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BILATERAL REMINISCENCE IN PURSUIT-ROTOR LEARNING

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Nine groups of Ss practiced on pursuit rotor in five experiments which were conducted systematically to see the bilateral reminiscence phenomenon.

The significant reminiscence is obtained in two bilateral transfer situations, one in which Ss shift from the right hand to the left hand, and the other in reverse order, as the conventional reminiscence is obtained in the unilateral transfer situation. Such reminiscence is not shown, however, in the spaced practice group.

These results, then, are discussed from the viewpoint of the inhibition theory.

Ammons and Ammons (1951), Irion and Gustafson (1952), and Kimble (1952) demonstrated that the phenomenon of reminiscence can be obtained also in bilateral transfer situation. Grice and Reynolds (1952) demonstrated that the amount of bilateral reminiscence is a function of the length of the interpolated rest period, and that while bilateral reminiscence is less in amount than unilateral reminiscence, it is related to the length of rest in approximately the same way as conventional reminiscence. Rockway (1953) found that bilateral reminiscence is an increase function of the amount of first-hand practice and the length of rest.

Reviewing the findings and theories, Irion (1966) stated that the bilateral reminiscence effect seems to be attributable to the dissipation of inhibition accumulated in connection with response systems common to the right-handed and the left-handed performances.

These studies are of considerable interest because they may cast some light on the nature and locus of inhibitory process and reminiscence.

The purpose of the present study is to obtain an additional evidence of bilateral reminiscence.

GENERAL METHOD

Five experiments are performed with nine groups of Ss. Only the general condition common to all groups are described here, since such specific conditions as rest period, hand used, etc. will be mentioned later in the report of each experiment. Conditions for each group will be shown in a table at the end of this paper with the results

obtained.

Apparatus and procedure.—The apparatus is a type of Koerth pursuit rotor made by Takei-kiki Co. Ltd. The turntable rotates clockwise at a speed of 60 rpm. The performance score is decided by the duration of contact between stylus and target, which is recorded cumulatively by a counter counting a 0.5 sec. contact as 1. Since the unit for measuring the contact time is rather coarse as counting in units of 0.5 sec., the point of stylus was soldered to a diameter of 5-mm in order to make contact easier.

The basic condition of practice is as follows: each group of Ss practice 15 50-sec. trials separated by 10-sec. pauses except for the two groups of Ss which practice their pre-rest trials under the spaced condition with 70-sec. pauses. For five groups, a 10-min. rest is interpolated between Trials 10 and 11. During the rest, Ss are in another room.

Subjects.—Ninety Ss, 10 per group, participated in these experiments. The Ss were right-handed male students of Yamagata Higashi High School. None of them have had any previous experience with pursuit-rotor learning. Those who scored more than 20 at their first trial were not employed as Ss as well as those who were very short-sighted or astigmatic.

Experiment 1

Experiment 1 is performed as a preliminary one for the remaining experiments in the series to see whether the reminiscence phenomenon occurs under the conditions described above.

Purpose.—To confirm the occurrence of conventional reminiscence in the right-handed practice.

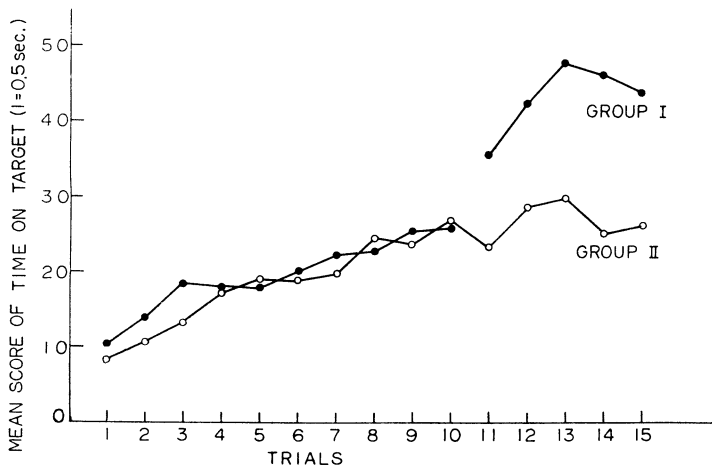


Fig. 1. Learning curves for Group I (RR, rest) and Group II (RR, no rest).

