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COLLECTED PAPERS PREPARED UNDER WORK UNIT ENDORSE: EFFECTS OF CONTROLLED ISOLATION ON PERFORMANCE

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Alexandria, Virginia

March 1968

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Professional Paper 6-68

March 1968

Collected Papers Prepared Under Work Unit ENDORSE:

Effects of Controlled Isolation on Performance

Presentations and Papers, 1958-1961

HumRRO

The George Washington University
HUMAN RESOURCES RESEARCH OFFICE

The Human Resources Research Office is a nongovernmental agency of The George Washington University. The research reported in this Professional Paper was conducted under contract with the Department of the Army (DA 44-188-ARO-2). HumRRO's mission for the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

The George Washington University • Human Resources Research Office
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Prefatory Note

During 1956-1962 the Human Resources Research Office undertook an extensive program of research to evaluate experimentally the effects of sensory deprivation and social isolation upon a variety of human behaviors. The research was initiated under Work Unit ENDORSE, Effects of Controlled Isolation on Performance. It was later transferred to HumRRO's basic research program, initially as Sub-Unit PIONEER VI, and then as Basic Research Study 6, Integrating and Systematizing the Findings of Military Psychotechnology. The research was performed at HumRRO Division No. 3 (Recruit Training), Presidio of Monterey, California.

The scope and duration of the experimental work was such that a large number of persons made direct and substantial contributions, and reporting on the research occurred over several years. This collection of papers consists primarily of presentations to the Western Psychological Association and the American Psychological Association during 1958-1961. Other publications under Work Unit ENDORSE are listed at the back of this publication.

Because of the continuing relevance of the subject matter of these papers, they are being issued in a group as part of the HumRRO Professional Paper series. This series was initiated in order to provide permanent record of specialized aspects of HumRRO work, and deposit in the scientific and technical information storage and retrieval systems of the Department of Defense and the Federal Clearinghouse.

CONTENTS

THE COUNTING OF AUDITORY STIMULI[1]

Richard A. Monty

This study involved a complex discrimination task in response to an auditory stimulus with many parameters (such as loudness, pitch, frequency, speed of repetition, and numerosity) appearing against certain background noise. All parameters except numerosity were held constant. It was found that error was directly related to numerosity and that a reduction in error was attributable to knowledge of results and was itself positively related to numerosity.

Although there has been considerable research on auditory discrimination and learning in terms of the areas of the basic correlates of the auditory stimulus and the psychophysiology of hearing, there have been few studies—other than those of Fred S. Keller (1, 2), who was primarily concerned with the learning of Morse Code—involving the numerosity of the auditory stimuli.

There is some evidence in the literature (3) that the numerosity of visual stimuli has a direct effect on the error in counting such stimuli: The greater the number of stimuli, the greater the counting error. The main problem of the study here described was to determine, under specific experimental conditions, the effects of (a) numerosity of subject-produced auditory stimuli upon the accuracy of counting of such stimuli, (b) knowledge of the number of stimuli actually produced upon the accuracy of counting, and (c) a short-time interval upon a previously learned counting ability.

The subjects were 40 male members of the U.S. Army from Fort Ord, California, who had just completed processing but had not started basic training. All subjects had received a score on the Army General Classification Test of 110 or better. They were instructed to depress a telegraph key which emitted a continuous series of blips at the rate of 6.3 per second. Blip items of 1, 2, 4, 6, 8, 10, 15, 20, 30, and 40 blips in length were requested in random order of six cycles of ten so that each blip item was requested once per cycle before the random ordering was continued.

There were two groups of subjects, one control and one experimental, and each went through three phases of the procedure. Each phase consisted of 60 trials, each trial separated from the preceding one by approximately a two-second interval. The second phase followed immediately after the first so that there were 120 successive trials. There was then a one-hour delay followed by the third phase of 60 trials.

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[1]Paper read at meeting of Western Psychological Association, Monterey, California, 1958.

All three phases were identical for the control group. The experimental group, however, was given knowledge of the actual number of sounds emitted after each of the 60 trials in the second phase.

The measure of error used was the absolute difference between the number of blips requested and the number actually produced on each trial.

Lindquist's "type 6" analysis of variance design (4) was used to analyze the data. Phases 1 and 2 and Phases 2 and 3 were analyzed separately as shown in Table 1. The trials on the shorter blip items resulted in heterogeneous variance; therefore, only the data on the 15, 20, 30, and 40 blip items were utilized in the analysis.

Table 1

Analysis of Variance of Error on Blip Test [a]

Source of Variation	*df*	Phases 1 and 2		Phases 2 and 3	
		MS	*F*	MS	*F*
Between Subjects	39	4,118.14		2,819.77	
Conditions (Experimental-Control)	1	13,094.41	3.29	22,461.75	9.75**
Error	38	3,953.75		2,302.88	
Within Subjects					
Phases	1	9,537.53	10.04**	67.53	<1
Blip Items	3	19,243.85	47.38***	10,059.44	132.58***
Phases x Blip Items	3	1,466.44	10.71***	3.47	<1
Phases x Conditions	1	6,471.00	6.82*	2,025.08	5.41*
Blip Items x Conditions	3	1,400.54	3.45*	2,415.14	31.83***
Phases x Blip Items x Conditions	3	520.76	3.80*	134.06	<1
Error (w)					
$Error_1$ (w)	114	949.33		374.29	
$Error_2$ (w)	114	406.17		75.87	
$Error_3$ (w)	114	136.88		285.54	

[a] * indicates $p < .05$; ** indicates $p < .01$; *** indicates $p < .001$.

Let us first consider the effects of numerosity of the subject-produced stimuli upon the accuracy of counting. As may be seen in Figure 1, the larger the blip item, the greater the mean error of estimation. This was found to be significant at the .001 level in both analyses; however, we also found several significant interactions of blip items with other variables, indicating that the magnitude of this effect was not independent of the other variables.

Figure 2 is simply a breakdown of Figure 1, for clarity. It includes the error on only the 15, 20, 30, and 40 blip items for Phases 1 and 2. It shows quite clearly that knowledge of the stimuli actually produced affected the accuracy of counting. On Phase 1 where no knowledge was provided, both groups made about the same number of errors. However, on Phase 2, there was an overall significant reduction of error (as indicated by the significant *F* for phases in Table 1). More particularly, the phases x conditions interaction (Table 1) suggests that there was a greater improvement for experimental than control

