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Mediated Generalization Among Synonyms*

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3306

Previous investigations have indicated that generalization of conditioning will occur from one word to another, even though the words in question possess no similarity of appearance or sound. Generalization thus has been shown to occur on the basis of synonymy, antonymy and a relationship described as a species-genus relationship (Rasran, 10, Riess, 11, Goodwin, Long & Welch, 6, Foley & Cofer, 4, Cofer, Janis and Rowell, 2, Wylie, 14, and others). Such findings have a good deal of importance in the understanding of language functions (1, cf. Miller, 9) and in the understanding of stimulus equivalence. Generalization of conditioning of the kinds enumerated above is associated with a learned equivalence of the stimulus words and has been named mediated generalization.

Many of the details of this process of mediated generalization among words remain to be explored. One detail is the subject of investigation of the present study. The problem that was investigated was this: Would generalization occur to synonyms of a word in amounts corresponding to the closeness of meaning of the synonyms to the original word? Although technically synonymy means close similarity in the meaning of two or more words, it seems likely that in general language usage one synonym may be regarded as more synonymous than others to a particular word. This gives rise to the possibility of a gradient of similarity among the synonyms of a given word and thus to the possibility of finding a gradient of amount of generalization to these several synonyms.

A further interest determined the specific form of this study. McGinnies (8) has reported that the subjects give free associations faster to stimulus words chosen from an Allport-Yernon value category on which they score high than to value category words on which they score low. It seemed possible that this finding reflected the operation of mediated generalization, and the present study was considered to be an indirect test of this possibility.

The theory underlying the method of the present study may be briefly described. It assumes that the occurrence of a word as a stimulus and of the response of seeing and reacting to it will immediately make more available or ready for response those words which bear some relationship to it (cf. Skinner, 12). Thus, if the word fashion is seen and pronounced related words such as style and mode should become more available than otherwise and should occur in the overt verbal behavior of the subject under suitable circumstances. Further, in the example cited above, if style is more closely synonymous to fashion than is mode, then style should receive a greater increment to its response strength and become more quickly available than mode.

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The method chosen to study this problem does not, strictly speaking, test the above assumptions. It involves one further step, namely, that the first associative reaction to the synonym (style or mode) will occur more quickly than to words not associated with a prior stimulus word. On the basis of the results of this study, this last assumption is evidently erroneous, as the results to be presented are entirely negative.

METHOD

In general, the method used in this experiment was as follows. A given standard word, say fashion, was presented, and the subject responded by pronouncing it. Immediately following this, a "stimulus word" was presented, and the subject gave to it his first free association. The stimulus word was either a synonym (like style or mode) with a known degree of similarity to the standard word or a neutral word bearing no semantic relationship to the standard word. In addition, each stimulus word was presented (in another group of subjects) alone and the associative reaction time to the stimulus word in isolation was determined.

Source of Words for the Construction of Word Lists

The source of words was a word list constructed by Haagen (7). The total list consists of 400 two-syllable adjectives differentiated into eighty groups of six words each which are related in meaning. In each group a "standard word" is compared with five of its synonyms along four word dimensions: (a) similarity of meaning (b) closeness of associative connection (c) vividness of connotation and (d) familiarity. Thus, the total list may be considered as consisting of 400 word pairs.

Haagen obtained scale values for each of the 400 pairs by having four groups of eighty judges each scale these pairs in regard to one of the four word dimensions using a seven point scale with equal appearing intervals. The final scale value assigned to each word pair was the median of eighty judgments. The scale was constructed too so that the total range of scale values was from .05 (maximum) to 6.5 (minimum). The list was assumed to be suitable for this experiment since the assignment of scale values was based on the judgments of undergraduate students registered in the Introductory Psychology course at the State University of Iowa.

On the basis of the distribution of scale values for each of the four word dimensions, Haagen concluded: "The present word list was compiled to sample the dimension of similarity of meaning and does not cover the full range of the other dimensions" (7, p.459). For this reason, only the scale values along the dimension of similarity of meaning were considered in the selection of word pairs from this list. The reliability of this scale of similarity of meaning, based on a Pearson Product-moment correlation between ratings of two independent, randomly chosen groups of forty judges is reported by Haagen to be ".91. fiducial limits (1 per cent), 0.89 and 0.93" (7, p.457).

