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## The Effect of Sensory Deprivation on Responses to the Word Association Test

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THE EFFECT OF SENSORY DEPRIVATION  
ON RESPONSES TO THE WORD  
ASSOCIATION TEST

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A Thesis  
Presented to  
the Faculty of the School of Graduate Studies  
of  
Western Michigan University

---

In Partial Fulfillment  
of the Requirements for the degree  
of Master of Arts

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by  
Robert Mitchell Browning  
Kalamazoo, Michigan  
August, 1962

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## SENSORY DEPRIVATION

This research is concerned with the effects of sensory deprivation on the responses of volunteer male college students on the Word Association Test. Before a detailed statement is given of this problem, a brief resume of significant literature on the effects of sensory deprivation will be presented so that the theoretical implications of this particular study are more apparent.

There have been numerous anecdotal accounts of marooned sailors and isolated explorers testifying to hallucinations and other forms of aberrations which they experienced during their ordeals. (Solomon, Leiderman, Mendelson, & Wexler, 1957) The common denominator for all of these accounts was social, and frequently, perceptual isolation. It has also been reported that persons suffering from poliomyelitis, orthopedic disorders, and recent blindness or deafness, often manifested psychotic-like states. (Leiderman, Mendelson, Wexler, & Solomon, 1958; Mendelson, Siger, & Solomon, 1960) Mendelson and Foley (1956) studied numerous polio patients and concluded that the well organized visual and auditory hallucinations, which began 24 to 48 hours after placement in a tank-type respirator, were in no way a function of fever, drugs, or metabolic dysfunctioning. Instead, they decided that the patient's

atypical behavior was precipitated by the absence of the ordinary visual, auditory, and kinesthetic stimulation which was encountered in the respirator. Jiskind, et al (1960) observed that patients who were required to wear eye patches following surgery were characteristically non-compliant and foggy as a result of their visual restrictions.

The above studies illustrate that humans respond irrationally when they are deprived of the usual modes of stimulation to which they are accustomed. The explorer who is isolated in an igloo perceives strange aberrations; the confined polio patient experiences hallucinations of moving vehicles; and the patient recovering from eye surgery appears bewildered and in a hypnogogic trance. Fortunately, these states are transient and subside once the individual is returned to the tactile, perceptual, and auditory stimulation with which he is familiar. However, it has been of clinical interest that the reactions to such conditions are very similar to some of the symptoms which are pathognomonic of emotional disturbance. Because of this clinical flavor, there has been a growing interest in research on behavioral responses to reduced environmental stimulation. This research is generally referred to as sensory deprivation research, and should be

distinguished from studies of isolation or confinement. These three areas of research are defined as: (Ormiston, 1961)

- 1-A sensory deprivation study involves a reduction of curtailment of all manipulable sources of stimulation.
- 2-An isolation study merely entails a separation of the individual from society.
- 3-A confinement study is any situation which restricts the movements of the person.

Of course, a research design could incorporate all three of the above restrictive techniques.

The most typical procedure for establishing sensory deprivation has been to place the subject in bed in an isolated, sound-proof room. The patient's arms are placed in cotton padded tubes, his ears plugged with glycerin soaked cotton, and his eyes covered with frosted or blackened goggles. A fan or air-conditioning unit is operated to mask any extraneous sounds and to maintain a constant temperature. The patient is frequently permitted to report his thoughts and sensations through an intercom system, but the examiner does not reply except for emergencies. Some designs have been so thorough as to provide the subject with an underwater breathing device and suspend him in water of body temperature for several hours. (Shurley, 1960)

The effects of sensory deprivation have been varied, and at times contradictory. Hebb (1955)

reports that after 24 hours of sensory deprivation the subjects demonstrated a statistically significant loss of ability to perform simple problems and to concentrate. The boredom experienced by the subjects made the prospect of performing experimental problems during the sensory deprivation period seem appealing, yet when such problems were presented the subjects did not feel like initiating the action to complete them. Hebb also found that his subjects had disturbed motor control and figure-ground relationships plus numerous two-dimensional hallucinations.

Vernon et al (1956; 1961) contradicted Hebb's conclusions when they discovered that the subject's ability to learn an adjective list improved with sensory deprivation, and that the majority of experimental hallucinations were composed of flashing, flickering lights located in the periphery of vision. Goldberger and Holt (1958) also claimed that their subjects did not demonstrate noticeably impaired cognitive functioning as a result of sensory deprivation.

On the other hand, Mendelson (1958) stated that although there were wide individual differences among his subjects, they all had vivid experiences, and many of them hallucinated. His results are quite interesting because many of the hallucinations were in color and he



also reported a few auditory hallucinations and one olfactory and one gustatory hallucination. It is noteworthy that these particular subjects recalled their hallucinations as pleasant and of a wish-fulfilling nature. Goldberger (1958) did observe that his subjects had difficulty with time orientation during sensory deprivation, and that nine out of the 14 subjects involved experienced visual images of a hypnogogic nature which were vivid enough to be recalled at will after the experiment.

