VERBAL REMINISCENCE IN SCHIZOPHRENICS

by Noel Edward Derrick

Thesis presented to the School of Psychology and Education of the University of Ottawa as partial fulfillment of the requirements for the degree of Master of Arts.

Brockville, Ontario, Canada, 1965

ACKNOWLEDGEMENTS

Grateful acknowledgement is hereby made to Dr. William Barry of the School of Psychology and Education of the University of Ottawa, under whose supervision this thesis was prepared.

The writer is also indebted to the Superintendent and ward psychiatrists of the Ontario Hospital, Brockville, where the experimental work was carried out, as well as to the patients who served as subjects.

CURRICULUM STUDIORUM

Noel Edward Derrick was born on January 2, 1931, in Irvinebank, Queensland, Australia. He received the Bachelor of Arts degree from the University of Queensland, Brisbane, Australia, in 1954.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Much recent research has invoked the principles of learning theory in the explanation of behavioural and personality differences, including abnormal behaviour. This thesis will endeavour to test, in the verbal area, one such hypothesis derived from motor studies, viz. that psychotics are characterized by excessive slowness of dissipation of reactive inhibition. Because of its important implications in the etiology of psychotic behaviour, it is felt that testing this hypothesis in another modality could be profitable. The verbal area appears to be especially important because disturbances of verbal functioning are characteristic in psychotics.

In the endeavour to study the dissipation of reactive inhibition in the verbal area, this thesis will concern itself with what will be referred to herein as "verbal reminiscence". As, to the writer's knowledge, no literature exists on this, it must be approached in discussion through the known phenomenon of verbal satiation. The latter may be defined as a reduction in the meaningfulness of a word for subjects who attend to it repeatedly. "Verbal reminiscence" will then refer to the subsequent recovery of meaningfulness following rest.

In Chapter I various studies on verbal satiation will be reviewed, and evidence presented of relationship with

stimulus qualities and with individual differences. It will be discussed in the light of neural-satiation theory, then by Eysenckian theory in which both neural satiation and motor reactive inhibition are attributed to the same process: cortical inhibition. From this, verbal satiation may be interpreted as due to a form of reactive inhibition, and consequently verbal reminiscence as due to the dissipation of this inhibition. Osgood's behaviouristic theory of meaning will be discussed, and it will be shown that a similar interpretation of verbal satiation has been derived independently through it. Motor reminiscence studies will be reviewed supporting the hypothesis of slower dissipation of I_R in psychotics than in others, and the present hypothesis will be derived from this by analogy.

In Chapter II will be described the experimental design: the experimental conditions chosen, the selection of subjects, the measuring instrument to observe change of meaningfulness, the administration and the statistical methods to be employed in analysing the results.

In Chapter III the results will be reported. The conclusions will then be discussed, and suggestions made for possible future research.

CHAPTER I

REVIEW OF THE LITERATURE

"Verbal (or "semantic") satiation" may be defined as a reduction in the meaningfulness of a word for subjects who attend to it repeatedly. The term "verbal reminiscence" is herein used to refer to the subsequent recovery of meaningfulness following rest. As, to the writer's knowledge, there is no literature on the latter, most attention will be given in this chapter to the former.

Studies on verbal satiation will be reviewed (section 1), and evidence given of relationship with stimulus properties (2) and with individual differences (3). As theoretical background, satiation theory derived from other modalities will be discussed (4), then theory by which both satiation and motor I_R are attributable to the same cortical inhibitory process (5). A theory of meaning provides another link, allowing verbal satiation, and consequently verbal reminiscence, to be interpreted as due to a cognitive form of I_R (6). From findings that the rate of dissipation of motor I_R (in reminiscence) can differentiate psychotics from non-psychotics (7), the hypothesis will be derived that verbal reminiscence should differentiate schizophrenics from non-psychotics (8).

1. Verbal Satiation - Historical Survey.

Some of the earliest reports are from followers of Titchener, who primarily studied the introspective impressions

of the "decay of meaning" when words were fixated or repeated for prolonged times. Severance and Washburn[1], in 1907, had six trained subjects fixate words of six letters for three minutes. Subjects reported : loss of auditory-motor image; loss of familiarity of the word, which became "just a collection of letters"; breaking-up of the word into syllables. In 1919, Bassett and Warne[2] had subjects repeat words aloud and report when the word's meaning seemed to fade, whereupon the experimenter noted the time. Times within 3 to 4 secondswere noted. Don and Weld[3], in 1924, used visual fixation for three minutes. After average times ranging from 5 to 14.6 seconds, subjects reported instantaneous lapses of meaning, appearing as "feelings of blankness", or the word would become "just letters".

These early studies suffer from the disadvantages of the introspective technique. The subject was told what to expect before experiencing it. The number of subjects was low. Nevertheless, these studies appear to give a good illustration of the subjective experience of verbal satiation.

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1 Elizabeth Severance and Margaret Washburn, "The Loss of Associative Power in Words after Long Fixation", American Journal of Psychology, Vol. 18, No. 2, April 1907, p. 182-186.

2 M. F. Bassett and C. J. Warne, "On the Lapse of Verbal Meaning with Repetition", American Journal of Psychology, Vol. 30, No. 4, October 1919, p. 415 - 418.

3 V. J. Don and H. P. Weld, "Lapse of Meaning with Visual Fixation", American Journal of Psychology, Vol. 35, No. 3, July 1924, p. 446 - 450.

In 1941, Mason[4] took readings of the galvanic skin response at intervals, while subjects repeated words aloud, signalling with a foot pedal when any apparent change of meaning occurred. Greater changes in GSR were recorded in those intervals in which change of meaning was signalled. Though no statistics of significance were employed, this technique gave greater objective validity to the subjective report of loss of meaning.

The study of Smith and Raygor[5] in 1956 appears to have been the first in which the experimenters did not rely on the subject's report, and also the first in which satiated words were compared with non-satiated control words. The stimulus words were chosen from the Kent-Rosanoff[6] list as being most likely to elicit "common" associations. After satiation by prolonged fixation, the words elicited significantly more "uncommon" associations than the control words.

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4 Molly Mason, "Changes in the Galvanic Skin Response Accompanying Reports of Changes in Meaning during Oral Repetition," Journal of General Psychology, Vol. 25, Second Half, October 1941, p. 353 - 401.

5 Donald E. P. Smith and Alton L. Raygor, "Verbal Satiation and Personality", Journal of Abnormal and Social Psychology, Vol. 52, No. 3, May 1956, p. 323 - 326.

6 G. H. Kent and A. J. Rosanoff, "A Study of Association in Insanity", American Journal of Insanity, Vol. 67, 1910, p. 37 - 96, and 317 - 390, quoted in idem.

Lambert and Jakobovits[7], in 1960 employed an even more objective and precise technique to measure the decay of meaningfulness, the Semantic Differential[8]. Five stimulus words were rated initially on nine scales of the Semantic Differential. Each word was satiated by oral repetition at the rate of approximately 2 or 3 per second, then rated on one of the scales. The 45 judgments were arranged in randomized order. The experimental group showed significantly greater drop in the polarity of ratings (i.e. in meaningfulness) than did control groups, who rerated the words immediately, or after 15" pause but without satiation, or who after satiation of one word rated a different word. Thinking the word silently also produced loss of meaningfulness. However, repeating silently the same phonetic syllables, but in reverse order, e.g. "nuka" for "canoe", did not. When other scales "meaningful-meaningless" and "comprehensible-incomprehensible" were included, there was significant movement towards the "meaningless" and "incomprehensible" poles, proving that the observed effect applied to the stimulus words only, not to the measuring instru-

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7 Wallace E. Lambert and Leon A. Jakobovits, "Verbal Satiation and Changes in the Intensity of Meaning", Journal of Experimental Psychology, Vol. 60, No. 6, December 1960, p. 376 - 383.

8 Charles E. Osgood, George J. Suci, and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois Press, 1957, vi - 342 p.

ment. The average amount of lapse of meaningfulness was only 21% of the possible total lapse to zero. The duration of the effect was not fully investigated, but a third rating after five minutes showed that it persisted at least this length of time.

Floyd[9], attempting to replicate this study, again demonstrated satiation of the basic stimulus words, though there was no generalization to words of similar meaning as predicted. Pillenbaum[10] did find evidence of such generalization, as words similar in meaning to the basic (satiated) words took less time to become meaningless on repetition, than did words remote in meaning.

A number of other studies were carried out by Lambert, Jakobovits and co-workers on various implications of verbal satiation. One study[11] found that in "compound" bilinguals the effect transferred from one language to the other to a significantly greater degree than in "co-ordinate" bilinguals. In paired-associate learning tasks, satiation impaired the

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9 Richard L. Floyd, "Semantic Satiation : Replication and Test of Further Implications", Psychological Reports, Vol. 11, No. 1, August 1962, p. 274.

10 Samuel Pillenbaum, "Semantic Generalization in Verbal Satiation", Psychological Reports, Vol. 13, No. 1, August 1963, p. 158.

11 Leon A. Jakobovits and Wallace E. Lambert, "Semantic Satiation among Bilinguals", Journal of Experimental Psychology, Vol. 62, No. 6, December 1961, p. 576 - 582.

ability to learn the word pairs[12, 13, 14]. This could be interpreted as being due to the consequent loss of meaningfulness; less meaningful material is more difficult to learn. Satiation decreased the number or relevant associations to satiated words as compared to non-satiated words[15]. Applied to numbers[16], satiation hindered performance in subsequent simple arithmetic tasks, as reflected in the increased latency. The effect was small, but the experimenters felt that greater disruption of performance would be obtained with more complex tasks. Some accumulative effect was noted over the length of the experiment, showing that satiation tended to persist.

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12 Leon A. Jakobovits and Wallace E. Lambert, "Mediated Satiation in Verbal Trasnfer", Journal of Experimental Psychology, Vol. 64, No. 4, October 1962, p. 346 - 351.

13 R. N. Kanungo, W. E. Lambert, and S. M. Mauer, "Semantic Satiation and Paired-Associate Learning", Journal of Experimental Psychology, Vol. 64, No.6, December 1962,p.600-607.

14 R. N. Kanungo and W. E. Lambert, "Paired-Associate Learning as a Function of Stimulus and Response Satiation", British Journal of Psychology, Vol. 54, No.2, May 1963,p.135-44.

15 -------- and --------, "Semantic Satiation and Meaningfulness", American Journal of Psychology, Vol. 76, No.3, September 1963, p. 421 - 428.

16 Leon A. Jakobovits and Wallace E. Lambert, "Semantic Satiation in an Addition Task", Canadian Journal of Psychology, Vol. 16, No. 2, June 1962, p. 112 - 119.

The findings of Warren[17,18,19] are also relevant here, though his technique differed from the other studies listed. The verbal stimuli were tape-recorded on a continuous loop, so that the subject heard the same words repeated continuously. "Verbal transformation" would occur so that the subject perceived apparent changes; e.g. the same speech sounds might reorganize to form different words, there might be changes in vowel or consonant, the subject might hear sounds which were absent or fail to hear sounds which were present. "Reversible" words might alternate in a manner analogous to visual reversible figures, e.g. "say" alternating with "ace".

Little has been done on the reliability of the satiation effect. Jakobovits[20] reports low test-retest reliability which he states is reminiscent of the low reliability of visual or kinesthetic satiation. A group of high school stu-

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17 Richard Warren, "Illusory Changes of Distinct Speech upon Repetition - the Verbal Transformation Effect", British Journal of Psychology, Vol. 52, No. 3, August 1961, p. 249 - 258.

18 --------, "Illusory Changes in Repeated Words: Differences between Young Adults and the Aged", American Journal of Psychology, Vol. 74, No. 4, December 1961, p.506-516.

19 -------- and Richard L. Gregory, "An Auditory Analogue of the Visual Reversible Figure", American Journal of Psychology, Vol. 71, No. 3, September 1958, p. 612 - 613.

20 Leon A. Jakobovits, The Effects of Repeated Stimulation upon Cognitive Aspects of Behavior: Some Studies on the Phenomenon of Semantic Satiation, unpublished Doctoral thesis presented to the University of McGill, 1962, ix- 171p.

dents, tested then retested one week later, obtained correlations of .32 (different forms) and .16 (same form), using the mean polarity difference score as a measure of satiation. He states that the low reliability may be partly attributable to the persistence of the effect. Split-half reliability was better, e.g. .57.

Other studies reporting positive findings on verbal satiation are listed later, because of their relevance to personality differences or to stimulus properties. A study by Reynierse and Barch[21] failed to produce satiation though conditions similar to other studies were employed. These authors also mention another study with negative results[22]. Satiation thus may not always be evident. Possibly this may be attributable to properties of the stimulus words or conditions, or to characteristics of the individual subjects.

2. Verbal Satiation and Stimulus Properties.

Don and Weld[23] had noted that words referring to specific objects retained their meaning longer. They used as stimuli a total of 250 common monosyllabic words. Such relationships

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21 James H. Reynierse and Abram M. Barch, "Semantic Satiation and Generalization", Psychological Reports, Vol. 13, No. 3, December 1963, p. 790.

22 D. R. Yelen and R. W. Schulz, "Verbal Satiation?" Journal of Verbal Learning and Verbal Behavior, Vol 1, 1963, p. 372 - 377, quoted in idem.

23 Op. cit.

were investigated by Wertheimer and Gillis[24,25]. Subjects fixated and silently repeated words which were projected on a screen, reporting when the meaning lapsed. The authors admitted that it was difficult for the subjects to maintain a constant criterion of the lapse of meaning. Significant relationships were however found. Those words retained their meaning longer which: were short (in number of letters), monosyllabic, occurred early in the experimental sequence, had sounds more "fitting" to the meaning, and, to a lesser extent, were of specific and objective rather than abstract referrent. Interaction of these factors seemed to be the rule. No relationship with frequence of occurence in the written language was found, though the authors had hypothesized that more frequently used words would retain meaning longer.

In his dissertation, Jakobovits[26] discusses this question of frequency. He states that the probable relationship is that meaningfulness would increase with repetition up to a certain critical point, thereafter decreasing. "Repetition" here would include all contacts with the word prior to the

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24 Michael Wertheimer, "The Relation between the Sound of a Word and its Meaning", American Journal of Psychology, Vol. 71, No. 2, June 1958, p. 412 - 415.

25 -------- and Willie Mae Gillis, "Satiation and the Rate of Lapse of Verbal Meaning", Journal of General Psychology, Vol. 59, First Half, July 1958, p. 79 - 85.

26 Op. cit.

experiment, during which the critical point is passed so that temporary decline in meaningfulness is observed. A relationship between word-count frequency and meaningfulness has been demonstrated by workers such as Noble[27], who used the associative value of the word, "m", as the measure of meaningfulness. No study has apparently attempted to determine the relationship between number of repetitions during the experiment and satiation, though this was held approximately constant by keeping the satiation time constant, in the later studies.

Complexity of the stimulus appears to be another factor, though Jakobovits'[28] results illustrating this depart from purely verbal material. Four types of stimulus were used: small objects, clear photos, under-exposed photos, and words, presumably lying along a continuum in this order from most to least complex. After prolonged fixation, the words declined in meaningfulness, the objects gained, while the other stimuli were intermediate.

