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Imitative Behavior in Japanese Quail

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IMITATIVE BEHAVIOR IN JAPANESE QUAIL

by

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THE PROBLEM AND ITS BACKGROUND

Imitative behavior was once believed to be restricted to humans and perhaps primates; however, recent experiments have demonstrated imitation in varied lower organisms. Imitation was observed in cats (Herbert and Harsh, 1944), in rats (Miller and Dollard, 1941; bayroff and Lard, 1944; Church, 1957; and Connors, 1965), and in Japanese quail (Bartlett and Lieberman, 1960). The possibility of observing imitative behavior in lower organisms is now generally accepted.

In the study of Miller and Dollard (1941) the model rat was trained to make a black-white discrimination in a one-unit T maze. The subjects, water-deprived rats, were rewarded in some cases for following the turn of the model and in other cases only if the learner took the turn opposite that of the model. The learners were tested for generalization of the following response and were found to follow different models of varying appearance. While the Miller and Dollard (1941) study is significant to the understanding of the "social" behavior of following the leader, questions regarding the factors which facilitate observational learning are left unanswered.

There is a difference between learning to reach a general goal (such as water) and learning to copy the response pattern of a teacher to achieve a goal. The learners did not learn the black-white discrimination response as the model had learned--they either learned to follow or not to follow the model. Thus the question of being able to imitate the response of the model is left open.

Concerning the factor of time in imitative learning, Miller and Dollard's (1941) learners performed with the teacher rat present. The distinction should be made between experimental situations where model and learner perform simultaneously and where the learner performs with the model removed. The question of the learners being able to learn to perform a similar response from observing a model, in the absence of that model, is left unanswered. It is generally accepted that delayed response is more difficult than immediate response. Therefore delayed performance of observational learning should be more difficult than simultaneous response.

The Herbert and Harsh (1944) study investigated the factors which affect observational learning. Thirteen cats were used in five different problems. One cat was teacher and learned the problem without aid. Other cats served as learners and either observed for all 30 sessions or were introduced halfway through the study for 15 observational sessions. The rotational sequence permitted a specific cat to act as teacher during one problem, as a 30 session observer on a second problem, and a 15 session observer during a third problem. The cats which had 30 sessions observed the learning process while the last group observed only skilled performances. Thus the possibility that the subjects were learning how to learn the solution of a problem. After having received the designated number of observational sessions, the learners were given ten test sessions on the problem. One of the experimental problems required the pulling of a wagon by a string into close proximity for the food within it. To have achieved the same general goal, it is not necessary for the learner to pattern his response after the teacher. The authors make the point that the learner could solve the problem by pulling with the paws and/or by grasping the string in the mouth. Thus all subjects which completed this task received the same reward (food), but the specific method used to get the reward need not always be the same (paws and/or mouth). The above authors conclude that both of the following are needed to demonstrate imitative behavior: A) the experimental organism should achieve the same goal and B) the learner should receive cues from the model for the patterning of his response to achieve part A. When the two-part criteria is applied to the string pulling problem, if the teacher pulled with his paws the learner would be required to demonstrate the same behavior (pulling with the paws). It is possible to demonstrate the learning of a delayed response such as pulling a wagon into reaching distance, without demonstrating imitative behavior when the response pattern is not duplicated by the learner. If the response for reward is not required to be the same, comparisons between response measures become very difficult if not meaningless for interpretation of data. It seems to the present author that both of the above criteria must be applied for the demonstration of imitative behavior.

Bartlett and Lieberman (1960) used 11 Japanese quail. One was designated as teacher and was taught to open a puzzle-box by pecking a latch. Learners were allowed to observe the teacher opening the box ten times. Then in a delayed response type situation, the learners attempted to solve the problem.

The purpose of the present study was to investigate the extent to which imitative behavior occurred in Japanese quail (Coturnix coturnix japonica) when given observational sessions of a model's key pecking. Japanese quail were chosen as subjects for the study because they have good vision and demonstrate organized social behavior. Facilitation of the learner's shaping for a key pecking response was investigated as a function of the number of observational sessions. Key pecking was chosen to meet the two part criteria discussed above.

METHOD

Subjects

Five female Japanese quail (<u>Coturnix coturnix japonica</u>), approximately 70 days old at the start of the experiment were selected from the bird colony at Western Michigan University. Each <u>S</u> was chosen on the criterion of appearing healthy. Prior to the experiment each bird lived in community housing consisting of two male and two female birds. The birds were housed individually for the duration of the experiment. One bird was selected to serve as "teacher" for the study with the other four serving as either "learners" or control. All birds were naive to the experimental situation.

