THE EFFECTS OF SENTENCE CONTEXT ON AMBIGUOUS, VAGUE, AND CLEAR NOUNS

By

Louis Blaine Goss

The purpose of this study was to test the effects of sentence context on response variation and response time for ambiguous, vague, and clear nouns. An ambiguous noun was defined as one with two or three different referents that are unrelated to one another. A vague noun was defined as one which refers to a large number of referents within a common field. A clear noun was defined as one which had one definition and essentially one referent. Response variation was defined as the number of different responses (one-word noun responses) the word elicited across subjects. This was reflected by an RVI score which was the number of different responses divided by the number of subjects responding. Response time was the number of seconds necessary to vocalize a response to the stimulus word.

Forty-six (46) subjects within a 2 x 3 x 5 mixed design responded to fifteen nouns (5 of each kind). Half of the subjects responded to the stimulus nouns alone, while the other half responded to the stimulus nouns in sentences.

The results indicated that when nouns appeared alone as compared to when they appeared in sentences, there was no significant difference in either response variation or response time. Thus the

sentences did not increase or reduce response variation or response time.

No significant context to clarity interactions were observed, thus demonstrating that the sentence contexts did not have differential effects on ambiguous nouns as compared to vague nouns or clear nouns.

The results did indicate, though, that clear nouns rather consistently needed less response time and generated more homogenous responses across subjects than did ambiguous or vague nouns.

It was also discovered that more response time was needed for subjects to verbalize the second meaning for ambiguous nouns than was required for their initial responses.

Finally, a substantial correlation between response variation and response time indicated that nouns that required more time also developed more different responses across subjects.

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Communication

1971

Accepted by the faculty of the Department of Communication, College of Communication Arts, Michigan State University, in partial fulfillment of the requirements for the Doctor of Philosophy degree.

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ACKNOWLEDGMENTS

To be human means to love and be loved. To help me be this, it is good to have my wife, Carol, and my daughter, Angela.

To be a social scientist means to be inquisitive and competently trained. To help me be this, it is good to have Drs. Gerald Miller, Erwin Bettinghaus, Verling Troldahl, David Ralph, and James Phillips.

To be a friend means to have friends. To help me be this, it is good to have Frank Zink and Beverly Clarke.

To be all of these is easy with this kind of company.

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CHAPTER I

INTRODUCTION

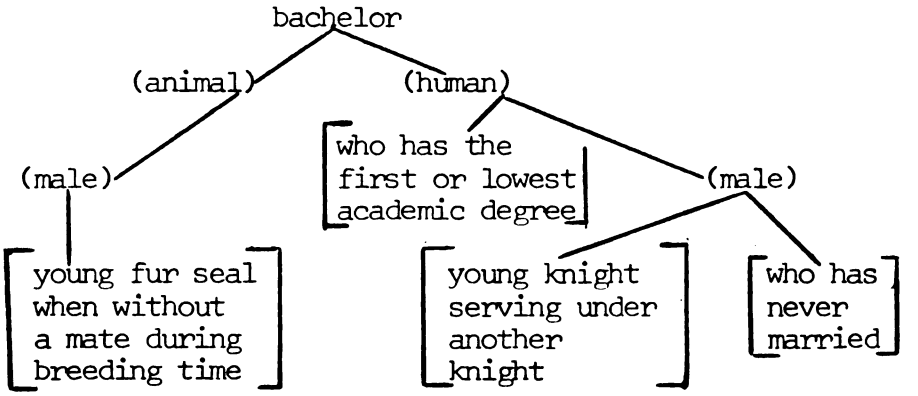
Our knowledge of the communication process could benefit from an understanding of message decoding processes. Although little is known about how messages are processed by humans, we know that messages can affect their consumers. How a person decodes a message is probably influenced by his attitudes and vocabulary, the situation at hand, and the words in the message. A characteristic of messages that may be important is that of lexical clarity, or the relative ease with which a decoder locates a referent that is commonly associated with the word under consideration. When a decoder immediately attaches a referential meaning to a word, the word is called clear. When he is not able to affix meaning with ease, the word is called unclear.

Lexical clarity, however, may be more complex than what is suggested by the clear-unclear dichotomy. For instance, words may be unclear in different ways and operate differently when used in sentences. The purpose of this study is to conceptually dissect the unclear category into two categories of ambiguity and vagueness and to observe how these different kinds of unclear words operate in sentences.

To understand the rationale for this study a consideration of "semantic markers" and a conceptualization of ambiguity and vagueness follow.

Semantic Markers

In 1963, Katz and Fodor introduced a new approach to the study of meaning. As a spinoff of transformational grammar, Katz and Fodor's structural "theory" is somewhat like a 20-questions game. They suggest that meanings can be seen as a bundle of semantic markers (attributes and functions). Semantic markers are decision points similar to IF statements in FORTRAN programing. They guide the interpretation process by asking binary, dichotomous questions, such as is the referent human or animal? By proceeding through a set of semantic markers as one would with a flowchart, the person can eventually work down to the last marker called the distinguisher which logically leads to the ultimate referent. In their example, Katz and Fodor use the term "bachelor."



By asking two questions (animal/human? and male/nonmale?) you can come to the young seal meaning of bachelor. Reaching the meaning of a bachelor as one who never married, requires three choice points (animal/human?, male/nonmale?, and knight/never married?).

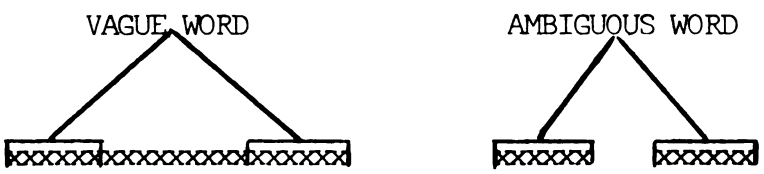
To a linguist, the Katz and Fodor scheme is somewhat of a controversial addition to the ongoing philosophical debate about

meaning. To the psychologist or communicologist interested in actual language behavior, the scheme has exciting implications but its behavioral utility is yet to be realized. Being essentially a competence model and not a performance model, it might be used to explain how people should process meaning, but it may not explain how they actually do process meaning. It is basically a linguistic model, operating under the assumption that meaning is to be discovered within the language system without necessary reference to the language user. Someday it may have high predictive utility, but this will not occur until research correlates actual performance with the model. Theoretically, it is potentially rich. Operationally or behaviorally, its germaneness awaits verification. For the purpose of this study the notion of semantic markers will be borrowed from Katz and Fodor in an attempt to understand the difference between ambiguity and vagueness. Keeping in mind the concept of semantic markers, let us turn to an analysis of ambiguity and vagueness.

