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AN EXPERIMENTAL STUDY OF HUMAN MOTIVATION

R.A. Willett and H.J. Eysenck*

Institute of Psychiatry (Maudsley Hospital), University of London

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THIS study is one of a series in which an attempt has been made to obtain evidence on a deduction from modern learning theory[1,2] according to which reminiscence should be a good index of motivation.[3,4] Employing the pursuit rotor as our instrument of choice, we had high and low drive groups perform for varying pre-rest periods, followed by a 6 min rest pause, followed by another 4 min of work. Performance was scored in terms of "time on target" over successive 10 sec periods of massed practice, and reminiscence was scored in terms of the difference between the last 10 sec pre-rest work period and the first 10 sec post-work period. High and low drive groups were obtained by testing industrial apprentices who either performed the test as part of a battery of admission tests to a training course which was widely sought after (high drive), or else served as subjects months after admission to the course, when performance could have no conceivable influence on their advancement (low drive).

The following are the main predictions generated by the theory:[3] (1) Reminiscence in low drive groups is independent of length of pre-rest practice, provided this is not shorter than 2 min. (2) Reminiscence in high drive groups is a negatively accelerated function of pre-rest practice. (3) Reminiscence scores of high and low drive groups begin to diverge after 2 min of pre-rest practice. (4) Reminiscence scores of the high drive groups should approach an asymptote, but theory does not enable us to predict at what level of pre-rest practice this asymptote might lie. Previous studies using pre-rest practice periods of 2, 3, 6 and 8 min had given results in accordance with these pre-

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TABLE 1

Reminiscence Scores of High Drive and Low Drive Groups after Varying Durations of Pre-rest Practice; Total Number of Subjects is 350 equally Divided between Drive Groups

Pre-rest practice period	N	Reminiscence scores	
		High drive	Low drive
2'	37	0.681	0.724
3'	30	0.793	0.537
6'	38	1.263	0.813
8'	30	1.510	0.507
12'	20	1.800	0.985
15'	20	1.872	0.235
	175		

TABLE 2

Analysis of Variance of Reminiscence Scores of High Drive and Low Drive Groups. All Scores are Significant beyond the 1% Level

Analysis of variance				
Source	Df	S.Sqs	M.S.V.	V.R.
Groups	11	71.78	6.5255	9.9824**
Levels of drive	1	29.90	29.90	45.7396**
Pre-rest practice	5	18.36	3.672	5.6173**
Practice x levels	5	23.53	4.706	7.1990**
Residuals	328	214.41	0.6537	
Total	350	357.98		

dictions, but had failed to reach the asymptote level expected for the high drive group; accordingly it was thought desirable to repeat the experiment with much longer pre-rest periods (12 and 15 min respectively), in the hope that these periods would prove long enough to settle this question. Another reason for repeating the previous studies lay in the failure of the expected superiority in pre-rest performance of the high drive groups to materialize. Kimble[2] and Wasserman[5] had found high-drive groups superior in performance; Eysenck and Maxwell[3] found slight but largely insignificant superiority of the high drive groups with pre-rest practice periods of 3 and 8 min, and Eysenck and Willett[4] found no difference with 2 and 6 min of pre-rest practice. The longer periods involved in the present experiment seemed particularly advantageous in showing up any differences in performance that might exist.

Mean reminiscence scores are shown in Table 1 for high and low drive groups for all durations of pre-rest practice together with the number of subjects tested, and Fig. 1 shows the details of the predicted negatively accelerated increase of reminiscence as a function of pre-rest practice for the high drive group, and the predicted failure of the low drive reminiscence scores to change with pre-rest practice. Table 2 gives the analysis of variance of the combined figures; it will be seen that all the predictions are borne out at a very high level of statistical significance. Table 3 gives an analysis of variance for the scores of the low drive group only; it shows the insignificance of the deviations from a straight line of these scores following different pre-rest work periods.