Concurrent activity, as part of the experimental conditions, was found by Miller[29] to influence satiation. Using

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27 Clyde E. Noble, "The Meaning-Familiarity Relationship", Psychological Review, Vol. 60, No. 2, March 1953, p89-98.

28 Op. cit.

29 Arnold Miller, "Verbal Satiation and the Role of Concurrent Activity", Journal of Abnormal and Social Psychology, Vol. 66, No. 3, March 1963, p. 206 - 212.

as stimuls words referring to activities: "push", "pull", "lift" and "lower", he observed the reported duration of subjective meaning under four conditions: "concordant" activity (e.g. action of pushing accompanying "push"), "discordant" (e.g. action of pulling accompanying "push"), "tangential" (unrelated activity), and no activity. Any accompanying activity was found to prolong the duration, especially concordant activity, and most of all when accompanied by appropriate visual and tactile stimuli. Mean times, quoted in logs, corresponded to 7.9" for concordant, 6.0" for no activity.

3. Verbal Satiation and Individual Differences.

Few of the above studies were concerned with individual differences. Smith and Raygor[30] found greater satiation effect in "impermeables", a personality type based on questionnaire results, and said to correspond to Eysenck's introverts with high anxiety. A study in Jakobovits' dissertation[31] found no relationship with authoritarianism or persuasibility, but did find a negative correlation with grades in a language course (subjects were high school students). The high-grade group, in fact, demonstrated generation rather than satiation of meaningfulness. In another study, satiability was found to be negatively related to paired-associate learning ability.

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30 Op. cit.

31 Op. cit.

Das[32] also concluded that there is a negative relationship between satiability and a learning aptitude, from the high correlation with hypnotizability (-.667). Previous studies on hypnotizability led him to conclude that it contained a learning factor which correlated in the present instance. Thus low satiation should predict high learning ability. Das reports further that preliminary results of another study appear to confirm this. He also found high positive correlation with vigilance (.757), and some correlation with rigidity (.231). No significant relationship was found with Extraversion or Neuroticism.

Jakobovits[33] reported a relationship with age. In repeat trials, adults showed satiation effects from the first, whereas a group of high school students showed it significantly only in the second trial. Warren [34], who set out specifically to compare two age groups on "verbal transformation", found that the older group (age 62 - 86), showed relatively little of the effect compared to the younger group (age 18 - 25).

Other evidence that verbal satiability is an individual characteristic is the correlation of -.30 between the

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32 J. P. Das, "Hypnosis, Verbal Satiation, Vigilance, and Personality Factors", Journal of Abnormal and Social Psychology, Vol. 68, No. 1, January 1964, p. 72 - 78.

33 Op. cit.

34 Op. cit.

time individuals retained meaning in verbal satiation and their scores in kinesthetic after-effect, in a study by Wertheimer and Crow[35]. They concluded that greater "modifiability" was reflected both in greater verbal satiability and in larger after-effects.

To the writer's knowledge, there is no literature on verbal reminiscence. One must assume that in all the studies listed on verbal satiation, recovery of meaningfulness took place after the experiment. However, this recovery was not traced, and consequently no relationships with stimulus properties or with individual characteristics investigated. The persistence of verbal satiation is however mentioned briefly: Lambert and Jakobovits[36] note that it persisted at least 5 minutes, Das[37], using a longer satiation time, at least one hour.

4. Verbal Satiation and Satiation Theory.

In its effects, verbal satiation appears analogous to the phenomenon known as "stimulus satiation", i.e. the diminished effectiveness or distortion of e.g. visual or kines-

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35 Michael Wertheimer and Eleanor G. Crow, "Relation between Individual Differences in Figural After-Effects and in Rate of Lapse of Meaning of Words", Perceptual and Motor Skills, Vol. 9, No. 1, March 1959, p. 82.

36 Op. cit.

37 Op. cit.

thetic stimuli which are attended to for a prolonged time. The assumption by some researchers, illustrated by their bestowal of the term "satiation" upon the verbal phenomenon, seems to have been that verbal satiation can also be explained by satiation theory. Some of the major current theories are here discussed.

Current satistion theory appears to stem from that of Kohler and Wallach[38], who first applied the term. They assume an isomorphic relationship between stimulus and its projection on the cortex, and postulate a non-neural electrical current flowing through the brain as a result of the stimulus. If prolonged, this causes polarization or satiation of the cells, which therefore offer resistance to subsequent current. A test stimulus projected on the same area will be diminished in effectiveness or distorted, as reflected in after-effects. The process reverses during rest. Relatively little attention was however paid to the recovery ("reminiscence") phase. Though derived from visual studies, the implications of this theory can be extended to other modalities. Wertheimer and Gillis[39] suppose that neural traces of words and meanings may

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38 Wolfgang Kohler and Hans Wallach, "Figural After-Effects", Proceedings of the American Philosophical Society, Vol. 88, 1944, p. 269 - 357, quoted by H. Spitz, "Present Status of the Kohler-Wallach Theory of Satiation", Psychological Bulletin, Vol. 55, No. 1, January 1958, p. 1 - 28.

39 Op. cit.

undergo the same process in verbal satiation.

Osgood and Heyer[40], though accepting this theory in principle, objects to its postulation of non-neural electrical fields. Their "Statistical Theory" modifies it to be more in line with current neurophysiological knowledge. Thus a contour, perceived as a fine line, is presumed to be represented by maximal excitation (rate of neuronal firing) along its cortical projection, plus excitation of surrounding neurones, the latter varying in a normally distributed manner according to the transverse distance from the projection. Under constant fixation, the cells become differentially adapted. If the projection of the test figure is close to that of the inspection figure, the adaptation function of the latter subtracts from the excitation function of the former, producing after-effect.

Klein and Krech[41] also present a modified Kohler-Wallach theory, though they stress the converse concept of "cortical conductivity", i.e. the faculty of the cortex to transmit excitation among different areas or "dynamic systems". This conductivity is temporarily lowered by prolonged stimu-

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40 Charles E. Osgood and Albert W. Heyer Jr., "A New Interpretation of Figural Aftereffects", Psychological Review, Vol. 59, No. 2, March 1952, p. 98 - 118.

41 George S. Klein and David Krech, "Cortical Conductivity in the Brain-Injured", Journal of Personality, Vol. 21, No. 1, September 1952, p. 118 - 148.

lation. Individuals whose basal level of conductivity is below normal, e.g. the brain-injured, will show more rapid generation of after-effect, greater magnitude and slower dissipation. Wertheimer[42], basing his work also on the Kohler-Wallach theory, came to the opposite conclusion: that higher metabolic efficiency (greater "modifiability") should result in greater figural after-effects. Studies correlating after-effects with standard medical measures of metabolism appeared to support this; schizophrenics, for example, in whom he found metabolic efficiency to be lower than normal, also obtained lower visual and kinesthetic figural after-effects[43,44].

Some direct evidence that verbal satiation may be related to other satiation measures was given in the study of Wertheimer and Crow[45], who found positive correlation with kinesthetic after-effect. There are however conflicting results in relations between other satiation measures:Wertheimer[42]

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42 Michael Wertheimer, "Figural Aftereffects as a Measure of Metabolic Efficiency", Journal of Personality, Vol. 24, No. 1, September 1955, p. 56 - 75.

43 --------, "The Differential Satiability of Schizophrenic and Normal Subjects: a Test of a Deduction from the Theory of Figural Aftereffects", Journal of General Psychology, Vol. 51, Second Half, October 1954, p. 291 - 299.

44 -------- and C. Wesley Jackson Jr., "Figural After-Effects, "Brain Modifiability", and Schizophrenia: a Further Study", Journal of General Psychology, Vol. 57, First Half, July 1957, p. 45 - 54.

45 Op. cit.

did find a positive relationship between visual and kinesthetic aftereffects, but Spitz and Lipman[46] did not, though the reliability of both measures was satisfactory. They also found that the two aftereffects dissipated at a different rate. Such conflicting results suggest that satiation is a rather unstable phenomenon.

Further to discussing verbal satiation in the light of satiation theory, it is profitable to consider other theory which attributes both satiation and motor reactive inhibition to the same cortical process. This theory allows verbal satiation to be considered analogous to motor I_R, and gives a more adequate interpretation of verbal reminiscence. These aspects will be discussed in the next sections.

5. Verbal Satiation, Verbal Reminiscence and I_R.

Analogous to satiation is performance decrement during massed practice of a motor response. This is attributed to the hypothetical construct of "reactive inhibition" (I_R), a construct derived by Hull from the work of Pavlov:

> All responses leave behind in the physical structures involved in the evocation, a state or substance which acts directly to inhibit the evocation of the activity in question. The hypothetical inhibitory condition or substance is observable only through its effect upon positive reaction potentials. This nega-

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46 H. H. Spitz and R. S. Lipman, "Reliability and Intercorrelation of Individual Differences on Visual and Kinesthetic Figural Aftereffects", Perceptual and Motor Skills, Vol. 10, No. 3, June 1960, p. 159 - 166.

> tive action is called reactive inhibition. An increment of reactive inhibition (ΔI_R) is assumed to be generated by every repetition of the response (R), whether reinforced or not, and these increments are assumed to accumulate except as they spontaneously disintegrate with the passage of time[47].

Though Hull supposed a peripheral locus for I_R, other researchers, e.g. Ammons[48], demonstrated that a central locus must be involved.

In the interests of scientific parsimony, workers attempted to equate satiation and reactive inhibition. Kohler[49] had already suggested a similarity between his satiation and inhibition in learning theory. Duncan[50], reviewing various works on motor tasks and figural aftereffects, concluded that neural satiation and I_R were similar in perhaps all characteristics, and might refer to the same processes. They are both, he points out, similar in their source, their central locus,

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47 C. L. Hull, Principles of Behavior, New York, Appleton-Century-Crofts, 1943, x - 422p., quoted by H. J. Eysenck, The Dynamics of Anxiety and Hysteria, New York, Praeger, 1957, xiv - 311 p.

48 R. B. Ammons and C. H. Ammons, "Bilateral Transfer of Rotary Pursuit Skill", American Psychologist, Vol. 6, No. 7, July 1951, p. 294.

49 Wolfgang Kohler and Julia Fishback, "The Destruction of the Muller-Lyer Illusion in Repeated Trials: I An Examination of Two Theories", Journal of Experimental Psychology, Vol. 40, No. 2, April 1950, p. 267 - 281.

50 Carl P. Duncan, "On the Similarity between Reactive Inhibition and Neural Satiation", American Journal of Psychology, Vol. 69, No. 2, June 1956, p. 227 - 235.

their effects, and in their pattern of accumulation and dissipation with time. Eysenck[51], basing his work on that of Pavlov and Hull, derived a comprehensive theory in which both neural satiation and reactive inhibition are aspects of the same cortical mechanism: "cortical inhibition". When either stimuli (satiation) or responses (reactive inhibition) are presented or elicited in rapid succession for a time, cortical inhibition accumulates. With rest, it dissipates in the reminiscence phase. As Eysenck explains the sequence:

> If a motor or perceptual task is carried out by the subject under conditions of massed practice, i.e. without or with minimal rest pauses, then the theory demands that he should develop temporal inhibition; this inhibition, being a fatigue-like state, should interfere with performance, and should dissipate during rest after the termination of the scheduled performance. If, then, the subject were asked to resume practice after the rest pause, then his performance should appear to have improved when a comparison is made of his scores immediately before and immediately after the rest pause. This improvement, which has often been demonstrated experimentally, is technically known as reminiscence, and [...] can be most readily understood in terms of temporal inhibition[52].

In the light of this theory, verbal satiation and verbal reminiscence may be interpreted as the effect on meaningfulness of respectively the accumulation and dissipation of

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51 The Dynamics of Anxiety and Hysteria, op. cit.

52 H. J. Eysenck, Editor, Experiments with Drugs, New York, MacMillan, 1963, xii - 421 p.

a form of reactive inhibition. As such, these phenomena must be expected to follow the same pattern as I_R reflected in measures of performance and reminiscence in motor tasks.

Evidence in support of Eysenck's hypothesis is given in his numerous studies in which the extravert personality type, defined by other behavioural characteristics, differs from the introvert type consistently in both measures of satiation and of I_R (performance decrement and reminiscence). The latter measures were obtained on such tasks as the pursuit rotor.

It should be pointed out, however, that the issue is somewhat controversial. Not all other researchers have been able to duplicate his results. Becker[53] criticises his interchangeable use of the terms reactive inhibition, satiation, and cortical inhibition, saying he would be more justified in using the term "reactive cortical inhibition". In Becker's study, there was no evidence that satiation and I_R could be regarded as a unitary trait, though these did have some variance in common with basal cortical inhibition. Rechtschaffen[54] also found only negligible correlations between measures of

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53 Wesley C. Becker, "Cortical Inhibition and Extraversion-Introversion", Journal of Abnormal and Social Psychology, Vol. 61, No. 1, July 1960, p. 52 - 66.

54 Allan Rechtschaffen, "Satiation, Inhibition and Introversion-Extraversion", Journal of Abnormal and Social Psychology, Vol. 57, No. 3, November 1958, p. 283 - 291.

visual satiation and reactive inhibition. Eysenck[55] was able to answer some of these criticisms. Lipman and Spitz[56] on the other hand found that high and low kinesthetic satiators differed significantly on the inhibitory pattern on a rotary pursuit task, and concluded that the rate of dissipation of I_R was an important concomitant of satiation differences. Though they found significantly larger reminiscence in low satiators, apparently counter to Eysenckian theory, they explain this as due to the high satiators converting I_R to ${}_SI_R$, so that the low satiators built up greater amounts of I_R; this was then dissipated during rest, yielding greater reminiscence.

The issue of a unitary cortical inhibitory process is thus somewhat controversial. Unfortunately for present purposes, there is a lack of the direct evidence which would ensue from a study correlating verbal satiation and reminiscence with motor performance decrement and motor reminiscence respectively. Evidence from those few studies which relate verbal satiation and other behavioural characteristics are somewhat

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55 H. J. Eysenck, "Comments on a Test of the Personality-Satiation-Inhibition Theory", Psychological Reports, Vol. 5, No. 3, September 1959, p. 395 - 396.

56 Ronald S. Lipman and Herman H. Spitz, "The Relationship between Kinesthetic Satiation and Inhibition in Rotary Pursuit Performance", Journal of Experimental Psychology, Vol. 62, No. 5, November 1961, p. 468 - 475.

inconclusive. The finding of Das[57] that subjects high in verbal satiation also tended to be high in vigilance appears to contradict the assumption that verbal satiation is a form of inhibition; one would expect the opposite relationship, that susceptibility to inhibition would lead to low vigilance and high satiation concomitantly. Das points out however that in the verbal satiation portion of his experiment, more intense attention to the verbal stimuli (presumably by the more highly vigilant subjects) would produce greater loss of meaning.

Smith and Raygor[58] found greater satiation effect in the "impermeable" personality type than in the "permeable". If these types correspond to "introvert" and "extravert" respectively, the finding opposes Eysenckian personality theory, according to which extraverts are more susceptible to inhibition.

Another element of confusion is introduced by evidence that satiation does not always occur with prolonged stimulation, though by satiation theory or by inhibition theory it would be expected to occur invariably. Petrie[59] found that in some subjects "augmentation" occurred under the same

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57 Op. cit.