Possibly some of these contradictory results can be attributed to differences in experimental techniques and interpretations of the data. One common factor which can be gleaned from the research is that there are great individual differences in the reactions to sensory deprivation. There have been some efforts to account for such differences as will be seen from the following studies. For example, Petrie and Collins (1958, 1960) reported that those persons who could not tolerate sensory deprivation were more tolerant of pain than those subjects who were comfortable during deprivation. Apparently, the former group found pain a welcome relief from the experimental condition.

Levy (1959) concluded from his study that personality is the main determinant of a response to sensory

deprivation and substantiated this with the example of schizoid subjects who found sensory deprivation stressful because of their excessive dependency upon familiar environmental surroundings. Typical of the research in this area, Grunebaum and Freedman (1960) disagreed with Levy (1959) when their sensorily deprived schizoid subjects reacted with typical defenses of withdrawal and intellectualization with little recall of imagery, yet found the entire experiment pleasant and undisturbing.

Cohen (1959) contributed to the enlightenment of individual differences in this area of research when he found that normal and neurotic subjects demonstrated more anxiety and restlessness during sensory deprivation than schizophrenic or sociopathic subjects. He concluded that those persons in poorest contact with reality showed the least discomfort during the experimental condition, and in fact displayed some positive reactions.

### Theoretical Interpretations of Reactions to Sensory Deprivation.

Although the studies by Vernon et al (1955; 1961) deny the presence of hallucinatory behavior during sensory deprivation, the bulk of research has been contradictory to their findings. Consequently, there have been numerous explanations proposed to account for such experimentally

aroused hallucinations and the other unique behavior.

Davis (1960) and Rosenzweig (1959) both concluded that it is not the absence of stimulation which produces the hallucinations, but rather the absence of meaningful stimuli. Freedman (1961) accounts for the perceptual effects of sensory deprivation as a collapse of the usual processes of stabilizing, structuring, and organizing the visual world. He claims that our spatial orientation is learned at an early age through visual, auditory, and kinesthetic experiences. This knowledge of spatial orientation enables the person to structure and organize his environment--that is, to know where he is and what is going on. During sensory deprivation there are no relevant cues with which to orientate oneself, and as a consequence one's internal frame of reference breaks down. As the situation persists, it becomes increasingly more difficult for the person to impose consistencies on his environment. The hallucinations and other strange reactions seen in sensory deprivation are the methods to which the subject finally resorts to structure this new environment which he is not equipped to handle. Freedman also states that contact with the "real world" is necessary before normal visual functioning returns. Hebb (1955) agrees with this explanation by stating that the human is

dependent upon the continuation of the stimulation he is accustomed to for the maintenance of psychological integrity.

Grunebaum et al (1960) noted that their subjects had more pronounced reactions to sensory deprivation when they were naive to the experimental conditions. It was also found that some subjects were more tolerant of sensory deprivation than others because of their particular means of adaptation and defense to this unique situation. Those who were intolerant of deprivation were characterized by poor reality testing and excessive reliance upon acting-out as a defense, which are found in the borderline psychotic and the sociopath, respectively. However, the schizoid individual's typical defense of withdrawal is favored during sensory deprivation. Grunebaum explains further that deprivation is an ambiguous situation which the subject structures to his own personality and handles with his habitual adaptive and defensive methods.

Solomon et al (1959) suggested that the mental disturbances elicited by sensory deprivation are caused by interference with little understood neural mechanisms essential to alertness and attentiveness. They also offer an alternate behavioral explanation which implies that either an absolute reduction, or an absence of

change of stimuli, has the effect of modifying the learned model of the world which each individual acquires for dealing with reality.

Goldberger and Holt (1961) rely upon Rapaport's (Gill & Rapaport, 1959) explanation of sensory deprivation reactions which states that the functioning of the secondary process depends upon the maintenance of continual contact with reality, and that the absence of such contact facilitates a regression to the primary process. Rational, reality attuned thinking typifies the secondary process and the primary process is composed of unrealistic, prelogical modes of thought. Goldberger and Holt (1958; 1961) noted that subjects who are not threatened by sensory deprivation can temporarily abandon the secondary process for the fantasy and pleasures of the primary process. During deprivation, the individual with weak ego-functioning reacts with guilt and anxiety as a consequence of the intruding primary process.

Silverman (1961) classified his subjects into two categories to explain their different reactions during deprivation. The first classification was the field-dependent individual who preferred to utilize external cues for orientation. The second group, the body-orientated, described their sensations as functions of

their own bodily feelings and were thus able to maintain their orientation in the absence of external cues during deprivation better than the field-dependent subjects.