The present experimenters assigned frequency ratings from the Thorndike-Lorge (13) word list to all the words in Hatten's list.

The highest Thorndike-Lorge frequency rating is that of "AA", indicating one hundred or more occurrences of a word in every one million words in standard English reading matter. The next highest rating is "A", indicating that a word occurs at least fifty times per million words. Haagen's word list contained a group of twenty-nine synonym pairs in which the stimulus word of the pair was rated "AA", and twenty-five synonym pairs in which the stimulus word of the pair was rated "A". It was decided that from these two groups of words, an initial a priori selection of words for use in the various experimental treatments would be made.

Construction of the Gradients of Similarity of Meaning.

In the construction of the gradients, certain arbitrary decisions were made in regard to the selection of word pairs. These were: (a) a standard word could be selected for only one gradient, and could appear only once within that gradient; (b) the differences between the scale values of degree of similarity of meaning of the word pairs would be approximately equal.

From the twenty-five pairs of synonyms rated "A", fifteen synonym pairs were selected to approximate a gradient of similarity of meaning increasing in increments of 0.1 and 0.2 scale units. The range of this gradient was from 0.9 to 4.5. This list of synonym pairs with their corresponding ratings of similarity of meaning is presented in Table I.

From the twenty-nine synonym pairs rated "AA", it was arbitrarily decided to select ten synonym pairs to approximate a gradient with a difference between successive scale values of 0.4. The range of the finally constructed gradient was from 0.9 to 4.8 in scale units. This list of ten synonym pairs with their corresponding degrees of similarity of meaning is presented in Table II. Up to this point in the construction of the gradients, all the requirements of the design were satisfied except that of equal availability of response to the stimulus words under control conditions. Even though a group of words may occur with equal frequency in the English language, the availability of associations to them may differ greatly. If then this were the case with the stimulus words in the two gradients, the effects, if any, of the independent variable could not be validly interpreted.

Free associative reaction times to the stimulus words presented individually were taken as the measure of availability of responses to the stimulus words in Table I and II. If a group of words has equal availabilities of response, then the free associative reaction times to them should be comparable.

Free associative reaction times were obtained for the fifteen stimulus words rated "A" in familiarity. Subjects were five male and five female undergraduate students enrolled in the Introductory Psychology course at the University of Maryland. Bartlett's test of homogeneity of variance as described by Edwards (3, p.196) was applied to the data, and a chi-square value of 85.10 was obtained. Chi-square with fourteen degrees of freedom is 29.141 at the .01 level of confidence.

TABLE I

The Initially Constructed Gradient of Similarity of
Meaning Composed of Standard Words with Stimulus
Words Occurring at Least Fifty Times, but not so
Frequently as One Hundred Times Per Million
Words in the English Language

Code	Standard Word	Stimulus Word	Degree of Similarity of Meaning
1	Sacred	Holy	0.9
2	Cautious	Careful	1.1
3	Wicked	Evil	1.2
4	Mammoth	Giant	1.4
5	Foremost	Leading	1.4
6	Constant	Steady	1.5
7	Middle	Central	1.6
8	Little	Tiny	1.8
9	Pleasant	Friendly	2.0
10	Empty	Hollow	2.4
11	Hidden	Secret	2.7
12	Complete	Perfect	3.4
13	Sullen	Silent	3.9
14	Beloved	Preferred	4.2
15	Former	Ancient	4.5

TABLE II

The Initially Constructed Gradient of Similarity of
Meaning Composed of Standard Words with Stimulus
Words Occurring One Hundred Times or More Per
Million Words in the English Language

Code	Standard Word	Stimulus Word	Degree of Similarity of Meaning
1	Rural	Country	0.9
2	Double	Paired	1.4
3	Unclear	Clouded	1.8
4	Spoken	Talking	2.3
5	Liquid	Flowing	2.7
6	Winding	Circling	3.0
7	Ardent	Burning	3.4
8	Royal	Nulling	3.9
9	Artless	Open	4.7
10	Urgent	Crying	4.8