58 Op. cit.

59 Asenath Petrie, "Some Psychological Aspects of Pain and the Relief of Suffering", Annals of the New York Academy of Sciences, Vol.86, Art.1, March 1960, p. 13 - 28.

conditions which produced kinesthetic satiation in other subjects. Rotman[60] also found augmentation in some tasks, though this did not appear to generalize from one modality to another within individuals. In verbal satiation, Jakobovits [61] found some evidences of augmentation. He concluded that the relationship of satiation and augmentation is a function of various factors: (i) frequency of repetition; up to a certain critical point the word gains in meaning, and beyond it declines; (ii) personality characteristics; for some individuals, the c critical point is later, so that they may be augmenting while other subjects are satiating. (iii) properties of the stimulus; a more complex stimulus would gain meaning for a longer time than a less complex one. Possibly some extension or modification of the Eysenckian cortical inhibition theory would be necessary to explain augmentation fully. The answer may lie in individual tolerance to inhibition among other factors.

Lambert and Jakobovits, in their series of studies on verbal satiation (e.g. that of 1960[62]), give an interpretation

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60 Bertram T. Rotman, Sensory Augmentation: a Possible Extension of the Eysenckian Theory of Introversion-Extraversion, unpublished Doctoral thesis presented to the University of Ottawa, 1964, vii - 79p.

61 Op. cit.

62 Op. cit.

of it which appears congruent with that which can be derived from the Eysenckian hypothesis: they regard it as "a cognitive form of reactive inhibition". To derive this they do not find it fruitful to explore theories of satiation (note however that they retain the term "satiation"), but invoke a theory of verbal meaning which provides a strong link between verbal behaviour and learning theory. To introduce their position, some discussion of theories of meaning is relevant.

6. Verbal Satiation and Theory of Meaning.

Only some few theories pertinent to the present study will be discussed. The earliest studies on verbal satiation were carried out by students of Titchener, who developed the context theory of meaning[63]. For him, meaning was the imaginal context that accrues to the initial sensory perception. Though the studies gave more attention to the subjective experience than to discussing verbal satiation in the light of the theory, the implication was that the link between imaginal and sensory aspects of the stimulus word became disrupted. Weaknesses of the image theory have later become apparent: many people do not report images, even though understanding words; for many of those who do, the image is highly personalized,

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63 Edward Bradford Titchener, Lectures on the Experimental Psychology of the Thought Process, New York, MacMillan, 1909, (no pagination), as quoted in Edwin G. Boring, A History of Experimental Psychology. second edition, New York, Appleton-Century-Crofts, 1950, p. 415 - 416.

not representing essential attributes; images of generic words were difficult to postulate.

With the advent of behaviourism the similarity was noted between the acquisition of meaning through repeated association and classical conditioning. Watson[64] concluded that association led to a transfer of behaviour from object (unconditioned stimulus) to word (conditioned stimulus). The response, which constituted the meaning, was not necessarily overt, but could be implicit, involving minute muscle currents in corresponding muscles or in the vocal apparatus. The work of Jacobson[65] appeared to support this, though it was not possible to demonstrate these minute currents in all instances, nor to find characteristic patterns differentiating one word from another. Another criticism is that the theory would point to the same and invariant response to the word as to the original object. Such weaknesses did not however detract from the validity of regarding language as a form of conditioned behaviour. Coper and Foley[66] describe a number of experi-

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64 J. B. Watson, Behaviorism, New York, People's Institute, 1924, (no pagination), as quoted by Roger Brown, Words and Things, Glencoe, Free Press, 1958, p. 93 - 97.

65 Edmund Jacobson, "Electrophysiology of Mental Activities", American Journal of Psychology, Vol. 44, No. 4, October 1932, p. 677 - 694.

66 Charles N. Coper and John P. Foley Jr., "Mediated Generalization and the Interpretation of Verbal Behavior", Psychological Review, Vol.49, No.6, November 1942, p.513-540.

ments in support of this and of their hypothesis that verbal meaning is mediated by internal processes and thus may be generalized from one context to another. These internal processes are responses, and therefore behave similarly to any response.

Influenced by Hullian learning theory, Osgood[67] refined the behaviouristic approach. In his representational-mediation theory, meaning is a response (or set of responses) which constitutes some fraction of the total response to the original stimulus object, i.e. representational of the latter. The internal response produces an internal stimulus which mediates the appropriate external behaviour. The internal process is acquired by association of the word with the original stimulus object, or with other words which have previously acquired meaning. The internal process is analogous to Hull's "pure stimulus acts" or "fractional antedating goal responses"[68]. Osgood explicitly leaves open the question of the nature of the process, though he appears to lean towards regarding them as neural events rather than actual muscular contractions or glandular secretions. From examples given,

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67 Charles E. Osgood, George J. Suci and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois Press, 1957, vi - 342 p.

68 Ernest R. Hilgard, "Hull's Systematic Behavior Theory", in --------, Theories of Learning, Second Edition, New York, Appleton-Century-Crofts, 1956, p. 121 - 184.

the internal process may equally well represent autonomic or instrumental responses.

There is considerable support for the theory in the literature. Mowrer[69] demonstrates that the sentence is a form of conditioning technique by which mediation processes are transferred from the predicate (unconditioned stimulus) to the subject (conditioned stimulus). Meaning is thus acquired in the mind of the hearer. He further points out that the concept of mediation is widely recognized, not just invented by Osgood to explain meaning. In a number of experments, Staats et al[70,71,72] demonstrate that words or nonsense syllables can acquire meaning, without the awareness of the subject, by association with a number of adjectives havan element in common e.g. positive evaluation. In another study, in which the number of such associations was varied,

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69 O. Hobart Mowrer, "The Psychologist Looks at Language", American Psychologist, Vol. 9, No. 11, November 1954, p. 660 - 694.

70 Arthur W. Staats and Carolyn K. Staats, "Meaning Established by Classical Conditioning", Journal of Experimental Psychology, Vol. 54, No. 1, July 1957, p. 74 - 80.

71 --------, --------, and Donald A. Biggs, "Meaning of Verbal Stimuli Changed by Conditioning", American Journal of Psychology, Vol. 71, No. 2, June 1958, p. 429 - 431.

72 --------, --------, William G. Heard and Larry P. Nims, "Replication Report: Meaning Established by Classical Conditioning", Journal of Experimental Psychology, Vol. 57, No. 1, January 1959, p. 64.

they demonstrated that the intensity of the acquired meaning was a function of that number[73]. They concluded that meaning is a response which follows the general laws of conditioning.

Support for the mediation aspect of the theory is given by studies demonstrating generalization of e.g. a lever-pressing response[74] or a conditioned GSR[75] to words as a decreasing function of their semantic distance from the original word. This agrees with the theoretical prediction, as the more similar the test word, the more mediators it should have in common, hence stronger generalization of conditioning.

Osgood's theory of meaning is that adopted by Lambert and Jakobovits in their work on verbal satiation. As outlined in their study of 1960[76], each repetition of the stimulus word may be supposed to elicit the representational-mediation process. This rapidly repeated elicitation produces a "cognitive form of reactive inhibition", just as I_R is produced when any

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73 Arthur W. Staats and Carolyn K. Staats, "Effect of the Number of Trials on the Language Conditioning of Meaning", Journal of General Psychology, Vol. 61, First Half, July 1959, p. 221 - 223.

74 Charles F. Dicken, "Connotative Meaning as a Determinant of Stimulus Generalization", Psychological Monographs, Vol. 75, No. 1, Whole No. 505, 1961, 27 p.

75 Laura W. Phillips, "Mediated Verbal Similarity as a Determinant of the Generalization of a Conditioned GSR", Journal of Experimental Psychology, Vol. 55, No. 1, January 1958, p. 56 - 62.

76 Op. cit.

response is elicited in rapid repetition. The I_R decreases the availability of the mediators, resulting in partial loss of meaningfulness, and impairing any cognitive process utilizing these mediators. The series of experiments by these authors and co-workers, listed earlier (p. 5 - 6), in which verbal satiation impaired subsequent paired-associate learning was felt by them to be consistent with this interpretation. One study in particular demonstrated that satiation not of the paired words themselves but of inferred mediating words could lead to proactive interference[77].

Floyd[78] attempted to test implications of this interpretation of verbal satiation, by observing whether it generalized to words of similar meaning. He was unable to demonstrate this, though Fillenbaum [79] did find generalization. Reynierse and Barch[80], who set out to test for generalization, were unable even to produce satiation of the basic words. Thus supportive evidence by generalization of verbal satiation is somewhat doubtful. It may be especially difficult to demonstrate, perhaps for reasons such as meaning being retained

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77 Jakobovits and Lambert, "Mediated Satiation in Verbal Transfer", op. cit.

78 Op. cit.

79 Op. cit.

80 Op. cit.

by other mediators not in common with the satiated word.

In view of the central locus of reactive inhibition, it is also relevant here to mention Lambert and Jakobovits'[81] attempt to demonstrate a central locus for the cognitive I_R. This involved having a control group think (silently) the same phonetic syllables as the experimental group, but in reverse order, thus involving different mediating processes. The subsequent drop in meaningfulness of the test word for the experimental group but not for the controls ruled out the possibility that satiation was due to implicit sub-vocal movements. Miller[82] raises the criticism however that this does not necessarily prove central locus, as it ignores the possible role of other peripheral implicit movements. His study, in which concurrent activity facilitated the retention of verbal meaning under satiation conditions, gives support to the idea of specific "body referrents" underlying the meaning of words. He concedes that it would be difficult to locate them in order to test the idea directly, and as his study only includes simple action verbs, it would be difficult to generalize from it.

In the present study, the writer will adopt the position, which can be derived either through Eysenckian theory

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81 Op. cit.

82 Op. cit.

of cortical inhibition or through Osgood's theory of meaning, that verbal satiation is due to a form of I_R. It follows that verbal reminiscence reflects the dissipation of this I_R, just as motor reminiscence reflects the dissipation of motor I_R, and that also verbal and motor reminiscence should prove to be analogous in all respects.

The next section will discuss findings in which motor reminiscence has differentiated psychotics from other groups.

7. Motor Reminiscence and Schizophrenia.

The hypothesis that susceptibility to inhibition may be an important personality variable originated with Pavlov[83]. Eysenck's work has validated and expanded this hypothesis. He has demonstrated that the introvert and extravert personality types (presumably corresponding to Pavlov's excitatory and inhibitory types) can be differentiated on measures of I_R. Motor reminiscence, previously defined, is one such measure.[84]

Pavlov had also presented a hypothesis regarding inhibition in schizophrenics[85]. Because of their excessive

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83 I. P. Pavlov, Conditioned Reflexes, London, Oxford University Press, 1927, (no pagination), quoted by H. J. Eysenck, "Reminiscence, Drive, and Personality Theory", Journal of Abnormal and Social Psychology, Vol. 53, No. 3, November 1956, p. 328 - 333.

84 Ibid.

85 R. Lynn, "Russian Theory and Research on Schizophrenia", Psychological Bulletin, Vol. 60, No. 5, September 1963, p. 486 - 498.

sensitivity to stimulation, they were prone to "protective inhibition", which protected their "weak nervous system" from being overloaded. Venables and Tizard[86] found evidence to support the idea that schizophrenics have an exaggerated tendency to develop I_R. In a following study, Venables[87] made the suggestion that it is the rate of dissipation, rather than the absolute level of inhibition, which is important in the performance of schizophrenics.

Eysenck[88] elaborates this hypothesis more fully, concluding that psychotic reactions are characterized by excessive slowness of dissipation of I_R. (It must be noted that he includes all psychotic categories in this hypothesis, not schizophrenics alone, presuming the slowness of dissipation of I_R to be a correlate of the psychoticism dimension of personality; it should thus differentiate psychotics from normals or neurotics). In this article, Eysenck presents preliminary evidence in support of this hypothesis; this is listed below. He points out the value of reminiscence measures in testing

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86 P. H. Venables and J. Tizard, "Performance of Functional Psychotics on a Repetitive Task", Journal of Abnormal and Social Psychology, Vol. 53, No. 1, July 1956, p. 23 - 26.

87 P. H. Venables, "Factors in the Motor Behavior of Functional Psychotics", Journal of Abnormal and Social Psychology, Vol. 58, No. 2, March 1959, p. 153 - 156.

88 H. J. Eysenck, "Psychosis, Drive and Inhibition: a Theoretical and Experimental Account", American Journal of Psychiatry, Vol. 118, No. 3, September 1961, p. 198 - 204.

it; if it is correct, psychotics would show little or no reminiscence after short rest periods, though it would be observed in individuals who dissipate I_R at the faster normal rate. After prolonged rest periods, even psychotics would show reminiscence.

The hypothesis is an important one because of its bearing on psychotic behaviour in other ways. As Eysenck points out in this article, inhibitory factors can be shown to account for two characteristic psychotic traits: their slow performance in problem-solving, and their apparent lack of motivation. Regarding the latter, which is relevant in the present study, Eysenck follows Kimble[89] to point out that, with increasing amounts of massed practice, I_R can develop only up to the level of drive. At that point an involuntary rest pause must take place, so that I_R begins to dissipate until again performance is resumed; this recommences to generate I_R up until the next involuntary rest pause. That is to say, the level of I_R is held at a point equivalent to the level of drive. The amount of reminiscence is therefore a measure of drive, providing that the massed practice and rest are sufficient. As shown in some of the studies listed below, the fact that reminiscence can be obtained in psychotics after

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89 A. Kimble, "An Experimental Test of a Two-Factor Theory of Inhibition", Journal of Experimental Psychology, Vol. 39, No. 1, February 1949, p. 15 - 23.

a long rest proves that their apparent lack of motivation is not what it appears to be, but is due to inhibitory factors.

After short rests following massed practice, various studies show that psychotics obtain little or no reminiscence. Broadhurst and Broadhurst[90] demonstrated the complete failure of chronic schizophrenics and manic-depressives to show reminiscence effects on the pursuit-rotor. Claridge[91], who took a number of behavioural measures on groups of normals, dysthymics, hysterics and schizophrenics, found a very low level of reminiscence in the latter after 10 minute rests. In many measures, the schizophrenics behaved similarly to the hysterics, except for longer duration of after-effect on the Archimedes spiral. The experiment was not designed to test different rates of dissipation of I_R -- as Claridge points out, in some of his measures the absolute level, rate of growth and speed of decay of inhibitory processes might all appear to have similar effects -- but he concluded that a slower rate of dissipation of I_R in schizophrenics would account most consistently for all the results; even though both schizophrenics

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90 A. Broadhurst and P. Broadhurst, (no title), Bulletin of the British Psychological Society, Vol. 37, 1959, quoted by H. J. Eysenck, "Psychosis, Drive and Inhibition....", op. cit.

91 Gordon Claridge, "The Excitation-Inhibition Balance in Neurotics", in H. J. Eysenck, Editor, Experiments In Personality, Volume Two, New York, Humanities, 1960, p.107-154.

and hysterics appeared to have high levels of inhibition, different inhibitory processes were important: in hysterics inhibitory growth rate rather than decay rate had been more frequently emphasized.