It is difficult to determine from these figures whether or not an asymptote has been reached by the reminiscence scores of the high drive group. Accordingly these reminiscence scores were plotted against the logarithms of the pre-rest practice periods, with results shown in Fig. 2. It will be obvious that the fit to a straight line is surprisingly good, and indeed does not show any significant departures from it. There is no sign of an asymptote having been reached, and clearly even longer periods than 15 min will have to be employed if evidence

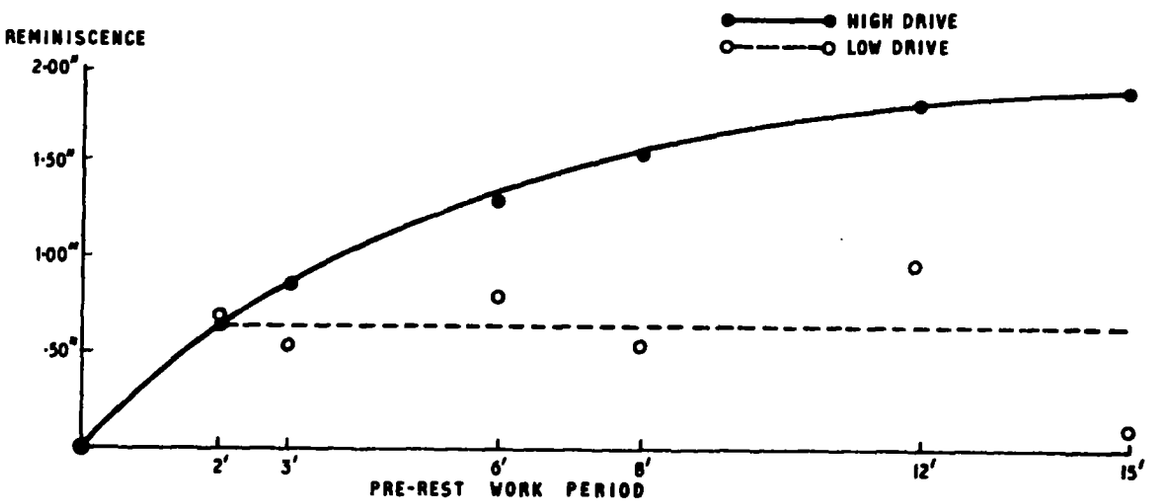

FIG. 1

Reminiscence as a function of duration of pre-rest work period in high drive and low drive groups.

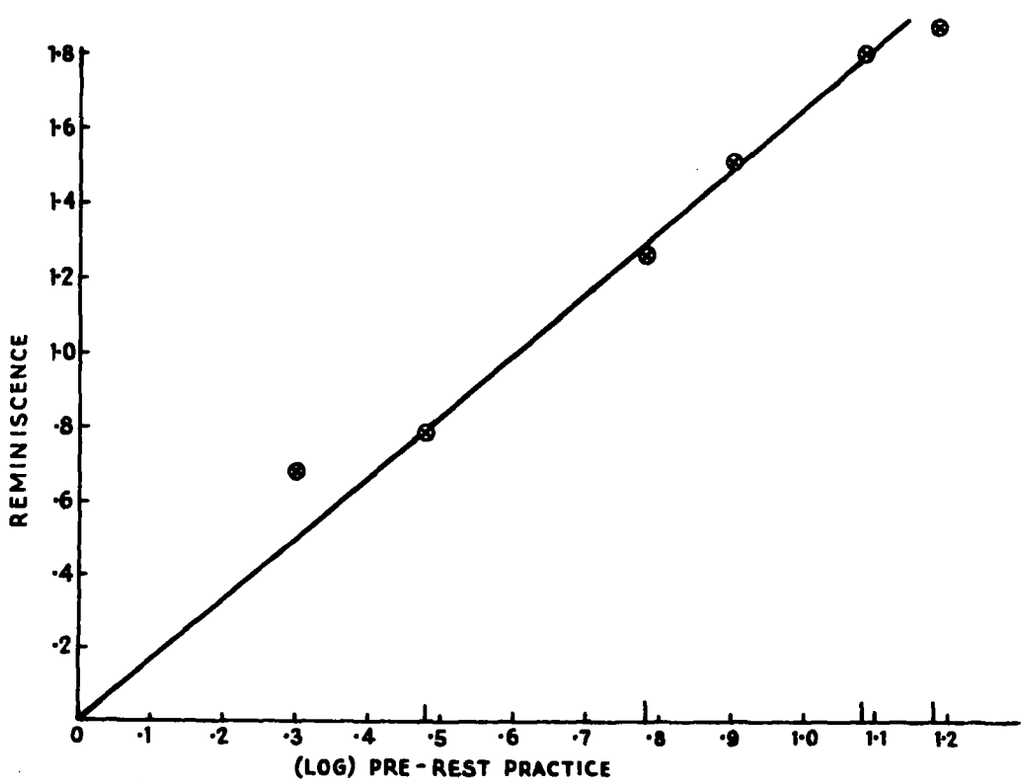

FIG. 2

Reminiscence as a function of the logarithm of pre-rest work period in high drive and low drive groups.

