Right and wrong feedback in multiple probability learning as a determinant of subsequent performance¹

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The effect of being right or wrong on a trial in a probability-learning context could influence the decision to try for the long shot or to maximize on the immediately following trial. Instructions in probability-learning situations generally encourage Ss to be correct as often as possible. Results showed no evidence for any trend toward maximization on the basis of the rightness or wrongness of the immediately preceding decision.

The purpose of this study was to investigate the effects of rightness and wrongness of a first prediction on a second prediction in a multiple probability-learning situation where each trial required two predictions by S. In the usual probability-learning context, first-order sequential effects are analyzed by comparing behavior on Trial k with that on Trial k + 1 for all ordered couplets. In the present study, each trial consisted of two related parts such that an ordered couplet was contained within the individual trial. The principle reason for this novel arrangement was to examine more clearly the effects of being right or wrong in a specific situation where the sequential relationship could be more obvious to S. Additionally, the arrangement provided a situation where S essentially switched back and forth from one probability-learning problem to another probability-learning problem.

METHOD

Display and Procedure

Experimental Ss saw three rectangular grey metal boxes arranged vertically. In the center of the front panel of the bottom box was a green light; at each end of the middle box was an amber light; and in the center of the top box was a red light. On each trial, the green light was illuminated for 3½ sec followed by one of the two amber lights for 3½ sec; the amber light was followed in turn by the red light for 1 sec a predetermined portion of the time. On each trial for each of the experimental groups, S predicted which of the two amber lights would occur and, after observing which did occur, made a second prediction within 3½ sec as to whether or not the red light would occur. After a 2-sec intertrial interval, S again made his predictions from bottom to top, first predicting which amber light would come on, then predicting whether or not the red light would follow whichever amber light did come on.

Control Ss saw only the top two boxes and predicted whether or not the red light would come on following whichever amber light had occurred in the first part of the trial. Time relationships for the amber and red lights and intertrial intervals were the same as for the experimental Ss.

All Ss were instructed to try to be correct in their predictions as often as possible. Responses were made on a specially prepared answer sheet with either four or three circles arranged for each trial in the same position as the display lights. S predicted the occurrence or nonoccurrence of a particular light with a short vertical or

horizontal line, respectively, drawn through the corresponding circle on the answer sheet.

Design

Five experimental treatments and five control treatments were run in small groups, maximum N = 6 for any one group. The treatments are shown in Table 1. In Experimental T1 through T5, each of the left and right amber lights followed the green light on 50% of the trials. In T1, the red light followed each amber light 3/14 of the trials on which that amber light was illuminated. In T2 and T3, the proportions of red-after-amber were 7/14 and 11/14, respectively. Proportions of 11/14 and 3/14 for left and right red-after-amber were used for T4 and the reverse for T5.

Control Treatments 1 through 5 were the same as experimental treatments, with the exception that only red-after-amber predictions were made.

Each block of training was made up of 28 trials, 14 with each of the amber lights randomly ordered. Total training consisted of 10 blocks, or 280 trials.

RESULTS

Learning curves for all treatments exhibited nothing peculiar, rising toward 79% where the experimental and control probabilities of red-after-amber were .786, declining toward 21% where the experimental and control probabilities of red-after-amber were .214, and varying around 50% for probabilities of .500 in predictions made of the amber lights in the experimental treatments and for red-after-amber predictions in both experimental and control treatments for $\pi = .500$. Only Experimental T5 showed little "learning" of the programmed probabilities.

The data bearing on the original purpose of the experiment are presented in Table 2.

