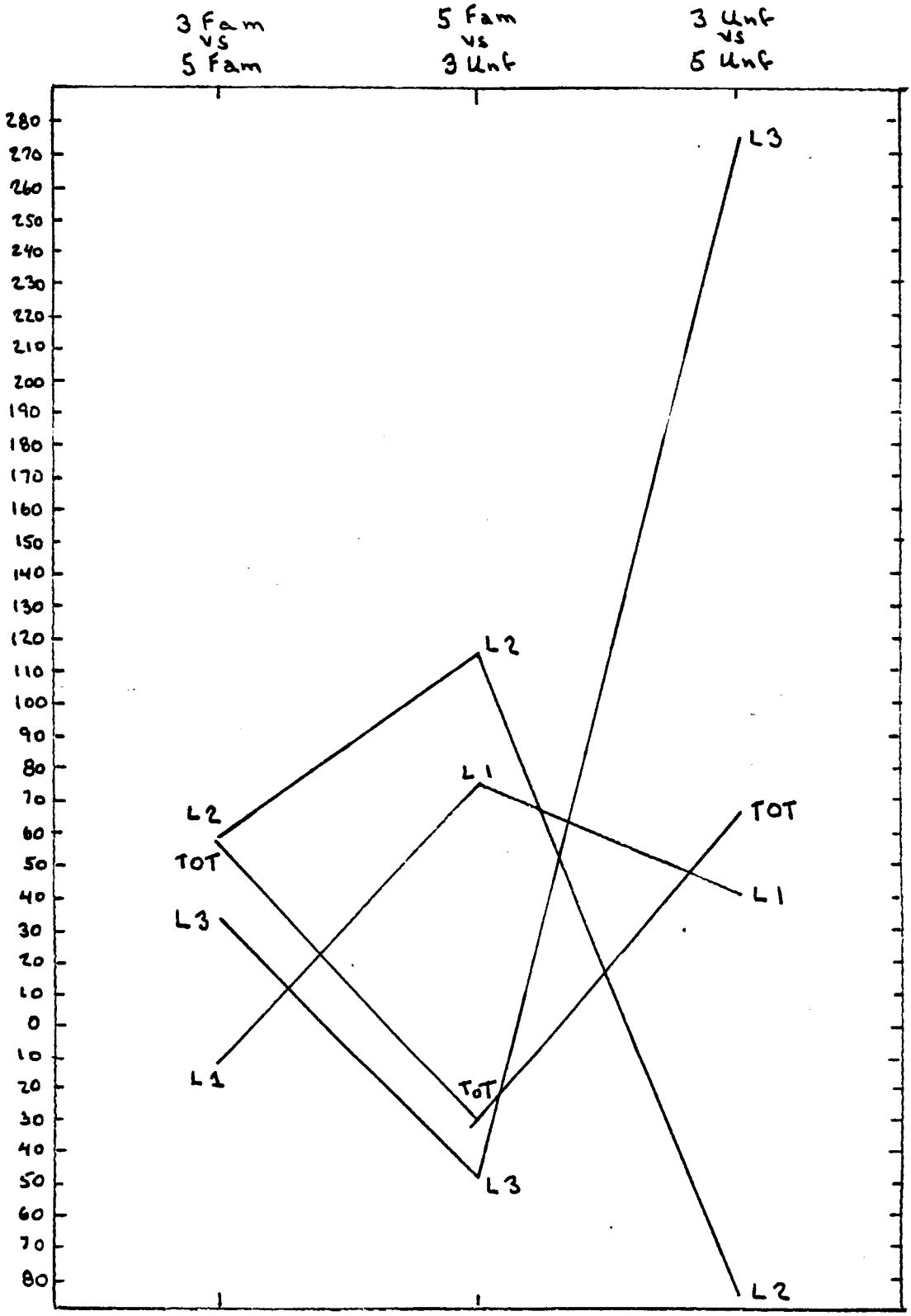
*p < .05
**p < .01
***p < .005

The results of the covariation of familiarity and complexity are reflected in the z-values listed in column 2, when compared in light of the two data points acting as the end-points of our hypothetical line. Rather than falling in the path of the line, despite the difference in slope, these data points fell outside of the line, forming substantial curves which cannot be explained in this study (See Figure 1 for an example of an arrays which was constructed in order to reflect the interaction). Such a repeated pattern led the author to two conclusions: (1) that an interaction effect exists when familiarity and complexity are covaried; and (2) to attempt to interpret the results of such comparisons would have no theoretical basis on which interpretation or explanation might be made. Again, this pattern may have resulted due to the low N size or to the design of the study; however, further research concerning this effect may add to our information concerning its existence.

Implications for Future Research

As was stated earlier, the final analysis in this particular study focused on a post hoc analysis of potential trends of difficulty across levels of complexity and familiarity. Although such an analysis seemed, at first, quite straight forward, it conversely reflected the highly complex nature of the interaction between the two variables. Not only did level 2 of each of the hierarchies form an opposite trend concerning level of difficulty; also an analysis which focused on specific interactions showed spurious results with which the study was unequipped to deal in this particular study. It is for these reasons that further analyses should be made: (1) with a larger N size; (2) with increasing levels of microanalysis at both the textbase and recall levels; and (3) with special attention focused on the nature of the textbase, specifically as reflected in the levels at which the anomalous results were discovered. Certainly the potential of determining trends in difficulty of recall would provide insights for scholars interested in listening research. Valid findings concerning these issues would lend additional support to notions concerning (1) the effects of familiarity and complexity on integration of new information, and (2) specific variables which may significantly affect the listening process.

FIGURE 1
DIRECTION OF z-VALUE CHANGE ACROSS 3
DIFFERENT COMPARISONS OF RESULTS



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