Ley[92] compared two groups of psychotics on the pursuit-rotor, measuring reminiscence after 10 minutes and 24 hours, and similarly two groups of normals. After the short rest the normals had significantly high positive reminiscence scores, but the psychotics' reminiscence was practically equal to zero. After the long rest the reminiscence scores of the normals were somewhat lower than after the short rest, while those of the psychotics were higher than either of the normals' scores. Each group contained only 10 subjects, however.

Studies by Rachman[93,94] obtained similar results with male chronic schizophrenics, using the pursuit-rotor, and rest-intervals of the same length as the previous study. Again reminiscence scores after the long rest were significantly higher than after the short rest.

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92 Ley, unpublished study quoted by H. J. Eysenck, "Psychosis, Drive and Inhibition ...", op. cit.

93 S. Rachman, (no title), Journal of Mental Science, (in press at time quoted), quoted by H. J. Eysenck, ibid.

94 --------, "Inhibition and Disinhibition in Schizophrenics", Archives of General Psychiatry, Vol. 8, No. 1, 1963, p. 91 - 98, quoted in Psychological Abstracts, Vol. 38, No. 2, April 1964, p. 319.

In a later article, Eysenck[95] quotes an experiment which strongly supports his hypothesis. Again two groups of schizophrenics and of normals were used, and reminiscence scores on the pursuit-rotor obtained after 10 minutes and 24 hours respectively. After 24 hours, the schizophrenics showed even greater reminiscence than did the normals. He presumes that 10 minutes may be enough for normal people, i.e. to allow dissipation of I_R, but not enough for schizophrenics.

The studies listed above support the hypothesis of slower dissipation of I_R in psychotics. To restate the conclusion as applying to a schizophrenic sample such as will be used in the present study: schizophrenics dissipate I_R at a slower rate than non-psychotics, as reflected in motor reminiscence after short and long rest-intervals.

8. Verbal Reminiscence and Schizophrenia: the Hypothesis.

Drawing upon conclusions reached in the previous discussion: (i) Verbal satiation is due to a cognitive form of I_R analogous to motor I_R;

(ii) Schizophrenics dissipate I_R at a slower rate than non-psychotics, as reflected in motor reminiscence; the following hypothesis may be made: Schizophrenics dissipate

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95 H. J. Eysenck, "The Measurement of Motivation", Scientific American, Vol. 208, No. 5, May 1963, p. 130 - 140.

cognitive I_R at a slower rate than non-psychotics as reflected in verbal reminiscence after short and long rest-intervals. This is the hypothesis to be tested in the present study.(The manner of testing this, and the form of the hypothesis for statistical analysis will be discussed in the next chapter.)

The present study may make a contribution in some of the following ways. It will attempt to validate in another modality, viz. verbal, a hypothesis regarding basic processes which has an important bearing on psychotic behaviour. The verbal area is of special interest because disturbances in verbal manipulation and communication are characteristic of schizophrenia. The experiment may also add to the body of knowledge linking verbal with other behaviour, thus demonstrating it to be subject to the same laws derived from learning theory. It also investigates an aspect of verbal satiation not previously investigated, its dissipation as reflected in verbal reminiscence.

As the present study involves some relatively unexplored areas in which no parameters have been derived, it is relevant to discuss in general terms some factors involved in testing the hypothesis. Some assumptions must be made by analogy with findings in studies employing motor performance. The experiment must comprise taking a measure of verbal meaningfulness immediately after verbal satiation, again after a short rest, than again after a long rest. A learning equation

must be presumed to apply in this situation, such as Jones' revision of the Hullian equation:

$$_{S}\bar{E}_{R} = f(D - I_R) \times ({}_{S}H_R - {}_{S}I_R)$$ [96]

In the present situation, reaction potential, $_{S}\bar{E}_{R}$, would be reflected in the measure of meaningfulness. Habit strength, $_{S}H_R$, would refer to basal meaningfulness acquired by past experience with the stimulus words. The other elements would have their usual meanings, being drive (D) and inhibition factors (I_R and $_{S}I_R$). As previously discussed, the satiation procedure and subsequent rest would affect the amount of I_R present. The amount of reminiscence observed might be influenced by some of the following factors:

(1) Habit strength at the beginning of the experiment, and subsequently following satiation, when it would be lower if any conditioned inhibition had been generated. Though past exposure to the words is likely to differ among individuals, on the whole one may assume it to be equivalent for the groups. Johnson[97] finds some loss of meaningfulness of words in psychotics, but he points out that much is retained,

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96 H. Gwynne Jones, "Learning and Abnormal Behaviour," in H. J. Eysenck, Editor, Handbook of Abnormal Psychology, New York, Basic Books, 1961, p. 488 - 528.

97 Ronald C. Johnson, Robert L. Weiss, and Paul F. Zelhart, "Similarities and Differences Between Normal and Psychotic Subjects in Responses to Verbal Stimuli", Journal of Abnormal and Social Psychology, Vol. 68, No. 2, February 1964, p. 221 - 226.

as verbal meaning is over-learned and relatively stable. The levels of meaningfulness following satiation, i.e. at the point where reminiscence begins, can be compared for the groups, so as to check the assumption that they begin at the same level.

(ii) Drive. Any difference in this might result in greater reminiscence in the high-drive group, i.e. if satiation were sufficient to surpass the drive level in the low-drive group. Once past this level, the high-drive group would continue to generate I_R during satiation, whereas the low-drive group would have reached a zero level of meaningfulness. However, if Eysenck's findings are accepted that the apparently low motivation of psychotics is really due to inhibitory factors[98], then an equivalent level of drive may be assumed for the groups in the experiment.

(iii) Satiation time. Here one can be guided by past experiments in choosing a time likely to produce a drop in meaningfulness, assuming that it will also be effective with the present type of subject, e.g. schizophrenics, with whom to the writer's knowledge there has been no previous work on verbal satiation. Reminiscence can be obtained if any I_R is produced, though it would be increased, up to a certain point, if satiation time is prolonged so as to produce more I_R.

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98 "Psychosis, Drive and Inhibition", op. cit.

(iv) Susceptibility to I_R. The more susceptible individuals will show a greater drop, whether from I_R alone, or from I_R plus gI_R. The more I_R produced, the greater reminiscence possible. If the hypothesis of greater susceptibility in schizophrenics is correct, their reminiscence scores may be raised. Here again, comparison of the levels of meaningfulness of the groups immediately after satiation would show whether this factor need be considered in evaluating the results.

(v) The length of the short and long rest intervals. The choice of times is crucial to the experiment, as they must be such that the short time allows complete or almost complete dissipation of I_R in individuals dissipating it at the normal rate, but yet is too short to allow significant reminiscence in the slow dissipators. The long interval must allow even the latter to achieve complete dissipation of I_R. There is little in the literature to dictate the choice of times for verbal reminiscence, the best guide probably being the 10-minute and 24-hour times of the motor experiments mentioned previously.

There is however a difference in the quality of the "rest" between motor experiments and this study. As the former involve an unusual activity, e.g. pursuit-rotor, inverted alphabet printing, the subject is unlikely to practise this during the rest. In a verbal study, on the other hand, there

is no guarantee that he does not come in contact with the stimulus words, or think of them, during the rest-interval. This would have to be ignored, on the assumption that the likelihood is equivalent for all groups, and that also the smaller amounts of I_R generated in such spasmodic contacts would have relatively little effect when compared to that generated by the satiation procedure.

(vi) Conditioned inhibition generated during the experiment. If the measure of meaningfulness employed were instantaneous, this factor would have little effect on any reminiscence. If not, some "warm-up" rise in meaningfulness, due to the dissipation of this $_SI_R$, might enter into the score. As the experiment will necessarily have to include a number of stimulus words, and the measuring procedure will necessitate further contact with these words over a short length of time, it is possible that this factor could operate. Again the assumption must be made that it will balance out between the groups, and that any reminiscence obtained reflects mostly the dissipation of I_R.

(vii) Rate of dissipation of I_R. This is the factor under investigation in the present study. If other factors can be assumed to be equivalent for all groups, and if all conditions are suitably chosen, the experiment to be outlined in the following chapter should test the difference in the rate of dissipation of I_R between schizophrenics and non-

psychotics.

9. Summary of Chapter I.

This chapter reviewed studies on verbal satiation, then from theoretical considerations derived the conclusion that it is due to a form of reactive inhibition. By analogy with motor reminiscence studies, the hypothesis was drawn that schizophrenics should dissipate this reactive inhibition more slowly than non-psychotics, as reflected in verbal reminiscence.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter will describe the experimental conditions (section 1), the subjects (2), the measuring instrument (3), the administrative procedure (4), and the statistical techniques to be employed (5).

1. Experimental Conditions.

As outlined previously, testing the hypothesis necessitates a technique for producing verbal satiation in stimulus words, measuring meaningfulness at that point, then again after a short rest, and once more after a long rest.

The technique chosen was that of repetition, subjects being asked to repeat the stimulus words rapidly aloud, for a time of 20". This time is slightly longer than the 15" used by Lambert and Jakobovits[1], upon whose procedure the present experiment was largely modelled. It was thought advisable to lengthen the time slightly because in a pilot study subjects, drawn from the same hospital population as the present sample, would repeat the words at a rather slower rate than the 2 - 3 per second used by those researchers. The time could not however be greatly increased for fear of prolonging the sessions unduly, with attendant increase in fatigue and boredom.

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1 Wallace E. Lambert and Leon A. Jakobovits, "Verbal Satiation and Changes in the Intensity of Meaning", Journal of Experimental Psychology, Vol. 60, No. 6, December 1960, p. 376 - 383.

For the rest-intervals, times of 15 minutes and 24 hours were chosen. The time was extended to 15 rather than the 10 minutes of Eysenck's motor experiments[2], mainly because this time made it easier to include a vocabulary scale within the rest interval as well as some genuine rest. The vocabulary scale was included as an index of general intelligence and verbal ability. The times were taken from the end of one section to the beginning of the next.

For each subject undergoing the full experimental procedure, the experiment began with the satiation. No measurement of meaningfulness was taken before this. Though such a measurement would have allowed the basal level of meaningfulness to be established, and thus any drop due to satiation, it was decided to sacrifice this rather than prolong the session with a fourth section, which would again risk creating further fatigue. As the experiment set out to observe reminiscence rather than satiation, this was in any case considered non-essential.

All experimental work was carried out by the writer. Subjects were interviewed in private and reasonably quiet surroundings, e.g. office or ward sitting-room.

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2 H. J. Eysenck, "Psychosis, Drive and Inhibition: a Theoretical and Experimental Account", American Journal of Psychiatry, Vol. 118, No. 3, September 1961, p. 198 - 204.

2. The Subjects.

The final population comprised 90 subjects, all male patients recently admitted to a Canadian provincial mental hospital. This total was composed of three groups of 30 each, designated the "schizophrenic", "non-psychotic", and "non-satiated" groups. The manner of allotting subjects to these groups is described below. The first two groups received the full experimental procedure, and were to be compared with each other in order to test the main hypothesis of this study. The third group was included as a control group, in order to test the efficacy of the technique in producing verbal reminiscence in the other groups; thus this group received the same procedure with the exception of prior satiation of the stimulus words.

By using for comparison with the schizophrenics other hospitalized subjects, it was hoped to equate as far as possible other variables such as being in (mental) hospital, medication etc. As to the latter, patients could not be taken off medication because of interference with their treatment program, as would have been ideal for experimental purposes. Certain drugs have been shown to have an effect on inhibitory processes[3]. The effect of the medication could not be

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3 H. J. Eysenck, Editor, Experiments with Drugs, New York, MacMillan, 1963, xii - 421 p.

accurately predicted in this instance. Most patients were on one or other of the tranquilizing medications, e.g. stellazine, largactil, librium, and some few on mood elevators such as elavil, in varying dosages. If these had an effect similar to central nervous system depressant drugs, as in some of the studies, one might predict that they would cause slower dissipation of I_R. Eysenck states that as yet no effect upon (motor) reminiscence has been noted, in comparing introverts with extraverts, but points out that to demonstrate this a fortunate choice of rest-times etc would be necessary[4]. For present purposes, this variable will be assumed to be equivalent in all groups.

Males only were included, in order to avoid complication due to known sex differences in verbal behaviour generally[5], and in satiation phenomena[6].

Subjects were approached only if from the admission documents they were of at least Grade 7 education, not over 60 or under 16 years of age, and not known to be defective, or suffering from an organic condition or psychosis other

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4 Experiments with Drugs, op. cit., p. 22.

5 Leona E. Tyler, "Sex Differences", in --------, The Psychology of Human Differences, Second Edition, New York, Appleton-Century-Crofts, 1956, p. 247 - 275.

6 Richard P. Barthol, "Individual and Sex Differences in Cortical Conductivity", Journal of Personality, Vol. 26, No. 3, September 1958, p. 365 - 378.

than schizophrenia. Of those approached, some few had to be excluded because of refusal or inability to carry out the instructions, e.g. due to poor vision, or to being too confused or preoccupied. All those able to complete the procedure were accepted, even though in some instances verbalizing irrelevant reasons for their responses. As part of the administration, the Binet Vocabulary Scale, form L - M[7], was given. The results of those scoring below 17 were excluded. This figure was chosen as being the score necessary to pass the 14-year level, corresponding approximately to the dull-normal level in adults. By this means it was hoped to exclude mental defectives, or those of low verbal ability. No subjects were rejected for any reason other than these. Recently admitted patients, whether admitted for the first time or otherwise, were seen until the required numbers were obtained. For the most part subjects were seen within a few days of admission, though some few were seen at times up to one month.

The Schizophrenic group contained patients of schizophrenic diagnosis, any subcategory, the Non-Psychotic group those of any non-psychotic diagnosis other than defective or organic, and the Non-Satiated group held 15 schizophrenics and 15 non-psychotics. Table I lists the accepted diagnoses,

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7 Lewis M. Terman and Maud A. Merrill, Stanford-Binet Intelligence Scale, Manual for the Third Revision Form L - M, Cambridge, Riverside Press, 1960, xi - 365 p.

Table I.-
Diagnoses Included in Schizophrenic, Non-Psychotic, and Non-Satiated Groups.

Diagnoses[a] (Schizophrenic)	Schiz. Group (N = 30) n	Non-Sat.[b] Group (N = 15) n	Diagnoses[a] (Non-Psychotic)	Non-Psy. Group (N = 30) n	Non-Sat.[b] Group (N = 15) n
300 Schizophrenic			310-318 Psychoneurotic		
300.0 Simple	1	1	313 Obsessive-Compulsive	--	1
300.1 Hebephrenic	--	--	314 Neurotic Depressive	3	1
300.2 Catatonic	11	5	318.4 Mixed Neurotic	2	--
300.3 Paranoid	8	3			
300.4 Acute Reaction	1	--	320-323, 326, Disorders		
300.5 Latent	1	1	of Character and Behaviour		
300.6 Schizoaffective	2	1	320.4 Antisocial	1	--
300.7 Unspecified	6	4	320.6 Sex Deviate	2	1
			321.2 Immature, Aggressive	2	2
			322.1 Chronic Alcoholic	18	9
			323 Other Drug Addiction	--	1
			353 Epilepsy		
			353.1 Grand Mal	1	--
			793.0 Observation Without Need for Further Care	1	--

a Canadian classification of mental illness.
b The Non-Satiated group comprised 15 of schizophrenic and 15 of non-psychotic diagnoses.

as well as the numbers actually obtained of each. The diagnosis for each subject was that entered in the hospital records, and as decided by the diagnostic conference of psychiatrists and other staff on the male service. The subject's scores in the present study played no part in influencing the diagnosis. The diagnostic categories are those of the Canadian classification of mental illness[8]. As the diagnostic conference was usually not held until some three to four weeks after admission, testing was for the majority of subjects carried out before diagnosis. In most cases it was clear however, from the case history, admission documents or behaviour, which diagnosis would probably be entered. The results of those subsequently diagnosed in other non-acceptable categories, e.g. manic-depressive, were excluded.