Mean Error as a Function of the Blip Item on All Phases

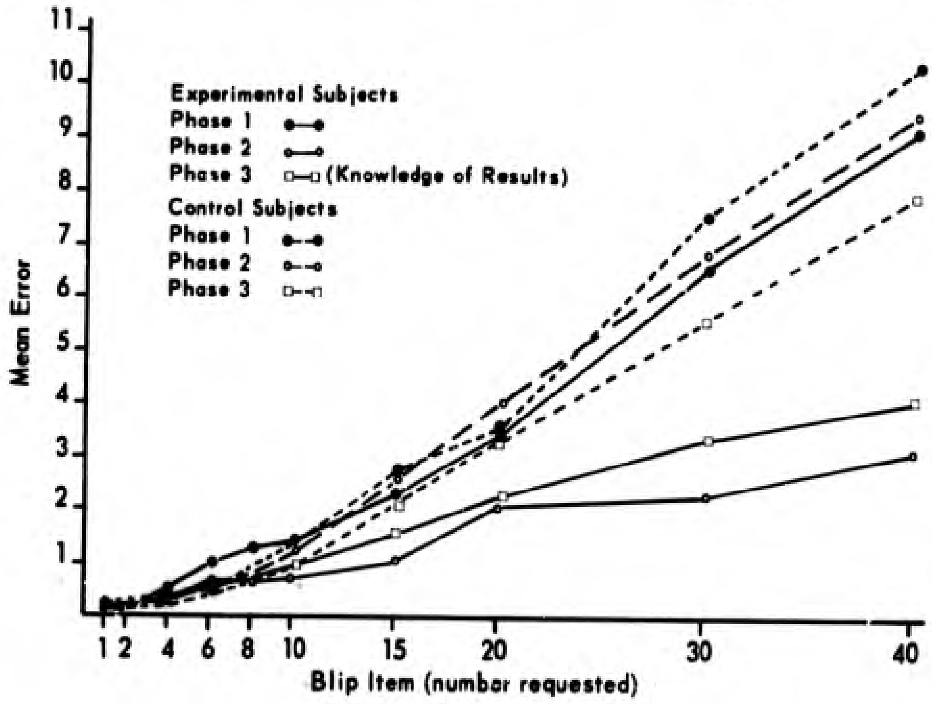

Figure 1

Mean Error as a Function of the Blip Item on Phases 1 and 2

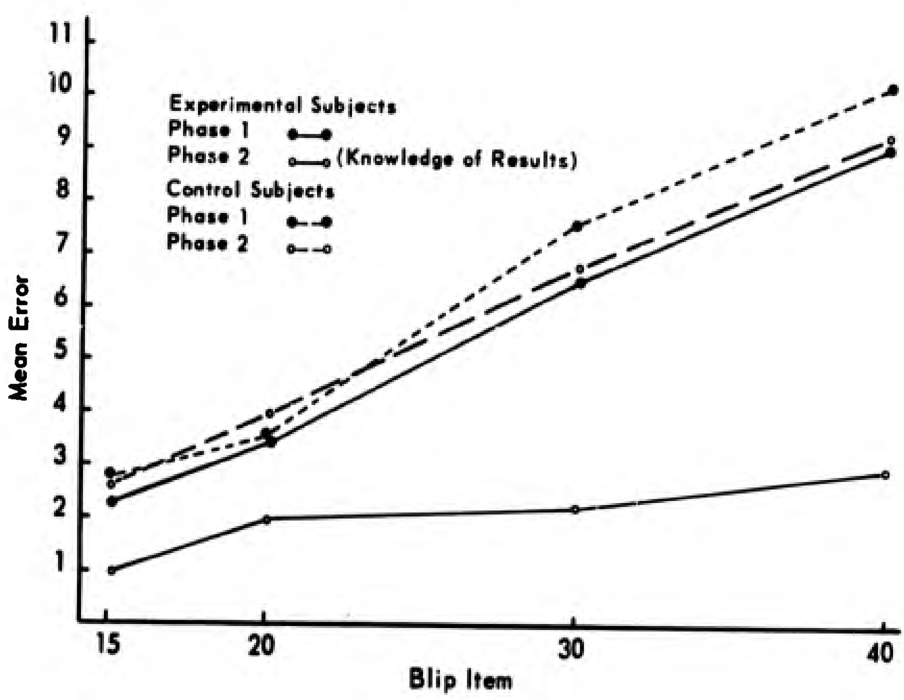

Figure 2

group, confirming the efficacy of knowledge of results. The significant triple interaction, phases x blip items x conditions, reflects the fact that the magnitude of the phases x conditions effect was a positive function of the length of the blip item. That is, knowledge of results contributed to better performance on each blip length, but its effect was progressively more pronounced on the more difficult items.

Significant interactions were also found between blip items and conditions and between blip items and phases. Unfortunately, however, the inferences that can be drawn are of limited value, in that the introduction of the experimental manipulation—knowledge of results—occurred during Phase 2, while experimental and control conditions were identical in procedure on Phase 1. This means that the phase factor in the phases x blip items interaction was not simply a stage of practice or experience variable, but was also partially confounded with the variable—presence or absence of feedback. Likewise, the conditions factor in the blip items x conditions interaction pooled over phases was not free of the contribution of Phase 1, in which conditions designation did not entail a procedural difference.

We can conclude then, that, while demonstrating approximately equal baseline performance on Phase 1, the experimental group showed a significant improvement on Phase 2 relative to the control group. The difference observed is attributed to the knowledge of performance provided.

Now let us consider the effects of the time interval and of withholding knowledge upon the previously learned counting abilities, bearing in mind that the experimental group performed better than the control group on Phase 2. On Phase 3 the performance of the experimental group (as

Mean Error as a Function of the Blip Item on Phases 2 and 3

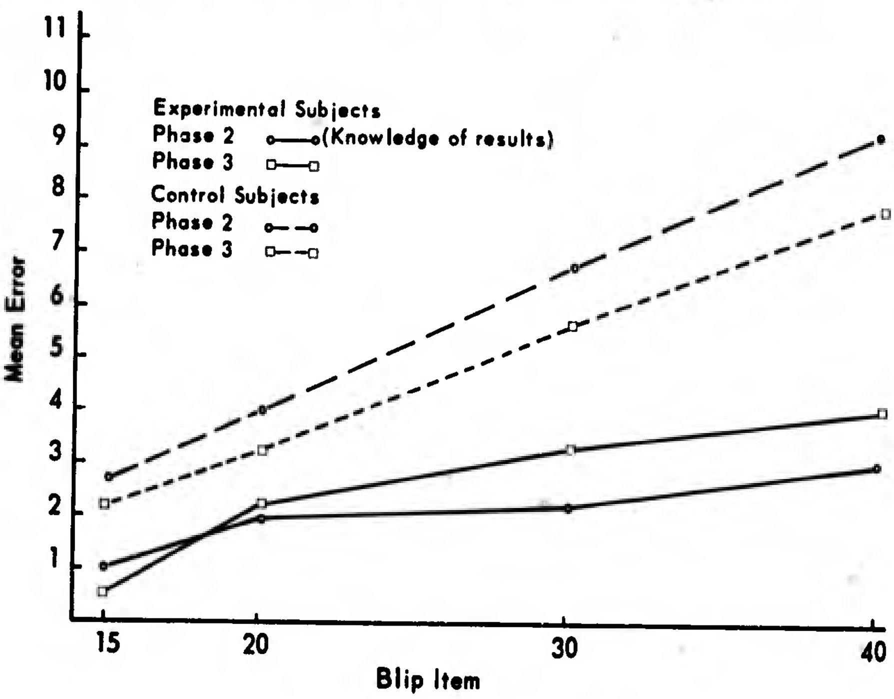

Figure 3

shown in Figure 3) was slightly inferior to its performance on Phase 2, while the control group showed slight improvement. The significant *F* for conditions in the Phase 2 and 3 analysis in Table 1 clearly indicates the overall difference between the two groups. Again, however, the interaction between phases and conditions indicates that the magnitude of the differences between groups was not constant over phases. That is, the superiority of the experimental group tended to decrease from Phase 2 to Phase 3.

In summary, we have seen that knowledge of the number of stimuli produced by the subjects improved the accuracy of their subsequent counting. One hour later in the absence of all feedback, the greater accuracy of the previously correctly informed group over the uninformed group still persisted, although there is evidence that this superiority had diminished and that it may not hold up over long periods of time.

The task involved a complex discrimination in response to an auditory stimulus with many parameters, such as loudness, pitch, frequency, speed of repetition, and numerosity, appearing against certain background noise. The experiment attempted to deal with only one of these—numerosity—while the others were held constant. It was found that error was directly related to numerosity. Furthermore, the reduction in error attributed to knowledge of results was itself positively related to numerosity. Further development of knowledge basic to such applications as code learning may require the study of the joint influence of a number of the fundamental auditory parameters.

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INFLUENCE OF INSTRUCTIONS ON VERBAL REPORT OF VISUAL SENSATIONS UNDER CONDITIONS OF REDUCED SENSORY INPUT[1]

Donald B. Murphy, Edward J. Kandel, and Thomas I. Myers

The subjects (42 basic trainees of superior intelligence) were taken into a semi-lightproofed office and given instructions of a positive-suggestive or negative-suggestive nature with respect to the possibilities of actual visual sensations in semi- or complete darkness. The positive instruction group reported a significantly greater number of visual sensations than did the negative instruction group and the sensations reported were significantly more complex.

Notable among the findings of Bexton (1), Lilly (2), Vernon (3, 4), and Wexler (5), and their associates concerning the effects of sensory deprivation on behavior has been the observation that under these conditions subjects reported hallucinatory experiences. These experiences were inferred from the verbal statements of subjects who had been confined for periods ranging from a few hours to three days. The verbal hallucinations can be rated from the least complex to the most complex depending on whether the subject reported seeing (a) lines, dots, or diffuse lights; (b) complex geometrical designs; (c) isolated or combinations of single objects; (d) integrated scenes. Most subjects reported hallucinatory experiences falling in the first two categories, while many fewer subjects reported the more complex hallucinatory experiences (see Table 1). On the basis of these findings, the investigators indicated that the report of visual hallucinatory experiences may be related to the effects of sensory deprivation.

The HumRRO research group at the Presidio of Monterey, California, is engaged in research on the effects of sustained sensory deprivation. Since the above-mentioned research did not provide data on the number of reported visual experiences under reduced sensory stimulation of minimal duration, we felt that it would be desirable to obtain this information before studying the effects of sustained deprivation upon the incidence of reported visual experiences. It was further noted that the observed differences in number of hallucinatory experiences reported in the earlier research may have been due to differences in the instructions to the subjects.

In order to study the effects of instructions on the incidence of reported visual sensations under reduced sensory stimulation of minimum duration, 42 Army basic trainees of superior intelligence were assigned

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[1]Paper read at Meeting of Western Psychological Association, Monterey, California, 1958.