Behavioral measures were taken and shaping was done while the birds were 12 hours food deprived. Following the completion of shaping of the "teacher" bird, the "learners" were each given an observational session of the teacher's pecking behavior at six hour intervals. Water was available at all times in the home cage. Each session of the experiment was ten minutes in duration. Operant rates for front-back preference of the chamber and key pecking were taken during one session for each subject with another bird in the adjoining chamber.

Apparatus

The apparatus of this experiment was a double chamber 20 X 9 1/2 X 12 inches. Each chamber was 10 X 9 1/2 X 12 inches with a common-wall of 1/2 inch hardware cloth separating the two parts. The front, back, and sides of the chambers were 1/2 inch plywood; the top was plexiglass; and the floor was 1/2 inch hardware cloth. The entire chamber was on a 20 X 9 1/2 X 6 inch plywood base with the chamber floor 6 inches off the base. The front panel of one chamber had a Lehigh Valley LVE 1348 pigeon key (exposed through a one inch circular aperture) centrally located from the sides and 7 1/2 inches from the hardware cloth floor; also centrally located on the front wall of the same chamber, 5 1/2 inches from the floor, an aperture 1 1/2 X 2 inches was placed. On the outside of the chamber an automatic feeder was placed over the aperture. The key was illuminated by a 7 1/2 watt yellow light. A 7 1/2 watt house light was centered on the back wall of each chamber 10 1/2 inches from the floor. The experimental events (lights and automatic feeding) were controlled by electromechanical and solid-state switching and timing circuits located in an adjacent room. Responding was monitored by counters. An electric fan was placed outside and approximately centered 6 inches from the apparatus. It was centered from the front wall to provide a masking noise and air flow.

Procedure

Shaping of the "teacher" bird

The experimenter obtained the operant rate of key pecking prior to the shaping process. The model bird was shaped to peck the key using game bird feed as a reinforcer. The criterion for learning was stabilization of responding such that the total number of responses per session did not differ by more than 30 for five consecutive sessions. The model was not fed outside of the experimental situation and was on FR 4 when the criterion was met.

Observational sessions

Each of the four learner birds received one ten-minute observational session with the model bird in the adjoining chamber four times per day. During the observational sessions, the model was reinforced for pecking on FR 4; the learners did not receive reinforcement while these sessions were in progress. All learner birds were given a ten-minute free feeding period of game bird feed following the running of the last learner bird's session.

The four learner birds were designated A, B, C, and D. Learners A, B, and C received a total of ten, 20 and 30 observational sessions respectively. D was designated control and was in the observational chamber for a total of 30 sessions with no model present. The four learners were run in a predetermined rotational sequence each six hours. The learner was first placed in the observational chamber with the house lights off in both chambers. The model was then placed in the other chamber which contained the food mechanism. The key was then illuminated for ten minutes. Upon the completion of the observational session the house light and automatic food mechanism were turned off and the learner bird was removed from the observational chamber and returned to the home cage. The second learner was placed in the chamber and the house lights and automatic food mechanism were turned on. The process was repeated until the four learners had each received their observational session. On completion of this sequence the model was returned to the home cage.

Shaping of learner birds

Upon the completion of the specified number of observational sessions by each learner bird, the learner was shaped to key peck. The shaping took place with the animals on 12 hours food deprivation. The criterion for stabilization of responding for the learner birds was the same as that previously stated for the model.

RESULTS

The operant rate of key pecking for all birds was zero. No bird showed a preference for either the front or back of the chamber. In a preliminary study the author noted that during a run of the experiment the number of responses by the model bird varied over the three observational sessions for learners A, B, and C. The total number of responses emitted by the model per session and the rotational sequence of learners are given in Table I. In the first block of ten sessions learner A observed 3,235 pecking responses by the teacher, learner B observed 2,139, and learner C observed 2,765. During the second block of sessions--runs 11 through 20--the teacher emitted 3,178 responses in the presence of B and 2,306 responses were emitted with C observing. The running of sessions 21 through 30 had a total of 3,217 responses emitted with C in the observational chamber. The results of shaping were recorded using three measures: A) the time until the bird first ate from the experimental food box, B) the time starting with the first eating from the food box needed for adaptation to the food mechanism being automatically opened and closed plus the time taken for successive approximation to key pecking--this measure ended with the first peck on the key, and C) the number of approximation responses before actually pecking the key. The data for these three measures are given in Table II.

