

Pragmatics in Memory: A Study of Natural Conversation

JANICE M. KEENAN, BRIAN MACWHINNEY, AND DEBORAH MAYHEW

University of Denver

Sentence processing in the context of natural, purposeful communication is said to differ from sentence processing in laboratory experiments in that pragmatic information is involved. Included in pragmatic information are the speaker's intentions, beliefs, and attitude toward the listener; such information is referred to as the *interactional content* of an utterance. Recognition memory for statements made during a luncheon discussion group was tested in an incidental learning paradigm following a retention interval of 30 hours. Statements which were high in interactional content yielded excellent memory for surface form, as well as meaning; statements low in interactional content showed no memory for surface form, and less memory for content. Three control studies demonstrate that this difference in memory for high and low interactional content statements cannot be due to (a) differences in the textual properties of the sentences; (b) differences in the quality of the distractors; or (c) reconstruction based on knowledge of the speaker's stylistic habits.

In his most recent book Neisser (1976) argues that "the study of information processing ... has not yet committed itself to any conception of human nature that could apply beyond the confines of the laboratory" (p. 6). With respect to memory, in particular, he states, "Until we know more about memory in the natural contexts where it develops and is normally used, theorizing is premature" (p. 142). However, elsewhere, he cautions that "Demands for ecological validity are only intelligible if they are specific. They must point to particular aspects of ordinary situations that are ignored by current experimental methods, and there must be good reason to suppose that these aspects are important" (p. 34).

The first section of this paper discusses a type of sentential information—pragmatic information—which is rarely involved in

laboratory experiments on sentence memory, but which appears to be important when sentences are processed in the context of natural, purposeful communication. This is followed by a series of experiments investigating memory for statements occurring in a natural, conversational setting.

Pragmatic Information in Naturalistic Sentence Processing

A number of the current models of human memory (e.g., Anderson & Bower, 1973; Kintsch, 1974) describe the process of encoding a sentence as drawing upon two types of information: (1) syntax—knowledge of the structure of linguistic expressions, grammatical as well as lexical information; and (2) semantics—knowledge of objects and their relations used to determine the referents of the expression. These models may adequately describe the encoding of linguistic information in the laboratory. But when a sentence is spoken by a real person in a real situation, it appears that additional information is brought

This research was supported by a grant from the University of Denver Faculty Research Council to Janice M. Keenan. Reprints may be obtained from Dr. Janice M. Keenan, Department of Psychology, University of Denver, Denver, Colorado 80208.

to bear in the encoding of that sentence. This additional information concerns knowledge about the context of the linguistic expression, the intentions of the speaker, the speaker's expectations of the hearer, and the formal identity of the speech act. Linguists have utilized such information in determining the conditions governing the well-formedness of sentences and texts (e.g., Stalnacker, 1972). Philosophers have studied the role of such information in determining truth values (e.g., Montague, 1972). Both groups refer to it as the study of pragmatics.

The term pragmatics is usually taken to refer to information about the communicative situation, the temporal position of the utterance in the communication, and various types of information about the speaker, e.g., his intentions, beliefs, and knowledge of and attitude toward the listener. Our experiments focus on the latter type of pragmatic information—information about the speaker's intentions, his beliefs, and his relations with the listener. We refer to this information as the *interactional content* of an utterance. The interactional content of an utterance can be contrasted with its propositional content, since the latter conveys information about objects and events in the world and is essentially independent of personal knowledge of the speaker.

In assessing the role of pragmatics in sentence memory, we examined memory for individual sentences which differed in the amount of interactional content they convey or elicit in interpretation. Typically, the amount of interactional content conveyed by a statement is critically dependent on one's knowledge of the speaker. However, in order to illustrate what is meant by the term *interactional content*, we present examples of sentences which do not depend on one's knowledge of the speaker, such as (1)-(4) below.

- (1) *Low Interactional Content*: Do you always use CRT displays?
- (2) *High Interactional Content*: Do you always put your foot in your mouth?

Or, to use an example which does not employ a cliché:

- (3) *Low Interactional Content*: I think there are two fundamental tasks in this study.
- (4) *High Interactional Content*: I think you've made a fundamental error in this study.