Ambiguity vs. Vagueness

Lionel Ruby (1960) points out that there are two kinds of ambiguity--lexical ambiguity and structural ambiguity. Lexical ambiguity is conceived as the denotative discrepancies between the source and receiver. Structural ambiguity (amphiboly) is created by an unusual placement of the parts of speech or adjacent phrases so that the receiver is unclear as to the relationship being suggested by the speaker. Aside from the work of MacKay and Bever, most of the past research has focused on lexical ambiguity.

Making a distinction between ambiguity and vagueness, Ruby explains that "ambiguous words have several distinct referents: [whereas] a vague word lacks precision and definiteness in its reference" (p. 527). Alexander (1969), a philosopher at the University of New Mexico, agrees with Ruby by maintaining that "an ambiguous term is one which has two or more rather distinct areas of reference . . . . A vague term . . . is one that has a large degree of extentional variability" (p. 89). Graphically, Alexander presents this distinction as follows:

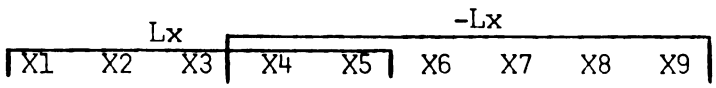


Ambiguity, then, has two specific areas of reference, whereas vagueness has a range of responses where the boundaries or extreme conditions come into question. A semanticist, Benjamin (1970), suggests that "the distinguishing factor of ambiguity is that the meanings are clear--only the choice is in question" (p. 37).

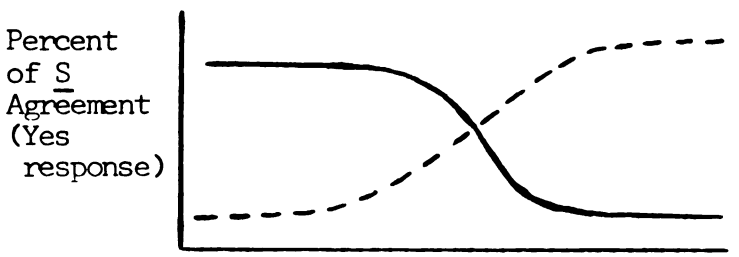
A closer inspection of vagueness and ambiguity suggests that the main difference between the two seems to be mostly in their fields of reference. Vague terms can apply to many situations/objects. More importantly, there are areas within a field of reference where a term may or may not apply; these are the boundary areas. These fuzzy, flexible boundaries make a term vague. How broad a range of interpretations is appropriate under the usage of the term is the main question. Responses within the middle part of the range are appropriate; those at the extreme ends of the range, at the thresholds of "not-X," are

questionable. Darnell (1967) provides a good example of vagueness when he considers the term "middle-aged." How old is middle-aged? Surely we would agree that a person 50 years old is middle-aged, but how about a person 39, or one 60? We can probably agree that ages 5 and 80 are not middle-aged, but we would have difficulty agreeing on the boundary ages that the term middle-aged applies. The age range acceptable to you may be different from that acceptable to me.

Taking a closer look at the boundary areas, Max Black (1949) presents a model of vagueness based on subject discriminations of a set of events which may or may not fit under the term in question. To Black, vague terms are characterized by a fringe area--a referential overlap area where a term may or may not apply depending on the respondent. Below is his illustration:



Black argues that clear terms would not have a fringe or overlap (X4 and X5) area. For it is the nature of the threshold between Lx (events covered by the term) and -Lx (events not covered by the term) that determines whether or not the term is vague or clear. A typically vague term would produce a distribution as follows:



—— = responses to "Is Xn furniture?"
--- = responses to "Is Xn not furniture?"

On the other hand, an ideally precise term would produce distributions that have no slopes. There should be no disagreement about those objects that fit under (L) and those that do not. The perfectly precise symbol would elicit a curve that has a sharp drop between the two events that are the last Lx and the first -Lx. The vague curves do not have sharp drop-off points; their thresholds are less clear and cover a range rather than a point.

The main drawback of this scheme is that it would be very difficult, if not impossible, to find words clear enough to generate the ideally precise dichotomy. Also, if the term is ideally precise, only one object would fit, everything else would not. Nonetheless, Black's analysis makes sense and it could provide a way to detect degrees of vagueness in words.

Unlike vague terms, ambiguous terms do not necessarily have broad fields of reference. Rather two or three popular referents emerge across people. These two or three meanings are known to most of the culture's language users. There is not as much variance in the number of referents to which a term applies. For instance, in our English language the word "port" can refer to a kind of wine, a harbor, or a hole in some encasement. The meanings are clear, only the choice is in question. Vague terms tend to be higher abstractions, ambiguous terms are not essentially higher abstractions. Ambiguous terms typically refer to different fields of reference, whereas vague terms have specific referents within a broad field of reference on a common dimension.

Relevant Research

Past research shows that the conceptual slipperyness of ambiguity and vagueness has led to a potpourri of operationalizations that has, in turn, generated some confusing findings. Such manipulations as intuitively creating ambiguous messages (Zimbardo, 1960), deleting every other word from intact messages (Manis, 1961), content analyses of written messages (Samovar, 1962; and Wilson 1966), and creating doubly qualified sentences by varying the logical adjectives (Johnson-Laird, 1969) have only led us to the tentative finding that subjects may assimilate the position of the message toward their own attitude more for ambiguous messages than for clear messages, and this finding is certainly not conclusive.

Perhaps the most rigorous empirical study of ambiguity comes from MacKay and Bever at M.I.T. Their research takes a generative grammar approach to ambiguity. They conceptualize ambiguity as any stimulus pattern which is capable of two and only two distinct interpretations. Ambiguity, according to MacKay and Bever, can occur at three levels:

1. Lexical: two possible referents for a word ("port" meaning wine or harbor).

2. Surface Structure: two distinct groupings of words ("good boys and girls" vs. "good boys and good girls").

3. Underlying Structures: two possible logical relations between thoughts ("They are flying planes" or "They are flying planes").

Their 1967 study involved creating 45 sentences which coincided with their conceptual levels of ambiguity. The subject was to look at the

sentence and when he could perceive more than one possible interpretation, he was to signal the E who would note the elapsed time. Comparing response times across the three levels, they found that subjects needed less time to detect the second meaning for lexical ambiguities than for surface or underlying structure ambiguities.

