Alternation responding following nonreinforcement (E_0) in 2-choice probability learning as a function of instructed interpretations of E_0 [1]

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With the contingent event probabilities of $\pi_1 = \pi_2 = .50$, alternating response choices across the E_0 event was investigated as a function of the two interpretations of this event, namely a wrong prediction or a blank trial. Groups receiving both interpretations of E_0 showed some tendency to alternate choices across E_0. Groups instructed with a single or neither interpretation displayed a tendency to repeat the E_0-trial choice on the next trial, which for the group given wrong-prediction instructions reached a significant level in the first 40 trials. However, the latter result differed markedly from the alternation tendency across the wrong-prediction E_0 found in a treatment group which had individual E_0's designated as either wrong predictions or blank trials during training. No satisfactory explanation for this discrepancy could be given.

The present report considers sequential responding across E_0 in the first 80 trials of a study where the reinforcement probabilities of A_1 and A_2 responses, denoted π_1 and π_2 respectively, were both set at .50. Here the scheduling was arranged so that the reinforcing events followed only their respective responses. Consequently, when E_0 came after a response, the outcome of the alternative, non-predicted choice could not be known. In previous research, this writer (Koehler, 1961) found choice frequencies to vary predictably with pretraining instructions which designated how S should interpret the E_0 event. The present work explores the possibility that sequential choice responding across E_0 also varies with E_0 interpretations since the effects of this event should be strongest on the trial following its occurrence.

To this writer's knowledge, there are no published data on sequential responding in the contingent reinforcement situation, probably because probabilistic models cannot easily distinguish sequential response dependencies from other influence on choice responding in this situation (cf., Anderson, 1959, p. 258). By having $\pi_1 = \pi_2 = .50$, however, there should be little problem in interpreting the relative effects of instructions on sequential responding across E_0 if, as expected, choice frequencies remain near 50% over the 80-trial series.

Information on sequential responding across E_0 was obtained with the following five treatments applied to separate groups of 32 Ss: (1) Group W received wrong-prediction instructions about E_0; (2) Group B, blank-trial instructions; (3) Group WB, both wrong-prediction and blank-trial instructions; (4) Group WrB, the same instruction as Group WB and identification during training of individual E_0 events as either wrong predictions

or blank trials; (5) Group C, no special treatment of the E_0 event.

Method

The 160 Ss were enrolled in introductory psychology classes. The Ss were run individually in a darkened room. The S sat in a booth and when a signal lamp at his eye level flashed, predicted which of two lamps was set to light by closing the spring-release lever under the lamp.

Instructions given Ss of Groups W and WB regarding E_0 were the same as those in the earlier study (Koehler, 1961) and are paraphrased in the following remarks. The Ss of Group B were told that when the lamp above the lever they pulled did not light (E_0) it meant both lamps were disconnected on that trial and could not be lighted by pulling their respective levers. The instructions to Group WrB Ss stated that when the red lamp found directly below the signal light flashed following a lever response, it meant the other lever should have been chosen since its lamp was set to go on. For the remaining E_0 occurrences, the Ss of this group were instructed to treat them as blank trials. No E_0 instructions were given Group C.

All groups also received the standard prediction situation instructions and with the exception of Group WrB, were told to ignore the red lamp below the signal light. After reading the instructions, the E asked the S to describe the instructions in his own words. Any apparent misunderstanding was clarified by paraphrasing the relevant parts.

The automatically-controlled temporal sequence on each trial went as follows: 1.5 sec for the signal lamp flash; 1 sec for either a lever lamp flash, a red lamp flash, or all lamps to stay dark; 1 sec darkness until next signal lamp flash. All experimental events and responses were automatically recorded. Pairs of reinforcement sequences were constructed by randomly designating half of each 10 successive A_1 and A_2 responses to be followed by their respective lamps glowing. For Group WrB, the red lamp flashed on a random 50 percent of 10 successive E_0 events occurring with each response. Eight Ss of the 32 assigned to each instructions group received a different pair of reinforcement sequences, and sequence pairs were kept orthogonal to instructions.