Table 1

Number of Subjects Reporting Visual Experiences in Deprivation Studies

Deprivation Study	*N*	Number of Subjects by Content Category[a]			
		Lines, Dots, Diffuse Light	Geometric Patterns	Isolated Objects	Integrated Scenes
Bexton, *et al.* (1)	14	14	11	7	3
Lilly, *et al.* (2)	2	0	0	0	2
Vernon, *et al.* (3)	9	1	0	0	0
Vernon, *et al.* (4)	9	4	6	0	0
Wexler, *et al.* (5)	17	b	b	b	3
Present Study					
Positive Instruction	21	19	16	10	5
Negative Instruction	20	14	9	4	2

[a]The content categories were developed by the authors of this paper, and the published data from other experiments were classified according to them.
[b]Indeterminate.

to two instruction groups. The subjects were taken individually to a semi-lightproofed office and given either positive or negative instructions.

The group receiving positive instruction was told:

> We are interested in certain visual sensations which occur after being in the dark for some time with your eyes open. In order for your eyes to become accustomed to the dark, I will leave you here lying on the bed. I also want you to wear these goggles.

The experimenter then handed the subject opaque goggles and continued:

> Note that you can open your eyes even with them on. Please keep the goggles on for the remainder of this task. As you know objects cannot be seen in a very dark room. However, the human eye is so constructed that people normally become aware of visual sensations when lying in the dark with their eyes open. These visual sensations are due to the physiology of the eye and are experienced by all people.

The experimenter then turned off the light and said:

> Right now, for example, you are not experiencing total blackness, but rather varying shades of darkness. As you lie here in the dark these sensations will become more pronounced and others will occur. Normally, you, as most people, are unaware of these sensations because you have learned to ignore them. In this task I'd like you to describe all the visual sensations you experience, while lying in the dark with your eyes open. However, I want you to describe only visual sensations. Please do not describe thoughts or memories which you are only thinking about but not actually seeing.

The group receiving negative instruction was told:

> We are interested in certain visual sensations which psychiatric patients report seeing in the dark. As you know, objects cannot be seen in a very dark room. However, these psychiatric cases claim to experience visual sensations while lying in the dark with their eyes open. In this task I'd like to know if you experience these visual sensations while lying in the dark with your eyes open. Please do not describe thoughts or memories which you are thinking about but not actually seeing. Be sure to describe only those visual sensations which actually seem to appear in front of your eyes. I also want you to wear these goggles. Note that you can open your eyes even with them on.

After 10 minutes of lying in the dark wearing the opaque goggles, each subject was asked identifying questions over the intercom system to make sure he was awake. He was then instructed to describe the visual sensations he was actually experiencing with his eyes open. One minute after these instructions the subject was told he was doing fine if he had been talking; if he had remained silent he was again told to describe all visual sensations. If the subject did not respond for four consecutive minutes, the experiment was discontinued. Otherwise, the subject was given 15 minutes of reporting time. Upon completion of the reporting time, each subject was asked a series of questions to gain more information about the reported visual sensations and, in particular, to determine whether he had been free-associating or whether he had been reporting visual sensations that seemed to appear in front of him. All responses were tape-recorded and protocols typed from the tapes.

The typed protocols were scored for the number of visual sensations reported and for the content of the reported visual sensations. A visual sensation was defined as a noun or pronoun with its verbs and modifiers. The four categories discussed earlier were used for content classification. Rules for scoring were drawn up and one-fourth of the protocols were scored by three individuals working independently. The scorers agreed 83% of the time in identifying the occurrence of a reported visual sensation. One protocol was discarded because, upon examination, it appeared the subject had free associated.

The total number of visual sensations reported by the positive and negative groups is shown in Table 2. Since the distribution of scores was badly skewed, a square root transformation was used on the data. A *t* test of the difference between the mean number of visual sensations reported by the two groups showed that the positive instruction group reported a significantly greater ($p<.05$) number of visual sensations than did the negative instruction group.

The total number of reported visual sensations as well as the number of individuals reporting visual sensations in each of the content categories is given in Table 3. For statistical reasons an analysis was not made on these data. However, it was found that the four content

Table 2

Total Number of Visual Sensations Reported by Instruction Groups

Instruction Group	N	Sensations		p
		Raw Score	Square Root Transformation	
Positive	21	655	106.67	<.05
Negative	20	365	64.55	<.05

Table 3

Number of Subjects Reporting Visual Sensations and Total Number of Visual Sensations Reported, by Category

Instruction Group	Lines, Dots, Diffuse Light			Geometric Patterns			Isolated Objects			Integrated Scenes		
	N of Sensations	Square Root	N of Subjects	N of Sensations	Square Root	N of Subjects	N of Sensations	Square Root	N of Subjects	N of Sensations	Square Root	N of Subjects
Positive (N=21)	489	120.80	19	146	43.93	16	68	23.03	10	15	6.89	5
Negative (N=20)	269	68.32	14	79	22.42	9	20	8.59	4	22	6.45	2

categories formed a Guttman-type scale with a reproducibility coefficient of .974. When subjects were assigned scores based on their scale-type, it was found that the positive instruction group had a significantly greater score ($p<.05$) in the direction of the more complex visual sensations than the negative instruction group.

The results of this study showed that after a 10-minute period of reduced sensory stimulation, a majority of subjects in both instruction groups reported visual sensations. This finding suggests that a base rate for reported visual sensations is needed in order to evaluate the incidence of reported visual sensations when the effects of sustained deprivation are being studied. The significant difference in the number of reported visual sensations, resulting from the type of instructions used, suggests that other implicit or explicit sets associated with the experimental conditions may also influence the incidence of reported visual sensations. The set as produced by the experimental conditions thus appears to be an important area of study in a research program on the effects of sustained sensory deprivation.

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INFLUENCE OF PRIOR VERBALIZATION AND INSTRUCTIONS ON VISUAL SENSATIONS REPORTED UNDER CONDITIONS OF REDUCED SENSORY INPUT[1]

Edward J. Kandel, Thomas I. Myers, and Donald B. Murphy

Thirty Army trainees received verbalization experience on selected Rorschach cards; another 30 had no Rorschach pretest. Subsequently, half of the subjects in each group were instructed that it was normal to experience visual sensations in the absence of light; the other half were told that psychiatric patients experienced these visual sensations. Each subject then put on opaque goggles and lay on a bed in a darkened room. After 10 minutes the subject was asked to describe the visual sensations he was actually seeing. The positive instructions resulted in significantly more reports of visual sensations than the negative instructions; prior verbalization had no effect.

Introduction

Bexton (1), Lilly (2), Vernon (3), Wexler (4) and their associates found that subjects in sensory deprivation experiments reported visual sensations that could not be accounted for in terms of external visual cues. These experimenters attributed the occurrence of the illusions or hallucinations to the deprivation conditions. However, the effects of such factors as preceding activities and instructions upon the incidence of reported visual sensations were left relatively uncontrolled, thus making it difficult to evaluate the effects of deprivation alone.

The HumRRO research group at the Presidio of Monterey, California, is engaged in research on sensory deprivation. We felt that the verbal report of experiences during isolation might be a valuable indicator of deprivation effects. In the present study we were concerned with determining the possible effects of (a) prior verbalization on the Rorschach, and (b) instructions on the number and complexity of reported visual sensations after a short period of reduced sensory stimulation.

Procedure

Our subjects were 80 Army basic trainees with a mean age of 22 years and an average of one year of college. All subjects had scores at least one-half sigma above the mean on a subscale of the Army Classification Battery which correlates highly with measures of general intelligence.

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[1]Paper read at meeting of the American Psychological Association, Washington, D.C., 1958.

The experimental variables were two prior verbalization conditions and two instruction conditions, which thus formed a 2 x 2 factorial design. For one of the prior verbalization conditions (Ror group), half of the subjects were presented with cards 8, 9, and 10 of the Rorschach, ostensibly as part of another experiment, and encouraged to verbalize freely about what they saw in the cards. If the subjects did not spontaneously verbalize percepts in each of certain predetermined categories of responses, the experimenter identified areas of the cards and encouraged the subjects to report seeing these percepts. In this manner, subjects were roughly equated in amount of prior verbalization. For the other prior verbalization condition, subjects had no immediately prior experience with the Rorschach (Non-Ror group).

Subsequently, the subjects in each of the two prior verbalization conditions were assigned to one of two instruction conditions. The positive instruction groups (Pos) were told that it is normal to experience visual sensations in the absence of external light, and although people normally learn to ignore or adapt to these sensations, the experimenter wished the subject to attend to and describe his visual sensations.

The negative groups were told that psychiatric cases characteristically experience visual sensations in the absence of light, and that in this task the experimenter wanted to know if the subject experienced any such visual sensations in the absence of light.

Following the instructions, the subject put on a pair of opaque goggles and lay on a bed in a semi-lightproofed office. After 10 minutes the experimenter, communicating by means of an intercom system, asked the subject several identifying questions to assure that he was awake. The subject was then asked to describe the visual sensations he was actually seeing. One minute after these instructions, the subject was told he was doing fine if he had been talking; if he had remained silent he was again asked to describe all the visual sensations he was experiencing. If, at any time, the subject was silent for four consecutive minutes the experiment was discontinued; otherwise the subject was allowed a 15-minute reporting time.