### The Value of Research in Sensory Deprivation.

Deprivation studies have been of particular interest to Air Force research because of the unusual and restricted conditions imposed upon space pilots. (Holt, & Goldberger, 1959; Holt & Goldberger, 1960; Ormiston, 1961) These researchers have been endeavoring to determine the effects of deprivation on the cognitive, perceptual, and motor processes, and to ascertain what criteria can be established to evaluate space cadets.

Ziskind (1958) has recognized the discomfort encountered by certain surgical and invalid cases. He noticed that many such patients manifested typical sensory deprivation symptoms and he suggested preventive measures such as sharing rooms, activity programs, numerous visitors, plenty of light, and a minimum of hospitalization for the young and aged. His plan is to keep the patient under frequent and familiar stimulation.

There has also been a growing optimism that sensory deprivation may be of therapeutic value for psychiatric patients. Gibby and Adams (1961) subjected white V.A. male psychiatric patients to four hours of partial sensory

and social deprivation. During this time each patient heard the same 14 minute tape recording which was carefully phrased to be of therapeutic value to his self-concept. Using the Brownfain Self-Rating Inventory they discovered that exposure to mild deprivation tended to increase the subject's receptiveness to the pre-recorded message as judged by the more favorable ratings they gave themselves after deprivation.

Gibby et al (1960) conducted a pilot study in which they exposed a diagnostically heterogenous group of V.A. patients to six hours of sensory deprivation. Although wide individual differences were noted, there were significant positive changes according to a symptom rating chart used for the duration of one week. The positive changes recorded were as follows:

- 1-The patients desired more social contacts and therapy.
- 2-There was an increased awareness of inner conflicts plus an acceptance of the responsibility of becoming well.
- 3-The patients had a generalized "stimulus hunger," in the form of greater receptiveness.
- 4-They had an increased desire to discuss their new found insights.
- 5-There was a less rigid use of repressive and inhibitive defenses.

Shurley (1960) found similar, encouraging results on the therapeutic value of sensory deprivation. Most

of his subjects previously had psychotherapy which may have reduced the threat of encroaching primary processes during the experimental deprivation. However, he found that the subjects, who were placed in a rigidly controlled deprivation environment, were exceptionally introspective and reportedly left the experiment in an elated mood. Lilly (Shurley, 1960), one of the discussants of Shurley's article, commented, "the long term efforts of repeated satisfactory exposures of these extreme conditions in several cases have been quite rewarding." It is recognized that this is an ambiguous conclusion based on the results taken from a very select group, but it does serve as another hopeful encouragement for the therapeutic use of sensory deprivation.

Azima (1959) also attempted to employ deprivation therapeutically. Under conditions of partial sensory deprivation and isolation for a period of six days he managed to engender an attitude of complete dependence in the patient for the examiner. In essence, he was systematically fostering the patient's dependency needs and thereby creating an anaclitic situation. The patients regressed considerably during this time and displayed less thought disorganization. Such regression and dependency is therapeutically valuable in that it stimulates a transference between client and clinician.



Such a therapeutic benefit was implied by Azima, but not taken advantage of in his study.

Robertson (1961) states that following stress some persons recover best after a period of withdrawal in themselves, which could be aided through sensory deprivation. He adds that the suggestibility of the patient during deprivation would make the inspection of previously unconscious material easier. Robertson then presents the theory that abnormal behavior is partially a function of self-imposed sensory deprivation in that the patient has become preoccupied with his problems to the exclusion of other external stimuli. (Robertson, 1961, a,) He then suggests the feasibility of negative practice in extinguishing such self-centered habits. Such an event would take place when the patient has been sensorily deprived to the point where he craves stimuli, and would thus be more amenable to therapy. He warns that if deprivation is to be used therapeutically, the patient should be trained to ward off the unpleasant effects which are sometimes encountered.

Sensory deprivation may also be of diagnostic use, although little research has been completed in this area. Robertson and Martin (1961) investigated the hypothesis that deprivation lowers the threshold for projection. This hypothesis stems from Lilly's (1956) comment that

"sensory deprivation causes one's mind to turn inward and to project outward its' contents." Robertson tested this hypothesis by presenting the autokinetic technique following three hours of deprivation. The experiment revealed no conclusive results, but this area has yet to be investigated thoroughly.

Goldberger and Holt (1961) used the Rorschach test to illustrate that isolation effects may cause a decrease in the efficiency of the secondary process. They used Holt's (1956) Rorschach method of estimating how efficiently 14 volunteer male college students handled their primary process. They found that the subjects who handled the primary process in a mature, effective manner on the Rorschach test reacted with significantly less unpleasant affect, more pleasant affect, and had more controlled, anxiety-free primary process thoughts during sensory deprivation than those subjects who, in their Rorschach responses, were defensive, avoidant, and had poor control of the primary process.