In constructing these examples of high interactional content statements, we simply made the propositional content of the utterance convey interactional information. It should be noted that the difference between high and low interactional content in the actual sentences used in this experiment was quite different from that illustrated by the above pairs. In the experiment, both high and low interactional content statements conveyed similar amounts of propositional content, and, unlike the pairs above, the difference in interactional content could only be detected by someone familiar with the basic sociolinguistic (Ervin-Tripp, 1969) components of the communication, that is, someone who was familiar with the speaker, the topic, the setting, and the purpose of the communication.

In formulating hypotheses for the role of pragmatics in sentence memory, we found but one study which directly addresses this issue (Jarvella & Collas, 1974). These authors examined memory for sentences which can convey either of two intentions of the speaker. An example is:

- (5) I've never seen you wear that before.

This statement may be either a compliment or an insult, depending on the context. Jarvella and Collas found superior recognition for these statements when the recognition context induced the same interpretation of sentence intention. These results indicate that pragmatic information, such as the speaker's intention, is encoded and stored.

Our experiment on the role of pragmatics in sentence memory goes beyond the Jarvella and Collas study in two respects. First, we tested memory for sentences which occurred spon-

taneously in a naturalistic conversation, that is, the experimental materials were generated by the subjects themselves, and consequently, were more personally meaningful than Jarvella and Collas' experimenter-constructed sentences presented in a laboratory. Our experiment therefore allows us to examine (a) the generalizability of laboratory experiments on sentence memory to real-world settings and (b) the possible existence of differences in memory for sentences that are personally meaningful versus memory for sentences that are not. Second, we are not simply testing whether pragmatics affects memory, rather we are testing two very specific hypotheses concerning the role of pragmatic information in memory.

First, we hypothesized that the meanings of sentences high in interactional content would be more memorable than those which are low. This hypothesis is based on the belief that subsequent interactions with the speaker often depend upon the contents of earlier interactionally significant events. Second, we hypothesized that memory for the surface structure of high interactional content statements would exceed memory for the surface forms of low interactional content statements. This hypothesis is based on the fact that frequently the way a statement is made, the choice of words and the style with which it is executed, is an integral part of the content of high interactional content statements. Just consider the difference between (6) and (7):

- (6) Would everyone please stop talking?
 (7) Would everyone please shut up?

Here the prepositional content of these two sentences may be equivalent in the sense that any situation fulfilling (6) would also fulfill (7). However, the surface structure of the two sentences reflects marked differences in interactional content.

Method

Subjects. Nineteen members of the Psychology Department (faculty and graduate

students) at the University of Denver served as subjects. They were participating in a research discussion and were unaware that they would later be given a memory test on the discussion.

Procedure and materials. The procedural format for a research luncheon discussion at the University of Denver consists of one participant presenting a set of ideas or experiments and others freely interrupting to ask questions, expand ideas, give criticism, or make humorous remarks. The research discussion under study was held in the usual manner with one exception: it was tape-recorded. Participants were aware of the tape recorder but were not aware of the purpose for taping, nor did anyone inquire as to the purpose. The speaker for the day was one of the authors. He did not attempt to inject statements particularly suited to the experiment; he simply spoke in his usual manner.

After the discussion we played the tape, selecting statements for the recognition test. Two classes of statements were defined: high interactional content statements and low interactional content statements. High interactional content statements typically conveyed wit, sarcasm, humor, or personal criticism. We selected, through mutual decision, 15 such statements for the recognition test. To match these 15 statements, 15 statements which were low in interactional content were selected from the tape in a random fashion. Eight of the 15 high interactional content statements were uttered by the main speaker and the remaining 7 were uttered by other participants. The 15 low interactional content statements were matched with the high interactional content statements in terms of speakers.

Table 1 presents one of the high and one of the low interactional content statements. Both were uttered by the same speaker. The statement about Italians is classified as high in interactional content because, for someone who knows the speaker, this statement conveys not only information about Italians but also information about the speaker. It was the speaker's witty way of excusing himself for not having completed running the Italian subjects

TABLE 1
 EXAMPLES OF A HIGH AND A LOW INTERACTIONAL
 CONTENT STATEMENT AND THEIR DISTRACTORS"

High interactional content	
Target:	Italians, you know what Italians are like, they had a strike, they had a heat wave.
(a)	Everyone knows what happens in Italy, first they had a strike, then they had a heat wave.
(b)	If in Madagascar they're weird enough to put the verb first, you can guess what their eye movements must be like.
(c)	They're so weird in Madagascar they put verbs first; you can imagine what they do with their eyes.
Low interactional content	
Target:	You put a little morpheme that says you're going to choose the Object as Subject.
(a)	When you get an Object topic, you add on another little morpheme.
(b)	What Hungarian does is agree with the Object, if the Subject isn't salient.
(c)	If the Hungarian Subject isn't salient, the Object agrees.