Table III

Analysis of Variance of the Free Associative Reaction
Time to Seven Stimulus Words Occurring Fifty to
One Hundred Times Per Million Words

Source of Variation	Sum of Squares	df	Mean Squares	<i>f</i>	<i>f</i> .01
Between words	1.4661	6	.2444		
Between Subjects	7.9460	9	.8829	3.2142	2.76
Interaction	14.3877	54	.2664		
Total	23.7998	69			

Table IV

The Final Gradient of Similarity of Meaning Composed of
Standard Words with Stimulus Words Having a
Thorndike-Lorge Rating of "A", and Having
Equal Response Availability

Code	Standard Word	Stimulus Word	Degree of Similarity of Meaning
1	Wicked	Evil	1.2
2	Mammoth	Giant	1.4
3	Little	Tiny	1.6
4	Pleasant	Friendly	2.3
5	Empty	Hollow	2.4
6	Sullen	Silent	3.9
7	Former	Ancient	4.5

The reaction times to the words "holy", "careful", "leading", "steady", "central", "secret", "perfect", and "preferred" appeared by inspection to contribute most of the variability. The data collected on these words were discarded, and Bartlett's test for homogeneity of variance was applied to the data of the remaining seven words. A chi-square value of 9.545 was obtained; chi-square with six degrees of freedom is 12.592 at the .05 level of confidence. Hence the variance for these words was considered to be essentially homogeneous.

The significance of the differences among the mean associative reaction times to the seven words was tested by analysis of variance with a double classification. The purpose was to demonstrate a Null hypothesis in regard to the differences between the means. The results are presented in Table III, and show no significance of the differences.

The final "A" gradient, as reproduced in Table IV, was thus composed of seven standard words with seven stimulus words equated in terms of frequency of occurrence in the English language and in availability of response.

Free associative reaction times were obtained for the ten stimulus words rated "AA" in familiarity. Subjects were five male and five female undergraduate students enrolled in the Introductory Psychology course at the University of Maryland. Bartlett's test of homogeneity of variance as described by Edwards (3, p.196) was applied to the data, and a chi-square value of 38.04 was obtained. Chi-square with nine degrees of freedom is 21.666 at the .01 level of confidence. The reaction times to the words "paired", "circling", and "ruling" were selected out as contributing most of the variability. The Bartlett's test for homogeneity of variance applied to the data of the remaining seven words yielded a chi-square value of 11.192; chi-square with six degrees of freedom is 12.593 at the .05 level of significance. A null hypothesis in regard to the differences in variances of the seven words had been demonstrated.

The significance of the differences among the mean associative reaction times of the seven "AA" words was evaluated by an analysis of variance with a double classification. The results are presented in Table V, and the differences are seen not to be significant.

The final "AA" gradient as reproduced in Table VI was thus composed of seven standard words with seven stimulus words equated in terms of familiarity and availability of response.

Construction of the Series of Word Pairs Unrelated in Meaning.

The construction of this series of word pairs was accomplished by random reassignment of the standard words presented in Table I to the stimulus words presented in Table IV, and by random reassignment of the standard words in

Table V

Source of Variation	Sum of Squares	df	Mean Square	F	F.05	P
Between Words	2.0331	6	.3389	1.7347	2.29	.05
Between Subjects	4.6562	9	.5174	2.6331	2.07	.05
Interaction	10.6105	54	.1965			
Total	17.2998	69				

Table VI

The Final Gradient of Similarity of Meaning Composed of
Standard Words with Stimulus Words Having A
Thorndike-Lorge Rating of "AA" and Having
Equal Response Availability

Code	Standard Word	Stimulus Word	Degree of Similarity Of meaning
1	Rural	Country	0.2
2	Unclear	Clouded	1.6
3	Spoken	Talking	2.3
4	Liquid	Flowing	2.7
5	Ardent	Burning	3.4
6	Artless	Open	4.7
7	Urgent	Crying	4.8

