EFFECTS OF VERBAL SATIATION ON COMPETING RESPONSE TENDENCIES

by

Lawrence F. Hurr

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the requirements for the degree of Master of Arts.

Department of Psychology,
McGill University,
Montreal.

August 1962.

ACKNOWLEDGEMENTS

This work was supported by research grant (D77-94-01-10) from the Defence Research Board of Canada to Dr. Wallace E. Lambert.

The author wishes to thank Dr. Rabindranath Kanungo and Mr. Moshe Anisfeld for their helpful suggestions during the course of this research.

Thanks are also expressed to Mr. Donald Overton for his advice concerning the electrical apparatus.

Finally, acknowledgement is made to the Quebec Command of the Royal Canadian Army for their cooperation in this research.

TABLE OF CONTENTS

INTRODUCTION

The general purpose of this thesis is to develop a method of reducing the inhibiting effects produced when two conflicting verbal response tendencies are placed in competition. Such conflicts are encountered in an exaggerated form when, for example, a child is taught not to pronounce subvocally while reading silently, or when a bilingual learns to set aside one system of verbal responses so that he does not mix his languages. Methods for resolving such conflicts would have practical as well as theoretical significance.

Recent studies at McGill (Kanungo, 1962; Kanungo, Lambert & Mauer, in press) have shown that interference of verbal materials can be diminished if the meaning of one of the potential competitors is reduced in intensity. The present study extends the use of meaning reduction as a method of diminishing the strength of a verbal habit by applying it in a situation which requires that one type of verbal habit be temporarily set aside in order that another form of verbal habit will be free for rapid execution. In the following sections, the situation and method will be described.

The Situation: The Color-Word Interference Test

In 1886, Cattell noted a difference in the time it takes to name colors and words. He reasoned that the process of naming words had become "automatic" as a result of the great

number of times the ideas that words symbolize are associated with their names in everyday use, whereas when colors are perceived (as colors, not color-words), they are not nearly so often associated with their names. Thus, naming colors involves "voluntary effort". This view has since been referred to as the "practice hypothesis". Brown (1915) found that with practice, color-naming speed improved more than word-reading speed but he did not consider the ratio of improvement to be large enough to justify acceptance of the practice hypothesis. Thus, he came to the conclusion that color-naming and word-reading involve different and distinctive associative processes.

Several investigators have found evidence in favor of differential practice as an explanation for differences encountered in color-naming and word-reading speeds. Peterson and his colleagues (1925) theorized that one response habit develops for color words while the colors themselves become associated with a variety of response tendencies. For such a state of affairs to develop, it seems reasonable to assume that we receive a disproportionate amount of practice in associating the color words with the reading response. Lund (1927) mentioned that no other interpretation but practice can account for Brown's (1915) data and proceeded to demonstrate that, by practice on word reading, word-reading speed can be brought down to color-naming speed for a preschool

child who has had more practice on color naming than on word reading.

The fact that there are stronger associations between words and the reading response than between colors and the naming response was clearly demonstrated by Stroop (1935). He interpreted his results as supporting Peterson's (1925) hypothesis. Stroop employed an ingenious interference method, first used in Jaench's laboratory, whereby color words are printed in colored ink in incongruous combinations. In this procedure, five color words were used in such a manner that each particular color word could appear in the ink-color of any of the other four words, but never in its own color. For example, the word GREEN would never appear printed in the color green. Stroop found that the time it took his subjects to read 100 words from this color-word test did not increase significantly (5.6%) over the time it took them to read the same words printed in black. However, when they were asked to name the <u>color</u> in which the words on the test were printed, the time it took them to complete the 100 items was quite significantly higher (74.3%) than the time required to name the same colors in the form of color patches.

This last-mentioned finding is quite relevant to the present study in that the design calls for a verbal conflict situation. The Stroop-type color-word interference test pre-

sents just such a situation. When subjects attempt to name the color in which the words are printed, the more effective response tendency to read the word interferes. The conflict situation results since only one channel (verbal) is allowed for the two competing responses.

Rouse & Maas (1961) found that even when their Ss were instructed to ignore the words, the word-reading tendency still interfered with color-naming. A study by Klein (1961) also demonstrates that the Ss' tendency to read the color-words is in some way responsible for their slowness in being able to name the colors. Klein showed that when Ss are allowed to say the color-word before naming the color in which it is written, their time on the color-naming task decreases. By providing separate non-competing response channels for the word-reading and color-naming responses, Rouse & Mayer (1961) obtained decreased times for the color-naming task.

It is possible that a decrease in time taken to complete this task can be demonstrated without providing separate response outlets and without having the Ss read the words aloud as they are perceived during the color-naming task. A time decrease on color-naming may be effected by reducing the response competition through the use of a procedure known as "verbal satiation".

The Method: Verbal Satiation

A loss or change of meaning of a word as a result of its

continued fixation or repetition is known as "verbal satiation". This phenomenon was demonstrated as early as 1907 when Severance & Washburn noticed a disappearance of the normal meaning and auditory-motor image of words after a few seconds of visual fixation. Bassett & Warne (1919) found that the meaning of familiar monosyllabic nouns dropped away when they were repeated at a rate of three times per second. Several investigators have since reported a variety of evidence for the existence of the verbal satiation phenomenon (Don & Weld, 1924; Mason, 1941; Smith & Raygor, 1956; Spence, 1961). For example, differential GSR changes have been obtained between subjects reporting loss of meaning for words and subjects not reporting such a meaning-lapse (Mason, 1941). Smith & Raygor (1956) discovered that a less common Kent-Rosanoff word association response will be elicited by a word as a result of its prolonged visual exposure. Similar results were reported by Spence (1961).

Recently, a technique for systematically measuring the changes in connotative meaning resulting from verbal satiation has been proposed by Lambert & Jakobovits (1960). They used the "semantic differential scales" developed by Osgood, Suci, & Tannenbaum (1957) as a measuring instrument and demonstrated that these scales reflect significant connotative meaning changes resulting from verbal satiation. Their results were interpreted along the lines of Osgood's (1953) theory of

meaning. Briefly, they reasoned that continued repetition of a word involves continuous elicitation of the representational mediation process (meaning) of the word and results in what may be viewed as a linguistic form of reactive inhibition (I_R; Hull, 1943). Thus, the central mediating responses constituting the meaning of the word become less effective. This shows up in the form of less extreme ratings on the semantic differential scales, which serve as a measure of the polarity or strength of these mediating responses.

This measuring technique has since been used successfully on several occasions to measure meaning changes brought about by the verbal satiation procedure. For example, this semantic scale technique has been instrumental in showing that verbal satiation will differentiate two types of bilinguals (Jakobovits & Lambert, 1961a), that physical characteristics of stimuli are important determinants of the effectiveness of the satiation treatment (Jakobovits & Lambert, 1961b), and that verbal satiation differentially affects the stimulus and response members in paired-associate learning (Kanungo, 1962).

The Problem

Doten (1955) came to the conclusion that I_R is operative when subjects repeatedly perform the color-naming task required in the Stroop color-word test. In effect, what happened was that repeated elicitation of the color-naming re-

sponse temporarily reduced the effectiveness of the color-naming habit, causing an increase in the time taken to give color names (as color-naming was already the weaker response tendency). Thus, subjects took increasingly longer to complete the test from trial to trial.

What would happen, if in the same type of color-test situation, the word-reading habit (the stronger response tendency) were made less efficient through an accumulation of I_R? Would it reduce the effectiveness of the word-reading habit, reflecting itself in a decrease in the amount of interference? If so, subjects should be able to complete the color-word test in less time after the interference and resulting conflict have been reduced. The present investigation is specifically directed to this problem.

It was hypothesized that verbal satiation does act as a temporary conflict reducer in a verbal conflict situation.

It was specifically hypothesized that verbal satiation of the color words will reduce their connotative meaning as reflected in their semantic polarity ratings, rendering them less effective as competitors in the verbal conflict situation. This should manifest itself in the form of lower time scores on a Stroop-type color-word interference test for subjects receiving verbal satiation of the color words than for subjects receiving no such satiation treatment.

Two experiments were carried out employing the verbal

satiation treatment for the purpose described above. Experiment I was a preliminary study which served to point out many of the problems that are to be encountered in a study using the above-mentioned variables. Various ideas emanating from Experiment I were incorporated into the design of Experiment II which was a much more highly controlled experiment, undertaken to investigate the problem at hand.