" (a) Paraphrase of target, (b) new content distractor, (c) paraphrase of (b).

in his study. The interactional content of this statement might thus be paraphrased as: The speaker is witty and believes that he can convince the listeners it was not his fault that the study was not yet completed. In contrast, the low interactional content statement simply conveys a fact about the world. Notice that in terms of rhythmic pattern and use of the second person, it is just as conversational as the high interactional content statement, but it conveys relatively little information about the speaker or his relation to the listener.

The classification of statements as high or low in interactional content was verified by informally asking three psycholinguists to rate each statement as high or low. These psycholinguists were not from the University of Denver, but were familiar with the main speaker and the topic of the discussion. Their ratings agreed completely with our classification.

For each of the 30 target statements selected, three distractors were constructed. All distractor items preserve the illocutionary force of their targets in the sense that all four items were jokes, sarcastic remarks, descriptive statements, etc. They differ in terms of preservation of prepositional content. The three distractor types are: (1) a paraphrase of the target; (2) a statement which differs in propositional content, but whose prepositional content was plausible in terms of the discussion; and (3) a paraphrase of (2). This latter distractor is a procedural necessity to make (2) a plausible alternative. Examples of the distractors are also shown in Table 1.

The recognition test was thus a 30-item four-alternative multiple choice test. Each item identified the speaker, e.g., "Brian said: (a) (b) (c) (d)." Instructions informed the subject that only one of the four statements was actually said. They were told, however, to examine each of the alternatives and to *rate each alternative* using the following scale:

OLD = I'm sure the statement was said.
 GUESS = I cannot remember anything about this statement. NEW = I'm sure this statement was not said.

This 3-point confidence scale was employed, rather than the typical *OLDI NEW* response categories, in order to separate correct guesses from true hits. It thus provides a clearer interpretation of hits and false alarms. The test was administered by giving each participant in the discussion a booklet and asking him to return it as soon as possible. The interval between research discussion and the recognition test ranged from 27 to 48 hours, with the average at approximately 30 hours.

Results

Table 2 presents the overall percentages of *OLD* responses for each type of test item. The first thing to note is that, even though the subjects were not aware that they would be given a memory test and even though the test

TABLE 2: OVERALL PERCENTAGES OF OLD RESPONSES TO TARGETS, PARAPHRASES OF TARGETS, AND NEW CONTENT DISTRACTORS FOR THE CONVERSATION EXPERIMENT

	Target	Paraphrase	New
High int. content	56	18	2
Low int. content	19	18	8

was given 30 hours after the discussion, subjects could still discriminate between the meanings of utterances which actually occurred and those which did not occur but were equally plausible. The mean percentage of OLD responses to targets and paraphrases of targets, pooling over high and low interactional content items, was 28% contrasted with a mean percentage of 5% for statements expressing new content.

The interactional content of an utterance was an important factor in determining the memorability of its meaning. There were 37% OLD responses to high interactional content targets and their paraphrases, and only 18.5% OLD responses to low interactional content targets and their paraphrases.

Not only was there better memory for meaning when the interactional content was high, but there was also the predicted finding of better memory for the surface form of the utterance. When the interactional content was high, there were 56% OLD responses to targets compared to 18% for paraphrases. On the other hand, when the interactional content was low, subjects responded OLD equally often to targets (19%) and paraphrases (18%).

Because of some dependencies in the responses to the four alternatives, all effects were tested using d' scores. Two d' scores were calculated. One measures memory for surface form, d'_{sf} ; the other measures memory for meaning, d'_m . In calculating d'_{sf} , only targets were counted as correct responses, and all three distractor types were used to calculate

the rate of false alarms. In calculating d'_m , paraphrases of targets, together with the targets, were counted as correct responses and only the two distractor types which differed in prepositional content were used to calculate the rate of false alarms.

Each of the analyses to be reported was performed twice: once treating subjects as a random factor while collapsing over statements, and once treating statements as a random factor while collapsing over subjects. Results are reported using $\min F'$ which combines the two analyses (Clark, 1973).