More interesting than the 1967 attempt is the followup study that MacKay reported a year before in 1966. Using a sentence completion technique, where the subjects were given a stem and asked to complete the sentence in their own words, MacKay found that ambiguous sentences took longer to complete than did unambiguous sentences. In addition, he reports that if the sentence has more than one ambiguity, it took longer than if it had only one. Analogous to the earlier study, MacKay found that completion times were shorter for lexical than for surface and underlying structure ambiguities.

Although these studies do not tell us much about the effects of sentence context on ambiguous nouns, they do reveal consistent effects of ambiguity on response time. How different this effect would be for vague terms is a question for the study being reported in this dissertation. In addition, MacKay and Bever's work demonstrates how consistent, replicable findings can be produced if the researcher will spend time conceptualizing his concepts thoroughly before he attempts to operationalize them.

In review, it has been suggested that an understanding of meaning might benefit from Katz and Fodor's notion of semantic markers; that ambiguity and vagueness may be conceptually different phenomena; and that the available research findings imply that ambiguity may affect

the respondents' processing mechanisms.

If Katz and Fodor's notion of semantic markers is combined with the earlier distinctions between ambiguity and vagueness, it can be seen how semantic markers may be useful to an understanding of ambiguity and vagueness. For instance, it might be that ambiguous words can be cleared up by one marker. In other words, if I use the term "bark" the only question necessary would be whether I mean animal or vegetable (dog/tree?). If I use a vague term like "furniture" when I am referring to chair, more than one semantic marker or question would be necessary to discover my referent of chair.

Given that vague terms may require more markers than ambiguous terms, the sentence context now becomes relevant. We have learned from grammarians that syntax helps determine meaning. For instance, we can predict that a word is a noun by its location in the sentence, and since nouns refer to persons, places, and things, etc., we know the referent must fit into one of the defining categories of nouns.

The other words in the sentence, in addition to syntax, help determine the meaning of the specified word. Knowing the semantic meaning of the other words (particularly the adjectives) helps the reader understand the intended meaning of the noun in question. He would have a meaning for the noun without the other words, but the other words should help direct his decision about the intended meaning. G. A. Miller (1965) has argued that "in isolation most words can have many different meanings; which meaning they take in a particular sentence will depend on the context in which they occur. That is to say, the meaning will depend both on the other words and on their

grammatical role in the sentence" (p. 16).

Given the informational value of the syntax and the other words in a sentence, isomorphism of meanings between the source and the receiver might be expected. As we all know, this is not the case. Some words are apparently still as confusing even after being used in a sentence. Part of this may be due to the relative vagueness of the term. Since vague terms would require many markers, it is unfair to expect the syntax and the sentence context to help the reader decide beyond the first or second marker. Let me illustrate. When I say "The furniture was Old English" I could be referring to all the items in the room or to just one or two items. Also am I talking about the lamps as well as the chairs? The sentence doesn't tell you.

With ambiguous terms, however, the sentence context could help clarify my meaning. For instance, "The bark was peeling." Do you think of dog after reading this sentence? Probably not. Ambiguous terms can become quite clear after appearing in a sentence.

The Problem

The effects of sentence context on the interpretation of ambiguous and vague terms have never been empirically tested. Thus, with the above rationale, an exploratory empirical study was conducted to test the response variance elicited by ambiguous and vague nouns as they appeared alone compared to when they appeared in a sentence.

To make the study more manageable, certain conceptual limitations were imposed by the researcher. For instance, ambiguity and vagueness were studied lexically as opposed to structurally. In other words, the writer was interested in referential discrepancies as

opposed to ambiguity created by surface structure manipulations, such as rearranging words in a sentence (amphiboly). Connotative meanings were set aside and held for future research. Only referential disagreements were of immediate concern. The present research effort was also concerned with nouns which had determinable referents. Those nouns which could have an indeterminable number of referents or could not have "object-world" referents were labeled meaningless and excluded from study. Also excluded were words which would be ambiguous only because they could be used as either a noun or verb, such as "tie," "show," "house," etc. These words are ambiguous when seen alone; otherwise sentence position tells the reader whether they are nouns or verbs. The noun/verb ambiguity is not of concern here.

In summary, the present study was interested in the variation of referential meanings elicited by nouns which had determinable referents. More specifically, the current study focused on the question of the effects of the sentence context upon response variation and response time to ambiguous, vague and clear nouns, with particular interest to possible response differences between ambiguity and vagueness. Two research questions prompted the study:

1. Do words appearing in sentences result in more homogenous responses across subjects than when they appear alone?

2. Will the sentence context have a differential effect on the number of different interpretations to vague nouns as compared to ambiguous nouns?

Since this was an exploratory study and since past research provided little precedence for directional hypotheses, only bi-directional hypotheses are appropriate. Intuitively it makes sense to expect that

the sentence context would reduce the response variation; and one might expect that when alone ambiguous and vague nouns would generate nearly equal numbers of different responses, while if the same terms appeared in a sentence, the ambiguous terms might develop fewer different responses than would the vague terms. Taking a conservative stance, the following two-tailed hypotheses are offered:

H1: There will be a significant difference in response variation for nouns appearing alone as compared to nouns appearing in sentences.

H2: There will be a significant difference in response variation for subjects' responses to ambiguous nouns appearing in sentences as compared to vague nouns appearing in sentences.

H3: There will be a significant difference in response time for nouns appearing alone as compared to nouns appearing in sentences.

H4: There will be a significant difference in response time for subjects' responses to ambiguous nouns appearing in sentences as compared to vague nouns appearing in sentences.

CHAPTER II

METHOD

Variables

The variables under study were the clarity of the noun (ambiguous, vague, or clear) and the context in which the noun appeared (alone or in a sentence). Since the study was motivated by a concern for people misunderstanding one another (having different referents in mind when communicating) the main dependent variable was referential variation. Another dependent variable of interest was response time. The reason for looking at response time rests on the notion that one kind of noun might be more cognitively complex to dispose of than the other and this might be reflected in response time.

Definitions

An ambiguous noun was one that refers to more than one class, but where the classes have a limited number of members. In a dictionary it would be a term with many unrelated definitions with each definition most often referring to one object. A vague noun refers to one class that has many members fitting into the class. In a dictionary it would be a term with essentially one definition followed by many examples for clarification. Finally, a clear noun refers to one class and that class has only one member. In a dictionary it would be a term that has one definition listed and only one object to which the definition applies. (See Appendix A for the nouns used in study.)