Protocols were typed from the tape-recorded reports of the subjects and then keyed. A technical assistant working independently scored the protocols by first bracketing the word groups which reported the occurrence of a visual sensation and then assigning one of four content categories to each bracketed area.

The content categories were decided on the basis of other deprivation experiments reported in the literature and by examination of the sensations reported by our subjects. The categories were, from least to most complex: (1) lines, dots, and diffuse light, (2) complex geometrical designs, (3) isolated objects, and (4) integrated scenes.

For reliability information a second technical assistant independently scored 36 of the protocols.

Results

Two scoring procedures were used in evaluating results. We first considered the number of sensations reported and then the complexity of the verbal reports of these sensations.

In scoring the occurrence of reported visual sensations, the two assistants working independently agreed 81% of the time. The total number of sensations reported by subjects in each of the treatment combinations is given in Table 1 and an analysis of variance of subjects' performance in Table 2. More than twice as many visual sensations were reported by the positive instruction group as by the negative instruction group ($p<.01$). Prior verbalization on the Rorschach had no significant effect on the number of sensations reported.

Table 1

Number of Visual Sensations Subjects Reported in Each Treatment Combination

Instruction Group	*N*	Sensations	Mean
Positive			
Non-Ror	20	340	17.0
Ror	20	297	14.8
Negative			
Non-Ror	20	162	8.1
Ror	20	146	7.3

Table 2

Analysis of Variance of Treatment Effects: Sensations

Source of Variation	*df*	MS	*F*	*p*
Instruction	1	1353.01	7.61	<.01
Prior Verbalization	1	43.51	–	
Instruction × Prior Verbalization	1	9.12	–	
Within Cells (error)	76	177.77		
Total	79			

The number of subjects reporting visual sensations in each of the four scoring categories for the present study and for other sensory deprivation experiments is shown in Table 3. It is of interest to note that there is a general tendency for a greater percentage of subjects in this experiment than in other experiments to report visual sensations in each of the categories, despite the minimal deprivation conditions used in this study.

Table 3

Number of Subjects Reporting Visual Sensations in Deprivation Studies Four Content Categories

Deprivation Study	*N*	Length of Deprivation Time	Number of Subjects by Content Category[a]			
			Lines, Dots, Diffuse Light	Geometric Patterns	Isolated Objects	Integrated Scenes
Bexton *et al.* (1)	14	Up to 48 hours	14	11	7	3
Lilly *et al.* (2)	2	Up to 3 hours	0	0	0	2
Vernon *et al.* (6)	9	Up to 72 hours	1	0	0	0
Vernon *et al.*(3)	9	Up to 72 hours	4	6	0	0
Wexler *et al.* (4)	17	Up to 36 hours	b	b	b	3
Present Study						
Positive Instruction						
Non-Ror	20	10 minutes	18	12	9	6
Ror	20	10 minutes	18	10	10	10
Negative Instruction						
Non-Ror	20	10 minutes	13	8	5	2
Ror	20	10 minutes	13	8	7	4

[a]The content categories used here were developed by the authors of this paper. For comparison purposes, the published data from other experiments were classified according to the same categories.

[b]Indeterminate.

Further examination of our data suggested that if a subject reported a Category 4 sensation, he also reported sensations in the less complex categories—that is, Categories 3, 2, and 1. Similarly, if a subject reported visual sensations in Category 3, he also reported visual sensations in Categories 2 and 1.

Thus the categories appeared to form a Guttman-type scale having to do with the complexity of the verbal report. The co-efficient of reproducibility, using Guttman's technique, was .937, which we felt was reliably above the mean chance expectancy for this statistic. This level of reproducibility seemed to warrant the use of a scaling procedure for assigning a score to each subject. Consequently, we assigned a scale score of 4 to subjects who reported sensations in all four categories; a score of 3 was given to subjects who reported sensations in the first three categories, and so forth. The scale scores for each subject, assigned on the basis of the protocols scored by the two assistants, were in agreement in 78% of the cases. The scores for each treatment combination are given in Table 4.

An analysis of variance of treatment effects when scale scores were used is presented in Table 5. Positive instructions were found to produce more complex reports than negative instructions at less than the .025 level. Prior verbalization had no significant effect on the complexity of the verbal report.

Table 4

Scale Scores of Subjects in Each Treatment Combination

Instruction Group	*N*	Sensations	Mean
Positive			
Non-Ror	20	44	2.20
Ror	20	54	2.70
Negative			
Non-Ror	20	30	1.5
Ror	20	37	1.85

Table 5

Analysis of Variance of Treatment Effects: Scale Scores

Source of Variation	*df*	MS	*F*	*p*
Instruction	1	12.01	6.13	<.025
Prior Verbalization	1	3.61	-	
Instruction × Prior Verbalization	1	.12	-	
Within Cells (error)	76	1.96		
Total	79			

In order to learn more about the instruction variable, we ran additional subjects under a neutral, non-Rorschach condition. In this case the subjects were told merely to describe any visual sensations they might experience in the dark. We found that the mean number of sensations reported by this group as well as the mean scale scores assigned on the basis of the reported sensations fell midway between the means for the positive and negative instruction groups.

Conclusions

The results of the study indicate that the type of instruction significantly influenced the frequency and complexity of visual sensations reported by normal subjects after a 10-minute period of reduced sensory stimulation. Prior verbalization, where the subject was asked to report visual percepts on the Rorschach, appeared to have no significant effect on the number or complexity of the sensations reported.

It is of interest to note that even under the most prohibitive conditions—negative instructions—the subjects reported an average of 7.7 visual sensations. This finding suggests that reports of visual sensations may occur quite frequently even when it may be assumed that deprivation effects are minimal.

In summary, then, it appears that the type of instructions used, and possibly other implicit or explicit sets associated with the experimental conditions, may influence the incidence and complexity of reported visual sensations. Furthermore, even under experimental conditions least conducive to verbalization, there are frequent reports of visual sensations. In further deprivation research both of these factors must be carefully evaluated before attributing the occurrence of visual sensations to the conditions of sensory deprivation alone.

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STUDIES ON THE EFFECTS OF SENSORY DEPRIVATION UPON VIGILANCE

I. Progress in the Development of a Visual Vigilance Task[1]

Richard A. Monty, Thomas I. Myers, and Donald B. Murphy

This study was part of a series concerned with effects of sensory deprivation and social isolation on the individual. A major research problem in this specific area is the development of measures that introduce minimum stimulation to the subject. This study is designed to develop a visual task that could be used to measure the effect of deprivation upon behavior.

Many recent developments such as increased utilization of distant military outposts, modern combat vehicles operating for long periods of time with limited crews, and the promised introduction of inhabited satellites and space ships, have put a premium on the effective utilization of available manpower. Specifically, man has placed himself in isolated, lonely surroundings where he will be forced to perform repetitious tasks for long sessions and needs to do so effectively. Most such tasks result in a marked deterioration in performance over periods of time, particularly in the case of a discriminative response, such as radar scanning (1), detection of visual or auditory signals indicating the presence of the enemy (2), guard duty, and a variety of other monitoring duties (3, 4, 5). Simplification has not proven to be an adequate solution; in fact, it may even contribute to the deterioration, possibly because of increased monotony or boredom. Even the previous practice of relief or rotation on such tasks promises to become impossible in these new situations.

Since many of these solitary or isolated jobs place a premium on effective vigilant behavior, Work Unit ENDORSE is attempting to develop a visual task which may later be used to measure the effects of partial and complete sensory deprivation upon behavior. The basic requirement is that the task be repetitious and show a deterioration in performance over a period of time. Furthermore, it is difficult to predict in what way vigilant behavior may be affected. Since it is not unreasonable to assume, for example, that sensory deprivation will result in a heightened sensitivity to stimuli, the basic difficulty of the task should be so great as to allow for any changes toward a reduction in error which might occur due to the subject's sensitivity. On the other hand, since sensitivity may be decreased, the difficulty should not be so great as to leave little room for deterioration in performance, should a slight upward shift in initial error occur.

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[1]HumRRO research paper, August 1958.

The two experiments described trace progress made toward achieving a satisfactory measure of vigilant behavior which may be sensitive to changes in performance as a result of sensory deprivation.

EXPERIMENT I

Subjects

Subjects were 20 male members of the U.S. Army from Fort Ord, California, who had just completed processing but had not started basic training. All had received a minimum Army Classification Battery (ACB) score of 110, placing them in an above-average intelligence bracket.