The first row of Table 3 presents the average d'_{sf} and d'_m for both high and low interactional content statements. Analysis of variance confirmed that the meanings of high interactional content statements were recognized better than low interactional content statements, $\min F'(1, 37) = 16.27, p < .001$. More importantly, memory for surface form was significantly better for high interactional content statements than for low interactional content statements, $\min F'(1, 41) = 10.61, p < .005$.

An analysis was also performed on the items to determine whether the 16 statements uttered by the main speaker were more memorable than the 14 statements uttered by the other participants. Since both high and low interactional content statements were balanced for speaker, this analysis had two main factors: Speaker and Interactional Content. There was no effect of Speaker on the

TABLE 3 MEASURES OF DISCRIMINABILITY BETWEEN TARGETS AND DISTRACTORS (d'_{sf}) AND BETWEEN TARGETS PLUS THEIR PARAPHRASES AND OTHER DISTRACTORS (d'_m) FOR THE CONVERSATION EXPERIMENT AND LIST-LEARNING CONTROL EXPERIMENT

	High interactional content		Low interactional content	
d'_{sf}	d'_m	d'_{sf}	d'_m	
Conversation	1.73	2.81	0.47	1.18
List-learning	1.12	1.96	1.20	1.72

High interactional Low interactional
 d'_{sf} d'_{sf}

memorability of utterances, $F(1, 24) < 1$; nor was the interaction significant, $F(1, 24) < 1$. The only significant effect was the effect of Interactional Content, $F(1, 24) = 20.29, p < .01$.

Discussion

The results of this experiment show a dramatic difference in memorability between statements classified as high and low in interactional content: There is greater accuracy in recognizing the meanings of high interactional content statements, and, also, there is excellent memory for the surface forms of high interactional content statements while virtually no memory for the surface forms of low interactional content statements. We would like to claim that these differences in memorability are due to differences in the amount of pragmatic information which supports the encoding and storage of sentences in a conversation. However, alternative explanations exist.

First, the difference in memorability between high and low interactional content statements could be due to differences between the sentences besides the difference in the amount of interactional content they convey. Because the sentences were uttered spontaneously, they could not be matched on factors known to affect memorability. It is possible that the two sets are not equal in terms of imagery, word frequency, syntactic structures, or ease of integration. Moreover, they differ in semantic content. One or more of these other factors could be responsible for the difference in memorability between high and low interactional content statements. Control Study 1 tests this possibility.

Second, even if the target statements were equally memorable, differences in memory for surface form could still obtain if the paraphrase distractors for the high interactional content statements did not function as well as the distractors for the low interactional content statements. Control Study 2 tests this possibility.

Finally, the results for high interactional content statements may simply reflect reconstruction on the basis of knowledge of the speaker rather than memory for particular utterances. Since we claim for these sentences that the choice of words conveys information about the speaker, it may be the case that anyone who knows the stylistic habits of the speaker could determine whether he said: "Would everyone please stop talking?" or "Would everyone please shut up?" Control Study 3 tests this possibility.

Control Study 1: Are there differences in sentence memorability when the interactional component is removed?

In an attempt to rule out nonpragmatic factors as an explanation of the difference in memorability between high and low interactional content statements, we performed a typical sentence memory experiment using the target statements of the first experiment. The sentences were presented in a list-learning fashion, and memory was tested by the same recognition memory test employed in the conversation experiment. If differences in lexical information, syntax, or semantics are responsible for the superior memory for high interactional content statements in the conversation experiment, then we should obtain the same pattern of results in this control experiment. On the other hand, if interactional factors were primarily responsible for the results, then, in this second experiment, where interactional factors have been eliminated by presenting the sentences as items on a list, there should be no difference in memorability between high and low interactional content statements.

Method

Subjects. Thirty-four Introductory Psychology students from the University of Denver volunteered to serve as subjects for course credit.

Procedure and materials. Subjects listened to a tape consisting of 100 conversational-type sentences. The list of sentences included the 15 high and 15 low interactional content statements from the conversation experiment and 70 filler sentences. Fillers were included to prevent ceiling effects on the memory test. All of the sentences were recorded by one speaker who spoke in a conversational tone. The order of sentence presentation was randomized with the constraint that the first 10 and last 10 sentences of the list be filler items to control for primacy and recency effects. Subjects were instructed to listen carefully to the sentences in order to do well on a subsequent memory test; the nature of the test was not specified.