Table II gives the mean ages, years of education and vocabulary scores of the groups. The groups were compared for each of these by analyses of variance, and were not shown to deviate significantly. The means of education and vocabulary are very close. The Non-Psychotic group is however somewhat older than the others, and actually if compared with the Schizophrenic group alone (the other experimental group), the mean difference of 6.79 years is significant ($t = 2.48$, $p < .02$).

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8 Dominion Bureau of Statistics, Health and Welfare Division, Mental Statistics Handbook, Second Edition, Ottawa, Queen's Printer, 1954, 79p.

Table II.-
Ages, Years of Education, and Vocabulary Scores of the Schizophrenic, Non-Psychotic, and Non-Satiated Groups.

	Schizophrenic Group		Non-Psychotic Group		Non-Satiated Group		F
	M	σ	M	σ	M	σ	
Age	30.980	10.567	37.770	10.318	33.920	10.656	3.042[a]
Educ.	10.800	1.833	10.100	2.314	10.667	2.413	0.827[a]
Vocab.	23.967	5.431	24.000	5.657	23.333	5.491	0.134[a]

a Not significant.

3. The Measuring Instrument: The Semantic Differential[9]

In order to observe any changes in meaningfulness occurring during the experiment, four stimulus words were rated on four scales of the Semantic Differential (a total of 16 judgments), at each of the various stages.

The Semantic Differential technique was designed as a measure of some aspects of connotative meaning. It consists of a number of scales, each composed of a pair of adjectives opposite in meaning, e.g. good - bad, with seven scale positions between them. These positions are defined as "neutral" (centre position), "slightly" (either side of centre), "quite" (next positions), and "extremely" (extreme positions). In judging a concept, the subject indicates the position he considers to be appropriate. Numerical scores may be given these positions, e.g. 0, 1, 2, 3 respectively, direction upon the scale being indicated by sign.

The underlying postulate is that meaning may be visualized as a "semantic space", analogous to a Euclidian space of a number of dimensions. The neutral point of each scale is assumed to pass through the origin, the point of absolute meaninglessness. From a number of factor analytic studies, employing a variety of subjects, concepts and scales, there

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9 Charles E. Osgood, George J. Suci, and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois Press, 1957, vi - 342 p.

emerges consistent evidence that this space may be defined by three major orthogonal factors: "evaluation" (represented by e.g. good - bad), "potency" (e.g. strong - weak), and "activity" (e.g. active - passive). By the use of a number of scales, representative of the factors, the meaning of any concept can be located in the space by its profile on the scales. Its meaning can thus be defined operationally according to two properties: direction from the origin (quality of meaning), and distance from the origin (intensity of meaning or meaningfulness). The present study is concerned only with the latter, meaningfulness.

The link with the theoretical definition of meaning in terms of representational mediation reactions (discussed in Chapter I) is provided by the assumption that the number of available reactions corresponds to the number of dimensions of the semantic space. The direction in the space then corresponds to the particular reactions which are elicited, and the distance from the origin to the intensity (habit strength) of those reactions.

The authors have compiled evidence regarding the reliability, validity, and various scaling assumptions of the technique[10]. A high degree of consistency is claimed for

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10 "Evaluation of the Semantic Differential", in The Measurement of Meaning, op. cit., p. 125 - 188.

items from test to retest. One study, using scores summed over items, found a test-retest correlation of .85. Even with an interval of one week, average error on retesting was less than one scale unit. In this connection, it is of interest to note that Jakobovits found that repeated retesting, under normal conditions, resulted in some progressive decline in meaningfulness[11].

As to validity, the authors report high correlation with such criteria as attitude scales, judgments about psychotherapy cases, etc. This refers mostly to the evaluative factor however. As an index of representational mediation processes, the validity is admitted by the authors to be still under investigation. Independent studies however, (discussed in Chapter I), testing the representational mediation theory, also give evidence of a degree of validity for the Semantic Differential in this regard; e.g. Dicken's Study on generalization[12], and Jakobovits' and Lambert's bilingual study[13].

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11 Leon A. Jakobovits, The Effects of Repeated Stimulation upon Cognitive Aspects of Behavior: Some Studies on the Phenomenon of Semantic Satiation, unpublished Doctoral thesis presented to McGill University, 1962, ix - 171 p.

12 Charles F. Dicken, "Connotative Meaning as a Determinant of Stimulus Generalization", Psychological Monographs, Vol. 75, No. 1, Whole No. 505, 1961, 27 p.

13 Leon A.Jakobovits and Wallace E. Lambert, "Semantic Satiation among Bilinguals", Journal of Experimental Psychology, Vol. 62, No. 6, December 1961, p. 576 - 582.

Further evidence by Osgood et al allows them to conclude that their scaling assumptions are reasonnable: that scale intervals are equal within scales or between scales; that the zero point falls at the centroid of each scale; that scales are linear. Support for the comparability of the technique across subjects is given by studies such as one in which schizophrenics and normals produced nearly identical factor structures. Especially relevant here is a study which checked the assumed relation between distance from the neutral point and intensity of mediating reactions. As an independent measure, the latency of response in moving a lever towards one or other pole of the scale upon exposure of the stimulus word, was compared with the scale distances obtained from rating the word in the usual way. The two measures were in significant agreement.

Also especially relevant is Lambert and Jakobovits' verbal satiation study of 1960[14], as the experimental procedure and scoring of the present study are largely modelled on theirs. In that and other studies in the series, they demonstrated that the Semantic Differential could validly measure the decline in meaningfulness, as the satiated words showed a significant drop in polarity along the scales. That the technique can also measure change in the other direction, when

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14 Op. cit.

meaningfulness is acquired by conditioning techniques, has been demonstrated by Staats and Staats[15]. (Other such studies were listed in Chapter I).

On the above evidence, it was felt that the choice of Semantic Differential scales to measure meaningfulness in the present study was warranted. The specific scales selected were "good - bad", "beautiful - ugly", "strong - weak", and "active - passive". The first two have high loadings on the evaluative factor, the next on potency, and the last on activity. The stimulus words chosen were "family", "memory", "symphony", and "tornado". Both scales and words were selected after a pilot study of a number of scales and words, from those appearing to reflect the most change after satiation. The results were however somewhat inconclusive, this appearing to be largely a function of the individual subject. The choice of words in the pilot study was guided to some extent by findings in the literature regarding the relationship between qualities of the stimulus word and satiation (discussed in Chapter I). Nouns only were included. The final words chosen,all of three syllables, were selected also as being likely to vary in their initial profile on the scales. It was not within the scope of the experiment, however, to

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15 Carolyn K. Staats and Arthur W. Staats, "Meaning Established by Classical Conditioning", Journal of Experimental Psychology, Vol. 54, No. 1, July 1957, p. 74 -80.

provide an adequate sampling of the semantic space in either the scales or the words.

For scoring purposes, each judgment would be given the numerical score of 0, 1, 2, or 3, depending on the scale position. All scores would be given a positive sign, as direction upon the scale is irrelevant in this study; thus, for example, "quite good" and "quite bad" would be considered equal in meaningfulness, both being scored 2. It was decided, depending on prior analysis of specific scales and words, to sum over words and scales, thus obtaining a score representing the total meaningfulness for a given individual at a given stage of the experiment. Change can then be observed by comparing the scores at different stages. This method, adapted from that of Lambert and Jakobovits[16], who summed over scales only, was considered preferable for present purposes to Osgood's D. The latter is a measure of distance across semantic space based on the theory of solid geometry[17]. The reason for preference, besides greater simplicity, is the intention to summate across the words as well as the scales, and also because the present study will not take specific account of the factors of meaning. It was understood that the reliability of the scores could be enhanced by increasing

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16 Op. cit.

17 The Measurement of Meaning, op. cit.

the number of scales and/or words. However, as the experiment was to involve repeating the same series of judgments a total of three times, it was decided to reduce the element of fatigue by limiting the number to 16.

4. Administrative Procedure.

Each stimulus word was typed in the centre of a plain white 8" by 5" card, in elite capitals, each letter being separated from the next by one space. It was enclosed in a rectangle whose sides were $5/16$" distant from the nearest edge of the word. Scales were typed on similar cards. Because in the pilot and other studies using such scales with a hospital population like the present, many subjects had been noted to have difficulty in understanding and remembering the various scale positions, it was decided to spell these out in full. The card was divided into seven approximately equal rectangles across its width, and "extremely good" etc typed in the centre of each in elite lower case letters, the qualifying adverb being above the adjective. The centre position was marked "either or neither". By this it was hoped to facilitate administration. As the subject was to indicate his judgment by pointing to the appropriate position, this would also make it easier for the examiner to note his response for recording. A practice scale "hot - cold", and practice words "fire", "ice" and "pen" were similarly prepared, also for the purpose of facilitating administration.

The 16 judgments were arranged in four lists, for each of which were prepared answer sheets which also served as a guide during administration. The order of presentation of the judgments varied from list to list, and was randomized, except that no word or scale was allowed to recur immediately within any list. Also scales were reversed in some lists, thus "good - bad" in other lists would be "bad - good". (This necessitated preparing two cards for each scale). The lists were assigned to individuals at random, though as near as possible the number receiving each list was kept equal within each of the three groups of subjects. The list assigned to any subject was maintained for him throughout the experiment.

As each subject was approached, it was explained to him that the examiner was carrying out a survey, with which his help was requested. He was assured that the results would not be used to judge him and would not affect his stay in hospital or treatment. After brief preliminaries, the experiment was presented in standardized form, the examiner saying as follows:

> This is a survey of the meanings or impressions of words for different people. What I will do is to show you words like this (laying the card with "fire" on the table before the subject), and ask you to give your impression by pointing out where you feel it would fit best on a scale like this (laying the card with "hot - cold" adjacent to the top of the other). You see how this has "hot" on one side, and "cold" on the other, and it is divided up into different boxes according to how hot or how cold your impression is. The outside boxes(pointing) are extremely hot or cold,

> the next ones just quite hot or cold, the next ones only slightly, and the middle box is if your impression does not fit anywhere else, or if it can be just as much one way as the other..... Where do you feel this word fits ("fire")?

After the subject judged "fire", the other practice words "ice" and "pen" were presented to be judged on the same scale. These were not scored. If necessary any questions were answered, or part of the instructions repeated until the subject appeared to comprehend what was required. The other scales were then shown him, in random order, so as to familiarize him with them:

> Here are some other scales I'll ask you to judge words on. They are all on the same principle. This one has "good" and "bad" (etc)..... (when the subject appeared to have understood them, they were gathered up). Here I have some words which I'll ask you to judge on the scales. There are no right or wrong answers to any of them, it's just whatever your impression is. Also, what I'll ask you to do when I first show you a word, is to keep looking at it and keep saying it over and over, aloud, rapidly, for 20 seconds. Then I'll give you the scale for you to judge it on..... Here is the first word.

The first word for that subject was then laid on the table before him, and 20" of repetition timed by stopwatch. The scale card was then laid adjacent to the top edge of the word card with the words: "Where do you feel it fits on this scale?" The cards were gathered up, his judgment recorded on the answer sheet, and the next word card laid down. The 16 judgments were obtained in this manner without pause. Fifteen minutes after the last judgment of the series, and again

approximately 24 hours later, the retests were introduced with the words : "The next part is some more of the same thing, judging the words on the scales. You don't have to say them over first, just go ahead and give your impression". For the retests, the word and scale cards were laid down simultaneously, in the same relative positions as before. The same procedure was followed for the Non-Satiated group, except that all reference to saying the words over first was deleted, and word and scale cards were presented simultaneously throughout.

Any questions by the subject during the experiment proper were answered in non-directive fashion. Though the majority did not ask questions, a typical question asked by some was: "Do you mean my family, or family in general?" To all such questions the examiner would reply that the subject could take it any way he liked, just whatever impression the word gave. The 15 minute pause was filled by giving the vocabulary scale, immediately after the last judgment, then by general conversation. If necessary, the subject was told that "we usually pause for a few minutes before doing the next part". At the close of the first interview, the subject was told that there was another brief part to be done the following day, and arrangments were made to meet then, at approximately the same time of day. Any questions as to the purpose of the survey or the results were answered in general terms to the effect that it was a survey, in the experimental stages, into how people

judged these particular words. No clue was given that change of judgment might occur.

5. Statistics.

The administrative procedure was designed to yield, for each subject, three sets of 16 scores. Each score represents the judgment of one word on one scale, and can vary between 0 and 3 inclusive. The three sets are: that obtained immediately following satiation (or the initial set for the Non-Satiated group), i.e. at zero rest-interval; that obtained after 15 minutes rest, and that obtained after 24 hours rest. For the initial analysis, two further sets of scores will be derived by subtraction of the zero-rest scores from the other two. These will be referred to as the 15-minute-difference and 24-hour-difference scores, and may be considered analogous to the manner of measuring reminiscence in motor studies. Their sign may be positive (rise in meaningfulness of that word on that scale) or negative (decline).

(1) Analysis of individual words and scales. As it is intended to derive composite scores for each subject by summing over words and scales, it is first desirable to test for any significant difference among these. The importance of any such difference would be in the effect upon change in meaningfulness, as this is the core of the study, i.e. change following prior satiation. Accordingly, null hypotheses of the following type will be set up for testing: there is no

significant difference among the words or among the scales in their effect upon the difference scores. This will be tested separately for each of the two experimental i.e. satiated groups, and separately for each of the 15-minute-difference and 24-hour-difference scores.

Making the necessary assumptions of approximate normality, and homogeneity of variance, a three-way analysis of variance, model aBC, individuals by scales by words will be used. The significance of the variance due to scales and to words will be tested against the interaction variance with individuals of scales and words respectively. The three two-way interactions will also be tested against the triple interaction. If the null hypothesis must be rejected for either scales or words, t-tests (for correlated means) will be used to determine between which specific ones the difference lies.

(ii) Deriving the composite scores. Depending on the outcome of the word-scale analysis, composite scores for individuals in all three groups will be derived by summing over those scales and words which may justifiably be combined. Scales or words which were shown to deviate from the others will be eliminated . These scores will represent the total meaningfulness at a given stage for a given individual. Each individual will have five scores, designated as follows with reference to the length of the rest-interval since satiation or since the beginning of the experiment : the Zero-score,

the 15-Minute-score, the 24-Hour-score, the 15-Minute-Difference score, and the 24-Hour-Difference score. These scores will be used in all subsequent analyses.