## PROBLEM

The objective of this research is to determine the effect of sensory deprivation on responses to a projective test. Schafer (1954) states that responses to a projective test may range from autistic fantasy to realistic thinking which are the extreme points of the response continuum would be dreaming, daydreaming, and normal realistic perceiving, with the secondary process most prevalent in the latter. Schafer contends that the more consistently a person interprets the projective stimuli in terms of the primary process, the more symptomatic this becomes of psychopathology. Rapaport (Gill & Rapaport, 1959) states that the secondary process depends upon the maintenance of continual contact with reality, and the absence of such contact, which is fostered in sensory deprivation, facilitates a regression to the primary process. Therefore, it would seem that if a person were subjected to sensory deprivation and then given a projective test, his responses would reflect the presence of the primary process. If the primary process did affect his responses, it would follow that his responses would be similar to those given by persons with definite psychopathology whose responses are characterized by the presence of the

primary process. Therefore, the hypothesis of this research is that responses to a projective test are significantly altered by sensory deprivation in the direction of the greater functioning of the primary process. If these responses are so affected by deprivation that they are similar to abnormal responses it would be supportive evidence for the theoretical assumption that sensory deprivation facilitates a regression to the primary process. The Word Association Test was chosen as the projective device to test this hypothesis.

## METHOD

Design.

Essentially, the experimental design to test the hypothesis is to compare subjects responses to a projective test before and after sensory deprivation with subjects not having deprivation, yet experiencing the same time interval between tests. The sensory deprivation and control conditions, the Word Association Test used for the projective test, and the subjects involved, will be discussed more fully after a more detailed presentation of this design.

Forty male college students served as subjects. According to a table of random numbers they were assigned to either groups A, B, C, or D, with ten subjects in each group. A and B were experimental groups, and C and D were the control groups. The 60 word Word Association Test was divided in half to make two halves of 30 words each. Group A subjects received the first half of the Word Association Test (1-30 words), and were then subjected to three hours of sensory deprivation. At the termination of three hours, and while remaining in the deprivation chamber, they were presented with the second half of the Word Association Test (31-60 words). Group B was administered the second half of the Word Association Test first (31-60 words), then had three hours of sensory deprivation, and finally, while in the

deprivation room, were given the first half of the Word Association Test (1-30 words). Thus, each experimental group served as its own comparison, and by counter-balancing the presentation of the two halves of the test, it was possible to determine if the subjects responded normally to both halves of the test before deprivation ensued. Group C served as the control for group A. These subjects received the first half of the projective test, then had a three hour interval of studying and conversing with other students, and finally returned to take the second half of the Word Association Test. Group D was the control for experimental group B. These subjects, like those in group B, had the second half of the Word Association Test at the onset of their experimental participation, then retired to the study room, and after three hours returned to be administered the first half of the test. If they showed as great a change as the experimental groups on the second administration of either half of the Word Association Test, it could be assumed that some other factor or factors than deprivation were responsible for such a change.

#### Experimental Condition.

A sound proof room at the Constance Brown Society was used for the sensory deprivation chamber. This

cubicle room was large enough to permit the subjects to lie down on an air mattress, and also to house a two-way speaker system which was connected to an adjacent room. The observation window between these two rooms was sealed against light leakage by black cardboard and tape. A ventilating system to the deprivation chamber maintained a fresh air supply of a constant temperature, and the fan served as a masking sound. The experimental condition was only given in the evenings so there were no vibrations transmitted through the building's structure to the deprivation room. The subjects' movements were restricted by cotton padded tubes placed on their arms and legs and with perforated cotton gloves on their hands. They were instructed to loosen their belts, shoes, collars, and to remove tight fitting watches and rings so that they would not be an added source of external stimulation, if not discomfort.

The two-way speaker system was such that the examiner could monitor each subject's stay in sensory deprivation. This system could be adjusted acutely enough to transmit the subject's breathing sounds to determine if he fell asleep, and also controlled so that when the examiner administered the Word Association Test, the voice loudness was the same for every subject.

In summary, the subjects were placed on an air mattress in a sound and light-proof room. They wore loose fitting cotton gloves and had cotton padded tubes on their arms and legs to cushion, restrict, and discourage movement. Tight fitting articles of clothing were loosened. The subject's entire period of deprivation was monitored by the examiner in an adjacent room by means of a two-way speaker system.

#### Control Condition.

The control group subjects were tested in the early evening as were the experimental subjects. The Word Association Test was administered to these subjects in an office in the University Health Service Building. After each subject received the first administration of the Word Association Test, they were taken to a classroom in the same building and permitted to study with the books they were instructed to bring, or to converse with other control subjects who were also present. The subjects were not allowed to leave the building. They were requested not to discuss the nature of the experiment, and it was ascertained that a moderate degree of cooperation was given to this request. After three hours in the classroom they were individually called back to the office and given the remainder of the Word Association Test.