Apparatus and Procedure

Three pairs of thyratron timing circuits were attached in series so that any one of the pairs could break and remake a single circuit. A standard one RPS chronoscope, its face so covered with white paper that only the hands were visible, was controlled by the thyratron unit. The first thyratron pair interrupted the movement of the clock hands approximately once every 10 minutes, the second pair once every seven minutes, and the third pair once every four minutes, resulting in a highly complex pattern of interruptions which appeared random to the subjects. The duration of the interrupted movement was approximately 0.1 seconds; each stop was recorded on a paper puller.

Subjects were seated seven feet from the clock in a normally lighted room. The click emitted each time the clock stopped was drowned out by white noise from a Grason-Stadler noise generator, thus making detection a visual process. Subjects were given the following instructions:

> You are going to be asked to watch that clock. You will notice that every once in a while, the clock will stop for a fraction of a second. When you see it stop, I want you to press this telegraph key. Do not press the key unless you actually see it stop. This is very similar to watching a radar screen, and you may find it a difficult task, but try and do your best. There will also be a rather loud noise in here so please wear these earphones to muffle it so it won't bother your ears. Are there any questions? Please begin as soon as the noise is turned on.

Total testing time was one hour; all responses were recorded on the paper puller.

Results

A percentage of signals missed per interval was obtained for each subject by dividing the number of times the subject failed to press the response key during any given time interval by the number of times the clock stopped during that interval. An analysis of variance, shown in Table 1, indicated that there was a significant difference in performance between intervals.

Figure 1 shows a satisfactory decrement in performance over a relatively short period of time. However, the error for the first 12-minute

Table 1

Analysis of Variance Based on 12-Minute Intervals

Source of Variation	*df*	MS	*F*[a]
12-Minute Intervals	4	441.26	3.41*
Subjects	19	823.96	
Subjects × Intervals	76	129.25	
Total	99		

[a]* Indicates significance at the .025 level.

interval amounts to only 3%, which allows little room for an initial reduction in error. It was concluded, therefore, that the task might not provide a satisfactorily flexible measure of the effects of sensory deprivation upon vigilance. One possible means of increasing the difficulty of the task might be to make the interruptions less perceptible by use of a slower chronoscope. According to Mackworth (1), fatigue effects are shown earlier with faint signals than with easily visible ones; therefore, an increase in the rate of deterioration as well as in greater initial difficulty might be expected.

EXPERIMENT II

Subjects

Subjects were 144 males meeting the same description as those in Experiment I except that these men were in their fifth week of basic training.

Apparatus and Procedure

An experiment, the purpose of which is reported in detail elsewhere[1], made possible a study of a more extensive nature than that of Experiment I. Briefly, it was an attempt to determine if differential amounts of information and differing lengths of testing sessions would result in measurable performance changes. Subjects were classified by length of testing session (whether they were to participate in the assessment battery, of which the vigilance task was a part, for a one- or two-day period) and by the amount of information they were to receive about the testing situation itself.

Three information levels were administered to both the one- and two-day groups; each of these six different conditions was replicated resulting in a total of 12 groups. The information levels were designated Max-Max, Max-Min, and Min-Min with the first term of the pair referring to the amount of information received by the subject regarding the testing procedure. The second term refers to the amount of information received regarding an interview which was conducted toward the end of

[1]Thomas I. Myers and associates, work with effects of instruction and processing time on an assessment battery, in 1958.

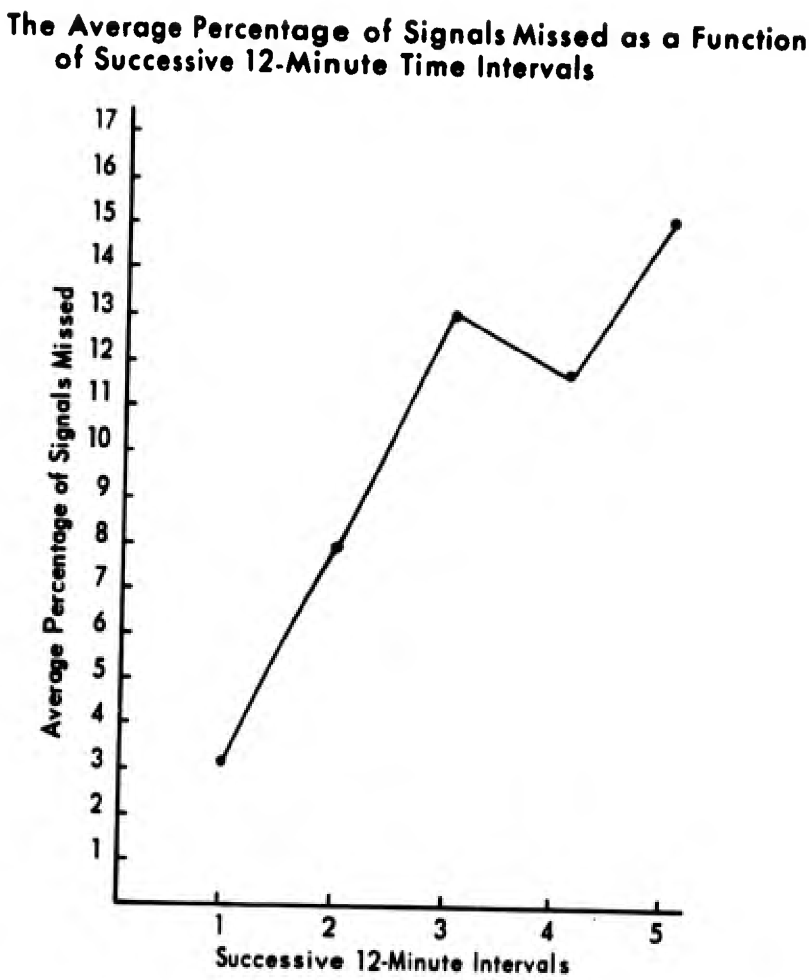

Figure 1

the test session and in which the subject was given an opportunity to volunteer for participation in another experiment.

The apparatus was the same as that used in Experiment I except that a one RPM chronoscope was substituted for the one RPS chronoscope. The instructions were identical to those given in the previous experiment but the total time spent in the vigilance test situation was reduced to 36 minutes.

Results

The percentage of signals missed was calculated in the same manner as in Experiment I. Two four-dimensional analyses of variance[1] were used to analyze the data as shown in Table 2.

The first analysis concerned the four Max-Max groups and the four Max-Min groups. The average percentage of error was plotted as a

[1]Donald B. Murphy, work in 1958 with a four-dimensional *F* test, mixed design of three between subjects factors and one within subjects factor, after E.F. Lindquist.

Table 2

Analysis of Variance Based on Four-Minute Intervals

Source of Variation	df	Max-Max–Max-Min		Max-Min–Min-Min	
		MS	F^a	MS	F^a
Between Subjects	95				
Days Participating (one or two)	1	9,038.33	2.68	381.56	<1
Instructions (Max-Max, Max-Min, Min-Min)	1	5,311.76	1.58	4,910.76	1.34
Replications	1	9,407.51	2.79	6,366.29	1.74
Days × Instructions	1	13,622.50	4.05*	4.46	<1
Days × Replications	1	20,350.03	6.04*	15,279.04	4.18*
Instructions × Replications	1	1,955.72	<1	3,773.25	1.03
Days × Instructions × Replications	1	8,031.38	2.38	11,807.67	3.23
Error	88	3,368.21		3,652.55	
Within Subjects	768				
Time Intervals	8	14,838.55	33.07**	12,657.55	28.45**
Days × Time Intervals	8	926.69	2.06*	421.12	<1
Instructions × Time Intervals	8	155.49	<1	173.79	3.91
Replications × Time Intervals	8	464.21	1.03	542.59	1.22
Days × Instructions × Time Intervals	8	618.96	1.38	83.30	<1
Instructions × Replications × Time Intervals	8	343.13	<1	206.45	<1
Days × Replications × Time Intervals	8	689.88	1.54	461.30	1.04
Days × Instructions × Replications × Time Intervals	8	510.88	1.14	158.18	<1
Error	704	448.66		444.84	

[a] *Indicates significance at the .05 level; **at the .001 level.

function of four-minute time intervals for each of four groups and their replicates as shown in Figure 2. The analysis indicated a Days x Instructions interaction significant at the .05 level. Closer examination of the means shows that the two-day Max-Max groups made fewer errors than did the one-day Max-Max groups. However, there was no difference between the one-day Max-Max groups, the one-day Max-Min groups, and the two-day Max-Min groups. The Days x Replications interaction was also significant at the .05 level. The first administration showed that subjects participating for a two-day period made fewer errors than subjects participating for a one-day period. However, upon replication, there was no corresponding difference, and, in fact, the two-day group made slightly more errors than the one-day group.

The F for time interval was significant at the .001 level which suggests that there is an overall deterioration in signal detection with the passage of time. The solid line in Figure 3 represents the average of all the curves discussed thus far. The overall vigilance effect is seen to be monotonic.