Immediately after listening to the 100 sentences, the subjects were given the same memory test used in the conversation experiment, except here the items were not identified by a speaker. As before, the subjects were told to rate each alternative using the 3-point scale of *OLD*, *NEW*, and *GUESS*.

Results

Table 4 presents the overall percentages of *OLD* responses for each type of test item. Like the participants in the discussion, these subjects were clearly able to differentiate between the contents of sentences they heard and sentences they did not hear. Collapsing over high and low interactional content statements, the percentage of *OLD* responses to targets and their paraphrases was 32%, while the percentage of *OLD* responses to new content

distractors was only 7.5%. Unlike the participants in the discussion, however, these subjects do not show differences in memory between high and low interactional content statements. The percentage of *OLD* responses to the target was exactly the same, 47%, for both high and low interactional content statements.

The analysis in terms of *d'* scores was identical with that used in the previous experiment. Mean *d'* scores are presented in the lower half of Table 3. Analysis of variance confirmed that for these subjects there was no difference in memorability between the sets of statements we termed High and Low in interactional content. [Minimum *F'* was not computed, since for the surface form analysis $F_1(1, 33) = 1.41, p = .24$, and $F_2(1, 28) < 1$, and for the meaning analysis $F_1(1, 33) = 2.33, \hat{\Lambda} = .14$, and $F_2(1, 28) < 1$.]

The data from both experiments were combined in two analyses of variance of *d'* scores, one for surface form and one for meaning. Both analyses yielded significant interactions between Experiment and Interaction[^] Content. In the analysis of surface form, $\min F'(1, 60) = 7.75, p < .01$; in the analysis for meaning, $\min F'(1, 60) = 9.66, p < .005$. These interactions confirm the results of the separate analyses where differences in interactional content led to differences in memory in the conversation experiment, but not in the list-learning experiment. Even though the *d'*_{sf} values for both sets of statements in the list-learning experiment are higher than the *d'*_{sf} values for low interactional content statements in the conversation experiment, high interactional content statements were remembered better in the conversation than in the list-learning paradigm, $\min F'(1, 60) = 4.03, p < .05$. This is a rather dramatic demonstration of the role of pragmatics in memory since the participants in the discussion were tested after 30 hours in an incidental learning paradigm, whereas the subjects in the list-learning experiment were tested immediately in an intentional learning paradigm.

TABLE 4

OVERALL PERCENTAGES OF OLD RESPONSES TO TARGETS, PARAPHRASES OF TARGETS, AND NEW CONTENT DISTRACTORS FOR CONTROL STUDY I

High interactional	Target	Paraphrase of target	New content
content	47	21	7
Low interactional	47	14	8

Discussion

The results of this experiment allow us to eliminate the possibility that there were differences, other than interactional differences, between the sentences of the conversation experiment which led to differences in memorability. This experiment clearly demonstrates that the high interactional content statements are not intrinsically more memorable than the low interactional content statements. Furthermore, it demonstrates that for these sentences the textual elements of the sentence play a minor role in eliciting pragmatic information. It is one's knowledge of the speaker which renders a statement sarcastic, humorous, or witty, not its linguistic structure.

Control Study 2: A test of the quality of the paraphrase distractors

In interpreting the results of the conversation experiment we assumed that the high recognition rates for high interactional content statements reflected subjects' memory for the surface forms of these statements. An alternative explanation is that the paraphrase distractors for these statements were of poorer quality than the paraphrases for low interactional content statements. In other words, the subject who remembered the gist of a high interactional content statement could easily select the target over its paraphrase, because the paraphrase did not have the properties associated with a conversational statement, e.g., rhythmic pattern, lexical items, etc.

In the following experiment subjects were given the 15 high and the 15 low interactional content statements, each paired with its paraphrase, and asked to choose which of the two statements would be most likely to occur in a conversational setting such as the research luncheon discussion. If the paraphrase distractors of high interactional content statements are less conversational than the targets, then the same pattern of results which obtained in the conversation experiment should obtain

here: high interactional content targets selected more frequently than their paraphrases and low interactional content targets selected just as often as their paraphrases. On the other hand, if the paraphrases for both sets of statements are of equal quality, no such interaction should obtain.

Method

Subjects. Thirty-one students in an undergraduate learning course at the University of Denver agreed to serve as subjects during class time. None of the subjects knew the speakers from the conversation experiment.

