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STUDIES ON SENSORY DEPRIVATION: II.

PART 2. EFFECTS OF SENSORY DEPRIVATION UPON

PERCEPTUAL AND MOTOR FUNCTIONS (2)

by

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In order to test effects of sensory deprivation upon psychomotor coordination functions and upon perceptual functions, two additional experiments were carried out after the previous experiments. The two tests were (1) simple and choice reaction test and (2) two-point discrimination test.

Mean reaction time became longer after sensory deprivation, but less fluctuations and error reactions were observed. From this it was suggested that sensory deprivation exerted its effects upon psychomotor coordination functions and tended to disturb them. In other words, by sensory deprivation the control between the perceptual and muscular motor systems might be retarded.

Two-point limen became lower after the sensory deprivation. This tendency is in line with the findings in our previous experiment and with other writers. It was confirmed that the skin sensitivity in sensory deprivation tended to increase.

In the previous paper (1) some effects of sensory deprivation upon perceptual and motor functions were reported. The experiments carried out then were as follows: 1) test of two-point discrimination, 2) experiment of apparent movement, 3) speed anticipation reaction test and 4) Motokawa's method of electric flicker.

It was suggested from these tests that it might be higher or more differentiated functions that were disturbed or disintegrated by sensory deprivation and might be lower or more primitive functions that were promoted or sensitized and also that level of psycho-motor coordination might be retarded.

On the basis of these suggestions, we carried out two additional experiments. They were 1) simple and choice reaction experiments and 2) two-point discrimination test. The former was administered to ascertain the assumption that reaction time will become longer and more inconsistent owing to the less coordinated associations between perceptual and motor functions in sensory deprivation. The latter was an additional one carried out to confirm the findings in the previous experiment (1).

General procedure was almost the same as in the previous experiment. That is, the tests were administered to both experimental and control subjects, at the same time intervals of 48 hrs. Subjects consisted of 16~17 students in all. They were divided into two groups: 8 Ss for experimental (S.D.) group and 8 Ss for control group. In the experimental group the test was carried out before and after the sensory deprivation, while the test for control group was carried

out at the same intervals as for the experimental group.

(1) Simple and Choice Reaction Experiment.

This experiment had three kinds of experimental conditions. There were 1) simple reaction session, 2) choice reaction A-session, and choice reaction B-session. The apparatuses used in the experiment were an apparatus of the Discriminative Reaction Test of Multiple Performance Type (2) (in the simple reaction session and choice reaction B-session) and a newly contrived one (in the choice reaction A-session). As a detailed information on the apparatus and method of this reaction experiment has already been given in the previous paper(2), only an outline of major procedure is described here.

The first session was a simple reaction session. In this series only one lamp, i. e., yellow lamp was presented, which is on the center of a black screen of the apparatus. This lamp was connected with the left hand key of S. S was instructed to react as fast as possible. S pushed the left hand key at the signal of "ready" by E each time and reacted by letting go the key as soon as he perceived the yellow lamp lightened. 20 trials in all were given.

After the simple reaction session was finished, the second choice reaction followed after a rest of 3 minutes. As the second session, half of the Ss were assigned the choice reaction (A) and the remainder of the Ss (B). The only difference of procedure between the two sessions is this: in the A-session three kinds of stimulus lights, i. e., green, yellow and red lights were presented at the same one place successively, while in the B-session they were presented in the respective three presentation loci. The procedure of presentations of stimuli by E and of reactions by S was, therefore, the same in both sessions in general except the locus of the presentation of stimulus. In the choice reaction conditions, S was instructed to react as *fast* and *correctly* as possible when he perceived one of the three kinds of stimulus lights. 16 trials in all were assigned. The stimulus lights were given with different frequency: the green lights 10 times, the yellow lights 4 and the red lights 2. They were presented in a random order. The order of presentation of the stimuli was the same in the Discriminative Reaction Test of Multiple Performance Type.

Results

The results of the first session (simple reaction) are shown in Table 1 and those of the second and the third (choice reaction) in Table 2 and Table 3.

Table 1. Result of 1st session (simple reaction).

Group \ Index	Control Group				Experimental Group			
	before	after	dif- ference	Rate	Pre-S.D.	Post-S.D.	dif- ference	Rate
\bar{X}^*	436 ^{ms}	425 ^{ms}	-11 ^{ms}	-2.5 [%]	420 ^{ms}	476 ^{ms}	+5.6 ^{ms}	+13.3 [%]
CV**	10.8%	9.5%	-1.3%	-12.0%	14.0%	14.0%	+2.5%	+17.9%

* \bar{X} : Mean Reaction Time ** CV : Coefficient of Variation

Table 2. Result of 2nd session (choice reaction A-session).