### The Word Association Test.

The Word Association Test (Rapaport, 1946) was decided upon as the appropriate projective test because it could be administered orally and thus be less disruptive of the sensory deprivation condition than a test requiring verbal and visual presentation. This test is standardized, and scoring of the test did not require subjective appraisal of the data by the experimenter. Rapaport (1946) has standardized the test according to popular responses, reaction times, and errors of recall. He has also standardized the above scoring indices for certain emotionally tinged words contained in the list. He referred to these words as traumatic words, and they are so notated in the list contained in the appendix. It would have been possible to make a more detailed, subjective analysis of the test results, but this was not considered necessary because the scoring categories given above were considered to be the most reliable indicators of existing pathology and consequently of the presence of the primary process. Also, the number of popular responses, reaction times, and errors of recall are quantifiable and, therefore, amenable to statistical analysis.

Rapaport's Word Association Test is listed in the appendix. There are 60 words, and for this research

the list was divided into two halves of 30 words each. The first half of the list was the first 30 words, and the second half was composed of words 31-60.

Before each subject was administered the Word Association Test, he was given a statement signed by the examiner stating that under no circumstances would his reactions to the test be divulged to any other person. A copy of this statement is contained in the appendix. The subject was seated so that he faced away from the examiner because it was felt that direct eye contact would tend to inhibit more spontaneous responses. The subject was then told the following instructions: (Rapaport, 1946)

"I am going to read you a series of words one-by-one. I want you to respond to each word with one other word. It does not make any difference what your word will be, but it should be the very first word that comes to your mind after you hear my word. I want you to be just as fast as you can because I will time you. When people take this test they have a tendency not to hear some of the words the examiner calls out. I want you to resist this tendency. I am not to repeat the words."

After the completion of the 30 words, the subject was again presented the list in the same order. This is referred to as the reproduction period and was preceded by the following instructions:

"Now I am going to call out the same words again, and I want you to respond with the

very same words you did before. Please try to be quick; I will time you again."

Rapaport (1946) found that normal subjects and individuals in certain diagnostic categories differed most significantly in terms of reaction times, popular responses, error responses, and reactions to traumatic words. These scoring indices were used by the examiner and they shall now be described and explained as to how they reflect the presence of the primary process.

#### Reaction Times.

This is the time it takes the subject to respond with the first word that comes to mind after hearing the stimulus word given by the examiner. Rapaport found that his control groups of normal subjects had the shortest reaction times and there were increasingly longer reaction times for neurotics, schizophrenics, and depressives. He noted that subjects with long reaction times to traumatic words were also delayed in their responses to non-traumatic words, but not as much as for the former. He also stated that a fast reaction time was within two seconds, an intermediate time from three to four seconds, and that a long reaction time was five seconds and more. Recall that Schafer (1954) stated that the more serious the psychopathology, the more persistently the person will demonstrate the

activity of the primary process. Logically, this would imply that the long reaction times of the neurotic, schizophrenic, and depressive would in some way be correlated with the primary process. Thus, if sensory deprivation did activate the primary process more than normal, reaction times would increase.

### Popular Responses.

Rapaport obtained from his research a list of the most frequent, and therefore popular, responses to the Word Association Test. This list is contained in the appendix. He contends that the normal population is in one way different from the psychiatric population by virtue of its greater stability of thought organization. He maintains that the higher incidence of popular responses in the normals supports this proposition. His interpretation of this phenomenon is that the normals' stability of thought organization facilitates an attitude of conforming with the instructions and the ability to withstand the onslaught of deep-lying affects and impulses seeking ideational representation in the reaction to the stimulus word. Therefore, if the primary process were sufficiently activated by sensory deprivation, these affects and impulses would be expressed at the expense of popular

responses.

### Error Responses.

These are also referred to as associative or reproduction disturbances. This is the subject's failure during the reproduction period to recall the word he gave to the stimulus word during the previous presentation of the list. Rapaport states (1946) that in the course of time, stable thought organization tends to achieve control over affects which would disrupt the original associative reaction, and therefore, normal subjects have less error responses during the reproduction period. A thought process initiated for the second time by the same stimulus word will usually traverse the same route of preparatory ideas leading to the original reaction. However, if there is an instability of thought, an intrusion of ideas stimulated by the primary process will interfere with an accurate recall. Thus, it is expected that persons experiencing sensory deprivation would have more error responses.

### Traumatic Words.

The traumatic stimulus words are those with sexual, anal, oral, familial, and aggressive connotations. These stimulus words are notated in the appendix. Rapaport

found that an increasing degree of maladjustment is paralleled by an increasing number of association disturbances with traumatic words during the initial presentation and the reproduction period of the Word Association Test. And once again, inasmuch as increasing pathology is marked with intrusions of the primary process, it logically follows that the effect of sensory deprivation on a subject's reactions to traumatic words would be disrupted by the aroused primary process.