TABLE 3

Analysis of the Reminiscence Scores of the Low Drive Groups, showing Lack of Significance of Pre-rest Practice Variations in Determining Reminiscence

Source	Df	S.Sqs	M.S.V.	V.R.
Between groups	5	7.93	1.586	1.701 n.s.
Within groups	170	158.47	0.932	
Total	175			

relating to the position of the asymptote is to be obtained.

It will be apparent from Fig. 1 that the group means for the high drive group are less variable than those for the low drive group, in the sense that they cleave more closely to their regression line. This suggests the possibility that high drive increases reliability, and accordingly the scores for the last and last but one 10 sec pre-rest practice periods have been correlated separately for the high and low drige groups, as were also the scores for the first and second post-rest 10 sec practice periods for these two groups. The correlations do not in any systematic way depend on the length of pre-rest practice, being remarkably similar, and have accordingly been averaged over these periods. The mean correlations for low and high drive groups respectively are 0.62 and 0.76 for the pre-rest periods, and 0.62 and 0.74 for the post-rest periods. It is apparent that the rest pause has had but little influence on the size of the correlation between successive practice periods, and that high drive is connected with higher correlations, and consequently reliability, than is low drive. As the reminiscence score is dependent on the difference between two of the scores considered, it follows mathematically that it too must be more reliable for the high drive group. Direct proof of this deduction would be desirable.

If predictions regarding reminiscence are borne out by the data, the same cannot be said of the data relating to performance. Figs. 3 and 4 show performance records of the 12 and 15 min pre-rest practice groups respectively; it will be seen that in both cases the low drive group is slightly superior

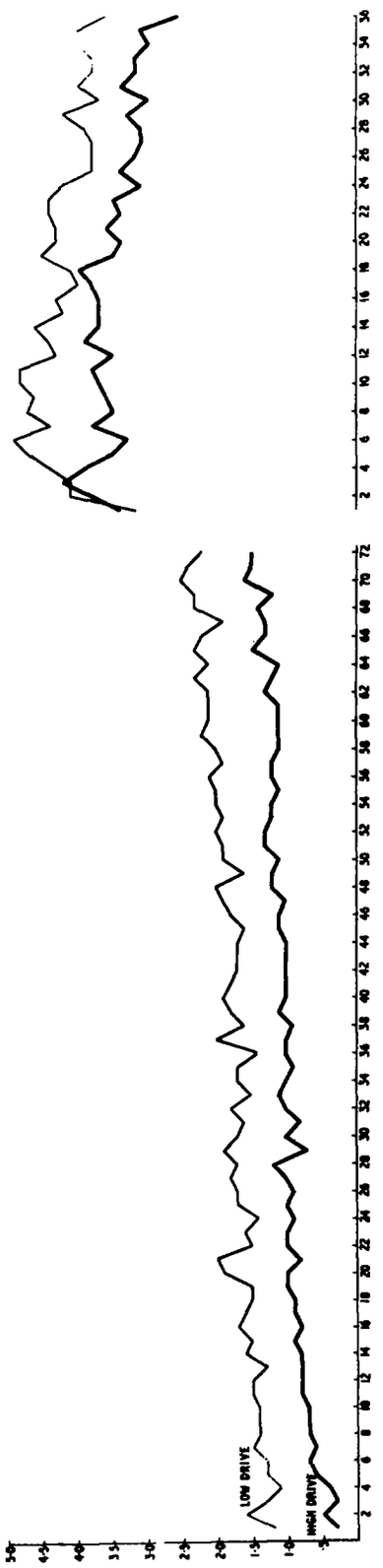

FIG. 3

Performance on the pursuit rotor of high drive and low drive groups; 12 min pre-rest period. Also shown is performance during 4 min practice after 6 min rest pause