The reliabilities of all scores will be estimated by split-half correlation, the halves being based on alternate judgments (ignoring any scales or words eliminated), corrected by the Spearman-Brown formula. This will be done for the three groups separately. An estimate of test-retest reliability of scores (without prior satiation) will also be made by correlating the Zero- with the 15-Minute and 24-Hour scores of the Non-Satiated group. This will give some idea of the error ensuing from merely repeating the measuring procedure.

As it might influence the results if the Zero-scores of one experimental group were significantly different from those of the other -- this being the starting point from which any verbal reminiscence will proceed -- a comparison of the Zero-scores of the Schizophrenic and Non-Psychotic groups is desirable. The Non-Satiated group may also be compared, as an initial test of the efficacy of satiation: assuming that the basal level of meaningfulness (i.e. prior to satiation) were equivalent in all three groups, following satiation the score of the Non-Satiated group might be predicted to be higher than that of either satiated group. Accordingly the following null hypothesis will be tested: there is no significant difference in Zero-scores among the three groups. The test

will be by one-way analysis of variance, the variance between groups being compared to the variance within groups. If the F is significant, t-test (for independent means) will be used.

(iii) Comparison of the four orders of administration of the judgments. The possibility might arise that these might not be equivalent. Again the main importance of any difference would be upon the Difference scores in the two experimental groups. Null hypotheses of the following type will therefore be tested: there is no significant difference among the four orders of administration upon the Difference scores. This will be tested separately for each of the Schizophrenic and Non-Psychotic groups, and again for these groups combined (i.e. all satiated subjects), and separately for the two Difference scores. Testing will be by one-way analysis of variance (numbers for each order being only approximately equal), comparing the variance between orders to that within orders. Any significant F will be followed by t-test (for independent means). If any order appears different from the others, subjects who received that order must be eliminated. If none of the null hypotheses can be rejected, the orders will be assumed equivalent.

(iv). Testing the production of verbal reminiscence. As the main hypothesis involves comparing the two experimental groups on the dissipation of I_R as reflected in verbal reminiscence, it follows that if there is no evidence of the

latter, the hypothesis cannot be tested.

If verbal reminiscence was produced in either of the Schizophrenic and Non-Psychotic groups to a significant degree, then in that group either or both of the 15-Minute and 24-Hour scores will be higher than the Zero-score. In the Non-Satiated group, no such difference would be predicted. For a preliminary analysis therefore, these three scores will be compared together, separately for each of the three groups as the pattern of change of meaningfulness with rest is different for all three. The null hypotheses read: there is no significant difference among the Zero-, 15-Minute, and 24-Hour scores. These will be tested by two-way analyses of variance, model aB, individuals by rest-intervals; the variance due to rest-intervals will be tested against the remainder variance. If any F proves to be significant, the scores will compared in pairs for that group, using t-test (correlated means).

If in either or both of the experimental groups there is evidence of a rise in meaningfulness, i.e. either or both of the 15-Minute and 24-Hour scores being significantly greater than the Zero-score, it is desirable to test whether this is in fact reminiscence, i.e. due to the prior satiation. Conceivably there might be other factors producing a rise in meaningfulness in the retests: the subject may in the retests have overcome initial wariness, and respond more boldly,

giving judgments nearer the extremes. If on the other hand the rise in meaningfulness is a consequence of the prior satiation, it should be greater for a satiated group than for the Non-Satiated group. The Non-Satiated group will therefore be compared with each of the other two in turn, testing the null hypotheses that there is no significant difference between the Non-Satiated group and the other group in the rise from the zero-score to the 15-Minute and 24-Hour scores. This is best tested by testing the significance of the interaction between rest-intervals and the factor of satiation-nonsatiation (assuming the latter to be the only independent variable on which the compared groups differ). A pseudo-three-way analysis of variance will be set up, a type described by McNemar[18] as Case XVII[19]. The dimensions are individuals (rows), by rest-intervals (columns) by groups (blocks). The "pseudo" refers to the fact that the subjects are not the same from block to block, differing in satiation, but they are the same from column to column. The hypotheses will be tested by comparing the group by rest-interval interaction variance to the remainder variance. Variance due to difference between groups alone can be tested against the individual variance, and that due to

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18 Quinn McNemar, Psychological Statistics, Second Edition, New York, Wiley, 1955, vii - 408 p.

19 Ibid. p. 332 - 335.

rest-intervals alone against the remainder variance.

For these analyses, though the assumption of normality is difficult to test because of the number of subjects involved, the assumptions of homogeneity of individual variance from group to group, and of individual by rest-interval interaction from group to group, will be tested by F.

In this connection, it was felt that both experimental groups could not be compared at once with the Non-Satiated group in a similar model of analysis of variance, i.e. by including all three groups in the group dimension. The reason is that this dimension would confound the two variables: Satiation-nonsatiation, and psychosis-nonpsychosis, both of which might affect the interaction between groups and rest-intervals. The Difference scores however provide a means of comparing the Non-Satiated group with the other two combined. They should be higher in a satiated group than in the Non-Satiated group. The null hypotheses will be of the type: the Difference scores of satiated subjects are not higher than those of non-satiated subjects. This could be tested by comparing the three groups together in one-way analysis of variance, separately for each of the two Difference scores, followed by t-test. T-test (for independent means) can also compare the Non-Satiated group with the other groups combined (i.e. with all satiated subjects), for each of the Difference scores separately.

(v) The main hypothesis. If as predicted, schizophrenics dissipate cognitive I_R more slowly than non-psychotics, as reflected in verbal reminiscence, then the formers' rise in meaningfulness should be less than the latters' after the shorter 15 minute rest, but may approach equality after the longer 24 hour rest. That is, assuming the rest times are suitable, there should be interaction between the rest-intervals and the variable psychotic (schizophrenic) -nonpsychotic. The assumption must be made that the particular subjects involved are representative of schizophrenics and of non-psychotics, and that the independent variable psychotic-nonpsychotic is the only one on which they differ.

In the null form, the hypothesis to be tested is: there is no significant difference between the Schizophrenic and the Non-Psychotic groups in the rise in meaningfulness from the Zero-score to the two post-rest scores. More specifically: there is no significant interaction between the groups and the rest-intervals. This is best tested by the same model of analysis of variance described above: a pseudo-three-way analysis, individuals (rows) by rest-intervals (columns), by groups (blocks), model aBC. The hypothesis will be tested by comparing the group by rest-interval interaction variance with the remainder variance. Again, the variance due to groups alone may also be tested against the individual variance, and that due to rest-intervals alone against the

remainder variance. F-test will be used to test the assumptions of homogeneity of individual variance from group to group, and of individual by rest-interval interaction variance from group to group.

Further implications, derived from findings with motor reminiscence measures, may also be tested. Reminiscence after the short rest may be predicted to be higher in non-psychotics than in schizophrenics; and reminiscence after a long rest to be higher than that after a short rest, in schizophrenics alone. The null hypotheses may be drawn up: 1. the 15-Minute-Difference scores of the Non-Psychotics are not significantly higher than those of the Schizophrenics, and 2. the 24-Hour-Difference scores of the Schizophrenics are not significantly higher than their 15-Minute-Difference scores. These may be tested by t-tests, for independent and for correlated means respectively.

(vi) The effect of age, education and vocabulary. As these variables were used in the selection of subjects, it is desirable to investigate their relevance. In this instance, this will be done by computing the correlation between these and the Difference scores. The null hypotheses to be tested are: the correlation between age (education, vocabulary) and the Difference score is not significantly different from zero. Correlations will be computed by Pearson's product-moment method for each of the experimental groups separately, and for

those groups combined, between each of the above variables and each of the two Difference scores. Correction will be made for attenuation, using the reliabilities of the Difference scores computed earlier. T-test will be used to test for significant difference from zero of the correlation coefficients.

In all tests of significance, the .05 level will be accepted as rejecting the null hypothesis.

6. Summary of Chapter II.

The Schizophrenic, Non-Psychotic and Non-Satiated groups were selected by diagnosis within certain limits of age, education and vocabulary. After satiation for 20", four words were rated on four scales of the Semantic Differential to measure meaningfulness, and rerated after 15 minutes and 24 hours rest. Subject to prior analysis, word- and scale-scores will be summated to yield composite scores (reliability:split-half). By comparing the scores at different rest-intervals within the groups, and by comparing the Non-Satiated group with the others, it will be determined whether verbal reminiscence was produced. The main hypothesis will be tested by comparing the Schizophrenics and Non-Psychotics on their rise of meaningfulness over the rest-intervals. The relationships between age, education vocabulary, and rise of meaningfulness will be investigated.

The results of these analyses will be discussed in Chapter III.

CHAPTER III

RESULTS AND DISCUSSION

The results will be presented in this chapter, following the outline given in the section on statistics in Chapter II: analysis of individual scales and words (section 1); deriving the composite scores (2); comparison of the four orders of administration (3); testing the production of verbal reminiscence (4); the main hypothesis (5); the effect of age, education and vocabulary (6). Following this the general conclusions will be discussed.

1. Analysis of Individual Scales and Words.

The analyses of variance are summarized in Tables III (15-minute-difference scores) and IV (24-hour-difference scores). In none of these is there reason to reject the null hypothesis concerning words, though the individual by word interaction variance is significant in the Non-Psychotic and the combined group, for the 24-hour-difference scores. This would suggest that, among the four words, the relative pattern of change of meaningfulness differed from individual to individual. One might speculate whether this could depend on specific connotations of the words for each individual, such that some words change meaningfulness more readily than others for him. As however there is no consistent difference shown among words throughout any group, there is justification for summing over words in deriving the composite scores.

Table III.-
Analysis of Variance: Individuals by Scales by Words.
(15-Minute-Difference Scores).

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Schizophrenics					
Individuals	38.560	29	1.330		
Scales	9.873	3	3.291	6.648	<.001
Words	0.673	3	0.224	0.373	N.S.
Inds. x Scales	43.065	87	0.495	0.695	N.S.
Inds. x Words	52.265	87	0.601	0.884	N.S.
Scales x Words	9.869	9	1.097	1.541	N.S.
Inds.x Scs.x Wds.	185.942	261	0.712		
Total	340.247	479			
Non-Psychotics					
Individuals	56.200	29	1.938		
Scales	3.875	3	1.292	1.709	N.S.
Words	4.425	3	1.475	1.341	N.S.
Inds. x Scales	65.750	87	0.756	0.864	N.S.
Inds. x Words	95.700	87	1.100	1.257	N.S.
Scales x Words	6.892	9	0.766	0.875	N.S.
Inds.x Scs.x Wds.	228.483	261	0.875		
Total	461.325	479			
Combined Group					
Individuals	98.324	59	1.667		
Scales	11.787	3	3.929	6.276	<.001
Words	1.287	3	0.429	0.500	N.S.
Inds. x Scales	110.838	177	0.626	0.793	N.S.
Inds. x Words	151.838	177	0.858	1.087	N.S.
Scales x Words	12.375	9	1.375	1.743	N.S.
Inds.x Scs.x Wds.	418.750	531	0.789		
Total	805.199	959			

Table IV.-
Analysis of Variance: Individuals by Scales by Words.
(24-Hour-Difference Scores)

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Schizophrenics					
Individuals	125.966	29	4.344		
Scales	3.692	3	1.231	2.497	N.S.
Words	1.425	3	0.475	0.581	N.S.
Inds. x Scales	42.933	87	0.493	0.684	N.S.
Inds. x Words	71.200	87	0.818	1.135	N.S.
Scales x Words	4.208	9	0.468	0.649	N.S.
Inds.x Scs.x Wds.	188.167	261	0.721		
Total	437.591	479			
Non-Psychotics					
Individuals	114.685	29	3.955		
Scales	3.756	3	1.252	1.437	N.S.
Words	5.690	3	1.897	1.348	N.S.
Inds. x Scales	75.807	87	0.871	1.168	N.S.
Inds. x Words	122.373	87	1.407	1.886	<.01
Scales x Words	9.852	9	1.095	1.468	N.S.
Inds.x Scs.x Wds.	194.835	261	0.746		
Total	526.998	479			
Combined Group					
Individuals	245.054	59	4.153		
Scales	6.787	3	2.262	4.309	<.01
Words	2.512	3	0.837	0.747	N.S.
Inds. x Scales	92.900	177	0.525	0.673	N.S.
Inds. x Words	198.175	177	1.120	1.439	<.01
Scales x Words	10.342	9	1.149	1.477	N.S.
Inds.x Scs.x Wds.	413.221	531	0.778		
Total	968.991	959			

As to scales however, the null hypothesis must be rejected in both Schizophrenic and combined groups on the 15 minute difference score, and in the combined group on the 24 hour difference score. Accordingly, t-tests were computed between scales (summed over words) for these groups and scores. None of the scales: good-bad, beautiful-ugly or strong-weak differed significantly among themselves in any group, but active-passive differed from all three others in various instances. The scale means and the results of t-tests between active-passive and the other scales are reported in Table V. For comparison, the means and t's for all the groups involved, and for both difference scores, are included, even though not all analyses warranted proceding to t-test, e.g. in the Non-Psychotic group. Even in the latter however, it is apparent that the means for active-passive are somewhat lower than all the others. In the Schizophrenic and combined groups, its means are negative, indicating that on the average judgments on this scale progressively approached the neutral point over the three sets of ratings, whereas on all other scales they approached the extremes. It was concluded that scores could be summed over three scales, excluding active-passive, as the latter appears to show a different pattern of change of meaningfulness.

Table V.-
Scale Means and t-Tests between "Active-Passive"[a,b] and other Scales following Analysis of Variance. (15 Minute and 24 Hour Difference Scores).

Scales	15 Min. Diff. Scores M	t	p	24 Hour Diff. Scores M	t	p
Schizophrenics						
good-bad	0.500	3.413	<.01	0.267	2.705	<.02
beautiful-ugly	0.433	3.358	<.01	0.467	2.472	<.02
strong-weak	0.533	4.427	<.001	0.200	1.887	N.S.
active-passive	−0.833			−0.467		
Non-Psychotics						
good-bad	0.833	1.556	N.S.	0.567	0.607	N.S.
beautiful-ugly	1.100	1.822	N.S.	1.233	2.012	N.S.
strong-weak	0.533	0.986	N.S.	0.567	0.688	N.S.
active-passive	0.133			0.267		
Combined Group						
good-bad	0.667	3.409	<.01	0.417	1.822	N.S.
beautiful-ugly	0.767	3.453	<.01	0.850	3.059	<.01
strong-weak	0.533	3.390	<.01	0.383	1.727	N.S.
active-passive	−0.350			−0.100		

a No t-tests among the other three scales reached significance.

b For comparison, means and t values with "active-passive" are quoted for all groups and scores, even for those which did not show significance due to scales in the Analysis of Variance.

2. Deriving the Composite Scores.

In accordance with findings in the previous section, each individual's scores were obtained by summation over all four words and three scales, excluding active-passive, i.e. over 12 judgments. The basic scores: the Zero-score, 15-Minute score and 24-Hour score, could range from 0 to 36 inclusive. The mean scores and standard deviations obtained for the three groups are listed in Table VI, including also the two Difference scores. For purposes of analysis it was assumed that all scores were normally distributed.