EXPERIMENT I

Method

The Ss were 72 undergraduate students (42 male, 30 female) enrolled in second-year psychology courses at McGill University. Twenty-four Ss were placed in each of three groups corresponding to three experimental conditions: A, B, and C. Each of these groups was further divided into two subgroups with 12 Ss receiving 15 sec. verbal satiation (i.e., continuous verbal repetitions at a rate of two to three per sec.) on each of the words appearing on the stimulus card, and another 12 Ss not receiving satiation. Thus, there were 12 experimental (satiation) and 12 control (non-satiation) Ss in each condition.

Condition A. The stimulus card was similar to Card C of the Stroop Test (as revised by Thurstone, 1944). One hundred color-words arranged in ten rows, ten words to a row, were printed in lower case ¼ in. letters on a 10 X 14 in. white card. The colors in which the words were printed were red, blue, green, and yellow for all three conditions. The words used in Condition A were also red, blue, green, and yellow. Color and word appeared in incongruent combinations, e.g., the word "red" was printed in blue, green, or yellow ink but never in red ink.

Condition B. The stimulus card was the same as used in

Condition A except that the words used were pink, orange, brown, and purple. This condition was used as a comparison to Condition A since the colors and words in Condition A were the same (although in incongruent combinations). The fact that the same colors and words occurred in Condition A introduced the possibility of "co-satiation" (satiation of both color and word) within that condition. Condition B provided a situation in which co-satiation of the colors and words could not occur.

Condition C. The stimulus card was the same as that used in Condition A except that the words were the nonsense words wib, khas, latuk, and volvap.

The stimulus cards used in Conditions A, B, and C will be referred to as "cards" A, B, and C. The words and colors on each card were randomized so that no one word or color appeared twice in succession. The same order was used on all three cards; pink and wib were made equivalent to red; orange and khas were made equivalent to blue, etc. An attempt was made to include the same number of letters and syllables in all words that were treated as equivalents in the random ordering. Exceptions to this were the words pink and orange on card B having, respectively, one and two more letters than their counterparts on cards A and C, and the nonsense word latuk having one more syllable than its counterparts on cards A and B.

Experimental Ss. By use of a Kardex folder, each word

that was to appear later on the stimulus card was exposed to S for a two-second period. Immediately following the exposure of each individual word, S was asked to repeat the word aloud at a rate of two to three times per sec. until he was told to stop. Each word was repeated for fifteen sec. Next, S was shown a small practice card on which appeared the four color-words that would be on the stimulus card. These words were printed in the four colors (one word in each color) that were used throughout the experiment. S was told to read each word in the row, from left to right, as quickly and as accurately as he could. This accomplished, he was asked to name the color of the ink for each of the words as quickly and as accurately as possible. The purpose of this practice period was to set the S to respond to the color-word stimuli on the card. During this procedure, S was seated across a small table from E. The stimulus card lay face-down on the table in front of S. Finally, S was instructed, "When I turn over this card there will be a number of rows like the one you just saw. For each word, name the color of the ink, not the name of the printed word. Do this as quickly and as accurately as you can, reading from left to right for each row, beginning at the top of the card." E timed S with a stop-watch and marked any mistakes made on a data sheet which listed the correct responses.

Control Ss. The procedure for control Ss was exactly

the same as that described above with the exception that these Ss did not receive satiation on the stimulus words before performing the experimental task.

Results

The times taken by the experimental and control groups of each condition to complete the task (i.e., reading the 100 colors on the stimulus card) were compared by t test for independent samples (see Table 1). The only t value approaching significance was in Condition A. There was a mean difference of 16.50 sec. between the average time it took the Ss in the satiation and non-satiation groups to complete card A, the satiation group taking the smaller amount of time, as hypothesized. This was a considerable difference in the direction expected, but due to the small sample size and a large variance, it only reached the .20 level of significance. In Conditions B and C, the satiation groups unexpectedly took longer (4.75 and 2.41 sec., respectively) than the non-satiation groups to complete cards B and C, but these differences were not significant.

A t test comparison of the non-satiation (control) groups in Conditions A, B, and C proved interesting (see Table 2). The mean amount of time it took each of these groups to complete the stimulus card should indicate the relative amount of interference present in the word-color combinations of cards A, B, and C. In this respect, all three conditions were

Table 1

t Tests Between Satiation and Non-satiation Groups

Condition	Time in Seconds				Mean Diff.	t	P
	Experimental		Control				
	$\bar{X}$	SD	$\bar{X}$	SD			
A	95.58	14.87	112.08	30.74	-16.50	1.60	<.20
B	87.58	11.53	82.83	8.94	+4.75	1.07	n.s.
C	69.58	13.45	67.17	6.00	+2.41	0.53	n.s.

Table 2

t Tests Between Non-satiation Groups

Conditions Compared	Time in Seconds				Mean Diff.	t	P
	$\bar{X}$	SD	$\bar{X}$	SD			
A-B	112.08	30.74	82.83	8.94	29.25	3.02	<.01
B-C	82.83	8.94	67.17	6.00	15.66	4.80	<.001
A-C	112.08	30.74	67.1	6.00	44.91	4.75	<.001

found to be significantly different from each other, Condition A taking the longest time, Condition C taking the least.

The number of errors made by the Ss during the experimental task was recorded, but since the average number of errors per S amounted to less than two out of a possible one hundred, the error data were not analyzed.

Conclusions

After some experience in testing Ss in this preliminary study, it became evident that the experimental design and apparatus were inadequate, failing to control many variables which may have important effects upon the findings. In the first place, although total length of repetition time (15 sec. per word) during the satiation treatment was constant for all Ss, the number of repetitions during this fifteen-sec. period was not controlled. All Ss were asked to repeat the words at a rate of two to three times per sec., but many were noticeably slower than this rate and others were noticeably faster. Secondly, during the administration of the color-word test, S was seated directly in front of the stimulus card, which lay flat on the table. The distance between the card and the S's eyes was quite short, approximately 1½ to 2½ feet. Since the Ss were of varying heights and were not restrained in any way from making head movements, this distance could have varied considerably between Ss and could have varied, even for the same S, during the experimental task. These circumstances

could have resulted in differences in the facility with which Ss perceived the stimuli on the color-word test. Thirdly, there seemed to be a large variability in responses to the first row of the stimulus card. After the first row, the Ss appeared to "settle down" to their normal rate of responding. Fourthly, the amount of time it took Ss to respond to individual portions of the test (first half vs. second half, etc.) was not recorded; the only time recorded was that taken to respond to the entire one hundred items on the test. However, during the last half, and especially toward the end of the test, many Ss increased their rate of responding, whereas others slowed down. Fifthly, although Ss could respond verbally to only one stimulus at a time, all one hundred stimuli involved in the test were in front of them during the experimental task. This presented a problem in that some Ss were observed skimming quickly across the rows of color-words, their eyes appearing to be one or two or more words ahead of the color-word to which they were presently responding. Many other Ss appeared to be concentrating only on one word at a time and would not attempt to scan the words following that particular word until they had verbally responded to it. Possibly the S's mode of attacking the task is in some way related to the method and speed with which he reads, especially since Ss worked from left to right on the rows and from the top to the bottom of the card. Sixthly, it was

shown that there were significant differences between the times it took control Ss to complete cards A, B, and C. A question arises as to what part of these differences is actually attributable to the time-interval between the perception of the word-color combination and emission of the verbal response and what part of these differences can be accounted for in the time-interval between the verbal response and the perception of the next word-color combination.

Although the results of this preliminary experiment were in no way conclusive, the experiment was not without value. Its primary usefulness lay in its value as an aid in laying the procedural groundwork for Experiment II.

Considering the possible effects of the inadequately controlled variables and the small amounts of verbal satiation involved (only 15 sec. per word), it was concluded that what happened under Condition A should be interpreted as being "suggestive" enough to merit further investigation into this phenomenon.

The observations listed above led to a decision to mechanize and standardize the apparatus and procedure and to increase the sample size to enable a more sophisticated analysis of the data. This was done in Experiment II.