For this study the sentence context involved four-word sentences. (See Appendix A for the sentences with interchangeable nouns used in study.) The sentences used have the same grammatical structure, and across the categories (ambiguous, vague, and clear) only the noun changed in the sentence, the other words remained the same. For example:

$$\text{The } \left\{\begin{matrix}\text{stake}\\ \text{item}\\ \text{paperclip}\end{matrix}\right\} \text{ was useful}$$

Nouns appearing alone were simply typed on the cards and presented by themselves. Response variation was defined as the number of different responses the stimulus word elicited across subjects. For purposes of quantitative analysis, a response variation index was created that is analogous to a type-token ratio used in content analytic studies. Thus, for any stimulus word, response variation can be reflected by the following ratio:

$$RVI = \frac{dW}{n}$$

The (RVI) score is calculated by counting the number of different responses (dW) the stimulus word elicits across the subjects and dividing that by the number of subjects responding to the particular stimulus word. By using this formula each stimulus word obtains a score value that is amenable to statistical analysis.

Response time was defined as the elapsed time between first seeing a stimulus card and vocalizing a response as measured by a stopwatch.

Design

The study employed a 2 x 3 x 5 design with one factor independent and the other two correlated. The independent factor was context (alone vs. sentence); the correlated factors were noun clarity (ambiguous, vague, and clear) and replications. (See Figure 1.)

Subjects

The subjects were 46 volunteer undergraduates enrolled in either Communication 101 or Communication 205 at Michigan State University, spring 1971. Both courses are lower division courses open to all majors in the university. They were randomly assigned to conditions so that half responded to the fifteen stimulus words alone while the other half responded to the same words in sentences.

Procedures

Phase 1. The subjects were treated individually by the experimenter in a private room and instructed as follows:

> This is an attempt to index definitions that people have for certain words. I will be handing you cards with words on them. The words you will respond to are nouns. In response to these nouns, I want you to give a noun. Do not use adjectives, adverbs, or forms other than nouns. Don't try to be creative; give the most obvious noun you think of.
>
> This is not a test of your verbal skills. I am merely interested in the kinds of responses these words elicit from people.
>
> For each word, then, tell me the noun that describes the object that comes to your mind when you think of the word.

Subjects responding to the nouns in sentences were in addition, told that the noun was a part of a sentence, and they would be shown the sentence with a blank space in place of the noun before they see the

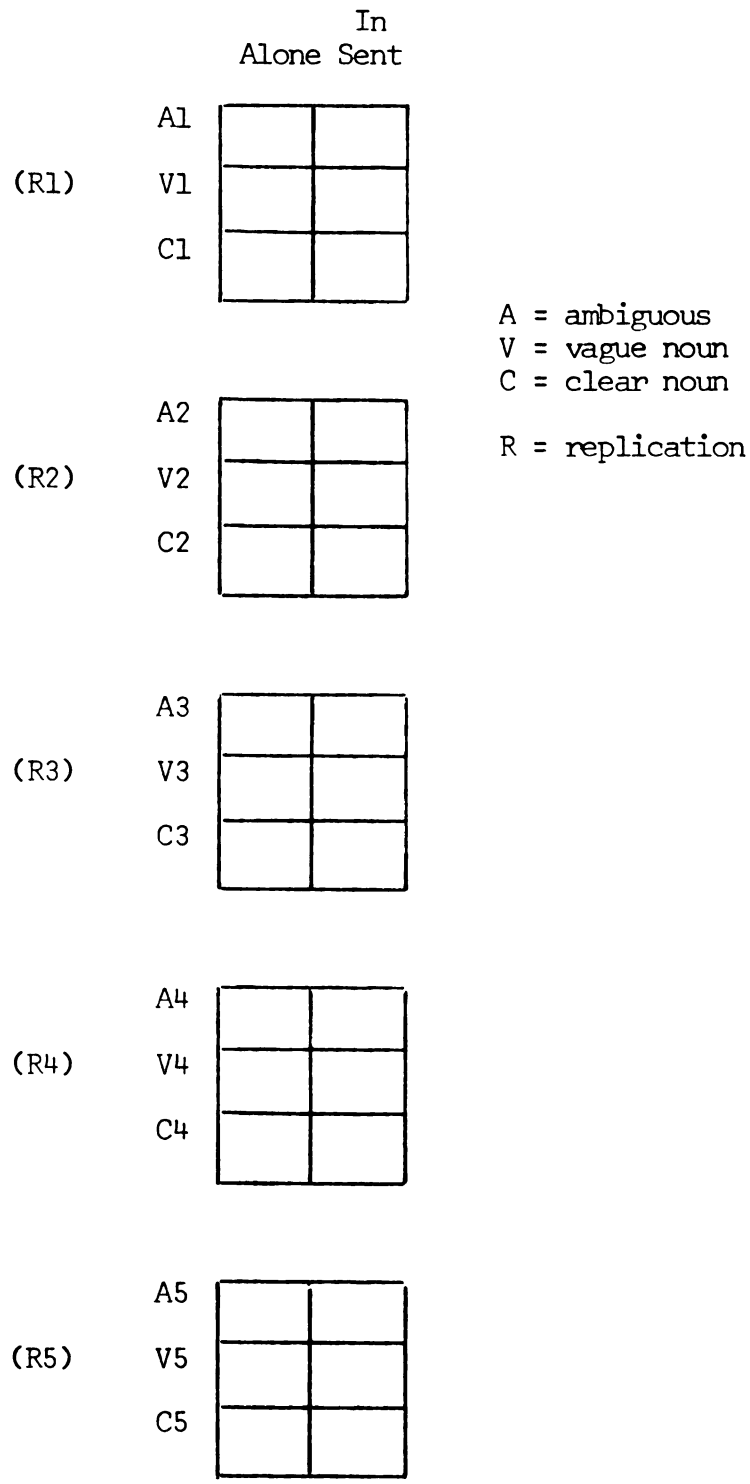


FIGURE 1. DESIGN

noun. This procedure was used because the first pilot study showed that subjects would not read the sentence but focus immediately on the noun if the noun was embedded in the sentence on the card.

To assure that the subject understood that he was to give one-word noun responses, he was given practice cards before the experimental cards.

Since the first pilot study demonstrated that subjects were conscious of the note taking of responses, and since the presence of the stopwatch tended to produce rapid-fire responses often consisting of adjectives or fantasy associations, the session was tape recorded and the response time was noted by using a clicker when the subject was first exposed to the word. The subjects were told that the session was being recorded "so I won't have to take notes," and that the clicker was being used to "tell me when the next card is coming up when I review the tape."