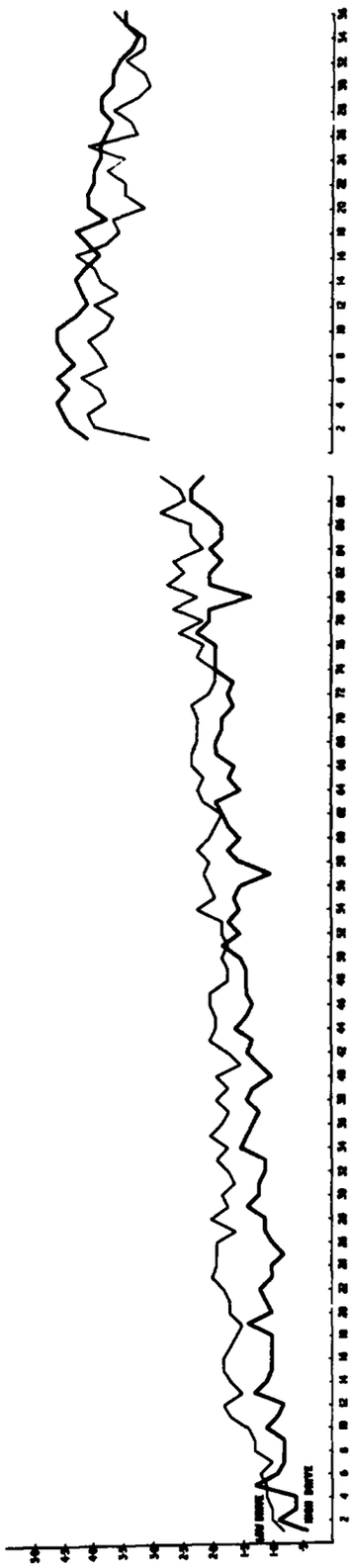

FIG. 4

Performance on the pursuit rotor of high drive and low drive groups; 15 min pre-rest period. Also shown is performance during 4 min practice after 6 min rest pause

throughout. When these data are taken together with our previous work, which showed a slight superiority of the high drive group, then it is quite apparent that in spite of the large number of subjects employed no certain conclusions can be drawn, other than that any performance differences between the groups are likely to be exceedingly small, if they exist at all. Statistical analysis reveals no significant differences of any kind. It might be argued that possibly the high drive group was in fact superior, but that this superiority was offset by the fact that this group of applicants was unselected, and was being compared with a low drive group selected in terms of their ability on various tests which might share common variance with the pursuit rotor. If this were so, then high drive group subjects rejected in the selection procedure should perform worse than those accepted; Fig. 5 shows that this is not so. In the three parts of this Fig. we have combined the 2 and 3 min pre-rest practice groups, the 6 and 8 min groups, and the 12 and 15 min groups, plotting in each case only as many practice periods as both groups had in common. The numbers of subjects involved in these comparisons are 16 and 51; 23 and 45; and 14 and 26 respectively, giving the number of accepted subjects first, the number of rejected subjects second. No significant differences are apparent, and with the exception of the 2 and 3 min groups none of the results are even suggestive of any differences. It may be necessary to have recourse to some variant of the Yerkes-Dodson law to account for our failure to observe performance differences between high and low drive groups,[6] on the assumption that the pursuit rotor task is at a level of difficulty which is intermediate between the optimal drive levels of the two groups, so that the high drive of the one group is partly directed towards the potentiation of wrong habits, thus cancelling out the advantage this group would otherwise have by its high drive potentiating the correct habits. This explanation is not, however, entirely satisfactory as it would lead one to expect changes in the relative performance of the high and low drive groups as habit strength increased; no such changes are apparent. A more incisive reformulation of the theory may be required, possibly along the lines