Procedure and materials. The subjects were first given an extensive description of the setting for the conversation experiment. This included a description of the people involved (no names were mentioned), the purpose and procedural format for the discussion, the manner in which people interact in these discussions, and some information concerning the topic under discussion. They were also told that we had selected certain statements from the discussion and had constructed paraphrases for them, and that we wondered whether they could distinguish our paraphrases from the real statements.

Following this description subjects were given test booklets containing 30 pairs of statements. Each pair consisted of one of the 30 target statements from the conversation experiment and its paraphrase. The subjects were told that one of the statements in each pair had actually occurred in the conversation, and that their task was to try to determine which one it was. The experimenter suggested that in making their judgments they consider such things as phrase structure, word choice, and overall "sound" of the statement. It should be noted that all subjects felt that the task was easy to do and they felt quite confident of their choices.

Results and Discussion

The top half of Table 5 presents the proportion of targets and paraphrases selected

TABLE 5

PROPORTION OF TARGETS AND PARAPHRASES SELECTED AS "MOST LIKELY TO OCCUR IN A CONVERSATION" FOR HIGH AND LOW INTERACTIONAL CONTENT STATEMENTS AND FOR SUBJECTS WHO KNEW THE SPEAKERS AND THOSE WHO DID NOT

	High interactional content		Low interactional content	
	Target	Paraphrase	Target	Paraphrase
Subjects who did not know the speakers (Control Study 2)	41	59	44	56
Subjects who knew the speakers (Control Study 3)	51	49	48	52

by subjects as most likely to occur in a conversation such as the research luncheon discussion. The paraphrases were selected more often than the targets for both high interactional content statements, 59 versus 41%, and low interactional content statements, 56 versus 44%. This difference is highly significant, $F(1, 30) = 17.7, p < .001$. Further, there was no interaction between target and paraphrase and high and low interactional content, $F(1, 30) < 1$.

These results clearly show that there was nothing peculiar about the paraphrase distractors for high interactional content statements that could have led subjects in the conversation experiment to reject them in favor of the targets. The paraphrases for both high and low interactional content statements were equally good candidates for conversational statements, and, interestingly, were even thought to be better candidates than the targets themselves.

Control Study 3: Is knowledge of the speaker sufficient to distinguish target from paraphrase?

The subjects in Control Study 2 did not know the speakers; their judgments simply reflect the conversational quality of targets and paraphrases. The following experiment employs the same task as Control Study 2, but here the statements are identified by speaker, and the subjects all know the speakers in that they interact with them on a weekly, if not

daily, basis. The purpose of this experiment is to determine whether knowledge of the speaker's stylistic habits is sufficient to determine which statement occurred in the conversation experiment. We are particularly interested in whether knowledge of the speaker allows one to select the target rather than the paraphrase for high interactional content statements but not for low interactional content statements. If so, then the surface form effect in the conversation experiment could not be interpreted as a result of memory; rather, it would reflect reconstruction on the basis of knowledge of the speaker's stylistic habits. On the other hand, if subjects who know the speakers cannot distinguish targets from paraphrases, then the results of the conversation experiment can be said to truly reflect memory for specific statements.

Method

Subjects. Fifteen University of Denver faculty and graduate students who rated themselves as familiar with the speakers and the setting of the conversation experiment, but who did not attend that particular discussion, served as subjects.

Procedure and materials. The procedure was similar to that of Control Study 2. The only difference was that each pair of statements in this case was identified by the speaker. In making their judgments of which statement occurred, the subjects were asked to

consider phrase structure, lexical items, and overall "sound" of the statement in terms of the particular speaker. It should be noted that all subjects were highly motivated and none felt that their selections were at all random.

Results and Discussion

The bottom half of Table 5 presents the proportion of targets and paraphrases selected as most likely to have been said. As can be readily seen, even subjects who knew the speakers were totally unable to distinguish the targets from the paraphrases, both in the case of the high interactional content statements (51% selection of targets and 49% selection of paraphrases) and in the case of the low interactional content statements (48% selection of targets and 52% selection of paraphrases). The analysis of variance confirmed that there was no main effect of Interactional Content, or Target—Paraphrase, and there was no interaction (for all three, $f > .1$).