To control for order effects in the presentation of the stimulus nouns, the order of cards in the original deck was randomized, then for each subsequent subject the top card was moved to the bottom. This allowed all stimulus nouns to appear in the first position an approximately equal number of times. This rotational method was used for both the alone deck and the sentence deck.

Phase 2. After the subject completed the first task, he was presented the cards with ambiguous nouns and reminded of his earlier response and asked to "think of another object that would imply a completely different meaning for the word." The purpose of this part of the study was to discover whether or not people develop cognitive sets,

when responding to words, that inhibit their ability to discover other meanings that are outside the set they are currently in. If they did develop these sets or frames of reference, their difficulty in discovering a second meaning should be reflected in their response time. In addition, if the theoretic distinction of ambiguity involving two popular referents is viable, similar responses should occur across subjects.

CHAPTER III

RESULTS

Response Variation

Within the treatment groups, the exact word response of each subject was noted and for each stimulus noun a list was made of all the different responses it elicited from the subjects. For each stimulus noun an RVI score was computed by summing the number of different responses for the noun across subjects and dividing that sum by the number of respondents. The RVI scores for each replication, within each type of noun, were combined to create a 2 x 3 mixed design and submitted to an analysis of variance (Winer, 1962, pp. 302-318).

Table 1 reveals that the sentence context had no significant effect on the response variation. In other words, the sentence did not reduce or increase the response variation. Thus Hypothesis 1 must be rejected. Also, since the context to clarity interaction was not significant, the hypothesis (H2) about possible differences in responses between ambiguous nouns appearing in sentences compared to vague nouns appearing in sentences must be rejected.

There was, however, a significant main effect for clarity. This suggests that clear nouns elicited more homogenous responses than did ambiguous or vague nouns. The respective means were 0.38 (clear), 0.61 (ambiguous) and 0.63 (vague).

TABLE 1

MEANS, AND ANALYSIS OF VARIANCE FOR RVI SCORES

	Alone	In Sentence	Mean
Ambiguous	0.62	0.60	0.61
Vague	0.56	0.69	0.63
Clear	0.34	0.41	0.38

Source	SS	df	MS	F
A (Context)	0.0340	1	0.0340	4.165
Error(a)	0.0653	8	0.0082	
B (Clarity)	0.3682	2	0.1841	12.167*
AB	0.0305	2	0.0152	
Error(b)	0.2421	16	0.0151	

*= < .001

Response Time

To detect the effects of the various treatments on response time, a 3 way analysis of variance within a 2 x 3 x 5 mixed design was performed. (See Winer, 1962, pp. 319-337 for a description of this design).

Table 2 illustrates that sentence context had no apparent effect on the response time. Responses to nouns appearing alone and responses to nouns appearing in sentences took about the same number of seconds. Thus Hypothesis 3 must be rejected. Also, because there was no context to clarity interaction, the hypothesis (H4) about

TABLE 2

MEANS, AND ANALYSIS OF VARIANCE FOR RESPONSE TIME

	Alone	In Sentence	Mean
Degree	3.10	3.55	3.32
Asset	4.73	4.27	4.50
Bison	2.50	2.73	2.62
Stake	3.77	4.34	4.06
Item	3.14	2.58	2.86
Paperclip	4.23	3.46	3.84
Club	2.83	4.10	3.46
Organism	3.80	4.16	3.98
Python	2.57	1.96	2.27
Coach	2.60	3.56	3.08
Vegetable	3.82	3.18	3.50
Seahorse	4.18	3.75	3.97
Seal	3.74	3.82	3.78
Instrument	3.50	3.57	3.53
Flea	2.40	2.58	2.49

Table 2 (cont'd.)

Source	SS	df	MS	F
A (Context)	0.375	1	0.375	<1
Error(a)	842.000	44	19.136	
B (Clarity)	52.187	2	26.094	3.28*
AB	32.664	2	16.332	2.05
Error(b)	699.850	88	7.953	
C (Replication)	13.404	4	3.351	1.02
AC	6.565	4	1.641	<1
Error(c)	579.810	176	3.294	
BC	200.498	4	25.062	9.21**
ABC	21.749	8	2.719	<1
Error(bc)	957.580	352	2.720	

*= < .05
**= < .005

possible differences between ambiguous and vague nouns in sentences must be rejected.

There was, however, a main effect for clarity indicating that clear nouns required fewer seconds of response time than either ambiguous or vague nouns. The respective means were 3.04 (clear), 3.54 (ambiguous) and 3.68 (vague).

The table also reveals a significant interaction between clarity and replications, meaning that clear nouns "paperclip" (3.84) and "seahorse" (3.97) took significantly longer response times than did the other three clear nouns. Significant Newman-Keuls q values (q =

4.57 for paperclip and q = 4.94 for seahorse) support the above interpretation (.99 critical value = 4.40).

RT and RVI Correlated

For further understanding of the dependent variables used in this study, a correlation between the RVI scores and the mean response times was performed, and the results demonstrated that there was a significant correlation between RVI and response time (r = .60, $p. <$ .05, df = 13). Thus, the more time necessary for a response, the more potential heterogeneity in responses across subjects.

Ambiguous Nouns: Trial 1 vs. Trial 2

The reader will recall that after the subject had given his initial response to the ambiguous noun, he was re-exposed to the noun and asked to give a response that denoted the "other meaning" for the stimulus noun. When the response times on the first and second trials for the ambiguous nouns were compared, it was discovered that the second responses took longer than the initial responses (5.69 vs. 3.54). Furthermore, Table 3 also reveals a significant main effect for replications indicating that overall the noun "stake" required more time than did the other ambiguous nouns (5.60 vs. 4.40, 4.14, 4.53, and 4.39). Finally a significant interaction between trials and replications indicated that "stake" required more time on the second trial than the other nouns (7.15 vs. 5.48, 4.83, 5.98, and 5.00). This interpretation is supported by a statistically significant Newman-Keuls q value of 4.76 (.99 critical value = 4.40).