Table 1 Mean increment for one trial in three periods of practice.

Group \ Trial	Pre-rest		Post-rest
	1~5	6~10	11~15
I	1.68	1.18	1.68
II	2.10	1.64	0.62

Condition. — Two groups of Ss practice on rotor for 15 50-sec. trials with the right hand separated by 10-sec. pauses. Group I is allowed a 10-min. rest between Trials 10 and 11, but Group II is allowed only the normal, 10-sec., intertrial pause.

Results. — The results are shown in Fig. 1. No important differences exist between the two groups during the first ten trials of practice (even the largest difference for Trial 3, 5.2, is not significant: $t_0=0.89$, $0.3 < p < 0.4$). The performances of both groups after a rest, however, are significantly different (even the smallest difference for Trail 11, 12.4, is significant: $t_0=4.80$, $p < 0.01$). The difference between the performances of Trial 10 and 11 for Group I is, then, 9.9, and this is more than six times of the mean increment for one trial before a rest, 1.52. Thus, a reminiscence phenomenon is shown by the insertion of a 10-sec. rest.

In Table 1, the mean increment for each group of five trials is shown. In pre-rest trials, the mean increment for the trials of the latter half is less than that for the first half. In post-rest trials, on the other hand, while the performance of Group I recovers to the level of the first half in pre-rest trials, the performance for Group II becomes poorer than the latter half.

Discussion. — As seen in Fig. 1, a significant reminiscence is shown following a 10-min. rest. It would be reasonable to assume that the dissipation of inhibition during 10-min. rest accumulated in 10 successive pre-rest trials produced the reminiscence phenomenon. The changes of the mean increment shown in Table 1 also support this interpretation.

Experiment 2

The reminiscence in the practice with the left hand is investigated under the same condition as that for Group I in Experiment 1.

Purpose. — To see the reminiscence in the left-handed practice.

Condition. — The condition is the same as that of Group I except that here, in Group III, Ss are asked to practice with the left hand.

Results. — In Fig. 2 the learning curve for Group III is shown with that for Group I. While the mean increment is 1.63 for 10 trials before rest, the increment from Trial 10 to 11 is 14.6. Thus, the reminiscence phenomenon occurs here, too, after a 10-min. rest. The mean increment for five post-rest trials, however, is lower than those for pre-rest trials as shown in Table 2.

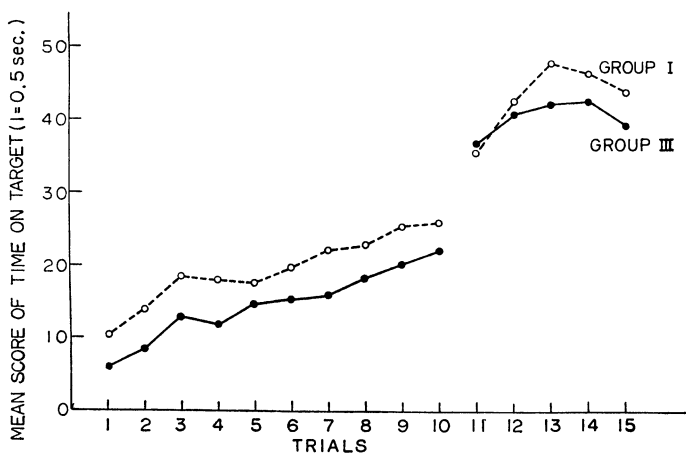


Fig. 2. Learning curves for Group I (RR, rest) and Group III (LL, rest).

Table 2 Mean increment for one trial in three periods of practice.