Table VII

Series of Word Pairs Unrelated in Meaning
With Stimulus Words Having a Thorndike-
Lorge Rating of "A"

Code	Standard Word	Stimulus Word
1	Former	Evil
2	Constant	Giant
3	Sullen	Tiny
4	Empty	Friendly
5	Cautious	Hollow
6	Beloved	Silent
7	Sacred	Ancient

Table II to the stimulus words in Table VI, with the requirement that no word pair thus constructed could be related in meaning. The following randomizing procedure was followed for both the "A" and "AA" groups; (a) standard and stimulus words were assigned code numbers; (b) cards were drawn with replacement from a numbered deck to determine the point of entry into a table of random numbers; (c) the standard word with code number corresponding to the first digit read from the table was assigned to the first stimulus word, etc. The two groups of word pairs unrelated in meaning, (hereafter referred to as the "A" and "AA" series), constructed by this procedure are presented in Table VII and Table VIII.

In addition to these two groups, eight words unrelated to each other, or to any of the words selected for this study were selected from Haagen's word list to serve as practice words. The eight words were divided into four pairs and one word of each pair was selected and designated as the standard word. These practice word pairs are in Table IX.

Table VIII

Series of Word Pairs Unrelated in Meaning with
Stimulus Words Having a Thorndike-Lorge
Rating of "AA"

Code	Standard Word	Stimulus Word
1	Royal	Country
2	Double	Clouded
3	Rural	Talking
4	Unclear	Fleeting
5	Spoken	Burning
6	Urgent	Open
7	Ardent	Crying

Table IX

Unrelated Word Pairs Used as Practice Words

Standard Word	Stimulus Word
Clever	Faulty
Guarded	Inert
Rustic	Swollen
Vacant	Nimble

Apparatus.

A presentation device was employed to expose the stimulus words described in the preceding sections. The subject sat approximately three feet before a vertical plywood shield, five feet long and four feet high, which fully concealed the experimenter and the apparatus. Centrally located on this shield was an aperture six inches wide and five inches high illuminated by a fluorescent tube. Behind this shield, a frame which held a card six and one-half inches long and six inches wide could be manually moved along a fixed horizontal track to expose the card through the aperture. The structure of the frame, the track and the cards was such that a word would appear in the same position in the aperture from trial to trial. Cards were rapidly and quietly placed in and removed from the frame, and the total operation of the card slide was achieved with minimum distraction to the subject.

Measurement of the speed of associative response was achieved by means of a chronoscope calibrated in hundredths of a second fixed with an electronic voice-key circuit.* When a card in the presentation device was exposed in the aperture, the frame holding the card closed a micro-switch. This switch, acting through the voice-key circuit, activated the chronoscope. The chronoscope was stopped when the subject responded to the stimulus by speaking his free association into a microphone connected to the voice-key circuit.

Each of the words listed in Tables IV and VI was printed in black India Ink on a white poster card which fit the card frame of the presentation device exactly. By use of a Leroy lettering set, pen number 6, and template number 350, the size of the print and amount of spacing was uniformly maintained for all words. In addition, the center point of each word was located in the same position on each card, assuring minimum variability of word position between the cards.

The reaction times of each subject was recorded on mimeographed forms constructed for efficiency in recording and tabulation.

Operating Procedures.

The experimental treatment employed to test the primary hypothesis was applied individually to twenty-five subjects. The order of presentation of the word pairs in the "A" and "AA" gradients presented in Tables IV and VI was randomly determined by the same randomizing procedure described above. Since a subject served only once in the experiment, the same random order of presentation was maintained for all subjects. To differentiate between standard words and stimulus words, the standard words were underlined on the presentation cards.

Each subject was seated comfortably before the presentation aperture and was requested to hold the microphone connected to the voice key. Then the experimenter gave the following instructions from memory.

*The voice-key was manufactured by Ralph Gerbrands, Scientific Instruments, 9C
 Ronald Road, Arlington, Massachusetts.