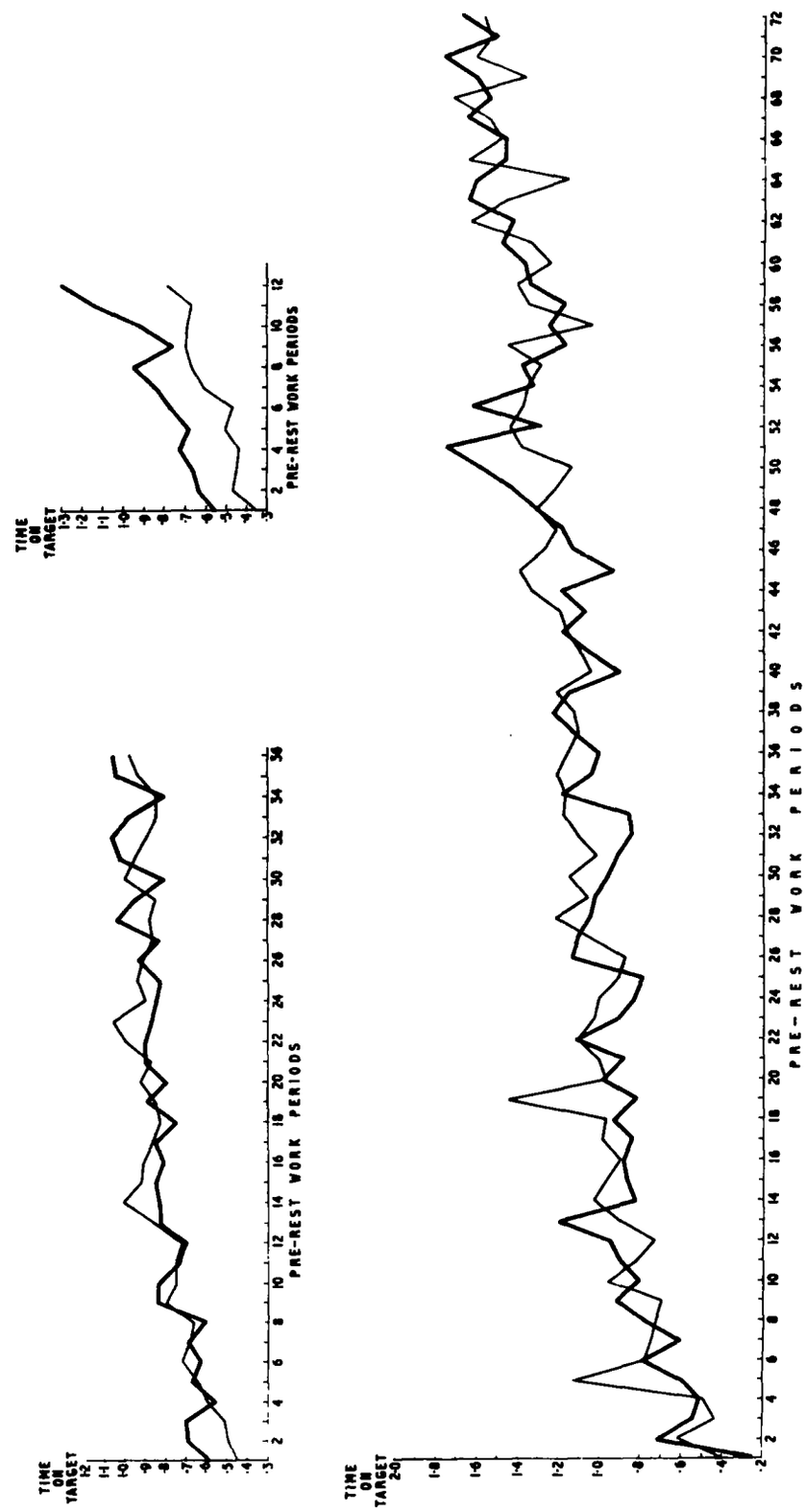

FIG. 5

Performance on pursuit rotor of high drive subjects accepted (thick line) or rejected (thin line) during selection procedure. Two and 3 min groups have been combined (top right), 6 and 8 min groups have been combined (top left), and 12 and 15 min groups have been combined (bottom of figure).

of incorporating the Spencian view that drive increases habit strength (instead of being irrelevant to the growth of habit strength, and only influencing performance, as in Hull's model) and also employing some form of the consolidation (perseveration) theory. Work is going on presently in an attempt to solve this problem.

Summary

An experimental test is reported of the hypothesis that reminiscence is a function of motivation. Using the pursuit rotor with pre-rest work periods of 12 and 15 min, groups of high and low drive subjects were found to give reminiscence scores in line with prediction; even with such long periods of work there was no evidence of approach to an asymptote in the high drive group. Performance scores did not differentiate between the groups; this was not in line with prediction and throws doubt on the adequacy of the original theoretical formulation. Suggestions were made regarding possible changes in the theory to incorporate these findings.

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