### Subjects.

The subjects used in this experiment were volunteer male college students drawn from a class in Abnormal Psychology. Male subjects were chosen instead of females because sensory deprivation can be a traumatic experience; it can be conducive to anxiety provoking fantasy; and the male examiner was unassisted. The subjects were solicited with the letter explaining the experiment which is contained in the appendix. The subjects were naive as to the exact nature of the experiment up to the time they participated. When a subject arrived to participate he was familiarized with the experimental condition and equipment, but not told the hypothesis of the experiment. This was done so that undue anxiety would not be aroused by suddenly being

placed in sensory deprivation without an adequate explanation. The experimenter felt that if sensory deprivation did engender anxiety in the subject, it should be a function of this condition alone, and not due to a fear of an unknown experimental condition, nor aroused before actually experiencing the condition. At the termination of each subject's participation, he was cautioned about the detrimental effect any discussion of the experiment would have on the validity of the results.

## RESULTS

A counter-balanced design was used in this experiment so that if there were any factors contained in either half of the Word Association Test that would influence the subject's responses, such effects would be distributed evenly over the experimental and control groups. The experimental and control groups were compared on the scoring indices of response time, popular responses, and errors of recall during the reproduction period. The hypothesis of this study assumes that following sensory deprivation the experimental subjects would have longer reaction times to the first and reproduction periods of the test, fewer popular responses, and more difficulty in recalling previous responses during the reproduction period, than the control subjects would have after three hours of studying. The statistical results derived from comparing the groups on these scoring variables are given below.

### Reaction Time.

Reaction times were compared by totaling the time in seconds spent by each subject in responding to the first presentation of the test, the reproduction period, and to the traumatic words. Mean changes in reaction time before and after deprivation were compared with the



corresponding test periods of the control group by means of the t-test.

It was found that the experimental group's accumulated response time to the Word Association Test had an average decrease of .521 seconds following sensory deprivation. The control subjects had total reaction times following the three hours of study time which were on the average 1.536 seconds shorter than the first administration of the test. When these mean changes were compared a t-value of .116 was obtained which is not statistically significant. Table 1 summarizes these findings.

TABLE 1

Comparisons of Mean Change in Reaction Times  
to The Word Association Test

<u>Mean Change</u>	<u>C</u>	<u>t-value</u>
Exp. group - .521	26.9	.116
Control group -1.536	31.53	

The experimental group's average reaction time to the reproduction section of the test was longer following sensory deprivation than prior to this condition. The control group had a decrease in the time spent on the reproduction period following the control condition of three hours of study time. However, these

mean changes in reaction time were very slight, and a non-significant t-value of .867 was found when the groups were compared. These results are summarized on Table 2.

TABLE 2

Comparisons of Mean Change in Reaction Times  
to the Reproduction Section  
of the Word Association Test

<u>Group</u>	<u>Mean Change</u>	<u><math>\sigma</math></u>	<u>t-value</u>
Exp. group	+2.257	16.567	.867
Control group	-1.722	11.218	

The experimental group's average reaction time for the 20 traumatic words was slightly shorter following sensory deprivation than pre-deprivation. The control subjects also had a slight decrease in reaction time to traumatic words after three hours of study. A t-value of .142 indicated that these groups could not be distinguished from one another on the basis of their response time to the traumatic words contained in the Test. These data are summarized on Table 3.

TABLE 3

Comparisons of Mean Change in Reaction Times  
to the Traumatic Words of  
The Word Association Test

<u>Group</u>	<u>Mean Change</u>	<u><math>\sigma</math></u>	<u>t-value</u>
Exp. group	- .544	9.006	.142
Control group	-1.016	11.660	

### Popular Responses.

The experimental group had a mean number of 28.8 popular responses to the Word Association Test and the control group had a mean of 28.7 popular reactions. From inspection of these means it is apparent that sensory deprivation had no differential effect on popular reactions, so that a test for mean differences was not warranted for this scoring category.

### Errors of Recall.

Table 4 indicates that both the experimental and control groups had fewer reproduction errors after deprivation and the control condition than on the first test administration. The t-value of .561 obtained by comparing the mean change in recall errors indicates that the groups were not noticeably different on this scoring indice.

TABLE 4

Comparisons of Mean Change in Errors of Recall  
During the Reproduction Period of  
The Word Association Test

<u>Group</u>	<u>Mean Change</u>	<u><math>\sigma</math></u>	<u>t-value</u>
Exp. group	- .35	4.327	.561
Control group	-1.00	2.608	

When the subjects were compared on the errors of recall they made to the traumatic words on the Test, it was found that there were no significant differences between the groups on this criterion. These results are included on Table 5.

TABLE 5

Comparisons of Mean Change in Errors of Recall  
for Traumatic Words During the Reproduction  
Period of the Word Association Test

<u>Group</u>	<u>Mean Change</u>	<u>C</u>	<u>t-value</u>
Exp. group	-.30	1.792	.090
Control group	-.35	1.621	

In summary of these results, the experimental and control groups were not differentiated from one another due to sensory deprivation according to the scoring indices used in this study. These results do not substantiate the hypothesis assumed in this study.