Group \ Trial	Pre-rest		Post-rest
	1~5	6~10	11~15
III	1.80	1.32	0.54

Discussion. — Compared with Group I, Group III shows a larger reminiscence but a smaller mean increment in post-rest trials. These difference between the left-handed and the right-handed practices may be attributed to the fact that the Ss were all right-handed. Thus, it is plausible that in the non-preferred (left) hand practice the larger amount of inhibition was accumulated than in the preferred (right) hand practice, which could not be dissipated completely during a 10-min. rest.

Experiment 3

Purpose. — To investigate the phenomenon of reminiscence in a bilateral transfer situation from the right hand to the left hand.

Condition. — Two groups of Ss, Group IV and V, receive ten trials of practice with the right hand followed by five trials of practice with the left hand. Group IV is allowed a 10-min. rest between Trials 10 and 11 (the point at which the shift in hands occurs). Group V shifts hands in the normal 10-sec. intertrial rest between Trials 10 and 11.

Results. — As seen in Fig. 3, there are no important differences between the two groups during the first ten trials of right-handed practice. After the switch to the left hand, however, it is evident that Group IV is superior to Group V.

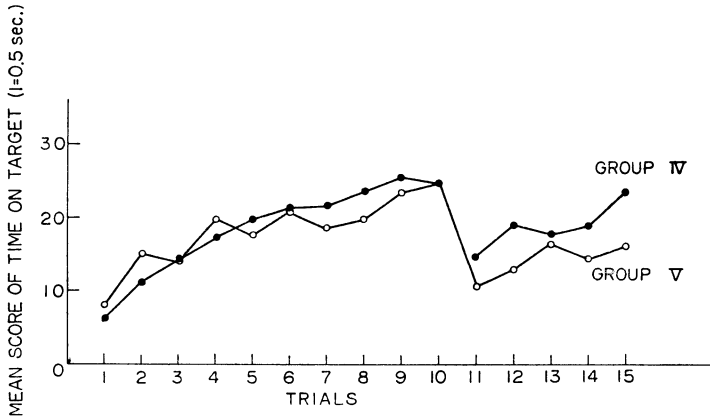


Fig. 3. Learning curves for Group IV (RL, rest) and Group V (RL, no rest).

Discussion. — The superiority of Group IV to Group V might be attributed to the dissipation of inhibition during the 10-min. rest. Thus, the difference of 4.0 between the score of Trial 11 for Group IV (14.8) and that for Group V (10.8) can be considered to show the amount of bilateral reminiscence transferred from the right hand to the left hand.

Experiment 4

Purpose. — To see the bilateral transfer and reminiscence transferred from the left hand to the right hand.

Condition. — The condition of practice is the same as in Experiment 3 except that the order of using the hands is reversed, the left hand first and the right hand second. Group VI is allowed a 10-min. rest but Group VII allowed only the normal 10-sec. intertrial pause.

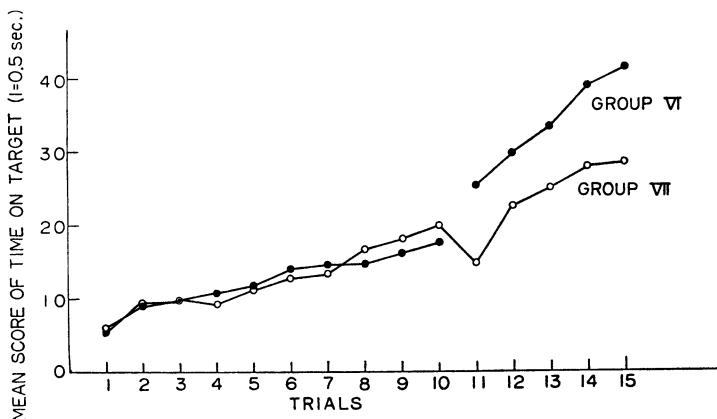


Fig. 4. Learning curves for Group VI (LR, rest) and Group VII (LR, no rest).