This is an experiment on the ability of persons to convey spoken messages in response to written orders over communication systems. The procedure here may seem artificial to you in comparison with an actual communication situation; however, the basic principles are the same for this experiment and for the actual situation.

The microphone is attached to an instrument measuring the pitch of the voice. By this experiment, I would like to determine if changes in pitch occur under conditions of simple repetition of a message and under conditions of sudden change in conveying a message. I would like to have you respond into the microphone to words which I shall place in this opening. Some of these words will be underlined, like this (subject is shown a card). Some will not be underlined, like this (shown another card).

When an underlined word appears in the window, pronounce it into the microphone as quickly as possible; following every underlined, another word that is not underlined will be presented. You are not to pronounce this word. Instead, you are to pronounce the first word that you think of when you see the word that is not underlined.

Do you have any questions? Here are several practice words that you can try.

At this point the experimenter walked behind the shield, and made the following remark:

Before presenting any word to you, I will say "ready", but you do not have to reply to this.

Following these instructions, the subject was presented with three practice word pairs which were unrelated in meaning. After this, the experimenter asked:

Is there anything you do not understand about what you are to do?
Then when I say ready, the formal experiment will begin.

The subject was then presented with the seven word pairs in the "A" gradient and the seven word pairs in the "AA" gradient; a standard word always being followed by a synonymous stimulus word. The speed with which each subject pronounced each standard word was recorded as his simple reading reaction time. The speed with which each subject gave a free association to each stimulus word was recorded as his free associative reaction time.

The experimental treatment employed to provide controls was applied to ten subjects individually. This involved obtaining the reading reaction times to the standard words and the free associative reaction times to the stimulus words of the "A" and "AA" series of unrelated word pairs presented in Tables VII and VIII. The order of presentation of these stimulus words, with their respective standard words was the same as the random order of the "A" and "AA" gradients. All other procedures including instructions, in this experimental treatment were identical with those of the first experimental treatment described.

Subjects.

Thirty-one college men and fourteen college women enrolled in the Introductory Psychology course and in a Social Psychology course at the University of Maryland volunteered to serve as subjects in this experiment. They were entirely naive with respect to the purpose of the experiment, but exhibited interest, and cooperated to the fullest extent.

RESULTS

The group mean and median free associative reaction times of the twenty-five subjects were obtained for each stimulus word in the "A" gradient. The major results are presented in Table X.

Table X

Mean and Median Associative Reaction Times
in Seconds of 25 Subjects to the Seven
Synonym Pairs in the "A" gradient

	Word Codes*						
	1	2	3	4	5	6	7
Scale	Highest						Least
Value	1.2	1.4	1.6	2.0	2.4	2.9	4.5
N	25	25	25	25	25	25	25
$\bar{X}$	1.406	1.116	1.020	1.415	1.639	1.301	.972
Median	1.02	.95	.87	1.21	1.08	.96	.87
S	1.05	.66	.42	.66	1.59	.97	.35

*See Table IV for Key.

The progression of mean reaction times for word pair 1, (highest in similarity of meaning), to word pair 7, (lowest in similarity of meaning), is completely at variance with the hypothesis of decreased speed of response as a function decreased similarity of meaning between two synonyms. The distribution of median associative

reaction times, although showing a consistently smaller size than the distribution of means, does not differ in pattern from the random distribution of mean associative reaction times.

The group mean and median free associative reaction times of the twenty-five subjects were obtained for each stimulus word in the "AA" gradient. Table XI contains the major results. Here, as with the "A" gradient, the distribution of mean associative reaction times shows no trend in the direction of decreased speed of associative response as a function of decreased similarity of meaning between two synonyms.

Group mean associative reaction times to the stimulus words rated "A" in familiarity were obtained from the data of the three experimental treatments. The results are presented in Table XII. It may be noted here that the group mean association time to stimulus words preceded by synonyms ("A" gradient), is greater than the group mean association time to stimulus words preceded by neutral or unrelated words, "A" series), and that both of these group means are greater than the group mean association time to the stimulus words presented individually ("A" group).