Finally, the Days x Time Intervals interaction was found to be significant at the .05 level. Examination of the means shows that

Average Percentage of Signals Missed as a Function of Successive Four-Minute Intervals for Max-Max and Max-Min Groups

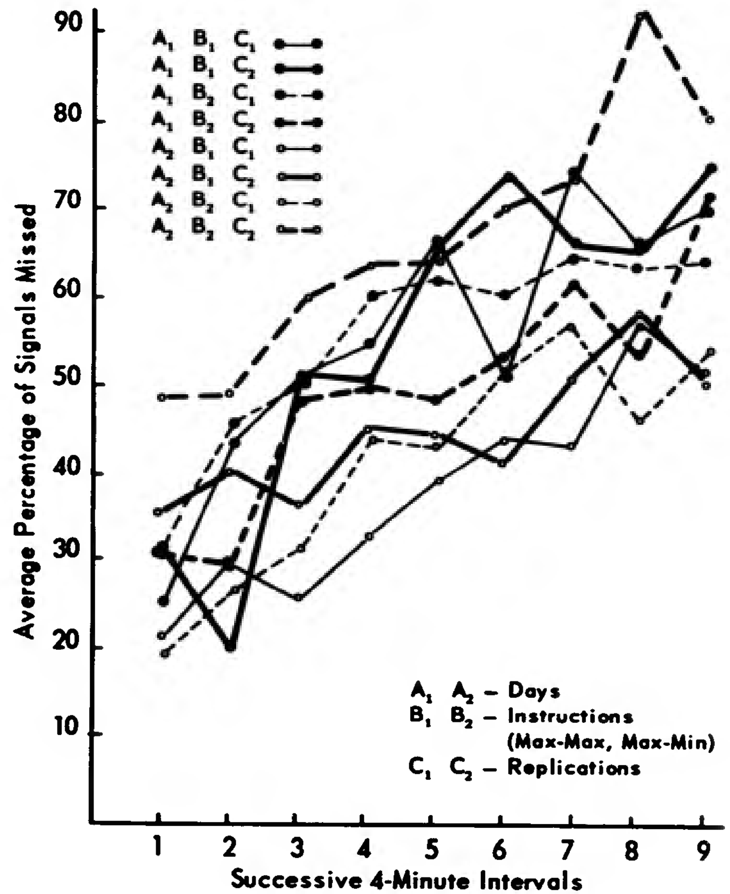

Figure 2

Average Percentage of Signals Missed as a Function of Successive Four-Minute Intervals for Combined Groups

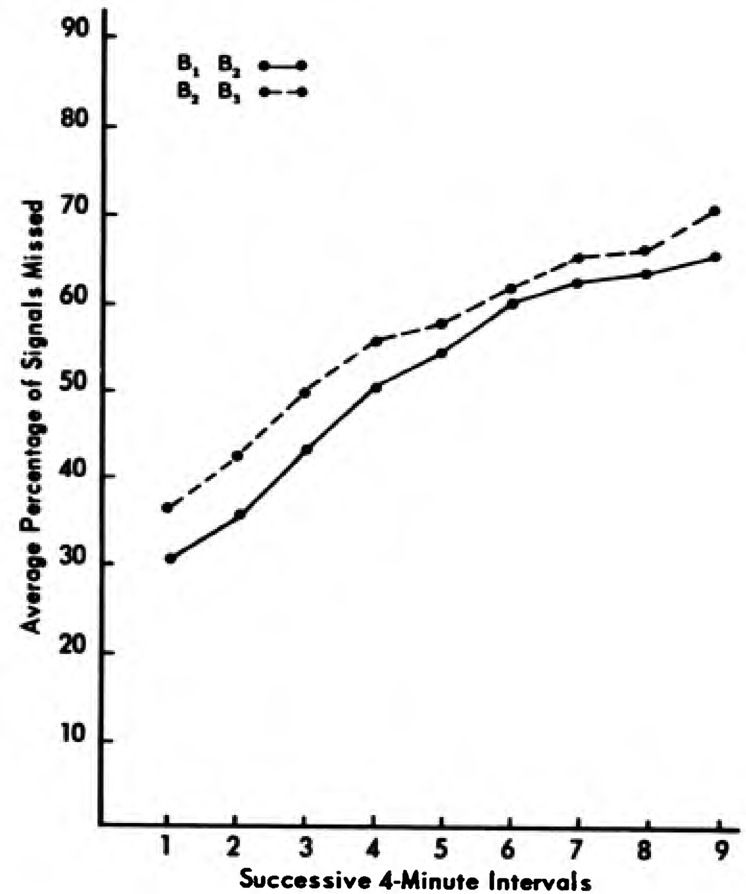

Figure 3

both the one-day and two-day groups made approximately the same percentage of error on the first two time intervals but, in general, the one-day group made a higher percentage of error on the succeeding intervals than did the two-day group.

The second half of Table 2 shows the results of the Max-Min Min-Min analysis. The data for these groups are plotted in Figure 4. Again, there is a Days x Replications interaction significant at the .05 level. Examination shows that the two-day groups of the first administration made fewer errors than the one-day group and that upon replication the two-day group showed a difference correspondingly as large in the opposite direction. The *F* for time interval was found to be significant at the .001 level, the monotonic nature of this curve being demonstrated in the dotted summary curve of Figure 3.

Average Percentage of Signals Missed as a Function of Successive Four-Minute Intervals for Max-Min and Min-Min Groups

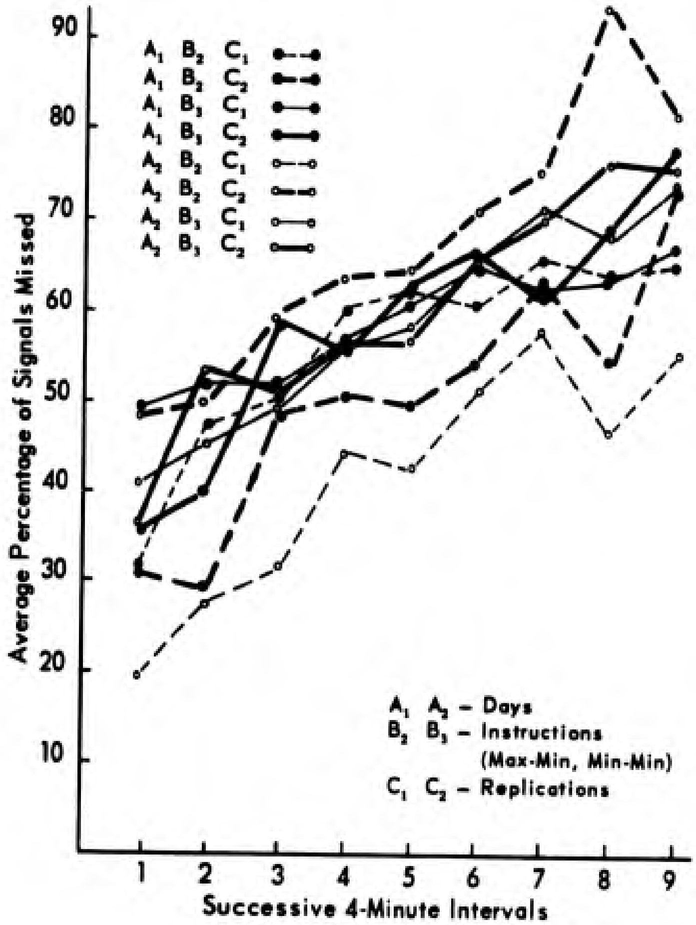

Figure 4

Discussion

In considering the interactions of the variables with days, several aspects of the testing situation should be mentioned. The subjects arrived in groups of 24 at the testing center where they were randomly placed in a one-day or two-day group. All subjects carried their overnight gear with them; the one-day groups consistently tried to determine if they would be staying overnight. This is easily understood in that an overnight stay meant relief from the stresses of life in basic training units, as well as a good night's sleep, better food, and relief from physical exertion. Also worth pointing out is the fact that the experimenters were in a somewhat trying situation themselves. Each experimenter ran subjects for nine hours a day, four days a week for three weeks, and there were perceptible changes in their attitude toward the subjects by the end of this period.

In light of this, the Days x Instructions interaction might conceivably indicate that not only was the amount of information about the interview important, but that a combination of the information level plus the fact that subjects had stayed overnight, and thereby avoided the stresses of their schedule in their unit, might be responsible for the observed differences. Both Days x Replications interactions might possibly be a reflection of the experimenters' attitude in that the replications were all run during the second half of the three-week testing period. Thus, the negative attitude of the experimenters could have proved stressful to the subjects and could conceivably have cancelled the otherwise positive effects of having stayed overnight by building up resentment of the testing situation. There are several possible explanations of the Days x Time Intervals interaction. The groups which stayed overnight were more rested than those staying only one day. On the other hand, the differences may have been in motivation.