DISPLAY

Table 1
Probabilities of Occurrences of Left and Right Amber Lights and Conditional Probabilities of the Red Light Following the Occurrence of Each Amber Light

		Left	Right			Left	Right
<u>Experimental Groups</u>							
T ₁ (N = 13)	Amber	.500	.500	Red After Amber		.214	.214
T ₂ (N = 12)	Amber	.500	.500	Red After Amber		.500	.500
T ₃ (N = 13)	Amber	.500	.500	Red After Amber		.786	.786
T ₄ (N = 11)	Amber	.500	.500	Red After Amber		.214	.786
T ₅ (N = 8)	Amber	.500	.500	Red After Amber		.786	.214
				Left	Right		
<u>Control Groups</u>							
T ₁ (N = 13)	Red After Amber		.214		.214		
T ₂ (N = 16)	Red After Amber		.500		.500		
T ₃ (N = 14)	Red After Amber		.786		.786		
T ₄ (N = 6)	Red After Amber		.214		.786		
T ₅ (N = 6)	Red After Amber		.786		.214

Fig. 1. Display as seen by experimental Ss. Control Ss saw only the top two boxes.

Table 2
Summary of Correct Second Predictions After Correct and Incorrect First Predictions

Experimental Treatments		Blocks										Mean Proportion Correct Blocks 6-10	Expected Proportion Correct Blocks 6-10
		1	2	3	4	5	6	7	8	9	10		
T ₁	CC	.535	.612	.571	.532	.645	.620	.619	.649	.725	.622	.647	.650
	XC	.545	.552	.648	.610	.651	.653	.672	.641	.668	.721	.671	
												.659	
T ₂	CC	.316	.377	.452	.413	.564	.434	.464	.540	.416	.438	.458	.500
	XC	.686	.742	.581	.520	.522	.641	.529	.535	.604	.493	.559	
												.503	
T ₃	CC	.578	.653	.632	.623	.681	.679	.680	.743	.666	.696	.694	.668
	XC	.487	.598	.598	.567	.616	.602	.676	.662	.629	.682	.649	
												.672	
T ₄	CC	.518	.573	.661	.697	.674	.685	.706	.648	.692	.662	.678	.667
	XC	.491	.666	.548	.647	.639	.625	.709	.621	.645	.681	.656	
												.668	
T ₅	CC	.508	.504	.462	.509	.416	.559	.528	.460	.610	.504	.531	.545
	XC	.558	.548	.508	.606	.508	.484	.541	.571	.566	.514	.536	
												.533	
Overall CC												.607	.611
Overall XC												.620	
Overall Combined												.613	
Control Treatments													
T ₁		.571	.590	.629	.626	.631	.651	.579	.598	.642	.626	.619	.632
T ₂		.482	.506	.459	.500	.493	.486	.495	.491	.455	.522	.490	.500
T ₃		.469	.612	.622	.627	.617	.678	.663	.678	.701	.655	.675	.670
T ₄ and T ₅		.502	.619	.541	.562	.607	.642	.589	.559	.633	.619	.608	.614
Overall												.593	.599

This table shows the proportions of correct predictions of red-after-amber for all treatments (a) after the prediction of which amber light would appear was correct (CC), (b) after the prediction of which amber light would appear was incorrect (XC), and (c) when the only prediction for a particular trial was the red light (Control Treatments 1 through 5). Table 2 also shows average proportions of correct predictions for the last five blocks of trials where the rates of responding have more closely approached stability.

Expected proportions of correct responses were calculated for each treatment by obtaining the proportions of red-after-amber predictions made by Ss (p), the proportions of predictions that red would not follow amber ($1 - p$),

multiplying these proportions by the actual programmed proportions of occurrences and nonoccurrences of the red light (π) and $(1 - \pi)$ and summing the respective products $p\pi$ and $(1 - p)(1 - \pi)$ (Grant, Hake, & Hornseth, 1951; Schipper, 1956).

DISCUSSION

That these data exhibit no pathological trends is seen by examining the last two columns of Table 2, where marked deviations between respective pairs would indicate nonrandom or "predictable" occurrence of the red event light.

There seems little support for the hypothesis that being right or wrong has any effect on the immediately subsequent predictions. Where maximization of correctness of behavior is meaningful (Experimental Treatments 1, 3, 4, and 5),

the effect was never more than an increase of correctness of a few per cent. Additional comparisons between experimental and control treatments lead to the same conclusion.

REFERENCES

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NOTES

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