Table XI

Mean and Median Associative Reaction Times in
Seconds of 25 Subjects to the Seven Synonym
Pairs in the "AA" Gradient

Word Code*							
	1	2	3	4	5	6	7
Scale	Highest						Least
Value	.9	1.8	2.3	2.7	3.4	4.7	4.8
N	25	25	25	25	25	25	25
X	1.055	1.560	1.230	1.099	1.168	1.079	1.054
Median	.97	1.26	1.16	1.07	1.13	.85	.80
S	.53	1.12	.70	.54	.49	.74	.51

*See Table VI for key.

Table XII

Group Mean Associative Reaction Times to Stimulus Words
In the "A" Group, The "A" Series, and the "A" Gradient

	Mode of Presentation		
	Presented Alone	Preceded by Neutral Word	Preceded by Synonym
N	0	70	175
X	1.075	1.2207	1.2670
S	.5820	.6855	.9327

The significance of the difference between group mean association times to stimulus words in the "A" group and to stimulus words in the "A" series was evaluated by means of Fisher's t technique. The finding difference between these two groups mean of 0.1441 produced a t value of 1.3417, which has a probability of chance occurrence greater than .05. This result indicated that preceding a stimulus word by an unrelated standard word does not increase the availability of responses to the stimulus word significantly more than merely presenting the stimulus word alone.

The significance of the difference between group mean association times to stimulus words in the "A" gradient and to stimulus words in the "A" series was evaluated initially by an analysis of variance. This analysis is presented in Table XIII.

Table XIII
Analysis of Variance of Free Associative Reaction Times of
25 Subjects to Stimulus Words in the "A" Gradient and
of 10 Subjects to Stimulus words in the "A" Series.

Source of Variation	Sum of Squares	df	Mean Square	F	F .05	P
Between Groups	.2182	1	.2182	1.0587	4.13	>.05
Within Groups	7.0057	34	.2061			
Total	7.2239	35				

The estimate of within groups' variance employed as the error term in this analysis, contains among other sources of variability, individual differences in speed of reading and vocalizing words. As explained in a preceding section the time required for each standard word was part of the data recorded.

To equalize the groups in regard to this source of variation, the significance of the difference between group mean association times to stimulus words in the "A" gradient and to stimulus words in the "A" series was evaluated by analysis of covariance, using these measures of reading reaction time of the subjects as the adjusting variable. This analysis, also produced an insignificant F ratio.

Adjusting for reading speed means that the differences in mean association times of the two groups cannot be accounted for by differences in mean level of ability to read and vocalize words, because the group mean association times were adjusted by the analysis to a common initial mean level of speed in reading and reacting to words.

The original unadjusted mean association times had an error variance of 0.2061. When the part of the error variance attributable to variability in reading and increase in the precision of the analysis of more than twenty-one percent.

However, even with this increase in precision, and the assurance that

individual variability alone could not account for differences, the F ratio obtained by covariance was insignificant. Independent of individual variability in reading speed, the difference between the mean association time to stimulus words preceded by synonyms and to the same stimulus words preceded by neutral words was no greater than might be expected by chance fluctuation.

Group mean associative reaction times to stimulus words rated "AA" in familiarity were obtained from the data of the three experimental treatments. The results are summarized in Table XIV. In this table, as in Table XII, it may be noted that the group mean association time to stimulus words in the gradient is larger than the group mean association time to stimulus words in the series, and both of these, in turn, are larger than the group mean association time to stimulus words presented alone.

The significance of the difference between the group mean association time to stimulus words in the "AA" group and the group mean association time to stimulus words in the "AA" series was evaluated by means of Fisher's t technique. The difference between the two group means was .0400, and the obtained t value of .4436 was insignificant below the .05 level of confidence. With 125 degrees of freedom, t at the .05 level is 1.979.