EXPERIMENT II

Method

Stimuli and Apparatus. Rather than using stimulus cards again, each stimulus was individually printed in lower-case letters with colored pencil on a 2 X 2 in. Graflex title slide (see Appendix A). The word-color combinations used as stimuli were the same as those used in Conditions A and B of Experiment I and will also be referred to as Conditions A and B in this experiment. There were 16 practice slides and 48 test slides in each condition. The same random order was used in both conditions, with the word pink being equivalent to the word red, etc. in the random ordering, as had been done in Experiment I. The stimuli were projected onto a 20 X 28 in. white rayon screen (see Appendix B) by a Kodak Carousel 550 slide projector. A microphone, into which S gave his response, was wired so that, via a sound switch and a pulse relay, it would simultaneously activate the projector and the pen on an Esterline-Angus (model AW) time recorder. Thus, any verbal response of a S caused the latency of that response to be recorded and, at the same time, caused the next word-color stimulus to be projected onto the screen.

Each latency recorded on the time-tape constituted the time-interval between the emission of one verbal response and the emission of the immediately succeeding verbal response.

The time it took the projector to change slides (a constant) could be subtracted from this, giving the time-interval between exposure of the stimulus and emission of the verbal response.

S was seated at a table with the microphone directly in front of him. The distance between S's eyes and the screen was eight feet. The projector and all other equipment were on a table behind S. Thus, E and all apparatus except the microphone and screen were out of view of S during the experiment (see Appendix B).

This apparatus has several distinctive advantages: (a) in addition to a record of total test time, it also gives a record of response latency for each stimulus; (b) the time-interval between S's verbal response and exposure to the next stimulus is held constant (the time it takes the projector to change slides - slightly under one second for each stimulus or 46 sec. for the 48-item test); (c) it allows exposure to only one stimulus at a time; and (d) it allows S to sit far enough away from the stimulus that differences in height and head movement will not grossly affect the distance between his eyes and the stimulus.

Semantic differential scales (Osgood, Suci, and Tannenbaum, 1957) were used in this experiment in an attempt to measure any word meaning changes resulting from the verbal satiation treatment. Six semantic differential scales (two

scales from each of the evaluative, potency, and activity dimensions) were employed. The scales used were: Ugly-Beautiful; Unpleasant-Pleasant: Weak-Strong; Soft-Hard; Passive-Active; and Calm-Excitable. A Meaningful-Meaningless scale was also used but because of possible confusion as to its neutral point, the results from this scale are not included. A Colorless-Colorful scale was also included in order to have an even number of scales (for randomizing purposes) but data from this scale were not analyzed. The bipolar adjectives for each of the scales were typed in capital letters, one above the other, on 2 X 2 in. Radio-mat slides. An arrow above the top adjective pointed toward the left, indicating that that adjective belonged with the left-hand side of the scale and an arrow beneath the bottom adjective pointed toward the right, indicating the right-hand side of the scale (see Appendix C). During the word-rating periods, S responded to the bipolar adjectives that appeared on the screen by making a check mark on a seven-point scale (see Appendix C). There was a booklet of these scales, with one page for each rating, in front of the S.

Subjects and Procedure. The Ss were 120 male English-speaking military personnel from military installations in the Montreal area. The age range was from 16 to 47 years, with over two-thirds of the sample falling within the ten-year span of 17-26 years.

Ss were randomly assigned to one of two conditions. Those in Condition A would be exposed to the same word-color combinations during the experimental task as were Ss in Condition A of Experiment I and those in Condition B would be exposed to the same word-color combinations during the experimental task as were Ss in Condition B of Experiment I. Ss within each condition were randomly assigned to one of three groups (20 Ss per group): (a) a group receiving verbal satiation of the words involved in the experimental task (experimental group); (b) a group receiving satiation of words other than those involved in the experimental task (different word control group); and (c) a group receiving no satiation at all (silence control group).

Before the testing session, Ss in all groups were required to name the numbers on the Dvorine Color Plates to insure that no color-blind Ss were introduced into the sample.

Procedure for Experimental Ss

(1) Practice on the Experimental Task. S was seated at a table with the microphone in front of him. He was given the following instructions: "You will be shown a sequence of words on the screen in front of you. As each word appears, read it to me as quickly and as accurately as you can, pronouncing it loudly and clearly, directly into the microphone. Since the sound of your voice causes the next word to be flashed onto the screen, say only the one word each time.

Do not touch the microphone or make any other sounds into it. If you make a mistake, it doesn't matter. Do not correct your mistakes or make any comments about them; just go on to the next word. ... Any questions? ... Say the word GO when you see it appear on the screen. This will begin the sequence of words." S then identified a series of eight practice words.

This accomplished, S was told, "You will now be shown another sequence of words similar to the one you just saw. This time, tell me the color in which the word is written as quickly and as accurately as you can. ... Any questions? ... You will begin the series of words with the word GO as you did before." S then identified a practice series of eight colors, exactly as he would soon have to do during the experimental task. The 16 stimuli (word-color combinations) used in the practice series were the same type as those appearing on the experimental test which followed.

(2) The Experimental Test. S was given instructions for the experimental task; namely, that he would be shown a series of words like the series he had just seen and, as each word appeared on the screen, he was to tell E the color in which it was written as quickly and as accurately as possible. The time recorder was set so that it would begin recording when S said the word GO. While S performed the experimental task, E recorded any errors that were made.

(3) Initial Semantic Ratings. After completing the experimental task, S was required to give an initial semantic differential scale rating of the words involved in the experimental task so that normal semantic profiles could be obtained for these words. Ss in Condition A rated the words red, blue, green, and yellow. Ss in Condition B rated the words pink, orange, brown, and purple.

S was instructed on how to use the semantic differential scales and asked to complete four practice scales. The word to be rated was presented on the screen (printed in black lower-case letters) for two sec. and then the bipolar adjectives, comprising the scale along which S was to rate the word, followed immediately. After each presentation of a word, S rated it on two scales. S was given ten sec. to make each rating.

The presentation of the words and scales was randomized in such a manner that no two Ss in one group got the same order, yet the same twenty random orders were used in each respective group. For example, S 4 in each of the three groups in Condition A and S 4 in each of the three groups in Condition B all got the same random order, but these were the only six Ss to get that particular order.

After the initial semantic rating session, Ss were given a five-minute rest period.

(4) Verbal Satiation and Satiation Ratings. Ss were informed that they would have to rate the words again according to the same procedure as they used before the rest period but that this time they would have to repeat each word aloud several times before rating it. S was told that he would see the word (2 sec.), then it would be taken off the screen and a tapping sound would begin. S was to repeat the word in time with the tapping sound (2 times per sec. for 15 sec.). When E told him to stop repeating the word, the adjectives would appear on the screen and he would rate the word on the semantic differential scales. Each of the four words used in the experimental test received one minute of verbal satiation (i.e., four 15-sec. periods of repetition). Ss in Condition A repeated the words red, blue, green, and yellow; those in Condition B repeated the words pink, orange, brown, and purple.

(5) Experimental Retest. Immediately following completion of the satiation treatment and satiation ratings, S again performed the experimental task. Instructions and task were the same for retest as they had been for the test. Time and errors were recorded as before.

This ended the testing session. Before S left the room, he was asked if he had encountered any difficulty in performing the experimental task and if he did (Ss unanimously did), he was asked to describe the difficulties he had, what his

reaction was at the time, and how he "tackled" the problem.

Procedure for Different Word Control Ss

The procedure was exactly the same as for the experimental Ss with the exception that verbal satiation was given on words not involved in the experimental task. Instead of repeating the words red, blue, etc. or pink, orange, etc., the Ss in this group (in both Conditions A and B) repeated the words hand, horse, bridge, and kitten.

Procedure for Silence Control Ss

Each set of word ratings (i.e., one word rated on two semantic differential scales) during the second rating session was preceded by 15 sec. of silence instead of 15 sec. of word repetition. Otherwise the procedure was identical to that of the experimental Ss.

A summary of the experimental procedure described above will be found in Tables 2 and 3.

Results

Experimental Task. The time taken by Ss to complete the experimental task in both the test and retest situations was obtained from the time-tapes. The retest time was subtracted from the test time, giving a difference score. The data are presented in Figure 1 and Table 4.

The difference scores obtained from all groups in both conditions were subjected to a 2 X 3 analysis of variance,

Table 2

Summary of Experimental Procedure for Experiment II

Condition A

Experimental	Different Word Control	Silence Control
1. Practice on color-word stimuli.	1. Practice on color-word stimuli.	1. Practice on color-word stimuli.
2. Color-word test with words red, blue, green, and yellow & colors also red, blue, green, and yellow	2. Color-word test with words red, blue, green, and yellow & colors also red, blue, green, and yellow.	2. Color-word test with words red, blue, green, and yellow & colors also red, blue, green, and yellow.
3. Initial semantic differential scale ratings of words red, blue, green and yellow.	3. Initial semantic differential scale ratings of words red, blue, green, and yellow.	3. Initial semantic differential scale ratings of words red, blue, green, and yellow.
Five-minute rest.	Five-minute rest.	Five-minute rest.
4. Verbal satiation of words red, blue, green, and yellow & second semantic differential scale ratings of those words.	4. Verbal satiation of words hand, horse, bridge, and kitten & second semantic ratings of words red, blue, green, and yellow.	4. Silence control periods and second semantic differential scale ratings of words red, blue, green, and yellow.
5. Same as step 2, above.	5. Same as step 2, above.	5. Same as step 2, above.

