

Studies on Sensory Deprivation: IV. Part 4. Effect of Sensory Deprivation on Retention of Verbal Material

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STUDIES ON SENSORY DEPRIVATION: IV.

PART 4. EFFECT OF SENSORY DEPRIVATION ON RETENTION OF VERBAL MATERIAL

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In two experiments the effect of sensory deprivation on the retention of verbal material is inspected. (1) One experiment revealed that 24 hrs sensory deprivation has no more effect on the content of the story reproduced than normal dialy life has, except that it has an inhibitory effect on the fluency of reproduction. (2) In the other experiment, it was found that 18 hrs sensory deprivation has a facilitating effect on the retention of Japanese two-letter syllables.

However, it is pointed out that these results should be considered only as tendencies.

The effect of sensory deprivation on learning, retention or recall is one of the complicated problems. On the one hand, the absence of extraneous inhibiting or distracting stimuli may favour a prediction of facilitating effect. On the other hand, there have been some findings suggesting deteriorative effect as impaired thinking function or disorganized intellectual performance. Such primary effects of sensory deprivation as the slowing tendency of EEG (10, 6) and the lowering tendency of CFF value (5) may also affect deterioratively learning as the secondary effect.

On the basis of the interference theory of forgetting, Grissom, R.J. et al (3) predicted a facilitating effect of sensory deprivation on retention and obtained a result that sensory deprivation as the intervening experience in a retroactive design facilitates retention of a short verbal passage.

As to the effect of sensory deprivation on learning, Vernon J. et al (8) found that the ability of learning adjective lists improves with continued sensory deprivation, but sbusequent studies (9, 1) did not always support their findings.

Thus, at the present time, it seems to be required that every result obtained in each study is pooled. In the present paper, the results of two retention tests obtained in a series of sensory deprivation experiment will be reported.

Test I*. Retention of a story

METHOD

Material; A story reconstructed by the writer from an old Chinese folk-story after Bartlett's notions (2) was used.

Procedure; Before entering into the cubicle the Ss were told to learn by heart the

* This test was administered in the 3rd experiment whose general methods were reported in detial with its main results (4).

story through three times reading at his own rate. After reading for 5 min. the Ss were asked to attempt a verbatim retelling of the story (RC-1). The 2nd reproduction was asked immediately after 24 hrs sensory deprivation in the cubicle (RC-2).

RESULTS

(1) *The fluency of reproduction*; The number of syllables produced in 1 sec. was computed for each subject by the following formula to see whether the story was recalled fluently.

$$\text{The fluency score} = \frac{\text{the length of the story recalled} \\ \text{(the number of syllables)}}{\text{the time required to reproduce} \\ \text{the story (seconds)}}$$

The total scores of 10 Ss in each group are given in Table 1. Utilizing the t test for correlated samples, it was determined that the differences between RC-1 and RC-2 is significant for control group ($P < .01$) but not for experimental group ($P > .5$).

Table 1. Total fluency score (the number of syllables reproduced/sec).

Group.	N	Pre.(RC-1)	Post(RC-2)	(RC-2)-(RC-1)	P
Exp.G	10	25.04	27.06	2.02	$t_0=0.67 .5 < P < .6$
Cont.G	10	19.22	23.01	3.79	$t_0=3.32 P < .01$

Namely, after 24 hrs (RC-2) the story was reproduced more fluently than immediately after the reading (RC-1) only by the Ss in the control group but not by the Ss in the experimental group. The difference between the two groups on the RC-1 was not significant ($t_0=1.80$, $P > .05$ two-tailed t test)

(2) *The change of memory*; The content of the story recalled was checked in the respects of (i) the proper nouns and numerals, (ii) the context or the thread of the story and (iii) other miscellaneous as "right", "wrong", "omission" etc. Then, the results of RC-1 were compared with those of RC-2 to see the change from the one to the other. And the changes of memory as forgetting or change of name, rationalization, omission etc. were inspected. These change, however, occurred to almost the same degree for both experimental and control Ss. Thus, any significant difference between two groups was not found in the respect of content recalled.

Test II*. Forward- backward recall of paired associates

To see the effect of sensory deprivation on the quantitative aspect of retention a paired associate method was used.

*administered in the 1st series of the 4th exp.

METHOD

Materials; From Umemoto and others' Table (7) Japanese two-letter syllables, 4 pairs of high (96–100%) and 4 pairs of low (50–60%) association values are choiced and these 8 paries are used as the learning material.

Learnig; The anticipation method was used. The list was presented at the rate of 1 item at every 2 seconds in three kinds of order until two perfect trials.