## DISCUSSION

The problem under investigation was whether a person's responses to a projective test are significantly altered by the effects of sensory deprivation. The theoretical position that would predict such a change is that during sensory deprivation the primary process finds greater expression in overt behavior and the person would give more responses to a projective test that would be similar to those of persons with psychopathology. The scoring indices used by Rapaport for the Word Association Test are reported to measure psychopathology. And, according to Schafer (1954), it is an indication of the functioning of the primary process when here is an expression of psychopathology on a projective test. In other words, expression of the primary process is a symptom of psychopathology. The results indicated that the subjects did not differ on any of the scoring indices. These results can also be stated as three hours of sensory deprivation did not significantly alter the thought organization of normal male college students.

When the experimental subjects were questioned following sensory deprivation, most of them testified that they fought the boredom of deprivation by fantasy, recalling recent events, ruminating over the nature of

the experiment, singing, and almost always, by short periods of sleep. However, fantasy was typically of a constructive nature, such as planning and building a house or boat. The other past-times were also deliberate, planned, and of a reality orientated nature. Sleep was often used as a defense against the boredom. Apparently, during such a short interval of sensory deprivation, the normal college male is resourceful enough to entertain and occupy himself in a reality-orientated fashion.

There is, of course, the outstanding question if true sensory deprivation was actually attained. It is the experimenter's opinion that the most ideal state of deprivation was not achieved. The subjects frequently complained that their limbs became stiff, or "fell asleep," which was a source of irritating stimulation. Head movements were not sufficiently controlled for, and they could hear themselves singing or talking. Feelings of depersonalization, or of being suspended in a void were not reported. It is regretful that a better state of sensory deprivation could not be attained.

Those studies which reported the more drastic reactions to sensory deprivation had the subjects under such a condition for a period of time that was

longer than used in this experiment. Possibly if the experimental condition were six or eight hours, a difference would have been found between the groups.

There are a few important points that have been obtained from this experiment which are of value for future research in this area. First of all, short periods of deprivation are not disruptive of the thought organization of normal male college students. And for the concern of future research in the area of sensory deprivation, it is suggested that the hypothesis presented in this thesis be investigated on a continuum of time. That is, the design should incorporate several groups having progressively greater periods of time in deprivation. In such a design, a trend could be established as to approximately when differences in projective behavior occur, if they do at all. Also, the data should be analyzed qualitatively as well as quantitatively. It would also be interesting to compare these groups on this continuum of time in terms of what they do specifically to relieve the boredom of deprivation. Thus, if other indices of personality were obtained from the subjects prior to sensory deprivation, it would be possible to ascertain more specifically the dynamics of the primary process if it is so activated by deprivation. The results from

such a study would also be of value to aid the person who is scoring a projective test to decide whether or not the primary process is functioning to the detriment of the patient's reality orientation.



SUMMARY

The objective of this experiment was to determine the effect of sensory deprivation on responses to a projective test. Theoretically, it is expected that during deprivation the subject will rely more heavily upon the primary process because of the absence of external stimulation. Also, it is expected that persons with psychopathology typically indulge in the primary process to the detriment of the more reality orientated secondary process. Therefore, if sensory deprivation does activate a normal person's reliance on the primary process, his responses to a projective test should be similar to those of persons with existing pathology, and quite different from normals who do not experience deprivation.

Rapaport's Word Association Test was used for the projective device because it was less disruptive of sensory deprivation than most tests, and there is standardized scoring that makes the test amenable to statistical analysis. It was hypothesized that the subject's responses to the Word Association Test would be affected by the deprivation condition as a result of greater functioning of the primary process.

To test this hypothesis, 40 volunteer male

college students were randomly assigned to each of four groups with ten subjects in each group. The Word Association Test was divided in half and counter-balanced in its presentation to the groups. Experimental group A received 1-30 words of the Word Association Test first, then had three hours of sensory deprivation, and finally the last half of the test while in deprivation. Group C received the same order of presentation of the Test, but served as the control group for A by studying for three hours rather than being exposed to sensory deprivation. Experimental group B received the 31-60 half of the Word Association Test, then were placed in sensory deprivation, and finally administered the 1-30 section of the Test after three hours. Group B's control, group D, had the same order of receiving the Word Association Test, but had three hours of study time like group C.

The tests were scored in terms of reaction times, number of popular responses, errors in recall during the reproduction period, and reactions to traumatic words. It was found that there were no statistically significant differences between the groups on these scoring indices. The results were interpreted as normal male college students are capable of preserving thought organization during three hours of sensory

deprivation by self-directed activities of good reality orientation. The problem of establishing pure sensory deprivation was discussed and it was decided that the best experimental condition was not reached in this experiment. From the experience derived from this experiment, the examiner proposed a more adequate design to investigate the effect of sensory deprivation on projective behavior and the role the primary process plays in this effect.