TABLE 3

MEAN RESPONSE TIMES AND ANALYSIS OF VARIANCE
FOR TWO TRIALS ON AMBIGUOUS NOUNS

	Trial 1			Trial 2			Row
	Alone	Sent	Mean	Alone	Sent	Mean	Mean
Degree	3.10	3.55	3.33	5.15	5.81	5.48	4.40
Stake	3.77	4.34	4.06	7.00	7.30	7.15	5.60
Club	2.83	4.10	3.46	5.03	4.62	4.83	4.15
Coach	2.60	3.56	3.08	6.47	5.48	5.98	4.53
Seal	3.73	3.82	3.78	4.70	5.31	5.00	4.39
Col. Mean			3.54			5.69	

Source	SS	df	MS	F
A (Context)	13.878	1	13.878	<1
Error(a)	758.060	44	17.230	
B (Trial)	532.017	1	532.017	61.86**
AB	11.363	1	11.363	1.32
Error(b)	378.240	44	8.600	
C (Replication)	120.275	4	30.068	8.28**
AC	4.329	4	1.082	<1
Error(c)	639.020	176	3.630	
BC	67.651	4	16.913	3.10*
ABC	28.723	4	7.181	1.32
Error(bc)	961.360	176	5.460	

* = < .05
** = < .001

The response variation (RVI) was also compared between trials. Table 4 shows that there were no main effects or interactions, thus indicating that the sentence context had no effect and that the responses did not become more or less homogenous on the second trial.

TABLE 4

MEAN RVI SCORES AND ANALYSIS OF VARIANCE FOR TWO TRIALS ON AMBIGUOUS NOUNS

	Alone	Sent
Trial 1	0.62	0.60
Trial 2	0.60	0.69

Source	SS	df	MS	F
A (Context)	0.070	1	0.070	3.89
Error(a)	0.150	8	0.018	
B (Trial)	0.050	1	0.050	3.33
AB	0.020	1	0.020	1.33
Error(b)	0.120	8	0.015	

Summary

Altogether, the main results were as follows:

1. The sentence context had no significant effect on response variation or response time.
2. Ambiguous nouns appearing in sentences did not have any more or less response variation or require more or less response time than did vague nouns

appearing in sentences.

3. Clear nouns tended to generate more homogenous responses and required less response time than did ambiguous or vague nouns.
4. There was a significant correlation between the two criterion variables--response variation and response time ($r = .60$).
5. For the two trials on the ambiguous nouns, the second trial took longer than the first trial.
6. The RVI scores for the ambiguous nouns were not significantly different on the second trial as compared to the first trial.

CHAPTER 4

DISCUSSION

Interpretation of the results reported in the third chapter will be handled first by discussing the results stemming from the hypotheses, then the significant exploratory findings which help provide direction for future research will be considered.

Sentence Context

Two hypotheses were presented concerning the effects of sentence context:

> H1: There will be a significant difference in response variation for nouns appearing alone as compared to nouns appearing in sentences.
>
> H3: There will be a significant difference in response time for nouns appearing alone as compared to nouns appearing in sentences.

Having to reject the above hypotheses, one would have to conclude that, within the operational limitations of this study, nouns appearing in sentences are not processed faster, nor do they necessarily evoke more homogenous responses than when they appear alone. These findings may be difficult to digest intuitively, especially from an information theory point of view which suggests (as do linguists) that the other words surrounding a word ought to provide information about the interpretation of the word, thus reducing some of the uncertainty about the intended meaning of the speaker. Although this feeling makes sense

intuitively, empirical support for it is yet forthcoming.

Several plausible explanations can be offered for why the results appear inconsistent with expectations. For one, the operational procedures themselves may have determined, in part, the nature of responses. Asking subjects to give a one-word noun response to a stimulus noun is essentially an associational task. Although, the instructions attempted to minimize the word association nature of the procedures, the researcher cannot be confident that the subjects were able to consistently give definitional responses as opposed to responses that simply go together with the stimulus word. In fact, a review of word association norms as presented by Palermo and Jenkins (1964) suggests that many, if not most, of the associative responses that people give are culturally embedded to the point of "habit responses." A response to a stimulus word is not necessarily definitional, it can be a response that "goes together" with the word regardless of the instructions given the respondents. When the writer surveyed the tabulated responses in the word association trials reported by Palermo and Jenkins (1964), at least seven bases for responding to a stimulus word were discovered, ranging from mentioning a member of the class implied by the stimulus word (fruit:apple) to giving a response that simply "goes together" with the stimulus word (bread:butter, cheese:mouse, etc.). With so many difficult bases for responding available to the subject, it is easy to see how across subjects this alone would contribute to the variability of responses. Moreover, the different subjects may be thinking of the same referent and still choose different responses to communicate that referent.

This kind of variability suggests that paradigms other than associational might be more appropriate for future research.

Another explanation for the nonsignificant finding could reside in the nature of the sentences used. In an attempt to create sentences in which the nouns could be interchanged and still make sense in all conditions, it was deemed necessary to use a simple sentence structure and use adjectives that had broad applicability. It may have been that the sentences did not direct the respondent to one meaning as explicitly as they could have. Sentences which clearly have a bias toward one meaning over the other might be better if they can be used with interchanging nouns and still be sensible. For instance, the sentence "The bark was peeling" is biased toward a "tree" response, whereas the sentence "The club was dangerous" does not necessarily force a "stick" response over an "organizational" response. An inspection of the stimulus sentences causes one to wonder about the amount of information contained in them. Since the sentences do not appear to be biased enough toward one of the possible meanings, the hypotheses were not given a fair chance to be supported. More strongly biased sentences would provide a more sensitive test of sentence context effects.

More than anything else, the relative weakness of the sentences probably accounted for the results.

Differential Sentence Context Effects on Ambiguity and Vagueness

Two hypotheses were presented concerning the differential effects of sentence context:

H2: There will be a significant difference in response variation for subjects' responses to ambiguous nouns appearing in sentences as compared to vague nouns appearing in sentences.

H4: There will be a significant difference in responses to ambiguous nouns appearing in sentences as compared to vague nouns appearing in sentences.

The results indicated that these hypotheses had to be rejected. Since no interactions for context and clarity were observed, the argument that ambiguity, more than vagueness, can be reduced by the sentence is now tenuous. Given no effects for sentence context, in general, these findings are not too surprising. As mentioned earlier, more biased sentences may help to support these hypotheses, but this should be a task for future research. Given these data, though, the sentence does not differentially reduce or increase response variation or response time for ambiguous and vague nouns.