Recall; Forward and backward recall tests were performed immediately before the beginning of the sensory deprivation i.e. about 1 hr after the learning (RC-1) and immediately after 18 hrs sensory deprivation (RC-2) through a mike-speaker system. If the Ss made no response within 10 sec. the response time was treated as 10 sec. and the next stimulus word was given.

RESULTS

(1) *The number of correct response*; The increase in the number of correct response of RC-2 over RC-1 seen for experimental and control Ss is shown in Table 2. ("reminiscence"

Table 2. The increased number of correct reponse.
(RC-2-RC-1)

Group. Associa- tion value of Material Direction of recall	Exp. G. (N=13)			Cont.G.(N=13)			(N=26) Total
	High	Low	High +Low	High	Low	High +Low	
Forward	11	6	17	7	3	10	27
Backward	11	8	19	7	5	12	31
Forward +Backward	22	14	36	14	8	22	58

occurred to 12 Ss in experimental and 11 Ss in control group.) The figures in Table 2 show the tendencies shown in Fig. 1. These tendencies are, however, not significant

Variable	The increased number
group:	experimental > control
association value:	high > low
direction of recall:	forward > backward

Fig. 1

statistically by the analysis of variance.

By the way, the difference between the total number of correct responses at RC-1 and that at RC-2 was tested by the rerated t test within each group and the results as shown in Fig. 2 were obtained. Namely, the number of correct responses increased significantly in the experimental group but not in the control group. The number of correct responses at RC-1 was not different significantly between the two groups.

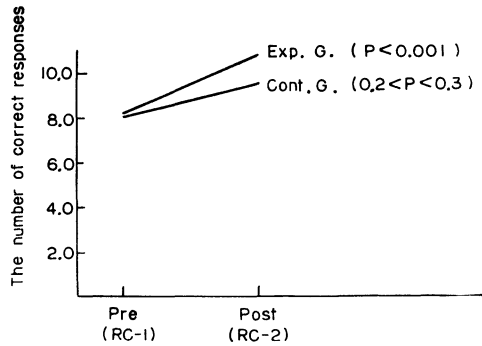


Fig. 2. The Mean of correct response at RC-1 and RC-2.

(2) *Response time:* Except for 2 Ss in control group, the mean response time is less at RC-2 than at RC-1. Table 3 shows the saving of the response time from RC-1 to RC-2.

Table 3. The saving of response time (RC-1-RC-2)

Group Associ- ation value of material Direction of recall	Exp. G. (N=13)			Cont. G. (N=13)			(N=26) Total
	High	Low	High +Low	High	Low	High +Low	
Forward	90.7	38.8	129.5	63.8	34.4	98.2	227.7
Backward	102.8	65.7	168.5	78.9	32.0	110.9	279.4
Forward +Backward	193.5	104.5	298.0	142.7	66.4	209.1	507.1

This table also shows the three same tendencies as in Fig. 1 seen in the case of the number of response, but again it is revealed they are not significant by the analysis of variance.

DISCUSSION

The results of the retention tests are as follows.

(1) Compared with the control condition of daily life, 24 hrs sensory deprivation has not any particular effect on the retention of a story, except that it has an inhibitory effect on the fluency of reproduction.

(2) 18 hrs sensory deprivation has a facilitating effect on the retention of nonsense syllables. These findings, however, might be better described only as tendencies. Because the results are significant only when they are treated by the related *t* test but not by the analysis of variance. In the latter, the conditional difference is overcome by the larger individual difference. Therefore the tendencies described above will become clearer if more numbers of S are used or the Ss are made, to some extent, even in

respect of their ability of learning and retention. Individual differences might be seen also concerning how the Ss accept the experimental situation.

As the effect of sensory deprivation on the learning is the product of complex interaction of various factors, further experiments should be done before it is determined generally.

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ZUSAMMENFASSUNG

In den zwei Experimenten wurde die Wirkung von sinnlicher Entziehung auf die Aufbewahrung untersucht und die folgenden Tendenzen wurden gefunden.

(1) Ein Experiment zeigt dass 24 Stunden lang sinnliche Entziehung keinen Einfluss mehr auf den Inhalt von der reproduzierten Erzählung als das normalen alltäglichen Leben hat, ausser dass sie eine hinderliche Wirkung auf die Geläufigkeit von der Reproduktion hat. (2) In dem anderen Experiment wurde es gefunden, dass die 18 Stunden lang sinnliche Entziehung eine förderliche Wirkung auf die Aufbewahrung von Japanischen zwei-Buchstaben Silbe hat.