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## APPENDIX

## Statement of Confidence

I, Robert M. Browning, make this statement to \_\_\_\_\_  
\_\_\_\_\_. The data obtained from you in this  
research project will be used objectively and ethically,  
and in no way will your name be used in reference to the  
data, nor shall I discuss, publish, or even mention your  
name to other persons, or organizations.

The data obtained from you is being collected for  
an approved research study in the Graduate program in  
Clinical Psychology at Western Michigan University.

Date \_\_\_\_\_ Examiner's signature \_\_\_\_\_

Date \_\_\_\_\_ Subject's signature \_\_\_\_\_

Sign-up Sheet for Male Student Volunteer Subjects  
in Psychological Research Project under the  
Supervision of Robert M. Browning

Your participation in this research project will be greatly appreciated. It is regretful that your services cannot be paid for, but I think you will find the experiment you are a part of rather interesting. It will involve three continuous hours of your time, which will be arranged according to your schedule.

Although the nature of the experiment cannot be disclosed at this time, you should know that it is unique and crucial to space and orbital flight research. Any conditions you may be subjected to during the experiment are in no way physically or emotionally detrimental. Any and all data obtained from you will be held in the utmost confidence, and you will be given an endorsed statement testifying to this. Your name will be used only for establishing an appointment, and thereafter the data derived from your reactions will be referred to by number, like subject number 1, 2, etc.

There are two criteria which will be required of every subject involved in this research. First, that if you agree to participate, you will make every effort to keep your appointment and to cooperate fully during the experiment. Secondly, that you will absolutely refrain from conversing with anyone about the experiment until you have been notified otherwise, which should be in early summer. The reason for this stipulation is that if a subject was familiar with the experimental condition prior to participating, he may behave differently, i.e., less natural and spontaneous. It is assumed that every subject will adhere to this very important requirement.

The experimental objectives will not be explained to you until all subjects have finished, and then you will receive a letter clarifying the exact nature of the study.

If you agree to participate, fill in the following page and hand it in to your instructor. You may wish to keep this first page so that you will have my name on hand. I shall contact you in the near future, either by phone or mail, to arrange the most convenient time of experimentation. Transportation to and from the laboratory will be provided and it is suggested that you wear old clothes.

The Word Association Test  
(words 1-30)

Words	Type	Popular Responses
1-world		earth, round, globe
2-love	traumatic	hate
3-father	traumatic	mother, parent, son
4-hat		coat, cap, head
5-breast	traumatic	chest, woman
6-curtains		drapes, window, shade, house
7-trunk		suitcase, clothes
8-drink		water, eat, liquor
9-party	traumatic	fun, people
10-bowel movement	traumatic	shit, toilet, excretion
11-book		read
12-lamp		light
13-rug		floor, carpet
14-chair		sit, seat, table
15-boy friend	traumatic	girl, girl friend
16-penis	traumatic	man, prick
17-dark		light, night, black
18-depressed		sad, happy
19-spring		summer, fall, winter
20-bowl		dish
21-suicide	traumatic	death, kill, murder
22-mountain		hill, valley, high
23-house	traumatic	home, barn, dwelling
24-paper		write, pen, pencil, news
25-homosexual	traumatic	no popular reaction given
26-radiator		heat, car, water
27-girl friend	traumatic	boy, boy friend, sweetheart
28-screen		window, fly, door
29-masturbate	traumatic	jack off
30-frame		picture, window

The Word Association Test  
(words 31-60)

<u>Words</u>	<u>Type</u>	<u>Popular Responses</u>
31-man		woman, male
32-orgasm	traumatic	no popular response given
33-movies		picture, show, theater
34-cut		blood, bleed, wound, knife
35-laugh		cry, happy, fun
36-bite	traumatic	teeth, chew, hurt
37-woman	traumatic	men, female, girl
38-dance		music, fun, pleasure, play
39-dog		cat, animal
40-daughter		son, child, girl, mother
41-taxi		car, automobile, cab, vehicle
42-mother	traumatic	father
43-table		chair, eat, food
44-beef		meat, cow, eat, food, cattle
45-nipple		breast, bottle, baby, teat
46-race		run, horse
47-water		drink, liquid
48-suck	traumatic	baby, nipple, draw, breast
49-horse		cow, animal, ride
50-fire		water, burn, heat, flame
51-vagina	traumatic	woman
52-farm		land, home, country
53-social		party, gathering, fun, pleasure
54-son	traumatic	daughter, boy, moon, heat, light
55-taxes		pay, money
56-tobacco		smoke, cigarette
57-city		town, country, people
58-intercourse	traumatic	fuck, sex, woman
59-hospital		sick, ill
60-doctor		sick, ill, nurse, lawyer