Group \ Index	Control Group				Experimental Group			
	before	after	dif- ference	Rate	Pre-S.D.	Post-S.D.	dif- ference	Rate
\bar{X}	538 ^{ms}	487 ^{ms}	-51 ^{ms}	-9.5 [%]	566 ^{ms}	556 ^{ms}	-10 ^{ms}	-1.8 [%]
CV	15.2%	15.7%	+0.5%	+3.3%	18.3%	18.9%	+0.6%	+4.1%

Table 3. Result of 3rd session (choice reaction B-session).

Group \ Index	Control Group				Experimental Group			
	before	after	dif- ference	Rate	Pre-S.D.	Post-S.D.	dif- ference	Rate
\bar{X}	663 ^{ms}	601 ^{ms}	-62 ^{ms}	-9.4 [%]	770 ^{ms}	713 ^{ms}	-57 ^{ms}	-7.4 [%]
CV	14.1%	15.1%	+1.0%	+7.1%	14.2%	10.5%	+1.3%	+5.2%

Table 1 shows that after sensory deprivation Ss reacted more slowly in contrast with the control group, the rate of increment of reaction time being 13.3%. In the control series 2.5% decrease was observed in the post measurement as compared with the pre-measurement. The difference between these rates is statistically significant ($t_0=2.11$, $df=14$, $P<.05$). This slower reaction tendency in sensory deprivation is found also in the choice reaction A-session, which is thought to have some similarities to the simple reaction situation, although the rate is in the minus. The difference between two groups is statistically significant ($t_0=1.77$, $df=14$, $P<.05$). In the choice reaction B session, however, when the stimuli were presented in the three different places, no difference in reaction time between the two groups was perceived. With regard to the coefficient of variation (CV), there was no difference between the two groups in each session. Few errors were found in both of the choice reaction sessions.

Discussion

In the reaction experiments, sensory deprivation brought about degraded reactions though errors and fluctuations of reaction did not increase. Contrary to our expectation, in the most complicated condition, i.e., in the choice reaction B-session, no effect of sensory deprivation was observed.

This slower reaction tendency, especially in the simple reaction conditions, may be regarded as a reflection of disturbed psychomotor functions, especially of disturbed efferent motor functions. As in the alcohol experiment⁽³⁾ where almost the same tendency was found, it may be suggested in the present experiment that the set not to make any errors may survive on the part of Ss.

Further investigations should be made, however, into the effects of sensory deprivation upon choice reaction B-session, because considerably different values of reaction time were observed in the pre-measurement between control and experimental groups. This difference of values in premeasurement may be ascribed to the difference of experience between the two groups. Control Ss had experienced the choice reaction B-session before, but experimental group had not. On the other hand, both of the groups experienced the simple reaction and choice reaction and choice reaction A-session for the first time.

(2) Two-Point Discrimination Test

As in the previous experiment (1), the two-point discrimination limen was measured on the center of the back of left hand by using Ebbinghaus' method of aesthiosimeter. 9 Ss were used in each of the experimental and control conditions. They were the same Ss that took part in the reaction experiments.

Result

The results of the test are given in Table 4. In this experiment also, which

Table 4. Mean values in two-point limen.

Group	N	Pre-S.D.	Post-S.D.	Rate	P
Exp. Group	10	16.7	12.7	-21.4	$t_0=3.95$ $df=17$ $P<.01$
Cont. Group	9	17.1	18.3	+7.0	

was carried out to confirm the findings got in the previous experiment(1), the same trends are observable. The two-point limen was found to become much lower after sensory deprivation. The difference between the values obtained before and after the sensory deprivation is statistically significant ($t_0=3.95$, $df=17$, $P<.05$).

Discussion

Most of the experimental Ss showed a lowered two-point limen after the sensory deprivation. The control Ss showed little change. This result is the same as in the previous experiment. From these data including the present one, it may safely be confirmed that somaesthetic sensitivity increases after sensory deprivation.

References

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Zusammenfassung

Der Einfluss von sinnlicher Entziehung auf psycho-motorische Funktionen wurde mittelst der Prüfungen (1) der einfachen und Wahl-Reaktion und (2) der Unterschiedsschwelle zweier Druckreize untersucht. Aus den Ergebnissen folgt: Bei der Reaktionsexperiment war die längere Reaktionszeit erkennbar. Hinsichtlich der Häufigkeit der Fehler-Reaktion zeigte sich hierbei kein bemerkenswertes Resultat zwischen zwei Gruppen. Bei der Prüfung der Raumschwelle war die erniedrigte Schwelle erkennbar.