Drive times habit in human eyelid conditioning¹

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The theory that drive multiplies with habit implies that performance differences between two groups with different drive should increase across trials, and that variances should be greater with increased drive. Data from human eyelid conditioning analyzed in the units of the theory did not support either prediction.

When UCS intensity is increased, both drive (D) and habit (H) are increased (Spence, Haggard, & Ross, 1958). Therefore, an increase in UCS intensity should produce effects similar to, but greater than, those accompanying an increase in D, since H is also increased. It would be predicted, therefore, that performance differences between high and low UCS-intensity groups should increase across trials and that between-S variance should be greater during the last half of training. Since individual differences in H are also multiplied by D, between-S variance should be greater with an increased UCS intensity.

Method

Apparatus. The CS was a 500-msec. 1000-cps tone of 82 dB superimposed on a 77 dB white noise background. The UCS was a corneal air-puff of 50-msec. duration and sufficient pressure to support either a 200-(high) or 100-(low) mm column of mercury, and was delivered at CS offset. Response pickup has been described elsewhere (Prokasy & Whaley, 1962) and recording was done via an Offner Type RC Dynagraph. A CR was defined as a deflection of at least 1 mm of the ink-recording pen occurring between 148 and 524 msec. after CS onset. A Western Union transmitter programmed the trials with a 12-sec. average intertrial interval.

Procedure. The two orthogonal independent variables were UCS intensity and a standard conditioning procedure (e.g., Prokasy & Whaley, 1962) versus a guessing-game masking procedure (e.g., Spence, Homzie, & Rutledge, 1964). The group labels will be: HN for high intensity and normal procedure; LN for low in-

tensity and normal procedure; HM for high intensity and masking procedure; and LM for low intensity and masking procedure. All Ss were given 10 CS-alone and 10 UCS-alone adaptation trials in a random order followed by 300 paired trials and 50 extinction trials. Extinction data will not be reported.

Results

Individual response probabilities were converted to excitatory potential (E), as described by Spence (1956). Table 1 provides median E in blocks of 20 trials in two ways: for all Ss, and then for those Ss not meeting the criterion of being a voluntary-form-responder.² Two expected effects were obtained: higher response levels with the higher intensity ($F=11.99$, $df=1/236$) and higher response levels with the typical conditioning procedure ($F=34.42$, $df=1/236$). The small negative values of Rho show that the differences between Groups HN and LN and between Groups HM and LM did not increase across trial blocks.

Table 2 provides between-S variances for trials 1-150 and 151-300. All variances increase from the first to the second block, though no increase is significant.³ Contrary to prediction, the larger variances were obtained in Groups LN and LM, though the effects were significant only in the former case.

Discussion

According to the theory that $E=D \times H$, the increase in mean performance which accompanies an increase in D results from divergence across trial blocks in the performance differences of high and low D groups. Although there exist some data which show trends to divergence (e.g., Spence, 1958, Fig. 2), there are also data which show, if anything, convergence (e.g., Spence, 1958, Fig. 5). In no prior instance has an appropriate statistical test been made. The tests made in this study fail to support the hypothesis of divergence between groups, although it is possible that some unusual interacting between the H and D components of UCS

Table 1. Median E Values (times 1000) in Blocks of 20 Trials

Group	N	Trial Blocks															Rho ^a
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
HN	60	2325	2900	3253	3842	3842	3919	4036	4016	4201	4106	4282	4106	4282	4282	4201	
LN	60	1964	2615	3000	3524	3691	3724	3675	3842	3842	3842	3759	3954	4036	4016	4132	-.31
HM	60	2325	2615	2963	3025	3319	3399	3441	3496	3569	3413	3441	3510	3691	3707	3598	
LM	60	1964	2168	2260	2476	2686	2615	2668	2757	2900	2937	3101	3126	3088	3126	3063	-.10
HN ^b	53	2168	2874	3176	3707	3842	3842	3842	3842	4036	4036	4036	4036	4282	4282	4036	
LN ^b	47	1891	2476	2816	3190	3253	3293	3524	3774	3675	3842	3675	3842	3842	3842	4036	-.30
HM ^b	52	2325	2401	3000	3000	3253	3399	3427	3413	3569	3385	3385	3385	3385	3644	3675	
LM ^b	54	1964	2215	2325	2476	2686	2615	2641	2757	2874	2874	3075	3126	3088	3126	3000	.01

^a = Rank-order correlation between ordinal trial block and size of difference between high and low intensity groups.

^b = With voluntary-form-responders removed.

Table 2. Variances in E and F-ratios Across Two Trial Blocks

Group	N	Trials		F(Blocks)
		1-150	151-300	
HN	60	.468	.613	1.31
LN	60	.898	.933	1.04
F(HN-LN)		1.92 ^a	1.52	
HM	60	.579	.706	1.22
LM	60	.647	.986	1.52
F(HM-LM)		1.12	1.40	
HN ^b	53	.311	.498	1.62
LN ^b	47	.869	.933	1.08
F(HN-LN)		2.79 ^a	2.05 ^a	
HM ^b	52	.633	.724	1.14
LM ^b	54	.796	1.065	1.34
F(HM-LM)		1.26	1.47	

a = $p < .05$, *b* = voluntary-form-responders deleted

intensity can account for this failure. The essential point is that the mean differences obtained cannot be construed as supportive of the theory in the absence of divergence between groups, as it is the latter which the theory predicts.

The outcome with variances, while not as predicted, need not be interpreted as a failure of the theory. Although not significant, the variances tended to increase from the first to the last trial block. The lower variance found with the higher UCS intensity can be interpreted, post hoc, with additional assumptions. If it is assumed that an increase in intensity serves not only to increase D and H, but also to reduce individual differ-

ences in H, i.e., enough to overcome and reverse the multiplicative effects of D, then smaller variances with higher intensities can be accounted for. However, the variance outcome together with the failure to obtain divergence, even though mean differences were obtained, points to a failure of predictive consistency for the D x H hypothesis within the same experimental setting.

References

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Notes

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2. A voluntary-form-responder was defined as a S with a CR slope of at least 60% of the slope of the UCR.
3. F ratios for variances were obtained by placing the larger variance over the smaller and adopting as the 5% level the tabled F value for half of that, i.e., the 2.5% level.