Table XIV

Group Mean Associative Reaction Times to Stimulus Words
In The "AA" Group, the "AA" Series, and The "AA" Gradient

	Mode of Presentation		
	Presented Alone	Preceded by Neutral Word	Preceded by Synonym
N	70	70	175
X	1.0696	1.1236	1.1708
S	.497	.568	.709

Table XV

Analysis of Variance of Free Associative Reaction Times
of 25 Subjects to Stimulus Words in the "AA" Gradient &
of 10 Subjects to Stimulus Words in the "AA" Series

Source of Variation	Sum of Squares	df	Mean Square	F	P
Between Groups	.0992	1	.0992		
Within Groups	6.9644	34	.2048		>.05
Total	7.0636	35			

The initial evaluation of the significance of the difference between the group mean association time to stimulus words in the "AA" gradient and the group mean association time to stimulus words in the "AA" series was to analysis of variance. The results are presented in Table XV, and are seen to be insignificant.

The analysis of covariance technique was again employed, using the measure of reading and vocalizing speed of the subjects as the adjusting variable. The difference between the unadjusted and the adjusted error variance is that between .2048 and .1298 a difference of .0750 representing an increase in precision of the original analysis of over thirty-six per cent. In spite of this increased precision, however, a clearly insignificant F ratio of 1.00 was obtained. The hypothesis that there is no significant difference between the associative reaction times of subjects to stimulus words in the "AA" gradient and "AA" series is highly tenable.

CONCLUSIONS

The results obtained by the method employed in this study did not demonstrate any significant relationship between the amount of mediated generalization among synonyms and the degree of similarity of meaning between any given word and its synonyms. This lack of relationship was demonstrated with two independent lists of synonym pairs in which the words to which free associations were given were equated in regard to frequency of occurrence in the English language and in availability of response under control conditions.

In addition, certain results that were expected in view of previous theoretical formulations (1) and experimental finding in regard to the operation of mediated generalization along various gradients were not demonstrated.

Theoretically, if generalization to synonyms is activated in a subject by the presentation of a given word, then synonyms of that the given word should be more available in the response repertoire of the subject than words unrelated to the given word. No significant differences in mean associative reaction time, however, were found between words preceded by their synonyms and words preceded by unrelated words. One result of this study may be interpreted as being consistent with theoretical expectation. Free association to only one word, without reference to any other words, requires a subject to select a response from his entire response repertoire.

Free association to a word with reference to an immediately preceding unrelated word should be more rapid than free association to only one word, since the subject is limited to a more restricted response repertoire. Therefore, the lack of any significant difference between associative reaction times to stimulus words preceded by neutral words and the same stimulus words presented by themselves was the result expected. In view of the other findings, however, the theoretical significance of this result cannot be readily interpreted.

There is no known explanation for the insignificance of the present results in

relation to other experimental findings in this area. However, the following suggestion is offered as a possible explanation.

It may be recalled that the study by McGinnies (8) was designed for the purpose of demonstrating by free association techniques, results that had been obtained using measures of perceptual threshold. The particular value words employed in his study were clearly differentiated into specific categories, i.e. aesthetic words, religious words, economic words. Even with these great differences in value connotation between the six categories of words employed, only the difference between association times to words representing the two extreme opposite values of the subjects was significant.

It is felt that the range of the relationships between the members of the synonym pairs employed in the present study was extremely limited. It is believed, however, that these differences in similarity of meaning do exist, and that they are influential in the operation of semantic generalization. It is possible that the performance required of the subject in this experiment was of such a simple nature and that superficial responses could be given so easily, that generalization was never activated.

A more sensitive test of the relationship between similarity of meaning between synonyms and the amount of mediated generalization might be measurement of reactions under conditions where a subject could not readily give superficial or effortless responses. Such conditions might be those involving ambiguous or vaguely perceptible visual stimuli or heavily masked auditory stimuli. Under these conditions, if the order of generalization among synonyms does occur as hypothesized in this study, a subject would be expected to perceive a word highly synonymous with a clearly presented standard word or reference more rapidly or at a lower threshold than a word vaguely synonymous with a clearly presented standard word. Future research along lines of the present study, but using as a dependent variable some measure of verbal reaction under ambiguous or subthreshold stimulus conditions might yield results which would permit a conclusive interpretation of the present problem.

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