The three groups did not differ significantly on the Zero-scores ($F = 0.080$, not significant). The means of the Schizophrenic and Non-Psychotic groups are very close, indicating that these groups may be regarded as commencing the rest-intervals with a similar level of meaningfulness; thus any subsequent difference between them must be due to different patterns of change of meaningfulness.

It appears somewhat anomalous that the mean Zero-score of the Non-Satiated group is lower than that of the other, satiated groups. If all groups had begun with a similar level of meaningfulness (before satiation: not measured), then following satiation the means of satiated groups would be predicted to be below that of the Non-Satiated group. Within this latter group, it was noted that the mean for the 15 subjects of schizophrenic diagnosis was 15.333, while that for the

Table VI.-
Composite Scores[a]: Means, Standard Deviations and Reliabilities Schizophrenic, Non-Psychotic and Non-Satiated Groups.

	Zero-Scores	15-Min. Scores	24-Hr./15-M.Diff./24-H.Diff. Scores		
Schizophrenics					
Mean	18.800	20.267	19.733	1.467	0.933
Standard Dev.	8.788	8.970	9.176	3.818	6.493
Reliability[b]	.818	.842	.895	.659	.854
Non-Psychotics					
Mean	18.767	21.233	21.133	2.467	2.367
Standard Dev.	7.796	7.693	8.663	4.624	5.930
Reliability[b]	.785	.706	.831	.672	.754
Non-Satiated					
Mean	17.967	17.867	17.500	-0.100	-0.467
Standard Dev.	10.245	9.793	10.960	4.657	6.484
Reliability[b]	.930	.894	.947	.954	.735

a Based on 12 judgments.
b Split-half correlation with Spearman-Brown correction.

remaining 15, those of non-psychotic diagnoses, was 20.600. The difference between these sub-groups and the experimental groups of like diagnoses, and between one sub-group and the other, were not statistically significant. Assuming however these figures to be typical, one might speculate whether the two experimental groups reacted in opposite ways to the satiation procedure, and arrived at their similar Zero-scores from opposite directions. Thus it may have been that the Non-Psychotics, beginning at a level of 20.600, dropped due to satiation to 18.767. This would be consistent with previous findings on verbal satiation. The Schizophrenics, on the other hand, may have begun at a level of 15.333, rising with "satiation" to 18.800. The speculation regarding differences between the two experimental groups in their reaction to the experimental procedure will be further discussed in the section on verbal reminiscence (section 4).

The estimated reliabilities of the various scores are also listed in Table VI. They appear to indicate fairly good internal consistency for these measures of meaningfulness. The figures for the two Difference scores are of special interest. They suggest that, for the words and scales included, any change of meaningfulness affects all the judgments with fair consistency. In the two experimental groups this applies more to the 24-hour-Difference score than to the 15-Minute-Difference score, while it is the reverse for the Non-Satiated

group, who also show some change of meaningfulness (decline).

The test-retest reliabilities of the basic scores, for the Non-Satiated group only, were .893 (Zero- and 15-Minute score) and .815 (Zero- and 24-Hour score). The 15-Minute and 24-Hour scores correlated .943. These figures suggest that these are fairly stable measures of meaningfulness. It should be noted however that the correlation method would not take into account any consistent change throughout a group from test to retest; i.e. correlation could still be high if the scores of all subjects, and therefore the mean, dropped (or rose) several points. However, the "error" from test to retest, as reflected in the Difference scores, appears relatively small: -0.100 and -0.467 as compared to the Non-Psychotics' 2.467 and 2.367. Comparison between the Non-Satiated and experimental groups (in the section on verbal reminiscence) will evaluate experimental change against these test-retest "errors".

3. Comparison of the Four Orders of Administration.

The results of the analyses of variance, carried out in order to test for any difference among the four orders of administration of the judgments in their effect upon the two Difference scores of the experimental groups, are summarized in Table VII. As the null hypothesis is not rejected in any of these, the four orders will be considered equivalent.

Table VII.-
Analysis of Variance: Orders of Administration
(15-Minute- and 24-Hour-Difference Scores)

Source	Sum of Squares	D.F./Estimate Variance		F	p
15-MINUTE-DIFF. SCORES					
Schizophrenics					
Between	26.387	3	8.796	0.556	N.S.
Within	411.080	26	15.811		
Total	437.467	29			
Non-Psychotics					
Between	34.224	3	11.408	0.488	N.S.
Within	607.243	26	23.356		
Total	641.467	29			
Combined Group					
Between	33.765	3	11.255	0.594	N.S.
Within	1060.168	56	18.932		
Total	1093.933	59			
24-HOUR-DIFF. SCORES					
Schizophrenics					
Between	215.835	3	71.945	1.783	N.S.
Within	1049.032	26	40.347		
Total	1264.867	29			
Non-Psychotics					
Between	30.320	3	10.107	0.256	N.S.
Within	1024.647	26	39.410		
Total	1054.967	29			
Combined Group					
Between	143.629	3	47.876	1.215	N.S.
Within	2207.021	56	39.411		
Total	2350.650	59			

4. Testing the Production of Verbal Reminiscence.

In both experimental groups, inspection of the mean scores (Table VI) shows a rise in meaningfulness following both rest intervals. In the Non-Satiated group, on the contrary, there has been a (relatively slight) drop. The results of analyses comparing the three basic scores, for each of the three groups, are reported in Table VIII. The null hypothesis is rejected only for the Non-Psychotic group. In this group both the 15-Minute and 24-Hour scores are significantly higher than the Zero-score ($t = 2.872$, $p < .01$, and $t = 2.148$, $p < .05$ respectively), but do not differ significantly from each other. This rise is consistent with the production of verbal reminiscence. In the Schizophrenic group, there is some indication of a rise in meaningfulness in that a t-test between the Zero-score and the 15-Minute score is significant ($t = 2.069$, $p < .05$). This is somewhat inconclusive, however, in view of the lack of significance in the overall test.

Tables IX and X report the results of analyses comparing the Schizophrenic and Non-Satiated groups (IX), and the Non-Psychotic and Non-Satiated groups (X), on any relative change of meaningfulness. The null hypothesis regarding the significance of the group by rest-interval interaction is not rejected in either analysis, though for the Non-Psychotics compared to the Non-Satiated group it may be said to approach significance ($F = 2.947$; at $p = .05$, $F \doteq 3.077$). However,

Table VIII.-
Analyses of Variance: Individuals by Rest-Intervals
(Schizophrenic, Non-Psychotic and Non-Satiated Groups)

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Schizophrenics					
Individuals	6450.267	29	222.423		
Rest-Intervals	33.067	2	16.534	1.189	N.S.
Remainder	806.266	58	13.901		
Total	7289.600	89			
Non-Psychotics					
Individuals	5177.833	29	178.546		
Rest-Intervals	116.956	2	58.478	5.044	<.01
Remainder	672.367	58	11.593		
Total	5967.156	89			
Non-Satiated					
Individuals	8856.889	29	305.410		
Rest-Intervals	3.622	2	1.811	0.136	N.S.
Remainder	773.045	58	13.328		
Total	9633.556	89			

Table IX.-
Analysis of Variance: Individuals by Groups by Rest-Intervals (Schizophrenic and Non-Satiated groups).

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Individuals	15307.156	58	262.192		
Groups	149.422	1	149.422	0.570	N.S.
Rest-Intervals	14.478	2	7.239	0.532	N.S.
Groups x Rest-Int.	22.211	2	11.106	0.816	N.S.
Remainder	1579.311	116	13.615		
Total	17072.578	179			
Assumptions					
(i) Ind.Variance[a]					
Schizophrenics	6450.267	29	222.423)	1.386	N.S.
Non-Satiated	8856.889	29	305.410)		
(ii) Ind.x Rest-Interval Variance[a]					
Schizophrenics	806.266	58	13.901)	1.043	N.S.
Non-Satiated	773.045	58	13.328)		

a For sum of squares, degrees of freedom and variance, see Table VIII.

Table X.-
Analysis of Variance: Individuals by Groups by Rest-Intervals
(Non-Psychotic and Non-Satiated Groups)

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Individuals	14034.711	58	241.978		
Groups	304.200	1	304.200	1.257	N.S.
Rest-Intervals	47.144	2	23.572	1.892	N.S.
Groups x Rest-Int.	73.434	2	36.717	2.947	N.S.
Remainder	1445.422	116	12.461		
Total	15904.911	179			
Assumptions					
(i) Ind. Variance[a]					
Non-Psychotics	5177.833	29	178.546)	1.711	N.S.
Non-Satiated	8856.889	29	305.410)		
(ii) Ind.x Rest-Interval Variance[a]					
Non-Psychotics	672.367	58	11.593)	1.150	N.S.
Non-Satiated	773.045	58	13.328)		

a For sum of squares, degrees of freedom and variance, see Table VIII.

these analyses do not establish that the pattern of change in the experimental groups differed from that of the Non-Satiated group. The individual variance is noted to be high, so that it might require a great number of subjects to detect a trend, if such exists. The assumptions regarding homogeneity of variances are not rejected, as the appropriate variances do not differ significantly.

The null hypotheses are not rejected in the analyses comparing the three groups on the Difference scores (Table XI). However, the Non-Satiated group does differ significantly from the other two combined, i.e. all satiated subjects, on the 15-Minute-Difference score ($t = 2.076$, $p < .05$). That this may stem largely from a difference with the Non-Psychotic group is suggested by the significant t (2.230, $p < .05$) when comparing the latter alone with the Non-Satiated group on the same score. In both experimental groups, the pattern seems to be one of rise over the first rest-interval, then some drop over the second; this drop parallels the drop in the Non-Satiated group, thereby decreasing any difference in overall pattern between it and the Non-Satiated group. Thus, despite the Non-Psychotics' significantly greater rise over the 15 minutes than the Non-Satiated group's, the group by rest-interval interaction variance is not significant (Table). However, lack of significance in this overall test makes the other evidence somewhat inconclusive.

Table XI.-
Analysis of Variance: Comparison of Schizophrenic, Non-Psychotic and Non-Satiated Groups on Difference Scores

Source	Sum of Squares	D.F.	Estimate Variance	F	p
15-Min.-Diff. Scores					
Between	100.422	2	50.211	2.526	N.S.
Within	1729.633	87	19.881		
Total	1830.055	89			
24-Hour-Diff. Scores					
Between	120.422	2	60.211	1.463	N.S.
Within	3581.300	87	41.164		
Total	3701.722	89			

The pattern of rise over the short rest, then some drop over the long rest (though not below the pre-rest level), appears analogous to the similar finding by Eysenck in motor reminiscence in normals[1].

Turning again to the two subgroups of the Non-Satiated group, it is noted that the non-psychotic subjects drop progressively, on the average, over both rest intervals (mean Difference scores: -1.267, σ = 4.170, and -1.667, σ = 7.030). This is consistent with Jakobovits' finding of a progressive drop in polarity in Semantic Differential ratings of words, in normals, due to retest alone[2]. The schizophrenic subgroup appears to rise over the first rest-interval, then drop slightly (mean Difference scores: 1.067, σ = 4.823, and 0.733, σ = 5.559).

In view of the low number of subjects and the high variability in these subgroups, any inference can only be speculative. Assuming however that these figures were representative, it might be that retest alone (possibly in itself a form of satiation) causes a decline in the scores of non-psychotics. When previously satiated, they show, on the con-

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1 H. J. Eysenck, "Psychosis, Drive and Inhibition: a Theoretical and Experimental Account", American Journal of Psychiatry, Vol. 118, No. 3, September 1961, p. 198 - 204.

2 Leon A. Jakobovits, The Effects of Repeated Stimulation upon Cognitive Aspects of Behavior: Some Studies on the Phenomenon of Semantic Satiation, unpublished Doctoral thesis presented to McGill University, 1962, ix - 171 p.

trary a significant rise, which at least for the 15 minute rest appears to be greater than could occur by chance from retest alone. This observed rise may be the resultant of the decline due to retesting subtracted from the rise due to verbal reminiscence. In all, the Non-Psychotic group's behaviour appears consistent with the production of I_R by the satiation technique, then its dissipation with rest.

In the non-satiated schizophrenic subjects, the pattern appears to be somewhat conflicting. Again assuming the figures to be representative, it would appear as if retesting causes an initial rise over the short rest, followed by a slight drop over the long rest. In the satiated Schizophrenics, the pattern is similar, though at a level roughly 3.5 points higher throughout, except that the rise over the 15 minute rest is relatively greater (note that their 15-Minute score is significantly higher than their Zero-score). Thus not only were the Schizophrenics not shown to differ from the Non-Satiated group as a whole, but they appear even more similar to the non-satiated schizophrenic subgroup. This suggests that the satiation technique was relatively ineffective with the Schizophrenic group. The figures would even be consistent with the verbal repetition causing initial rise rather than decline in meaningfulness (similarly as with retest alone). If this were a valid supposition, a conceivable explanation could be in terms of the schizophrenic subjects entering the

experiment with high levels of conditioned inhibition; this might then dissipate initially with the verbal repetition ("warm-up") such that only at some later point does the production of I_R begin to cause a drop. Ability to pay attention may be another factor. However, the apparently greater rise over the 15 minute rest in the experimental Schizophrenic group appears consistent with the production, then dissipation, of some I_R.

The figures may be merely a function of the present samples. Such speculations could therefore only be tested by incorporating two separate non-satiated control groups, one of each diagnostic category, and of the same number of subjects as the experimental groups. Numbers in all groups should also be increased. Study of verbal satiation in schizophrenics would also be essential, in order to evaluate the various possible factors, and the subjects' reaction-pattern, and also to evolve a technique ensuring the production of I_R to a significant degree.

A measure of the relative amount of change of meaning in the Non-Psychotic group was made by computing the percentage ratio of the appropriate Difference score over the 15-Minute and 24-Hour scores.(mean values). This assumes that the latter are approximations of the basal level of meaningfulness. The results were 11.62% and 11.20% respectively. Though it is difficult to know how comparable such a ratio

may be to the percentage drop of meaningfulness in a satiation experiment, the figures are apparently much smaller than the 21% drop noted by Lambert and Jakobovits[3]. This suggests that even in the Non-Psychotic group the technique was relatively less effective in producing satiation and consequently reminiscence.

To recapitulate, the evidence that verbal reminiscence was produced is somewhat inconclusive, and suggests probably rather small amounts. This would detract from the study's efficacy as a test of the main hypothesis. However, as the evidence does suggest that verbal reminiscence was produced in at least one of the two groups, it was felt that the hypothesis could still be tested.

5. The Main Hypothesis.

Table XII reports the results of the analysis of variance comparing the Schizophrenic and Non-Psychotic groups on the pattern of change of meaningfulness. As the group by rest-interval interaction variance is not significant, the null hypothesis is not rejected. The significant rest-interval variance confirms the findings of Table VIII. Again the assumptions of homogeneity of variances are not rejected on

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3 Wallace E. Lambert and Leon A. Jakobovits, "Verbal Satiation and Changes in the Intensity of Meaning", Journal of Experimental Psychology, Vol. 60, No. 6, December 1960, p. 376 - 383.