Table 3

Summary of Experimental Procedure for Experiment II

Condition B

Experimental	Different Word Control	Silence Control
1. Practice on color-word stimuli.	1. Practice on color-word stimuli.	1. Practice on color-word stimuli.
2. Color-word test with words pink, orange, brown, and purple & colors red, blue green, and yellow.	2. Color-word test with words pink, orange, brown, and purple & colors red, blue, green, and yellow.	2. Color-word test with words pink, orange, brown, and purple & colors red, blue, green, and yellow.
3. Initial semantic differential scale ratings of words pink, orange, brown, and purple.	3. Initial semantic differential scale ratings of words pink, orange, brown, and purple.	3. Initial semantic differential scale ratings of words pink, orange, brown, and purple.
Five-minute rest.	Five-minute rest.	Five-minute rest.
4. Verbal satiation of words pink, orange, brown, and purple & second semantic differential scale ratings of those words.	4. Verbal satiation of words hand, horse, bridge, and kitten & second semantic ratings of words pink, orange, brown, and purple.	4. Silence control periods and second semantic differential scale ratings of words pink, orange, brown, and purple.
5. Same as step 2, above.	5. Same as step 2, above.	5. Same as step 2, above.

Table 4

Time Differences Between First and Second Trials on the Color-Word Test

Group	Condition A	Condition B
Experimental	-3.39 sec.	-1.55 sec.
Diff. Word	-1.56 sec.	-0.53 sec.
Silence	-1.11 sec.	+0.93 sec.

A minus indicates a time decrease from first to second trial.

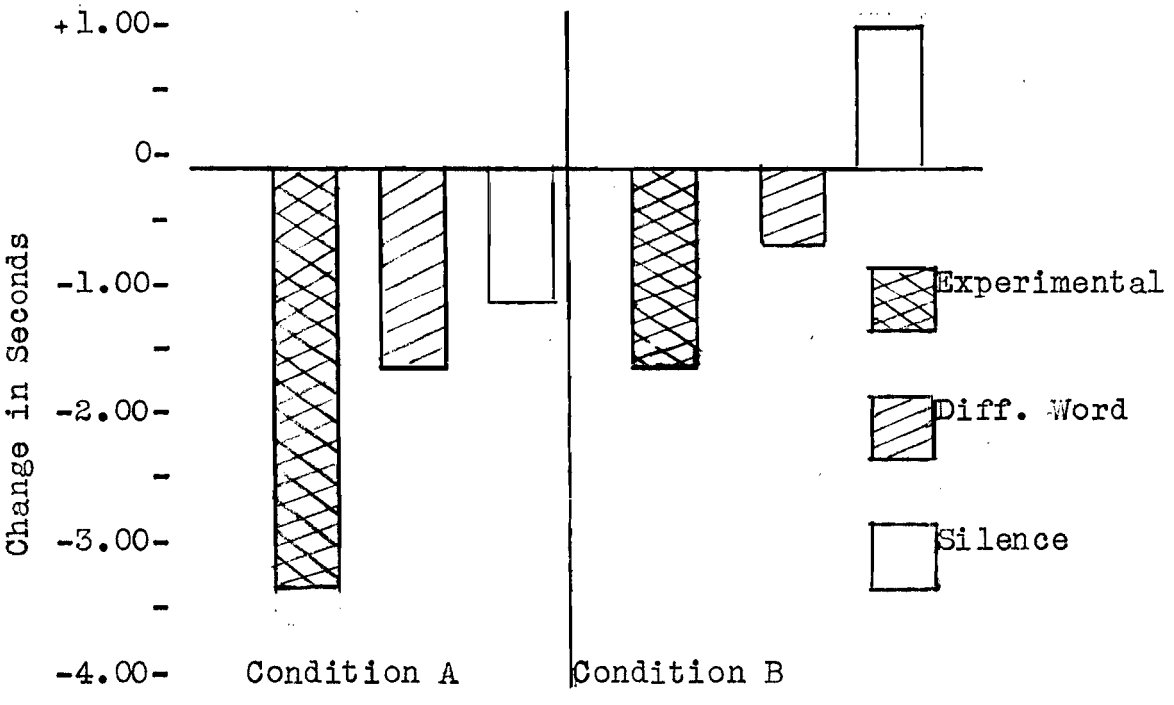


Figure 1

Information from Table 4 Presented in Graphic Form

the results of which are presented in Table 5. The fact that the experimental variable (verbal satiation) is having a significantly differential effect upon the time scores for the experimental, different word control, and silence control groups is reflected by the between-groups F ratio (see Table 5).

Following the analysis of variance, t tests were applied to the group means, using the error term (within cells variance estimate), in an attempt to determine just where the between-groups significance lies. Ferguson (1959) attaches some doubt to the relevance of the 5 per cent level of significance when applying a t test following an F test and suggests the 10/k(k-1) per cent level as being a more accurate statistic for this situation, since a more rigorous basis is required for rejection of the null hypothesis. Thus, the 10/k(k-1) level was adopted in this case. With three groups, this becomes the 2 per cent level. These t tests revealed that there was indeed a significant difference between the experimental (satiation) and silence (non-satiation) groups. Differences between the experimental and different word control groups and between the different word control and silence control groups were not significant (see Table 6).

It will be recalled that in Experiment I, significant differences were obtained between the non-satiation groups in Conditions A, B, and C. Such a comparison should prove interesting in Experiment II, since the time-interval between

Table 5

Analysis of Variance for the Time Difference Scores on the Color-Word Test

Source of Variation	Sum of Squares	df	Variance Estimate	F	P
Between Conditions	74.41	1	74.41	4.09	<.05
Between Groups	118.63	2	59.31	3.26	<.05
Interaction	5.58	2	2.79	0.15	n.s.
Within Cells	2073.17	114	18.18	----	----
Total	2271.79	119			

Table 6

t Tests Between Groups using Within Cells Variance Estimate

Groups	df	t	P
Exper. - Silence Control	38	2.54	<.02
Exper. - Diff. Word Control	38	1.53	n.s.
Diff. Word - Silence Control	38	1.01	n.s.

emission of the verbal response and presentation of the following stimulus was controlled (i.e., held constant) in this study.

Comparisons were made between the test scores on the experimental task (i.e., the number of seconds it took S to complete the experimental task the first time) for each of the three groups across conditions. That is, the initial score of the experimental group in Condition A was tested against the initial score of the experimental group in Condition B, etc. The results are presented in Table 7. All t tests are two-tailed. The data presented in Table 7 indicates that there were slight differences in the direction found in Experiment I and by Klein (1961); that is, the time scores were lower in Condition B than Condition A. From this information we might infer that the Condition B color-word test is "easier" (containing less interference) than the Condition A test. However, in this study,none of these differences became significant and it appears that such an inference cannot be safely made here.

Even though the above-mentioned t tests showed no significant differences between the initial time scores in Conditions A and B, the analysis of variance for the time difference scores between test and retest indicated that the satiation treatment was operating differentially upon Conditions A and B (see between-conditions F, Table 5). An attempted

Table 7

t Tests Between Conditions for Time Scores on First Trial of the Color-Word Test

Groups Compared	Condition A N	$\bar{X}$	SD	Condition B N	$\bar{X}$	SD	Mean Diff. in sec.	*t*	P
Experimental	20	57.39	7.37	20	54.91	6.14	-2.48	1.13	n.s.
Diff. Word Control	20	56.70	4.80	20	54.52	5.55	-2.18	1.66	n.s.
Silence Control	20	58.42	8.94	20	54.29	7.62	-4.13	1.53	n.s.

A minus in the mean difference column indicates time scores were lower (faster) on Condition B than on Condition A.

explanation of this finding, as well as the other results mentioned on these pages, will be found in the discussion section of this thesis.