Unhypothesized Findings

RT. Going back to the response time data, the reader will recall that a significant main effect was found for clarity, meaning that clear nouns required less time than either ambiguous or vague nouns. This main effect is qualified by a corresponding interaction between clarity and replications. This interaction tells us that the clear nouns "paperclip" and "seahorse" required more response time than the other three clear nouns. The implication here is that "paperclip" and "seahorse" did not fit the theoretic model as operationalized in this study or that response time is not sensitive enough to detect the clarity of the two "deviant" members. Assuming that the response time is reasonably sufficient to detect the clarity of these two

nouns, it can be assumed that there may be some essential difference between these two nouns and the other three clear nouns that behaved according to the theoretic model. It could be that it is easier to think of the classes animal for bison, snake for python, and insect for flea, than it is to think of fastener for paperclip and fish for seahorse. In the debriefing sessions, subjects often reported a difficulty of thinking of an appropriate response for these two nouns. What might account for these results is that animal, snake, and insect are object classes, and fastener is a function class. Perhaps it is easier to think within object classes rather than function classes. This is a testable hypothesis open for future study. The class of fish for seahorse is similar to the other object classes, but it is likely that subjects weren't sure that a seahorse was a fish. In fact, the juxtaposition of sea and horse could have brought an "ocean animal" response. For paperclip, then, noun class differences probably accounted for the variation, and for seahorse, an unsureness of the fish or animal status of seahorse probably accounted for the difference.

If the replications (2 and 4) that contained "paperclip" and "seahorse" were dropped from analysis, the respective means for the types of nouns would be as follows:

vague:	4.00 secs.
ambiguous:	3.52 secs.
clear:	2.46 secs.

This distribution of means aligns closely with the theoretic model that would predict vague nouns taking longest, ambiguous nouns next, and clear nouns the least time.

RVI. The main effect for clarity on the RVI scores is evidence that clear nouns elicited more homogenous responses than did ambiguous or vague nouns. The rank order of the respective means (vague = 0.63, ambiguous = 0.61, and clear = 0.38) fits the theoretic model even though the difference between the vague and ambiguous nouns is probably not significant.

Trials. When the subjects were given the ambiguous nouns for a second response a significant main effect for trials revealed that the second responses did take longer to emit than did the original response. Exactly what this means is hard to determine, but it could be that the subjects did develop cognitive sets or commitments to the original meaning that interfered with their search for the other meaning unrelated to the first meaning. Longer response time is to be expected if these cognitive sets are operating. Another explanation may be that meanings for ambiguous nouns may not have equal probabilities of being recalled or elicited. Hence, when the subject is asked to give the second meaning to an ambiguous noun, that meaning may be the less probable of the two; thus, more retrieval time would be necessary. Some evidence for this explanation comes from a chi-square test of the responses to the first trial which indicated that for each ambiguous noun the division of responses was not equal for the two possible meanings. The most equally divided responses occurred for "degree" (23-17) while the least equally divided responses occurred for "stake" (37-7). The obtained chi-square of 33.21 was significant at the .001 level. Given these data, it is more reasonable to assume that subjects took more time to verbalize the second meaning because

it was less likely to occur than the first. In addition, the debriefing with the subjects demonstrated that they often were not even thinking of the second meaning when they were giving the first meaning, and when asked to do so, it wasn't an easy task.

An inspection of the response times for the ambiguous nouns reveals that "stake" may have been a more difficult noun to respond to than the other ambiguous nouns. The significant replication effect noted in Table 3 is evidence for "stake" being different from the others. If meanings for words stored in memory can have probabilities of surfacing, then the meanings of stake (post or wager) may be of low probability. It may be that we do not use the term "stake" in our daily discourse as much as we use other ambiguous terms, therefore its meanings may be stored in some inactive file as opposed to an active file. If frequency of usage is an intervening variable, future work should control for this by knowing the frequency values for each of the stimulus words.

Overall, it would have been more pleasing to support the major hypotheses, but the significant findings of this study are encouraging and informative for future research. For instance, the fairly consistent effects for clear nouns indicates that there is a difference between nouns and that at least two types exist--clear and unclear. The task of future work should be to parcel out the variation in the unclear category. With revisions to the paradigm of this study, differences within the unclear category may be detected, and these differences may be attributable to ambiguity and vagueness.

The difference found between response trials one and two with the ambiguous nouns is intriguing. Future research ought to investigate the probabilities of meanings for ambiguous terms.

Also encouraging is the significant correlation found between response time and the RVI scores. With a substantial correlation of .60, one can explain 36 per cent of the variance of one variable by knowing the values of the other variable. Even though they do not necessarily measure the same thing, the two variables covary, thus one can be used without the other to measure responses to verbal stimuli. This could help the efficiency of future designs, because the researcher would not have to worry about timing the response, instead he could simply record the response. By using the response variation index (RVI) by itself, one deals with group data. This implies that an increased number of stimulus words should be used to increase the number of RVI scores that could be entered in each condition.

Directions for Future Research

1. This kind of exploratory research often leads to many paths for future efforts. Perhaps the most immediately needed research at this point would be a replication of this study with some changes. The writer is confident that he can detect an effect for sentence context given certain changes in the present design and procedures. For instance a replication should maintain the response variation variable but omit the response time criterion variable. Response time as a criterion variable is difficult to interpret even if significant differences are realized. As an example, what can you say about a significant response time difference between words appearing alone

versus words appearing in sentences? You could say that one condition was more "difficult" than the other, but any interpretation of response time differences could involve risky inferences unless response time is inherently tied to the manipulated variables. Furthermore, the significant correlation between response time and response variation ($r = .60$) suggests that one may be used without the other. Thus, a follow-up study should use the RVI scores as the dependent variable and not use response time.

Another possible alteration could be the elimination of the second trial on the ambiguous nouns. This might be done for two reasons. One is the unique behavior of "stake" requiring more time than the other nouns. Secondly, the RVI scores showed no significant differences between trials one and two. For the specific purpose of demonstrating an effect of sentence context on responses, it is unnecessary to have the second trials.

The most important change for a follow-up study should entail reworking the sentence contexts so they are more biased toward one of the meanings. Coupling this with an expanded dictionary, say ten words for each type, one can test the effects of sentence context on RVI scores within a non-associational paradigm as follows. The experimenter could bring a group of subjects together, no longer using the one-to-one interview setting, and present each subject with a deck of cards. His task would be to read the word on the card (either alone or in a sentence), write on the card a definition of the word, and then in the space provided write in a "key word" of his choosing that capsulizes the referent his definition describes. No time pressures

would be placed on him and he could work on his deck as the others work on their decks. This procedure might direct the subject's thinking toward referents and away from associations. This should help reduce some of the variance in the RVI scores.

Finally, an addition to the criteria for selecting stimulus nouns would be helpful. The nouns should not only be chosen because they are ambiguous, vague or clear, nouns should also be chosen based on some external criterion variable such as frequency of usage scores. Therefore, if any stimulus word varies from the others it might be explained by its high or low frequency of usage in everday discourse.