Results. — As shown in Fig. 4, no important differences exist between the two groups during the first ten trials. After a rest, on the other hand, Group VI is always superior to Group VII.

Discussion. — The superiority of rest group to non-rest group could also be attributed to the dissipation of inhibitory factor during a rest. The difference of 10.3 between the scores for both groups at Trial 11 might be taken to show the amount of bilateral reminiscence transferred from the left hand to the right hand.

That the amount of reminiscence in Experiment 4, therefore, is shown to be larger than that in Experiment 3. Thus, the amount of bilateral reminiscence is larger in the order of shifting from the left hand to the right hand than in the reverse order.

Experiment 5

Since the condition of practice in the experiments reported above was a kind of “massed” one (successive practice of 50-sec. trials separated by 10-sec. pauses), here in Experiment 5, the performance under the “spaced” condition is investigated.

Purpose. — To see the performance under the “spaced” condition of practice.

Condition. — Two groups of Ss, Group VIII and IX, receive 10 50-sec. trials of right-handed practice. After receiving ten trials separated by 70-sec. intertrial rest (“spaced” condition), they practice five trials with 10-sec. intertrial pauses (“massed” condition). Group VIII is allowed a 10-min. rest between Trials 10 and 11, but Group IX allowed only the normal 70-sec. intertrial rest.

Results. — As shown in Fig. 5, no significant difference is found between the two groups during the first ten trials of practice. After taking a rest, the differences between the two groups are not significant but tend to become larger (in Trial 15, $t_0 = 1.6$, $0.1 < p < 0.2$).

Discussion. — In Fig. 5, the performance for Group I is presented for the purpose

Table 3 Table of conditions

Ss	Trial	Condition*			Pre-			
		Pre-rest	Rest	Post-rest	1	2	3	4
Group	N	(1~10)		(11~15)				
I	10	m., R	10 min	m., R	10.4	13.6	18.2	17.9
II	10	m., R	—	m., R	8.3	10.4	13.0	17.0
III	10	m., L	10 min	m., L	5.6	8.1	12.7	11.9
IV	10	m., R	10 min	m., L	6.1	11.4	14.3	17.1
V	10	m., R	—	m., L	8.1	15.0	14.2	19.6
VI	10	m., L	10 min	m., R	6.0	9.1	9.9	10.7
VII	10	m., L	—	m., R	5.6	9.0	9.9	9.3
VIII	10	s., R	10 min	m., R	7.7	12.5	23.1	29.6
IX	10	s., R	—	m., R	6.8	11.2	18.6	27.7

(* m : massed practice, S : spaced practice,

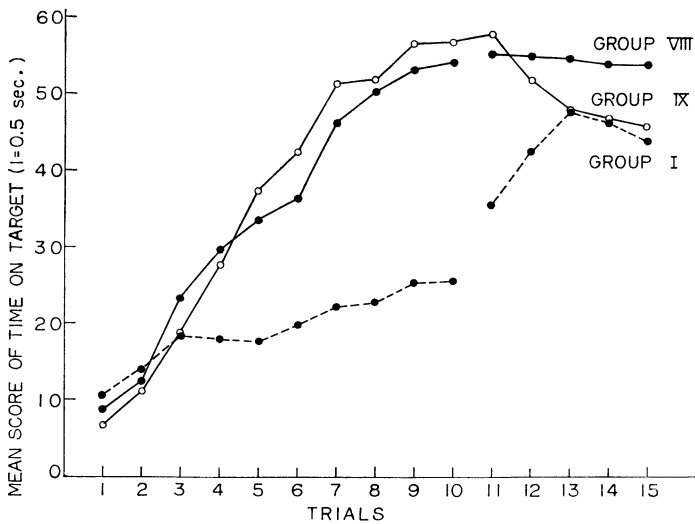


Fig. 5. Learning curves for Group I (massed, RR, rest), Group VIII (spaced, RR, rest) and Group IX (spaced, RR, no rest).

of comparison between the performances shown under massed and spaced conditions. The effect of spaced condition becomes apparent from Trial 4 on. The performance score for the Ss under spaced condition comes close to 2 times in Trial 7 and 2.4 times in Trial 10. In spite of the insertion of a 10-min rest, the reminiscence phenomenon did not occur in the group which practiced under the spaced condition.