Semantic Differential Scale Ratings. An analysis of variance was carried out on the differences obtained between the initial and second ratings on the semantic differential scales. This was a 2 X 3 analysis of variance involving all the groups in Conditions A and B. The results of this analysis are presented in Table 8. These results indicate that either there was no significant change in polarity ratings (showing no significant change in connotative meaning) of the words as a result of verbal satiation in the experimental groups; or if there was any meaning-change, it was not reflected by the semantic differential scales.

The difference scores obtained from the Ss' ratings on the scales were rather surprising in that all the groups but one (the experimental group in Condition B) showed an increase in polarity ratings from the initial to the second rating session. The mean change per S over the six scales, given in semantic scale units, is presented in Table 9. t tests for correlated means were applied to the initial and second ratings within each group to determine if the meaning change within each group varied significantly from zero (see Table 9). All t tests are two-tailed.

The silence control (no satiation) group in Condition

Table 8

Analysis of Variance for Differences between the First and Second Ratings on the Semantic Differential Scales

Source of Variation	Sum of Squares	df	Variance Estimate	F	P
Between Conditions	36.30	1	36.30	0.52	n.s.
Between Groups	335.40	2	167.70	2.42	n.s.
Interaction	213.80	2	106.90	1.54	n.s.
Within Cells	7887.70	114	69.19	----	----
Total	8473.20	119			

Table 9

t Tests for Correlated Means applied to Initial and Second Ratings on the Semantic Differential Scales

Group	Condition A N	$\bar{X}$ change	t	P	Condition B N	$\bar{X}$ change	t	P
Experimental	20	+0.60	0.34	n.s.	20	-1.70	0.86	n.s.
Diff. Word	20	+1.45	0.74	n.s.	20	+4.05	2.07	n.s.
Silence	20	+5.00	2.55	$<.02$	20	+1.40	0.90	n.s.

A displayed a significant increase from initial to second ratings on the semantic differential scales. Also in Condition A, the experimental (satiation) and different word control (different word satiation) groups showed non-significant increases in ratings. The experimental group of Condition B decreased their polarity ratings, but not significantly. The other two groups in Condition B gave non-significant rating increases.

It appears that the verbal satiation treatment, instead of causing a significant decrease in semantic differential scale polarity ratings, prevented polarity increases such as those which took place in the control groups.

DISCUSSION

It was hypothesized that meaning reduction resulting from verbal satiation would lower the amount of interference in a verbal conflict situation and thus become manifest in lower time scores on the interference task. Since this meaning reduction has been interpreted as an inhibition of the effectiveness of mediating reactions, it was further hypothesized that any lowering of time scores as a result of satiation would be accompanied by less extreme semantic differential scale ratings of the satiated color-words.

The results of Experiment II showed that verbal satiation of one of the competing responses in the color-word interference test does cause a significant reduction in the time it takes Ss to complete the test, indicating a reduction in the interference ($F = 3.26$, $p < .05$, see Table 4). However, the following aspects of the results appear to be inconsistent with the hypotheses given above: (1) Although the time reduction in the different word control groups was considerably less than in the experimental groups, this difference was not significant. (2) The semantic differential scales did not reflect a significant drop in the meaning of the color-words. Another finding which requires explanation is that differential amounts of time reduction were evident in Conditions A and B.

When the nature of these findings was more carefully examined, it was observed that the results obtained could not be adequately accounted for by meaning reduction alone. It became evident that the verbal satiation treatment reduced interference not only through the meaning reduction factor but also through some other influence not yet identified. An attempt will be made to identify and explain the factors underlying the results obtained from this experiment.

The following interpretations are not offered as definite conclusions, but are meant to serve primarily as guides to further experimentation on the main problem presented in this thesis.

Verbal Repetition as a Variable in Interference Reduction

If the time reductions evidenced in the data from this experiment were entirely due to meaning reduction it would be expected that the amount of time reduction (from first to second trial on the color-word test) displayed by the different word control Ss would differ from that of the experimental Ss to about the same extent as would the time reduction displayed by the silence control Ss. The words on which the different word control Ss were given satiation treatment were not involved in the color-word test. Thus, any reduction in their meaning should not have affected Ss' performance on the test. But it took the different word con-

trol groups considerably less time (though not significantly less) to complete the color-word task after repetition of these non-relevant words than it took the silence control groups to complete the same task after a period of silence (see Table 5).

The only difference between the different word control and silence control groups was that the Ss in the different word control groups were involved in the verbal repetition task immediately before the second trial on the color-word test and the Ss in the silence control groups were not. Since verbally repeating a word is a motor response, it seems reasonable to suggest that the crucial factor differentiating the different word and silence groups may have been the presence or absence of this motor task (verbal repetition) preceding the Ss' performance on the color-word test.

A possible explanation of the apparent satiation effect in the different word control groups can now be offered. It is quite plausible that word repetition per se, when immediately preceding the experimental task involving repeated motor responses through the same channel (verbal motor), causes some form of motor facilitation. Since the data from this experiment show only the effects of such a phenomenon and since the design did not provide for measurement of this phenomenon, should it occur, its exact form cannot be characterized specifically here. An example of how this add-

itional verbal repetition factor may operate can, however, be given in the context of a theory of "motor adjustments" offered by Freeman (1948).

Freeman's theory invokes the concept of a basic energy level which is maintained within the organism by a "homeostatic process". Motor sets are "homeostatic adjustment acts" which prepare the response to be discharged through a particular channel, preventing "overflow" into non-relevant response outlets. These adjustments are possible because feedback stimuli from muscular adjustments previously made to the expected stimulus establish "a central condition of lowered threshold for the stimulus about to be presented". As a result, less energy mobilization is required to make the relevant responses (1948, p226).

For the Ss in the experimental and different word control groups of the present experiment, the word repetition just before the final (second) trial on the color-word test provides the necessary motor adjustments immediately prior to the experimental task. This has the effect of readying the verbal response outlet which will be used by Ss in responding to the color-word stimuli. In other words, the use of a particular motor response channel has been facilitated. Since this particular type of response (in this case, verbal) now requires less energy mobilization and can now be more easily invoked, Ss become less hesitant and emit their responses more rapidly.

It is obvious that such a motor facilitation factor would not be operating in the silence control groups as they were not involved in any verbal motor activity immediately preceding the experimental task. Thus, it can be expected that any reduction in time scores due to this factor would take place only in the experimental and different word control groups. Whatever the amount of this effect is, it seems that it would be of about the same intensity in both of the different word control groups and in the experimental group of Condition B. This is because the words repeated during the repetition period in all three of these groups were not the same words that would be emitted during the color naming task. In the experimental group of Condition A, however, these words were the same. The experimental Ss in Condition A were being prepared not only to use a particular motor response channel, but also were being facilitated on the use of the specific motor responses which would eventually have to use that channel as an outlet during the color naming task. As can be observed by referring to Fig. 1, the time reduction in this group (experimental, Condition A) was considerably larger than in any other group. It has less, but almost equal, effect on the other experimental group (in Condition B) and on both different word control groups, and has no effect at all upon the silence control groups.

What evolves from the above interpretation is essentially

a two-factor theory for explaining how verbal repetition affects competing response tendencies, the factors being meaning reduction and motor facilitation. In this verbal interference situation, the meaning reduction factor, for reasons already mentioned, is presumed to render the incorrect response (the written word) less effective in the sense that its symbolic significance is less easily conceptualized than under normal reading conditions and the word consequently becomes a less effective competitor. The motor facilitation factor is hypothesized to have a general priming effect of decreasing the latency of emitting motor responses. When particular responses which will later be appropriate for the experimental task (as in the experimental group of Condition A) are involved, they are apparently made especially easy to emit.

The Verbal Material as a Variable in Interference Reduction

The analysis of variance on the time difference scores showed that the amount of time reduction occurring in Conditions A and B differed significantly ($F = 4.09$, $P < .05$, see Table 4). It should be recalled that a comparison of the time scores from the initial trial on the color-word test showed the Condition A time scores not to be significantly lower than those for Condition B (see Table 5). An attempt will be made to explain why a larger time reduction

occurred in the experimental group of Condition A than in the experimental group of Condition B.