The most important conclusion is that the task does show a decrement in performance over a period of time. It remains to be considered in terms of its usefulness in measuring possible deprivation effects. As it stands, it now meets a criterion not met by the task in Experiment I: that is, the difficulty is great enough to allow room for improvement in performance during the first time intervals. Also, as was anticipated, the percentage of error rose at a greater rate than was the case in Experiment I. It can be concluded, then, that the test as it now stands should be useful as a pre- and post-deprivation measure. If, however, the test is to be used during deprivation, there are several points that warrant further study.

In order to maximize the deprivation conditions two methods of presentation are now under consideration. The first would consist of showing the chronoscope via a closed circuit TV system; the second would keep the subject in complete darkness and would light only the face of the chronoscope. This would necessitate the use of a silent chronoscope. There is some evidence in the literature (4, 2) that noise may facilitate the decrement in performance on tasks of this nature; however, it is by no means conclusive nor even one-sided. If noise should prove to be a heavily contributing factor to the initial difficulty and/or decrement in performance, it may be necessary to restrict the use of this task to pre- and post-deprivation measurements.

Summary

This paper reports two steps in the development of a visual vigilance task that will later be used to test changes that may result from sensory deprivation. The task reported in Experiment I showed a satisfactory decrement in performance in a relatively short period of time. However, because of its simplicity, it was considered insensitive as an indicator of improved performance which might be produced by such experimental treatments as sensory deprivation. Modifications were thereupon made in the apparatus. On the basis of Experiment II it was concluded that the task would be useful as a pre- and post-deprivation measure of vigilant behavior.

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THE EFFECTS OF MISINFORMATION UPON THE COUNTING OF AUDITORY STIMULI[1]

Richard A. Monty, Thomas I. Myers, and Donald B. Murphy

Subjects were given misinformation on "blip" items, interspersed with correct information in an experiment involving the ability to count auditory stimuli.

Purpose

The purpose of the study was to determine the effects of misinformation upon the ability to count auditory stimuli.

Procedure

Forty Army trainees were instructed to depress a telegraph key which emitted a continuous series of "blips" at the rate of 6.3 per second. Blip items of 20, 30, 40, 55, and 70 blips in length were requested in random order.

Three phases or blocks of 30-blip items each were administered to each subject. During the first phase, the experimental subjects were given correct knowledge of the number of blips actually produced on each item; during the second phase, misinformation was given on the 55-blip and 70-blip items but correct information was provided on the other items; during the third phase, one hour after the second, no knowledge of results was given. For the control group, Phases 1 and 3 were identical with the experimental group; however, in Phase 2 they received correct information on all trials.

The score on a trial was the absolute difference between the number of blips produced and the number requested.

Results

Lindquist's "type 6" analysis of variance design[2] was used to analyze the data. Phases 1 and 2 and Phases 2 and 3 were analyzed separately as shown in Table 1.

Conclusions

Following approximately equal baseline performance, misinformation on the 55-blip and 70-blip items interspersed with correct information

[1]The material represents notes for a presentation to the Western Psychological Association, San Diego, California, 1959.

[2]E.F. Lindquist, *Design and Analysis of Experiments in Psychology and Education*, Houghton Mifflin Company, Boston, 1953.

Table 1

Analysis of Variance of Scores on Three-Phase Blip Test [a]

Source of Variation	*df*	Phases 1 and 2		Phases 2 and 3	
		MS	*F*	MS	*F*
Between Subjects	39	2,981.15		5,557.33	
Conditions (groups)	1	11,257.21	4.07	30,800.25	6.29*
Error	38	2,763.36		4,893.04	
Within Subjects	320	627.49		857.08	
Phases	1	1,232.01	1.41	3,069.16	2.67
Blip Items	4	14,349.24	31.63***	20,346.90	29.96***
Phases x Blip Items	4	113.21	<1	229.54	1.43
Phases x Conditions	1	7,378.81	8.47**	272.25	<1
Blip Items x Conditions	4	1,869.31	4.12**	4,140.82	6.10***
Phases x Blip Items x Conditions	4	1,285.98	9.94***	197.79	1.97
Error (w)					
$Error_1$ (w)	38	870.80		1,148.90	
$Error_2$ (w)	152	453.62		679.02	
$Error_3$ (w)	152	129.43		160.49	

[a] * indicates $p < .05$; ** indicates $p < .01$; *** indicates $p < .001$.

on the other items resulted in poorer overall accuracy of judgment for the experimental group than was found for the control group which was correctly informed on all items.

During Phase 3, which omitted all feedback to both groups, the inferior accuracy of the previously misinformed experimental group to the control group persisted to about the same degree.

EFFECTS OF SENSORY DEPRIVATION UPON RECEPTION OF COMPLEX INSTRUCTIONS: DEVELOPMENT OF A MEASURE[1]

Robert D. McDonald

Experiments were conducted to develop a simple motor task which would indicate the efficiency of reception of complex instructions in complete darkness after sensory or social deprivation. Army trainees were administered 10 tape-recorded problems. Analysis of variance indicated significant improvement in performance over trials; other experimental treatments had no effect.

Area

(1) Sensory Deprivation
(2) Tests and Measurements

Purpose

The purpose of the study was to develop a simple motor task which would indicate the efficiency of reception of complex instructions in complete darkness after sensory or social deprivation.

Assumption

Basic requirements of the task were that it should (a) involve simple motor movements, (b) show performance increment with repeated trials, and (c) allow for possible experimental decrement. Bavelas's task of arranging blocks into patterns following verbal instructions met these requirements.

Procedure and Results

Experiment 1. Ten randomly constructed tape-recorded problems (5 sighted, 5 blind) of five blocks each were administered to 144 Army trainees of superior intelligence. The score was the number of errors. Subjects were divided into subgroups, each receiving different amounts of information about why they were being tested. Analysis of variance indicated significant ($p<.001$) improvement in performance over trials; other treatments had no effect. Because errors were few, this series was adequate only if isolation caused deterioration.

Experiment 2. To increase the difficulty of the task, the number of problems was increased to 15. Time for individual block placement within a problem was halved. Two new series were tested on 60 Army trainees.

[1] The material represents notes for a presentation to the Western Psychological Association, San Diego, California, 1959.

The effect of blindfolding, session effects, and differences between series of problems were evaluated by analysis of variance. Results indicated that the difficulty of the task had not increased sufficiently. Acquisition curves indicated that stopping at the seventh problem would permit a subsequent experimental increment or decrement. Blindfolded performance met the same criteria as sighted, permitting the use of this measure during, as well as after, sensory deprivation. However, specific problems do interact with treatments, so that randomly constructed forms cannot be presumed equivalent.

Conclusions

Bavelas's block test can be modified for use in studying the effects of visual and social deprivation, provided the problems are difficult enough, trials are short enough, and all groups use the same problems.

NOTES ON AN AUDITORY VIGILANCE TECHNIQUE[1]

Seward Smith and Paul M. Haas

An auditory vigilance technique was developed for use in research involving sensory deprivation and social isolation. Subjects were placed separately in special rooms constructed to provide an average sound transmission loss of 40 decibels to sounds from the outside. They took the test while lying on a bed in a quiet lighted room. The subject's task was to operate a Lindsley manipulandum by releasing it as quickly as he could each time he heard a short tone. The technique produced a vigilance effect and a significant performance deterioration over time, and also minimized the adverse effects of such factors as sensory thresholds, motivation, signal rate expectancy, and drowsiness.

As a part of a research project at the HumRRO research group at the Presidio of Monterey, California, involving sensory deprivation and social isolation, an auditory vigilance technique has been developed. It is presently being used to find out whether persons voluntarily undergoing a several-day period of isolation differ significantly in their ability to maintain vigilance when compared with control subjects who have not been isolated. None of the data to be reported at this time, however, were obtained from persons undergoing isolation.

In addition to the special problems created by the isolation situation, a variety of concerns about problems in vigilance research motivated our choice of vigilance technique. In this paper we will comment about some of these concerns within the context of a discussion of our auditory vigilance technique.

In many experimental vigilance situations, several factors appear to be operating which, *a priori*, might be expected to affect adversely latter portions of the vigilance task to a greater extent than earlier portions. For example, observed performance decrements over time often can be shown to be attributable, in part, to such factors as sleep. But, of course, whether such a factor as sleep is regarded as an artifact or as a basic human reaction to the vigilance task, is a matter of preference for the behavioral scientist. Our choice has been to select a rather narrow definition of a vigilance task in order to minimize the contribution of certain factors to observed vigilance decrements. Specifically, the factors were sensory thresholds, motivation, signal rate expectancy, and drowsiness or sleep. For comparative use

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[1]Paper read at meeting of the Western Psychological Association, Seattle, Washington, 1961.

in the isolation study we felt we needed a vigilance task which produced a performance deterioration over time but which permitted as few adverse effects as possible from these factors.