Thus, the results for these two groups suggest that the inhibitory factor might be dissipated at each interval during 70-sec. intertrial rest under the spaced condition. The results from the five trials of practice after a rest show that the curve for Group IX falls almost parallel to the curve for Group I, while the curve for group VIII con-

and results for all groups.

Result (Mean score of time on target)										
rest						Post-rest				
5	6	7	8	9	10	11	12	13	14	15
17.6	19.7	22.0	22.7	25.4	25.6	35.5	42.3	47.9	46.1	43.9
18.8	18.6	19.7	24.4	23.6	26.8	23.1	27.7	29.7	25.0	26.2
14.6	15.3	16.0	18.2	20.1	21.9	36.5	40.7	42.0	42.5	39.2
19.8	21.2	21.3	23.3	25.2	24.5	14.8	19.0	17.8	18.9	23.7
17.6	20.6	18.5	19.8	23.3	24.9	10.8	13.0	16.4	14.3	16.0
11.6	14.0	14.4	14.7	16.0	17.3	25.1	29.8	33.1	38.8	42.1
12.1	12.8	13.4	16.5	18.0	19.8	14.8	22.4	24.7	27.8	28.4
33.6	36.4	46.4	50.3	53.2	54.1	55.4	55.1	54.9	53.9	53.9
37.3	42.2	51.2	51.9	56.7	56.6	57.7	51.9	48.0	46.9	45.9

R : right hand, L : left hand)

tinues on a nearly straight course. Further investigations will be required, however, to determine the nature of inhibitory factor producing the difference shown between the two curves.

GENERAL DISCUSSION

First, the occurrence of the conventional reminiscence is confirmed in both the right-handed practice (Experiment 1) and the left-handed practice (Experiment 2). It is noted, however, that the mean increment for post-rest trials does not recover to the one for pre-rest trials in the left-handed practice (Experiment 2) as it does in the right-handed practice (Experiment 1).

Second, the occurrence of bilateral reminiscence is demonstrated in the groups with a rest at the time of the switchover of hand from the right to the left (Group IV in Experiment 3) and from the left to the right (Group VI in Experiment 4), though the amount of reminiscence for the latter is larger than that of the former. This difference in the amount of reminiscence by the order of using hands might suggest that the transfer of skill, and therefore the transfer of the inhibitory factor, depends not only on the general or central factor common to both laterals but also on the factor specific to the lateral or the effector.

Though not demonstrated here, it might be interesting to compare the results between Groups I and VI, Groups II and VII, and Groups III and IV, respectively, in order to see how the first learning experience with the different hand effects the second learning experience with the same hand from the viewpoint of "proaction".

Finally, the performance for those who practiced the pre-rest trials under the spaced condition might be explained by the dissipation of inhibition during the intertrial rest.

In Table 3, the mean scores for all groups are given with the conditions under which they were obtained. More detailed consideration from the viewpoint of inhibition theory will be left for future study.

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ZUSAMMENFASSUNG

Neune Gruppen von Vpn übten sich auf dem Verforgung-rotor in fünf Ven Versuchen, welche systematisch um die bilaterale Reminiszenz zu untersuchen angestellt wurden.

Die bezeichnende Reminiszenz wurde in zweien bilateralen Transfer Situationen gezeigt, wie in dem unilateralen Transfer Situation. Solche Reminiszenz wurde nicht in der verteilten Übung Gruppe gezeigt.

Die Ergebnissen wurden aus dem Gesichtspunkt von dem Inhibition Theorie disktiertet.

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