The fact that the experimental groups in Conditions A and B differed on time reduction was interpreted as an indication that the verbal repetition treatment had a differential effect in the two conditions. Why, then, would the satiation treatment act less effectively upon the verbal material contained in the Condition B color test? The motor facilitation and meaning reduction factors could both be contributory here. The motor facilitation factor having a greater impact in the experimental group of Condition A than in any of the other groups (i.e., the facilitation of the specific verbal motor responses occurring only for this group) may partially account for the difference between the experimental groups. The meaning reduction factor may also be more effective in the Condition A experimental group than in the Condition B experimental group. Kanungo has argued that satiation treatment, up to a point, is not satiation at all, but familiarization (Kanungo 1962, p.24). Beyond this point, the verbal repetition becomes inhibitory and the meaning reduction factor comes into play. It will be noted that three of the words used in the Condition B color-word test had a lower Thorndike-Lorge frequency (therefore, lower familiarity) than any of the words appearing on the Condition A color-word test (see Appendix D). Presumably, more repetitions

would be required to bring the rarer or less familiar words to that maximum point of familiarization beyond which meaning reduction would begin to occur. Following this premise, it would be expected that within a given period of verbal satiation in which the number of word repetitions per second is controlled, less meaning reduction effect would be operative in Condition B. This is because familiarization with the words in this condition takes longer (as the words used in this condition are less familiar), leaving less time, and thus less repetitions, during which the meaning reduction factor can exert its influence. The interference value of the words in Condition B, therefore, would not be diminished as much as in Condition A. If such were the case, the expected result would be lower time scores on the final (second) trial on the color-word test for the experimental group of Condition A than for the experimental group of Condition B. As Fig. 6 shows, this is the result that was obtained (the mean time for Condition A was 1.84 sec. less than that for Condition B).

Figure 6 also shows that the time scores were lower in <u>all</u> the groups in Condition A than in their corresponding groups in Condition B. This was interpreted as an indication that differential amounts of familiarization in Conditions A and B (as mentioned immediately above) may be operating

within the color-word test itself. The word-reading task, which interferes with the color-naming task, is actually very much like a satiation task and consequently may be "self-satiating". It became obvious during the experiments that Ss must read these words before being able to name the color in which they are written. The impressions that the Ss conveyed to E, after they had completed the testing session, indicated that this was the case, almost without exception. Reading these words repeatedly during the color-word test could reduce the intensity of their meanings. The meaning-reduction resulting would be expected to cause some reduction in time scores from test to retest in all the groups. However, it would have less chance to operate in Condition B for the reason stated above: that is, the words in Condition B require a longer period of familiarization, leaving less opportunity for the satiation effect to exert its influence. Evidently, the two trials on the color-word test provided enough repetitions for this within-task satiation effect to operate differentially on the words (thus, the time scores) in Conditions A and B. Since it would have operated longer in Condition A, lower time scores would be expected from that condition.

Why this time score difference between conditions did not occur on the first trial of the color-word test, as

it did in Experiment I of this thesis and in a study by Klein (1961) will be briefly discussed. Since stimulus cards were employed in the Klein study and in Experiment I, and since a stimulus projection technique which controlled time between each stimulus presentation was employed in the present experiment, it appears that the crucial factor to be dealt with here is the time interval between S's verbal response and the presentation of the following stimulus. For the lack of a more convenient name, this time interval will be referred to as the "shift" period (a term used by Lund, 1927). An explanation, proposed by Klein (1961), of what happens during the shift period seems relevant here. Klein proposed that the response competition for the single motor outlet causes the S to "seek additional stimulation from the region of relevant perceptual information (color) in order to produce the appropriate motor response (color name)". Thus, it appears that what is happening during shift is what Klein chooses to call "restimulation" of the color-naming response. In other words, S is simply concentrating hard on trying to emit the proper type of response. Since the power of the color elements as competitors in the interference task is a function of the frequency and strength of meaning of the words they are competing with, differential amounts of restimulation would be required to reach the color threshold in Conditions A and B. Mechanization of the apparatus in Experiment II made it possible

to hold the shift period constant - something that is not possible when stimulus cards are used. Evidently this constant one-second shift period was long enough to "cover up" the differential amounts of restimulation occurring in Conditions A and B. When stimulus cards are used, the S determines the length of the shift period and these differential amounts of restimulation can manifest themselves in the time scores. Holding the length of shift constant also has the important side effect of not allowing S to look ahead and restimulate on stimulus Y while still verbally responding to stimulus X.

What appears to have happened is that equalizing the shift periods and preventing S from seeing the next stimulus has nullified the large portion of apparent interference difference (between Conditions A and B) which was possibly due to the differential amounts of restimulation during shift. This turn of events, however, was probably advantageous in that it left only one response measure - the time interval between presentation of the stimulus and S's verbal response - to be measured and analyzed. However, this type of control - or, possibly, over-control - may also prove to be disadvantageous in that it may have sharply reduced the size of the time difference scores obtained, since the satiation treatment may also affect what happens during the shift period.

It will be recalled that Condition B was introduced into the design as a comparison control to Condition A due to the possibility that "co-satiation" (i.e., satiation of both word and color) may occur in Condition A. In the event of such co-satiation, it would be predicted that larger time reductions would occur in Condition B since co-satiation would weaken the effectiveness of both competing response tendencies in Condition A. The fact that the larger time reductions were in Condition A suggests that no co-satiation occurred. Further investigation into the question of whether co-satiation exists may prove to be interesting since the absence of this phenomenon would be suggestive of some kind of cognitive separation between color naming and color-word reading.

To summarize, it appears that more effective interference reduction can be accomplished in Condition A than in Condition B because of: (1) more specific or more appropriate motor facilitation in Condition A; (2) more meaning reduction being possible in Condition A; and (3) a lack of co-satiation in Condition A.

It should be emphasized that the above interpretations are not conclusive, but are suggestive of further experimentation required in this area.

The Semantic Differential Scale Ratings

The semantic differential scales were employed in an

attempt to measure certain changes in the connotative aspects of color-word meanings that might occur between the first and second trial on the color-word interference test. A meaning reduction would be reflected by a decrease in the polarity ratings on these scales.

The data obtained from the control groups suggest that under conditions where color words are not subjected to verbal satiation treatment, an increase occurs from the initial to the second polarity ratings (see Table 9). One experimental group displayed a decrease in polarity ratings; the other showed a very slight increase. Rather than decreasing the polarity ratings themselves, the satiation treatment seems to have had the effect of diminishing the amount of polarity increase which normally occurred in the control groups.

The polarity ratings of the experimental groups, however, were not significantly less than those of the control groups ($F = 2.42$, p = n.s., see Table 8). The fact that the meaning-reduction factor did not play as important a role in resolving the verbal conflict as had been hypothesized does not eliminate the necessity of attempting to find some explanation for the lack of significant polarity shifts on the semantic differential scales.

Most studies using the semantic scale technique to measure meaning reductions involved in verbal satiation <u>have</u> reported significant shifts in polarity ratings for the words

satiated (Lambert & Jakobovits, 1960; Jakobovits & Lambert, 1961a; Jakobovits & Lambert, 1961b; Kanungo, 1962). An important question to ask is, "How do these studies differ from the experiment being discussed here?" The answer which most obviously presents itself is that the Ss used in all these studies were drawn from a college population while the Ss used in the present experiment were soldiers with a mean education of less than ten years. This difference in samples may be important for the following reasons: the soldiers had less education and quite obviously a much lower mean intelligence than that of college students. From this it can be safely inferred that they also have done considerably less reading. Having much less reading experience than college students, they would be less familiar with words in the form of written verbal stimuli. Hence, the portion of the verbal satiation treatment which is actually familiarization is probably larger in the case of the Ss with a limited educational background. Accordingly, the amount of meaning reduction occurring during a given period of verbal satiation would be less for the soldiers than for college students.

There is also a possibility that a significant meaning reduction did occur but was not measured by the semantic scales. Messer, Jakobovits, Kanungo, & Lambert (1962) have recently discovered that semantic differential scales will not reflect a reduction in the meaning of numbers (either in

the form of words or digits) after they have been subjected to the verbal satiation treatment. However, they did find reductions manifested on a meaningful-meaningless scale. They concluded that the semantic differential scales do not adequately measure the meaning of numbers. Perhaps these scales are insensitive not only to numbers, but also to colors.

In addition, some of the failure of the Ss in this experiment to demonstrate significant shifts in semantic differential scale polarity ratings may be attributable to another factor entirely independent of meaning reduction, but having an influence that prevents meaning reduction from being measured by the scales. When Ss are asked to perform a task - in this case, give semantic scale ratings - and shortly afterward are asked to repeat the same task, they commonly get the impression that their ability to recall is being tested. From comments made by the Ss after they had participated in the experiment, E discovered that most of them were under this impression. The fact is, Ss were purposely trying to produce exactly the same ratings during the second administration of the semantic differential scales as they had on the initial administration of these scales. Since a mid-experiment change of instructions was not feasible, this inappropriate behavior on the part of the Ss could not be corrected.