These results clearly support the contention that the participants in the discussion actually remembered the surface forms of high interactional content statements, and did not simply base their responses on their knowledge of the stylistic habits of a given speaker. The present experiment shows that knowledge of the speaker is not sufficient to distinguish the targets from the paraphrases. However, knowledge of the speaker surely plays some role in the decision process, since subjects who did not know the speakers selected the paraphrases significantly more often than the targets (Control Study 2), while subjects who did know the speakers selected targets and paraphrases equally often (Control Study 3). Thus, for the sentences used in these experiments, knowledge of the speaker was only sufficient to overcome a response bias for the paraphrases and allow responding in accordance with chance.

CONCLUSIONS

The central finding of this study is the excellent retention of surface form for state-

ments that have high interactional content within the context of a real-life communication. This finding contrasts sharply with the commonly held belief that memory for sentences involves only memory for their meanings and not for their surface forms (James, 1890; Pillsbury & Meader, 1928; Stern, 1931; Sachs, 1967; Brewer, 1974). The studies which have investigated this issue present a broad range of results. Some experiments (Wanner, 1974) have shown the influence of task demands on memory for surface form, and others (Anderson, 1974; Keenan, 1975) have shown the influence of text structure on memory for surface form. Some experiments have found that memory for surface form is negligible or, at best, transient (Sachs, 1967; Wanner, 1974); others find that it persists over very long retention intervals (Keenan, 1975; Kolers, 1975). These apparently contradictory findings indicate that the parameters which control the retention of surface form information in laboratory experiments have yet to be worked out. The present experiment demonstrates the importance of a parameter of a quite different nature. This parameter involves the degree to which a statement conveys information about the speaker's intentions, beliefs, and attitudes toward the listener. Our results indicate that the impact of this parameter on memory is more dramatic than that of any of the other parameters which have been examined to date.

The finding that interactional content improves memory can be explained in at least four ways. According to one explanation, high interactional content sentences are remembered better because they contain a larger quantity of information than low interactional content sentences. Both types of sentences involve what Searle (1975) calls direct speech acts, that is, literal statements. However, high interactional content sentences also involve what Searle calls indirect speech acts. For example, as a direct speech act, the sentence *it's hot in here* refers to the temperature in the room. However, as an indirect speech act, the sentence may be a request to have a window

opened. Since indirect speech act sentences contain two types of information and direct speech act sentences only contain one, memory will always be best for indirect speech act sentences. The problem with this explanation is that there is no such thing as an indirect speech act sentence, since indirect meaning is not a property of the sentence as an isolated object but only of the sentence as a component of a real interaction. In fact, the results of the list-learning study show that this explanation is not tenable, since memory for sentences that did not involve indirect speech acts was as good as memory for sentences that did.

A second explanation avoids the errors of the first by claiming that the additional quantum of information contained by an indirect speech act statement derives from the relation of the statement to an interaction. According to this quantitative account, the exact structure of the interaction is irrelevant. The crucial factor facilitating memory for surface form is that somehow the interaction leads to the perception of the statement as two acts in one.

A third explanation focuses on the quality of the information conveyed and emphasizes the interpersonal nature of the statements. This explanation states that high interactional content statements are remembered better because they can be easily assimilated into a rich cognitive organization developed by the listener through previous interactions with the speaker. Bartlett (1932) often employed this explanation in his experiments on memory for schematic faces and memory for texts. He found that, when a face or some detail in a story reminded subjects of themselves or someone they knew, retention was particularly good. Explaining memory performance in terms of the cognitive organization a listener has acquired for a speaker extends the theoretical notions developed by Craik and Tulving (1975). These authors stressed the role of semantic information in remembering events; we add to their notions the role of interpersonal knowledge. The more com-

patible an event is with the structure and organization of semantic memory or with the structure of one's beliefs and attitudes, the greater its retention because a more elaborate memory trace can be laid down and because the existing cognitive organization can be drawn upon to facilitate reconstructive processes involved in retrieval. Note that these notions accommodate the finding in Control Study 3, that subjects who knew the speakers selected target statements more often than subjects who did not.

A fourth explanation also focuses on the quality of the information conveyed, but here the emphasis is on the affective nature of high interactional content statements. This explanation states that high interactional content statements are remembered better because they elicit an emotional or affective reaction in the listener. While most of our high interactional content statements did not elicit a readily observable affective response, such as laughter, it is possible that more sensitive observations, such as GSR or heart-rate recordings, would provide evidence in support of this explanation.

It would seem that explanations three and four share a further presupposition which is that the interpersonally or affectively salient features are often properties of surface form such as lexical choice, word order stylistics, or paralinguistic indicators. Memory for surface form can, therefore, be seen as memory for the level of information richest in these markers.