Table XII.-
Analysis of Variance: Individuals by Groups by Rest-Intervals (Schizophrenic and Non-Psychotic Groups)

Source	Sum of Squares	D.F.	Estimate Variance	F	p
Individuals	11628.089	58	200.484		
Groups	27.222	1	27.222	0.136	N.S.
Rest-Intervals	133.811	2	66.906	5.249	<.01
Group x Rest-Int.	16.211	2	8.106	0.636	N.S.
Remainder	1478.645	116	12.747		
Total	13283.978	179			
Assumptions					
(i) Ind. Variance[a]					
Schizophrenics	6450.267	29	222.423)	1.246	N.S.
Non-Psychotics	5177.833	29	178.546)		
(ii) Ind.x Rest-Interval Variance[a]					
Schizophrenics	806.266	58	13.901)	1.199	N.S.
Non-Psychotics	672.367	58	11.593)		

a For sum of squares, degrees of freedom and variance, see Table VIII.

comparison of the variances by F-test. As before, individual variance is high.

As to the further implications, the null hypotheses are also not rejected. Though the Non-Psychotics' mean 15-Minute-Difference score (2.467) is higher than that of the Schizophrenics (1.467), the difference is not significant ($t = 0.441$, N.S.). The Schizophrenics' 24-Hour-Difference score (0.933) is actually less than their 15-Minute-Difference score (1.467), though not significantly so ($t = 0.586$, N.S.).

Thus there is no evidence that the Schizophrenic group dissipated I_R more slowly than the Non-Psychotics.

6. The Effect of Age, Education and Vocabulary.

The correlations of these variables with the two Difference scores of the experimental groups are listed in Table XIII. Three correlation coefficients, obtained on the combined group, proved to be significantly different from zero: that between the 15-Minute-Difference score and years of education, between the 24-Hour-Difference score and years of education, and between the 15-Minute-Difference score and vocabulary. All are low negative correlations. These correlations call to mind the negative correlations between verbal satiability and various learning aptitudes, which were noted by Jakobovits[4]

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4 Op. cit.

Table XIII.-
Correlations[a] between Age, Education, and Vocabulary, and the Difference Scores (Schizophrenic and Non-Psychotic Groups).

	Age	Years of Education	Binet Vocabulary
Schizophrenics			
15-Min.-Diff. Score	-.027	-.235	-.233
24-Hour-Diff. Score	.005	-.164	-.022
Non-Psychotics			
15-Min.-Diff. Score	-.041	-.314	-.276
24-Hour-Diff. Score	.129	-.358	-.246
Combined Group			
15-Min.-Diff. Score	.011	-.301[b]	-.256[c]
24-Hour-Diff. Score	.098	-.277[d]	-.126

a Product-moment, corrected for attenuation.
b Significantly $\neq 0$, $t = 2.404$, $p < .02$.
c .. .. $\neq 0$, $t = 2.017$, $p < .05$.
d .. .. $\neq 0$, $t = 2.194$, $p < .05$.

and Das[5] (discussed in Chapter I). This lends indirect support to the supposition that the Difference scores may reflect some verbal reminiscence. The negligible correlations with age suggest that within the limits chosen this variable was unimportant.

The Difference score reliabilities used in correcting for attenuation were quoted in Table VI, excepting those for the combined group; the latter were : .662 (15-Minute-Difference score) and .809 (24-Hour-Difference score).

7. Summary of Chapter III.

As preliminary analysis of words and scales showed only "active-passive" to be divergent, composite scores were derived by summing over all others. No difference among the orders of administration being found, these were assumed to be equivalent. There was evidence of significant rise in score with rest, following satiation, but only in the Non-Psychotic group was this shown, somewhat inconclusively, to be greater than the change in score of the Non-Satiated group. No significant difference was found in the pattern of rise in scores between the Schizophrenics and the Non-Psychotics. Low negative correlations were found between the Difference scores and education and vocabulary.

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5 J. P. Das, "Hypnosis, Verbal Satiation, Vigilance, and Personality Factors", Journal of Abnormal and Social Psychology, Vol. 68, No. 1, January 1964, p. 72 - 78.

SUMMARY AND CONCLUSIONS

The aim of this study was to test the hypothesis, derived by analogy from findings of motor reminiscence studies, that schizophrenics dissipate reactive inhibition in a verbal task more slowly than non-psychotics. This was investigated with a technique designed to produce verbal reminiscence, the rationale being that from theoretical considerations verbal satiation, and consequently verbal reminiscence, may be interpreted as manifestations of a form of reactive inhibition.

The null hypothesis was not rejected. In considering this result, several factors may need to be brought into account. It could be that the hypothesis of slower dissipation of motor I_R in schizophrenics, if itself valid, cannot be transposed from the motor to this verbal task. This could arise from some weakness in the theoretical analogy, though there is much evidence in the literature that verbal and other behaviour are both subject to the same principles of learning theory. It could be also that the two types of task are differently affected by what would appear to be the same conditions: thus the rest interval may not entail complete absence of contact with the task material in the verbal task, which it does in the usual motor study. On the other hand it might well be supposed that contact during the rest with the same or other verbal stimuli could have a disinhibiting effect.

Because of greater complexity, the verbal task, involving a number of words and scales which sample a multi-dimensional semantic space, may not be directly comparable to the apparently simpler motor task.

However, an important consideration appears to be the uncertain and probably weak production of verbal reminiscence in these subjects. There were suggestions that the prior satiating technique may not have been fully effective in all subjects. Only if this had caused a significant drop in meaningfulness in both groups could they be compared adequately on their rates of dissipation of I_R. The high individual variability observed suggests also, that if other than a quite marked difference in trend were involved, a greater number of subjects might be needed to give conclusive results.

The relative length of the rest-intervals is a crucial factor. If the amount of I_R produced were only slight, as seems quite likely to have been the case in this study, then the "short" rest interval may yet have been long enough to enable even slow dissipators of I_R to attain full reminiscence. No difference between fast and slow dissipators, or between short and long rest-intervals, could then be observed. In the absence of previously established parameters in verbal reminiscence, it is difficult to choose an optimum length of time for the rest-intervals.

Another factor may have been the composition of the group used for comparison with the Schizophrenics. This sample of non-psychotic patients, who as long as they were of any one of the acceptable diagnoses were not further selected diagnostically, contained a high proportion (76.7%) of character disorders (see Table I). These, from Eysenck's point of view, would tend to be extraverted, and as such a somewhat similar hypothesis of slower than normal dissipation of I_R would be applicable to them[6]. Although the implication appears to be that psychotics dissipate I_R even more slowly, the difference from a predominantly extraverted group might be less distinct than from normals. A comparison group of normals might thus be preferable in initial studies, although the use of fellow-patients helps control for variables such as medication, hospitalization etc. It is to be noted, however, that the present results did suggest some difference in pattern between the two groups, though not significant.

In view of the above, it appears that the present results may be regarded as inconclusive.

An immediate suggestion for future research emanating from this study is a cross-validation. This should incorporate the changes shown to be desirable by the present findings.

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6 H. J. Eysenck, The Dynamics of Anxiety and Hysteria, New York, Praeger, 1957, xiv - 311 p.

An initial step would be a study of verbal satiation in schizophrenics, as it appears possible from the present observations that they may react in a specifically different manner to the satiating technique. Presumably they also are satiable, though one hypothesis to be tested might be, as Wertheimer's [7] work with other modalities would indicate, that they are less satiable than normals. From this might be evolved a technique capable of producing an adequate drop in meaningfulness in both groups, as the starting point for observing reminiscence. Non-satiated control groups, one of schizophrenics and one similar to the Non-Psychotic group, would be desirable to estimate the amount of reminiscence in the experiment proper. Numbers in each group should be quite large, and, as indicated by the correlations found, groups should be matched for education and/or vocabulary. The choice of the comparison group would require careful consideration. Either normals should be used, or if patients are used because of the other advantages, it would be wise to ensure that the sample is not biased. Ideally even, several groups might be included, each of narrower diagnostic range than the present.

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7 Michael Wertheimer, "The Differential Satiability of Schizophrenic and Normal Subjects: a Test of a Deduction from the Theory of Figural Aftereffects", Journal of General Psychology, Vol. 51, Second Half, October 1954, p. 291 - 299.

Furthermore, much basic research remains to be done in verbal reminiscence, and even in verbal satiation. Besides establishing various parameters, e.g. the effect of varying the satiation- or the rest-time, or the frequency of repetition during satiation, it could be profitable to investigate verbal reminiscence as an individual trait. In the present study individuals appeared to vary widely on it. The important question would be whether susceptibility to verbal reminiscence is in fact a stable individual trait. Does it correlate highly with itself on retest, preferably using a different set of stimulus words? Does it correlate with other measures of reminiscence, i.e. motor and perceptual, taken on the same individual? The effect of drugs, or its efficacy in differentiating various personality types could also prove to be fruitful, to parallel and supplement such work done with manifestations of inhibition in other modalities. All such work might further the rapprochement between verbal and other behaviour.

The effect of varying qualities of the verbal material could also be worthwhile to investigate. The significant individual-word interaction for example, suggests that one might try to find what specific qualities or connotations of a word determine a difference in reminiscence from other words, for each individual. The difference among scales suggests a possible difference among the three factors of meaning, though

the inclusion of only one or two scales per factor in the present study could not adequately verify this. It appeared suggestive however that "active-passive" (activity factor) was the divergent scale for this hospitalized sample, especially in the schizophrenics for whom passivity is a characteristic trait. At the same time, this difference suggests that unless a study in verbal reminiscence undertakes specifically to investigate the difference among factors of meaning, it would do better to restrict itself to the scales of just one. The lead given by studies in verbal satiation could be followed by studying the relationship with various characteristics of words, and both words and scales could be varied in order to explore semantic space through the new medium of verbal reminiscence.

BIBLIOGRAPHY

Eysenck, H. J., The Dynamics of Anxiety and Hysteria, New York, Praeger, 1957, xiv - 311 p.

In this work, Eysenck applies learning theory to the etiology and dynamics of two behavioural types: dysthymics (introverted neurotics) and hysterics (extraverted neurotics). He relates the introversion-extraversion dimension to basic constitutional differences in susceptibility to central excitatory and inhibitory mechanisms. These differences are reflected in various areas: conditioning, perceptual and motor performance, socialization, reaction to drugs, etc.

The specific relevance to the present study is the hypothesis, supported by various compiled studies, that perceptual satiation and motor reactive inhibition are both attributable to the same cortical inhibitory process. By assuming verbal satiation also to be included, the necessary theoretical rationale is provided for drawing the analogy between verbal reminiscence and motor reminiscence.

Secondly, the demonstration that behavioural types differ on various measures of inhibition, including reminiscence, both in perceptual and motor tasks, provides further support for the prediction that verbal reminiscence can similarly differentiate.

--------, "Psychosis, Drive and Inhibition: a Theoretical and Experimental Account", American Journal of Psychiatry, Vol. 118, No. 3, September 1961, p. 198 - 204.

In this article, learning theory is applied to an explanation of the characteristic slowness of psychotics. Eysenck contends that this is due, not to lack of motivation, but to an excessively slow rate of dissipation of reactive inhibition. Experimental support of this hypothesis is given by motor reminiscence studies, which found little or no reminiscence in psychotics after short rests following massed practice, but strong reminiscence after long rests.

If then motor reminiscence can differentiate psychotics from others, and if, as above, verbal reminiscence is analogous to motor reminiscence, the main hypothesis of the present study follows: verbal reminiscence should differentiate psychotics from others.

Jakobovits, Leon A., The Effects of Repeated Stimulation upon Cognitive Aspects of Behavior: Some Studies on the Phenomenon of Semantic Satiation, unpublished Doctoral thesis presented to McGill University, 1962, ix - 171 p.

This dissertation comprises a comprehensive review of the literature on verbal satiation and analogous phenomena,

plus original experiments. In the absence of literature on verbal reminiscence, the empirical and theoretical background important for the present study, verbal satiation being the precursor and converse of verbal reminiscence. The original work gives data on reliability, relationship with individual differences and with the complexity of the stimulus, and presents the author's conclusions on the relationship between the frequency of contact with the stimulus and the generation and satiation of meaningfulness.

As in the chronologically earlier study of Lambert and Jakobovits (see below), these experiments illustrate the use of the Semantic Differential in measuring the change in meaningfulness, and support the theoretical interpretation of verbal satiation as a form of reactive inhibition.

Lambert, Wallace E., and Leon A. Jakobovits, "Verbal Satiation and Changes in the Intensity of Meaning", Journal of Experimental Psychology, Vol. 60, No. 6, December 1960, p. 376 - 383.

This study is the first of a series by these authors and coworkers on various effects of verbal satiation. It demonstrated conclusively, by the use of the Semantic Differential, that the subjective loss of meaningfulness is objectively measurable, and significant in comparison to the responses of a variety of non-satiated controls.

From Osgood's theory of meaning in which meaning is regarded as a response, they derive the interpretation of verbal satiation as a cognitive form of reactive inhibition, generated by the repeated elicitation of this response. This independently derived interpretation is thus similar to, and tends to corroborate the interpretation of verbal satiation which can be derived through Eysenckian theory.

Besides the theoretical significance, the experimental technique and derivation of scores served as a model for the present study, except that the latter deals with the reminiscence phase.

Osgood, Charles E., George J. Suci, and Percy H. Tannenbaum, The Measurement of Meaning, Urbana, University of Illinois Press, 1957, vi - 342 p.

This work introduces the representational-mediation theory of meaning, a behaviouristic theory in which meaning is a response, therefore subject to the same laws as any response. On this theory may be based the interpretations of verbal satiation and reminiscence to be adopted in this study, viz. as manifestations of reactive inhibition.

This book also describes the Semantic Differential technique, its rationale, relationship with the theory of meaning, construction and administration. Data are also

presented on its reliability, validity, justification of the various scaling assumptions, and illustration of experimental use in many areas, all of which support this technique as the apt one for measuring meaningfulness in the present study.

APPENDIX 1

ABSTRACT OF

Verbal Reminiscence in Schizophrenics[1]

This thesis attempts to test, in the verbal area, a hypothesis derived from motor reminiscence studies, that psychotics are characterized by excessively slow dissipation of reactive inhibition. Utilizing the phenomenon of verbal satiation -- the reduction in meaningfulness of a word for subjects who attend to it repeatedly -- the thesis concerns itself with "verbal reminiscence", the name given to the subsequent recovery of meaningfulness with rest. As from theoretical considerations, verbal satiation has been interpreted as due to a form of I_R, verbal reminiscence may be regarded as reflecting the dissipation of this I_R.

A group of schizophrenic and a group of non-psychotic mental hospital patients, screened for age, education and vocabulary, satiated four stimulus words by repetition for 20". Measures of meaningfulness were taken on four scales of the Semantic Differential immediately, then again after 15 minutes and after 24 hours. Scores of overall meaningfulness rose significantly in the rest-intervals, but only in the

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1 N. E. Derrick, master's thesis presented to the School of Psychology of the University of Ottawa, May 1965, vii - 105 p.

non-psychotic group was there evidence that this rise was significantly greater than in a third, non-satiated control group. As the difference in the pattern of rise in score was not shown to be significant for the schizophrenic and non-psychotic groups, the hypothesis was not supported. However, it was felt that the study should be cross-validated, employing a technique yielding larger amounts of verbal reminiscence.