CONCLUSIONS

The fact that Ss who received verbal satiation of the color words did display significantly lower time scores on the color-naming task leads to the conclusion that the verbal satiation treatment does effectively reduce response competition. The failure of these same Ss to give significantly lower semantic polarity ratings for the satiated words, however, indicates that either a significant meaning reduction did not occur and thus the result is not attributable to meaning reduction alone, or that all the meaning reduction that occurred was not measured by the semantic scales. Close observation of the procedure and results of this experiment indicated that both these possibilities may have played a role.

The between-groups differences were interpreted as an indication that, in addition to meaning reduction, a motor facilitation effect was being produced by the word repetition. That some meaning reduction was produced is evident from the analysis of variance shown in Table 7. As a result of an inappropriate procedural set on the part of the Ss and possible inadequacies of the semantic scales, all the meaning reduction that did occur was probably not measured, thus, there is indeed much uncertainty as to how important the meaning reduction factor actually was. Since there is uncertainty about the measurement of the one factor (meaning

reduction) and no provision was made to measure the other factor (motor facilitation), any statement as to their relative importance is not appropriate.

It is concluded that: (1) Verbal satiation will reduce interference in a verbal conflict situation. (2) Two factors play an important role in this interference reduction when the word repetition form of satiation is used. These are meaning reduction and motor facilitation. (3) A statement as to the relative importance of these two factors cannot be made on the basis of the information available from this experiment. (4) A further investigation employing this same general design should be carried out, using a sample of Ss of a higher mean educational level than the sample used here. (5) A further improvement which might be incorporated into such a study would be to use visual fixation instead of verbal repetition as the satiation treatment. This modification would eliminate the motor facilitation effects found in the present experiment and allow interpretation of the results on the basis of meaning reduction alone.

SUMMARY

Two experiments were conducted to investigate the effects of verbal satiation on competing response tendencies. It was hypothesized that verbal satiation of the color words appearing on a Stroop-type color-word interference test would temporarily lower the connotative meaning of those words, rendering them less effective as competitors in the verbal interference situation. Accordingly, it was predicted that Ss receiving the verbal satiation treatment would complete the color-word test more rapidly than would Ss not receiving satiation on the color words. Also it was expected that less extreme semantic differential scale polarity ratings for the color words would be given by the Ss who had received verbal satiation treatment on those words.

Time scores on the color-word test were found to be significantly lower for the Ss in the satiation groups, as predicted. Ss who received satiation of words other than those involved in the experimental task (color-word test) also displayed lower time scores than did the non-satiation Ss. These time scores, however, were not significantly lower than the scores of the non-satiation Ss.

These findings were interpreted as an indication that the time reductions obtained could not be attributable to meaning reduction alone. It was postulated that, whenever

word repetition occurs, a motor facilitation effect becomes operative, whether or not meaning reduction has occurred. The time reduction shown by Ss who received satiation treatment on non-relevant words was attributed to the operation of this motor facilitation factor. The significant time reduction for the Ss in the experimental (satiation) groups was interpreted as a product of the joint operation of meaning reduction and motor facilitation during verbal repetition.

There was evidence to indicate that the type of verbal material (words) used on the color-word test is a variable influencing the amount of time reduction resulting from the verbal satiation treatment. It was suggested that effectiveness of the satiation treatment may be a function of the frequency and familiarity of the written words used as competitors on the test.

No evidence was found that supported the notion that repetition of a color word would simultaneously satiate that color word and the corresponding color itself.

Although the predicted time decrease did occur, significant decreases in polarity ratings for the satiated color words were not in evidence. It was suggested that possible reasons for this finding were: (1) a sample with an average amount of education and reading experience far below that of the samples used in other satiation studies; (2) the lack of applicability of semantic scales for the measurement of the

meaning of colors; and (3) an inappropriate procedural set on the part of the Ss.

It was concluded that verbal satiation of the word repetition variety reduces interference in a verbal conflict situation through the operation of two factors, meaning reduction and motor facilitation. No statement was possible as to the relative importance of these two factors. A suggestion was made as to how the meaning reduction factor could be subjected to further investigation.

REFERENCES

Bassett, M. F., & Warne, C. J. On the lapse of verbal meaning with repetition. Amer. J. Psychol., 1919, 30, 415-418.

Brown, W. Practice in associating color-names with colors. Psychol. Rev., 1915, 22, 45-55.

Cattell, J. McK. The time it takes to see and name objects. Mind, 1886, 11, 63-65.

Don, V. J., & Weld, H. P. Lapse of meaning with visual fixation. Amer. J. Psychol., 1924, 35, 446-450.

Doten, G. W. The effects of rest periods on interference of a well established habit. J. exp. Psychol., 1955, 49, 401-406.

Ferguson, G. A. Statistical analysis in psychology and education. New York: McGraw-Hill, 1959.

Freeman, G. L. The energetics of human behavior. Ithaca: Cornell Univer. Press, 1948.

Jakobovits, L. A., & Lambert, W. E. Semantic satiation among bilinguals. J. exp. Psychol., 1961a, 62, 576-582.

Jakobovits, L. A., & Lambert, W. E. Stimulus characteristics as determinants of semantic changes with repeated presentation. 1961b, Paper read at 1961 meeting of Canadian Psychological Association, Montreal.

Kanungo, R. Semantic satiation and paired associate learning. Unpublished Ph.D. dissertation, McGill University, 1962.

Kanungo, R., Lambert, W. E., & Mauer, S. M. Semantic satiation and paired associate learning. In press for British J. Psychol.

Klein, G. S. Semantic power measured through the interference of words with color-naming. Paper presented at Psychonomic Society, New York, August, 1961.

Lambert, W. E., & Jakobovits, L. A. Verbal satiation and changes in the intensity of meaning. J. exp. Psychol., 1960, 60, 376-383.

Lund, F. H. The role of practice in speed of association. J. exp. Psychol., 1927, 10, 424-433.

Mason, M. Changes in the galvanic skin response accompanying reports of changes in meaning during oral repetition. J. gen. Psychol., 1941, 25, 353-401.

Messer, S., Jakobovits, L. A., Kanungo, R., & Lambert, W. E. A comparison of the effects of satiation treatment on words and numbers. Paper read at 1962 meeting of Canadian Psychological Association, Hamilton, Ontario.

Osgood, C. E. Method and theory in experimental psychology. New York: Oxford Univer. Press, 1953.

Osgood, C. E., Suci, C. J., & Tannenbaum, P. H. The measurement of meaning. Urbana: Univer. Illinois Press, 1957.

Peterson, J., Lanier, L. H., & Walker, H. M. Comparisons of white and negro children. J. comp. Psychol., 1925, 5, 271-283.

Rouse, R. O., & Maas, J. B. Interference with color naming as a function of degree of practice on the color-bearing materials. Paper presented at Eastern Psychological Association, Philadelphia, 1961.

Rouse, R. O., & Mayer, F. On the reduction of response competition by practice providing separate response channels. Paper presented at Psychonomic Society, New York, August, 1961.

Severance, E., & Washburn, M. F. The loss of associative power in words after long fixation. Amer. J. Psychol., 1907, 18, 182-186.

Smith, D. E. P., & Raygor, A. L. Verbal satiation and personality. J. abnorm. soc. Psychol., 1956, 52, 323-326.

Spence, D. Effects of verbal satiation on recall. Psychol. Reports, 1961, 9, 476.

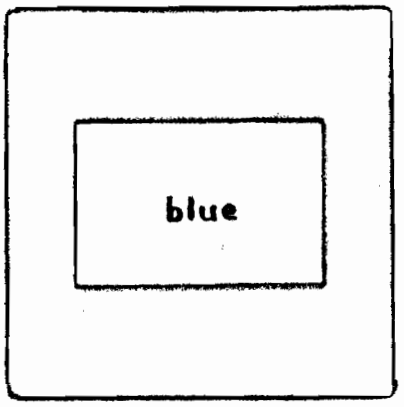
Stroop, J. R. Studies of interference in serial verbal reactions. J. exp. Psychol., 1935, 18, 643-661.