Future research will need to distinguish between these last three explanations, and possibly others. In addition, future research will need to determine the relative importance of various factors which can be said to control the interactional context. These factors include the degree of previous involvement with the speaker, the formal identity of speech acts represented by particular statements, the organizational structure of the interaction [e.g., lecture format (Kintsch & Bates, 1977) versus group discussion], and the amount of active participation on the part of the listener. For example, would the results of the present

experiment obtain if subjects, instead of participating in the discussion, simply viewed the discussion on videotape? Or, would they obtain if the subject simply read a personal letter which contained high interactional content statements?

As future research proceeds, an important task will be to develop a set of a priori criteria that will permit one to determine which sentences are high in interactional content. High interactional content statements for this experiment were selected intuitively on the basis of our knowledge of the speaker and the structure of the interaction. We know that these intuitive judgments are reliable, since three psycholinguists, who were not present at the discussion but who knew the main speaker, were able to sort perfectly the high from the low interactional content statements. Future research, however, should provide an empirical and theoretical analysis of the factors underlying these judgments.

This study is a simple demonstration of differences in the operating characteristics of memory as studied in the laboratory and in natural situations. The results strongly suggest that the study of pragmatics in psychological processes must be undertaken if we are ever to apply our work on learning and memory to real-world situations.

REFERENCES

- ANDERSON, J. R. Verbatim and propositional representations of sentences in immediate and long-term memory. *Journal of Verbal Learning and Verbal Behavior*, 1974, **13**, 149-162.
- ANDERSON, J. R., & BOWER, G. H. *Human associative memory*. Washington, D.C.: Winston, 1973.
- BARTLETT, F. C. *Remembering: A study in experimental and social psychology*. Cambridge: The University Press, 1932.
- BREWER, W. F. The problem of meaning and the interrelations of the higher mental processes. In W. B. Weimer & D. S. Palermo (Eds.), *Cognition and the symbolic processes*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1974.
- CLARK, H. H. The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. *Journal of Verbal Learning and Verbal Behavior*, 1973, **12**, 335-359.
- CRAIK, F. I. M., & TULVING, E. Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General*, 1975, **104**, 268-294.
- ERVIN-TRIPP, S. Sociolinguistics. In L. Berkowitz (Ed.), *Advances in experimental social psychology*. New York: Academic Press, 1969. Vol. 4.
- JAMES, W. *The principles of psychology*. London: Macmillan, 1890.
- JARVELLA, R. J., & COLLAS, J. G. Memory for the intentions of sentences. *Memory and Cognition*, 1974, **2**, 185-188.
- KEENAN, J. M. *The role of episodic information in the assessment of semantic memory representations for sentences*. Doctoral dissertation, Department of Psychology, University of Colorado, 1975.
- KINTSCH, W. *The representation of meaning in memory*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1974.
- KINTSCH, W., & BATES, E. Recognition memory for statements from a classroom lecture. *Journal of Experimental Psychology: Human Learning and Memory*, 1977, **3**, 150-159.
- KOLERS, P. A. Specificity of operations in sentence recognition. *Cognitive Psychology*, 1975, **7**, 289-306.
- MONTAGUE, R. Pragmatics and intensional logic. In D. Davidson & G. Harman (Eds.), *Semantics of natural language*. Dordrecht, Holland: D. Reidel, 1972.
- NEISSER, U. *Cognition and reality*. San Francisco: Freeman, 1976.
- PILLSBURY, W. B., & MEADER, C. L. *The psychology of language*. New York: Appleton, 1928.
- SACHS, J. Recognition memory for syntactic and semantic aspects of connected discourse. *Perception and Psychophysics*, 1967, **2**, 437-442.
- SEARLE, J. Indirect speech acts. In P. Cole & J. Morgan (Eds.), *Syntax and semantics, Volume 3: Speech acts*. New York: Academic Press, 1975.
- STALNAKER, R. C. Pragmatics. In D. Davidson & G. Harman (Eds.), *Semantics of natural language*. Dordrecht, Holland: D. Reidel, 1972.
- STERN, G. *Meaning and change of meaning*. Goteborg: Elanders Boktrycken Aktiebolag, 1931. (Reprinted at Bloomington: Indiana University Press, 1964.)
- WANNER, E. *On remembering, forgetting and understanding sentences*. The Hague: Mouton, 1974.

(Received December 27, 1976)