For this task subjects were placed separately in special rooms constructed to provide an average sound transmission loss of 40 decibels to sounds from the outside. They took the test while lying on a bed in the quiet room with the light on. The subject's task required him to pull out the lever of a Lindsley manipulandum and hold it out, and to release it as quickly as he could each time he heard a short tone. He was informed that his response speed was being timed.

There were 12 tone signals to be detected in a 48-minute period. They ranged from two to six minutes apart, and averaged four minutes apart. The signal was a 500 cycle per second tone presented for one-tenth of a second at an intensity of 60 decibels measured at the head of the bed.[1]

To minimize the role of sensory acuity, this signal tone intensity was chosen to be clearly detectable by all subjects during all portions of the vigilance task. Thus, any absolute threshold differences between subjects and any sensitivity changes within subjects as the task progressed presumably would have little effect on vigilance performance. In addition, signal detection was considerably eased by presenting the signal tone against the background of silence offered by the test room. Therefore, any slight changes which might occur in a subject's differential threshold probably would not grossly effect his detection of the tone.

We were particularly desirous of minimizing the possibility that signal rate expectancies might change due to the missing of signals as the task progressed. Since the vigilance technique reported here produced the desired result of virtually no missed signals for the subjects tested, it is probably reasonable to assume that no appreciable signal rate expectancy changes occurred after the first few signals had been detected.

One key behavior in vigilance situations is undoubtedly sleeping by subjects. In our situation several steps were taken to prevent or detect its occurrence. The subjects were well rested at the time of their participation in this task. As a deterrent to sleep the subject was required to hold his lever switch out while awaiting the tones. This requirement kept his hand on the response device and also provided valuable information for evaluating cooperation and sleeping. In this study only one of the 33 subjects showed signs of being asleep.

Several steps were employed to achieve high motivation, since this is obviously an extremely important factor in vigilance situations. The subjects, who were military personnel, were carefully briefed about the project of which this study was a part. The briefings and procedures surrounding their stay at the Presidio of Monterey for the

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[1]Ambient noise in the room was approximately 40 to 45 decibels (decibel measures re: .0002 microbar).

project were designed to elicit high motivation and cooperation. From subject's statements of how hard they tried on the vigilance task and from information indicating virtually no dozing, it appears that fairly high motivation was achieved.

Several pilot studies were conducted using this vigilance technique. It is interesting to note that significant performance decrements occurred in all of these studies even though the control over the factors above was reasonably adequate.

One representative study utilized young Army personnel of above-average intelligence. Data collection was fully automated. A punched 35mm tape programmed the apparatus, and the subjects' response latencies were recorded on printing counters and on a graphic recorder.

The subjects' average response latencies for the four quarters of the 48-minute vigilance task are shown in Figure 1. Each quarter of the task contained three tone signals. One of these signals was presented two minutes after the previous signal, another after four minutes, and another after six minutes. These between-signal intervals occurred in an unpredictable order for each quarter, however, so that there was no discernible pattern of intervals between signals for the total task.

Mean Response Latencies for Four Quarters

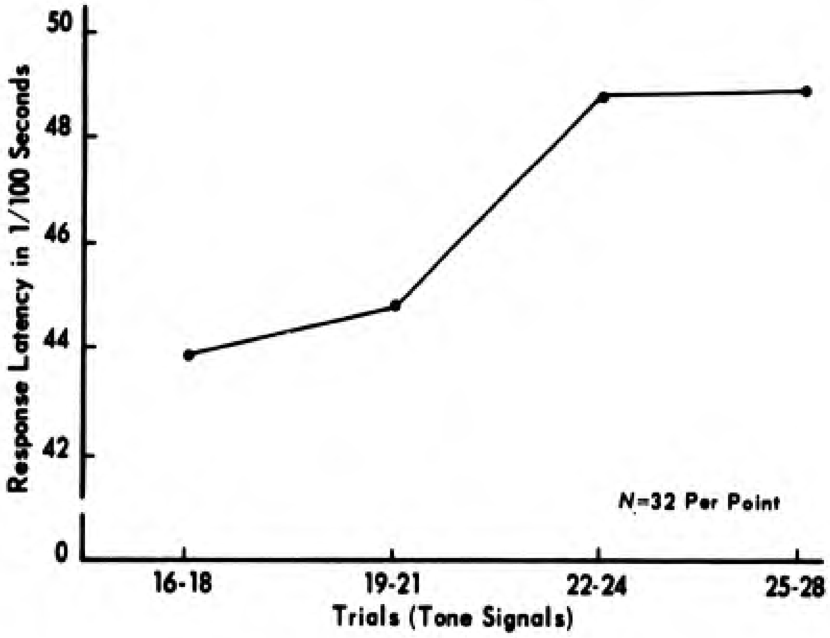

Figure 1

A treatments-by-subjects analysis of variance of the response data for 32 subjects revealed an increase in latency as the task progressed. This decrement was significant beyond the .01 level of confidence. Signals that were missed did not figure in the computation of a subject's average response latencies, and the data from the one subject who was asleep were not included in the analysis.

In actuality, out of a total of 384 signals which could have been missed by the 32 subjects, there were only five missed signals and seven occasions where a subject could not make a proper response because he did not have his lever pulled at the time a signal occurred.

OTHER PUBLICATIONS UNDER WORK UNIT ENDORSE[1]

Effects of Correct and Incorrect Knowledge of Results on Ability to Count Auditory Stimuli, HumRRO Research Report 3, by Richard A. Monty, Thomas I. Myers, and Donald B. Murphy, March 1960. AD-234 599

Progress Report on Studies of Sensory Deprivation, Research Memorandum, by Thomas I. Myers, Donald B. Murphy, and Seward Smith, March 1961. AD-478 520L

The Reliability of a Modified Digit Span Test Procedure, by Thomas I. Myers, Gerald Burday, Lyman Forbes, and Jack Arbit.[2]

Some Basic Factors in Sensory Deprivation Research, by Thomas I. Myers.[2]

A Technique for Studying Attitude Change, by Donald B. Murphy and George L. Hampton.[2]

[1]The ENDORSE research was continued under Basic Research Study 6; other material published under that program is listed in the HumRRO Bibliography.

[2]Included in *Collected Papers Related to the Study of the Effects of Sensory Deprivation and Social Isolation,* Basic Research Study 6, Research Memorandum by HumRRO Staff, February 1962. AD-478 300

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* Human Resources Research Office The George Washington University Alexandria, Virginia 22314	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

COLLECTED PAPERS PREPARED UNDER WORK UNIT ENDORSE:
EFFECTS OF CONTROLLED ISOLATION ON PERFORMANCE

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Professional Paper

5. AUTHOR(S) *(First name, middle initial, last name)*

Paul M. Haas, Edward J. Kandel, Robert D. McDonald, Richard A. Monty, Donald B. Murphy, Thomas I. Myers, Seward Smith

6. REPORT DATE March 1968	7a. TOTAL NO. OF PAGES 40	7b. NO. OF REFS 26

8a. CONTRACT OR GRANT NO. DA 44-188-ARO-2 b. PROJECT NO. 2J024701A712 01 c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) Professional Paper 6-68 9b. OTHER REPORT NO.(S) *(Any other numbers that may be assigned this report)*

10. DISTRIBUTION STATEMENT

This document has been approved for public release and sale; its distribution is unlimited.

11. SUPPLEMENTARY NOTES Presentations and Papers, 1958-1961	12. SPONSORING MILITARY ACTIVITY Office, Chief of Research and Development Department of the Army Washington, D.C. 20310

13. ABSTRACT

This collection of papers given at meetings of the Western Psychological and the American Psychological Associations during the years 1958-1961 reports on specific phases of research to evaluate experimentally the effects of sensory deprivation and social isolation upon a variety of human behaviors. The phases reported on include a study involving a complex discrimination task in response to an auditory stimulus; an experiment involving positive-suggestive or negative-suggestive instructions concerning the possibilities of actual visual sensations in semi- or complete darkness; an experiment on the influence of positive and negative instructions concerning visual sensations; an experiment to develop a simple motor task to indicate efficiency of reception of instructions in complete darkness after sensory or social deprivation; an experiment to assess the effects of misinformation on the counting of auditory stimuli; a study to assess the effects of sensory deprivation and social isolation on reception of complex instructions; and a study of an auditory vigilance technique.

DD FORM 1 NOV 65 1473

Unclassified

Security Classification

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Auditory Stimuli						
Auditory Vigilance						
Sensory Deprivation						
Sensory Stimulation						
Social Isolation						
Vigilance						
Visual Sensations						
Visual Vigilance						

Unclassified

Security Classification