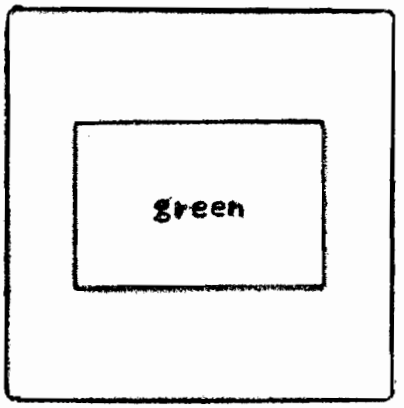
Thorndike, E. L., & Lorge, I. The teacher's word book of 30,000 words. New York: Teacher's College, Columbia Univer., 1944.

Thurstone, L. L. A factorial study of perception. Chicago: Univer. of Chicago Press, 1944.

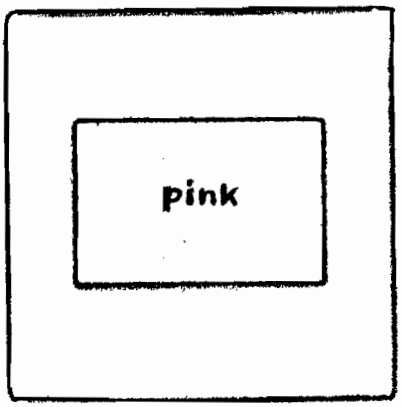
APPENDIX A

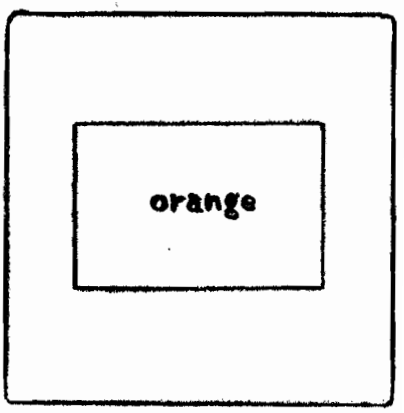
Examples of Slides Used for Condition A





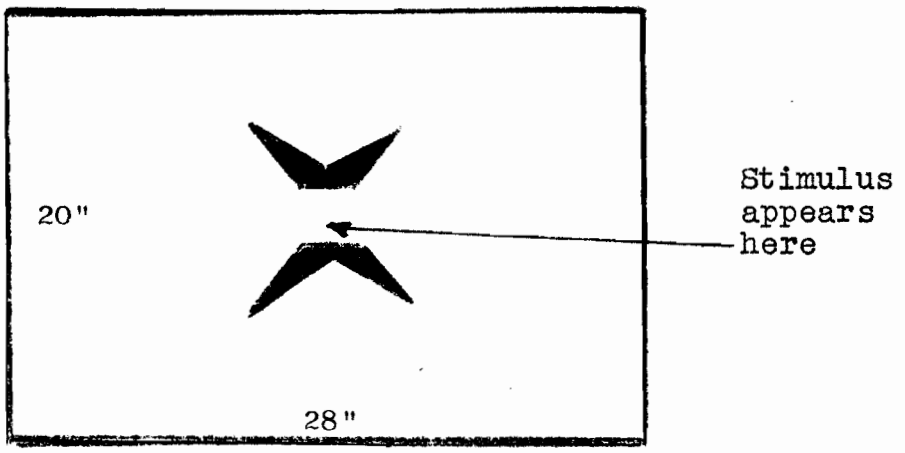
Examples of Slides Used for Condition B



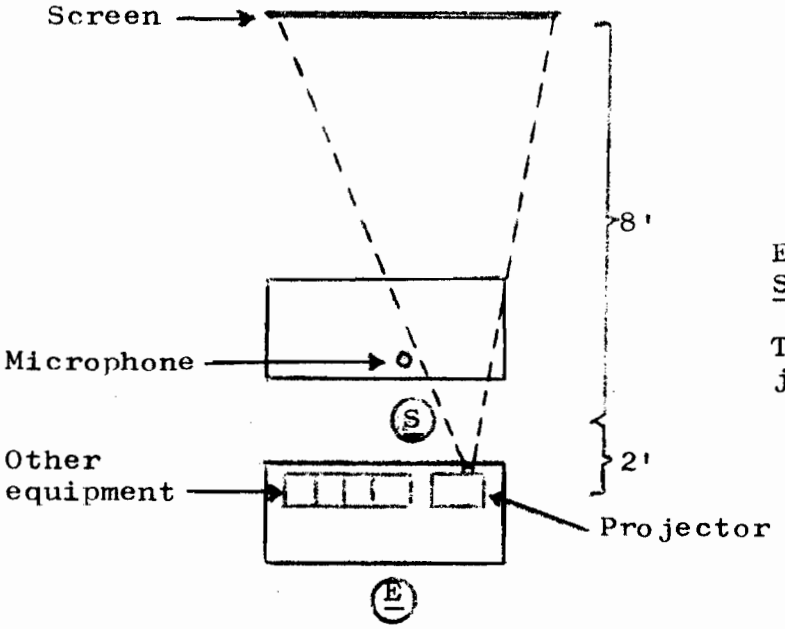


APPENDIX B

Diagrams of Stimulus Screen and Experimental Setting



The purpose of the black, blunted arrows on the screen was to draw S's attention to the place on the screen where the stimulus word would appear. Ss were requested not to use such tricks as looking only at the first or last letter in the word or blurring the word out-of-focus with their eyes.

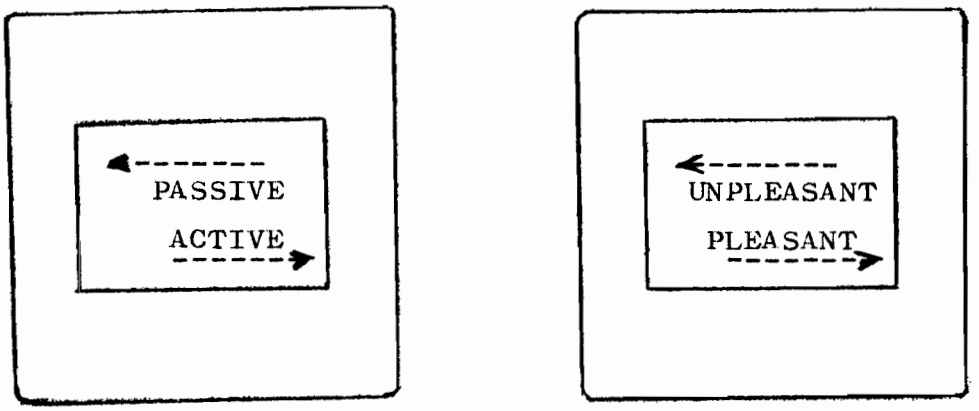


Eight feet from S to screen.

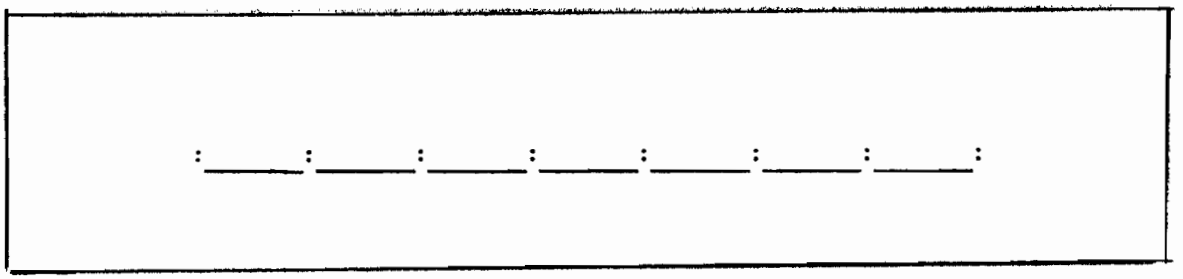
Ten feet from projector to screen.

APPENDIX C

Diagrams of Modified Semantic Differential Procedures



Examples of bipolar adjectives used with the semantic differential scales are shown above. The word on top (arrow points to the left) goes at the left end of the semantic differential scale (shown below) and the word on the bottom goes at the right end of the scale.



The spaces on the semantic differential scale represent, from left to right: very, medium, slight, neutral, slight, medium, very. When the scales were scored, these spaces were respectively given the following weights: -3, -2, -1, 0, + 1, + 2, + 3.

APPENDIX D

Thorndike-Lorge General Frequencies for the Color Words used in Experiments I and II

Condition A		Condition B	
red	AA	pink	A
blue	AA	orange	A
green	AA	brown	AA
yellow	AA	purple	37

AA = over 100 occurrences per million

A = over 50 occurrences per million