Results

The proportions of alternating choices after E_0, designated $P(A_{j,n+1}|A_{i,n},E_{0,n})$, are presented in Table 1 for

Table 1. $A_{j,n+1} | A_{i,n} E_{o,n}$ and A_1 Proportions

Group	Block 1		Block 2	
	$P(A_{j,n+1} | A_{i,n} E_{o,n})$	$P(A_1)$	$P(A_{j,n+1} | A_{i,n} E_{o,n})$	$P(A_1)$
Wrong (W)	.397**	.494	.444	.502
Blank (B)	.485	.500	.437*	.476
W-B	.478	.505	.527	.466
Control	.479	.497	.460	.465
W-r-B	.506	.488	.470	.474
Wrong E_o	.522		.502	
Blank E_o	.495		.436	

Note—*Significant t values for the $P(A_{j,n+1} | A_{i,n} E_{o,n})$ deviation from .50 are indicated with the standard asterisk notation.*

* $p < .05$

** $p < .01$

each of the instructions groups. Separate entries for the two types of E_o events used in the Group WrB condition are also listed in the table as Wrong E_o and Blank E_o. Each $P(A_{j,n+1} | A_{i,n}, E_{o,n})$ in the table was obtained by pooling frequency scores over Ss, both choice responses and blocks of 40 trials. As an indication of the equality of choice frequencies, the proportion of left lever responses are also given in the table under $P(A_1)$.

In the present work with $\pi_1 = \pi_2 = .50$, a deviation of $P(A_{j,n+1} | A_{i,n} E_{o,n})$ from .50 denotes a sequential response effect across E_o. The differences between these proportions and .50 were evaluated by finding a t on the equivalent 32 raw frequency scores of each treatment group. For these ts, whose significant values are indicated in Table 1, the sampling error was estimated by pooling the within-groups sums of squares across trial blocks.

The table shows most of the $P(A_{j,n+1} | A_{i,n} E_{o,n})$ to be below .50, signifying a tendency to perseverate on the choice of the E_o trial. This sequential effect was found to be significantly different from .50 only for Group W in Block 1 (Trials 2–40) and for Group B in Block 2 (Trials 41–80). However in the latter case, there may be some doubt about its validity since $P(A_1)$ dropped below .50 for this group, as well as others (see Table 1), in Block 2.

The table also indicates that some nonsignificant alternation responding across E_o occurred in Groups WrB (Block 1) and WB (Block 2). In the case of Group WrB, this appeared to be related to the two types of E_o events: alternation took place across the Wrong E_o and perseveration across the Blank E_o. However, in a test for paired scores based on the data pooled over all 80 trials, this difference failed to reach significance, t = 1.17, df = 31, p < .25.

Discussion

In general, the $P(A_{j,n+1} | A_{i,n} E_{o,n})$ entries in Table 1 give little evidence of a recognizable pattern that will relate meaningfully to the instructions sets. There is some indication that groups given both interpretations of E_o, namely Groups WrB and WB, tend to alternate, whereas those receiving a single or neither interpretation are more likely to perseverate across E_o. But this relationship would seem to be somewhat doubtful when considering that the wrong-prediction interpretation led to opposite sequential response tendencies in Groups WrB and W. Besides, alternating choices across Wrong E_o in Group WrB also disagree with the results obtained on related treatment groups in a study having a noncontingent 50:50 event sequence (LaBerge, Greeno, & Peterson, 1962). These investigators found that over the event comparable to Wrong E_o, perseveration was prevalent on the early trials of a training series in those groups receiving 33% and 67% E_o trials. Thus, since a similar sequential effect was obtained under the Group W condition here, it seems that factors in the Group WrB procedure, probably unrelated to the instructions, were responsible for choice alternation across the Wrong E_o: presently these factors are unknown.

The tendency to perseverate across E_o found in several groups here has also turned up in previous work with 50:50 event sequences (Greeno & LaBerge, 1963; LaBerge et al, 1962). In the present work, this effect may have been enhanced by the use of event sequences with short runs since response perseveration on the incorrect choice has been found to vary inversely with event run length (Goodnow & Pettigrew, 1955). But, unfortunately, while this explanation might give a good accounting of the marked perseveration which developed in the first 40 trials under the Group W condition, it would be at odds with the equivocal results obtained with the wrong-prediction interpretation of the E_o event.

References

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Note