By creating more biased sentences, using a non-associational setting, and choosing words based on an external control variable, a more sensitive test of the hypotheses would be possible.

2. Extending beyond a follow-up study, it appears that future research can take place within two strains--the psycholinguistical and the rhetorical. For instance, within the former strain, an operationalization of Katz and Fodor's semantic markers could be developed in which a subject might be presented with one of two kinds of instructions, vague or clear. The researcher would be interested in the number of questions that a subject would ask before committing himself to performing the act implied in the instructions. If people can and do respond consciously to vagueness, it might be expected that subjects in a vague instruction task would ask more questions about the task than subjects in the clear instructions task, particularly when the task requires some precision or fidelity for successful completion (such as disarming a bomb). If the semantic markers

idea can be demonstrated through such a question-asking paradigm it might lend some credence to the semantic meaning model proposed by Katz and Fodor.

3. Another psycholinguistical extension of this study might be to test the effects of an interaction of ambiguous and vague adjectives with ambiguous and vague nouns. In other words, is there a compounding or additive effect when ambiguous or vague nouns are modified by ambiguous or vague adjectives? This would call for more thought and conceptualization about the nature of adjectival ambiguity and vagueness, but given time, a usable set of adjectives might emerge.

4. Perhaps a more obvious direction for research would be the development of a dictionary of ambiguous and vague nouns. Through rather extensive data gathering, scale values for the terms may be created, thus making them amenable to cloze procedure types of manipulations within multisentence messages.

5. Within a rhetorical framework, equivocation--a concept related to ambiguity and vagueness could be studied. Equivocation is a rhetorical strategy where the speaker purposefully uses words that are vague. The success of equivocation apparently depends on the listeners having similar connotative meanings or at least similar evaluative meanings. Within this conceptual paradigm, the researcher could use the following procedure to create, systematically, both clear and vague messages to test their effects on the listeners' evaluations of the speaker when he is speaking or advocating a position counter to the listeners' beliefs.

The first task would be to generate a list of concepts related to the topic area and find how these words are placed in semantic space by the subjects (connotative meaning). Since the semantic differential (Osgood, 1957) is available for determining connotative meaning, it can be readily used. Determining referential meaning is another story. One might ask the subjects to list the objects that are included under the concept being considered, or he might ask the subjects to provide examples of the concept.

Once a large enough number of subjects have been sampled, the researcher could review the examples provided by the subjects and create for each concept a list of examples (subclasses of the class). These concepts and their respective lists of examples could be presented along with examples that should not fit the concept to a new sample of people from the same parent population. The task of the subject from the second sample would be to check those examples which he thinks fit under the given concept and rank order them according to their "goodness of fit." He would do the same for examples that do not fit the concept. He would also respond to each concept on semantic differential scales representing the evaluative, activity, and potency dimensions of Osgood's semantic space.

From this set of data, the researcher could select those concepts which meet the criterion of high connotative agreement and low referential agreement and call those concepts vague. Clear concepts can be obtained by taking the concepts which have high connotative and high denotative agreement. Using Black's check on the distribution of responses, the vague and clear concepts chosen could

be confirmed. With the concepts selected, one message could be created using the vague concepts and another message could be written using the clear concepts. The nature of the vague message would be to advocate the connotative properties of the vague concepts never mentioning any class members (referents). By substituting the clear concepts in place of the vague concepts, a clear message can be created. These two messages could be tested for their respective effects on a speaker's credibility. The hypothesis would be that when speaking on a topic counter to the listener's attitude, messages using vague concepts will result in more favorable credibility ratings than messages using clear concepts.

Summary

This study examined the effects of sentence context on response variation and response time for ambiguous, vague, and clear nouns. Forty-six (46) subjects within a 2 x 3 x 5 mixed design responded to fifteen nouns (5 of each type). Half the subjects responded to the stimulus nouns alone, while the other half responded to the stimulus nouns in sentences. The results indicated that when nouns appeared alone as compared to when they appeared in sentences, there was no significant differences in either response variation or response time. No significant context to clarity interactions were observed, meaning that ambiguous nouns appearing in sentences did not result in more or less response variation or response time than did vague nouns appearing in sentences.

The results did indicate, however, that clear nouns rather consistently needed less response time and generated more homogenous

responses across subjects than did ambiguous or vague nouns.

It was also discovered that more response time was needed for a subject to verbalize the second meaning for ambiguous nouns than was required for his first response.

Finally, a substantial correlation between response variation and response time was uncovered.

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APPENDICES

APPENDIX A

STIMULUS NOUNS AND SENTENCES

APPENDIX A

STIMULUS NOUNS AND SENTENCES

Nouns:

Ambiguous	Vague	Clear
Club	Organism	Python
Degree	Asset	Bison
Stake	Item	Paperclip
Coach	Vegetable	Seahorse
Seal	Instrument	Flea

Sentence Contexts:

The [club / organism / python] was dangerous.

The [degree / asset / bison] was large.

The [stake / item / paperclip] was useful.

The [coach / vegetable / seahorse] was cold.

The [seal / instrument / flea] was small.

APPENDIX B

RVI SCORES AND MEAN RESPONSE TIMES

APPENDIX B

RVI SCORES AND MEAN RESPONSE TIMES

	RVI		$\bar{X}RT$		RVI_2		$\bar{X}RT_2$	
	Alone	Sen-tence	Alone	Sen-tence	Alone	Sen-tence	Alone	Sen-tence
Degree	0.75	0.64	3.10	3.55	0.77	0.75	5.15	5.81
Stake	0.54	0.50	3.77	4.34	0.61	1.00	7.00	7.31
Club	0.54	0.55	2.83	4.10	0.46	0.57	5.03	4.62
Coach	0.58	0.65	2.60	3.56	0.57	0.63	6.47	5.49
Seal	0.67	0.68	3.74	3.82	0.57	0.48	4.70	5.31
Asset	0.58	0.74	4.73	4.27	--	--	--	--
Item	0.58	0.64	3.14	2.58	--	--	--	--
Organism	0.55	0.74	3.80	4.16	--	--	--	--
Vegetable	0.42	0.57	3.82	3.18	--	--	--	--
Instrument	0.58	0.74	3.50	3.57	--	--	--	--
Bison	0.29	0.32	2.50	2.73	--	--	--	--
Paperclip	0.54	0.73	4.23	3.46	--	--	--	--
Python	0.17	0.27	2.57	1.97	--	--	--	--
Seahorse	0.38	0.35	4.18	3.75	--	--	--	--
Flea	0.33	0.39	2.40	2.58	--	--	--	--