The total number of key pecking responses for all birds during shaping were recorded for each ten-minute interval. The data are reported in graphic form in Figures 1, 2, 3, and 4.

TABLE I

Total Responses per Session
by Model and Sequence of
Learner Present

Run	1st Learner	2nd Learner	3rd Learner	4th Learner
1	197 - A	84 - B	83 - C	- D
2	120 - B	287 - C	370 - A	- D
3	353 - C	352 - A	355 - B	- D
4	357 - A	197 - B	265 - C	- D
5	215 - B	350 - C	233 - A	- D
6	258 - C	353 - A	57 - B	- D
7	368 - A	197 - B	361 - C	- D
8	257 - B	333 - C	340 - A	- D
9	326 - C	341 - A	335 - B	- D
10	324 - A	322 - B	149 - C	- D
11	178 - C	261 - B		- D
12	312 - B	319 - C		- D
13	140 - C	344 - B		- D
14	278 - B	215 - C		- D
15	303 - C	289 - B		- D
16	307 - B	149 - C		- D
17	310 - C	381 - B		- D
18	381 - B	252 - C		- D
19	285 - C	315 - B		- D
20	310 - B	155 - C		- D
21	205 - C			- D
22	290 - C			- D
23	374 - C			- D
24	370 - C			- D
25	280 - C			- D
26	372 - C			- D
27	358 - C			- D
28	337 - C			- D
29	287 - C			- D
30	344 - C			- D

TABLE II

Data of Shaping Process

Subject	Time until eating from feeder	Time from first eating to adaptation of automatic feeding	Number of near responses prior to pecking on key
Teacher	45 min.	75 min.	65
A	4.5 min.	40.5 min.	10
B	5 min.	15 min.	15
C	5 min.	10 min.	13
D Control	12 min.	78 min.	80

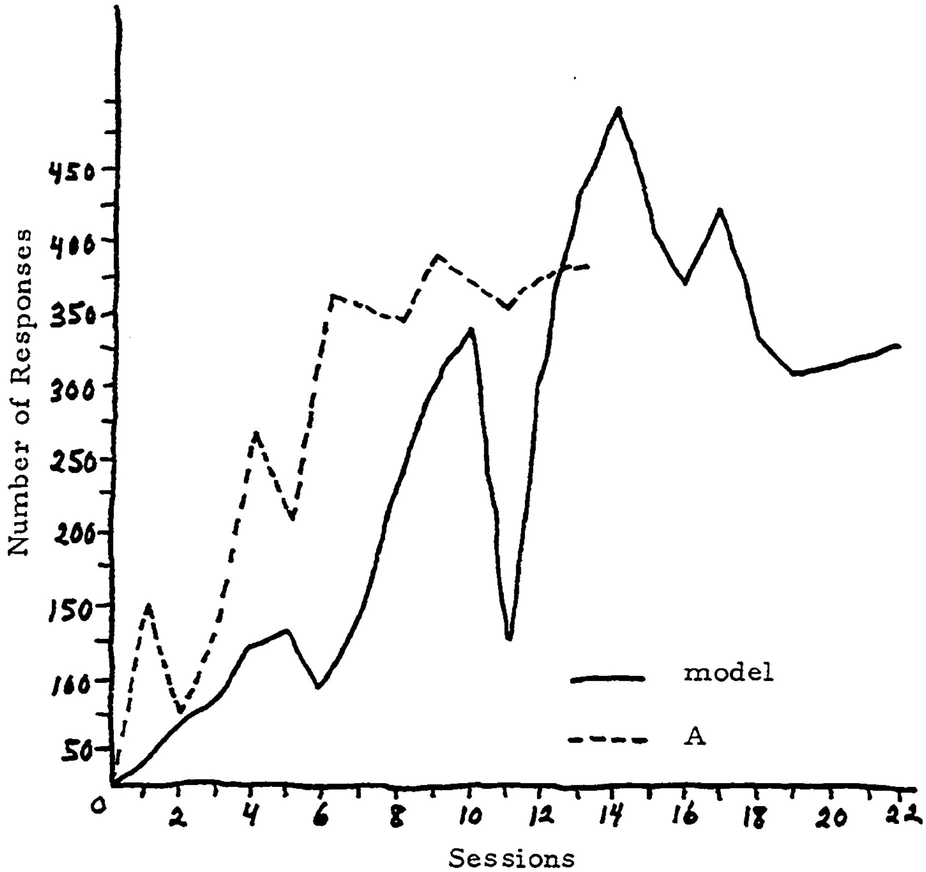

Figure 1. Total responses per session emitted by the model and learner A to stabilization.

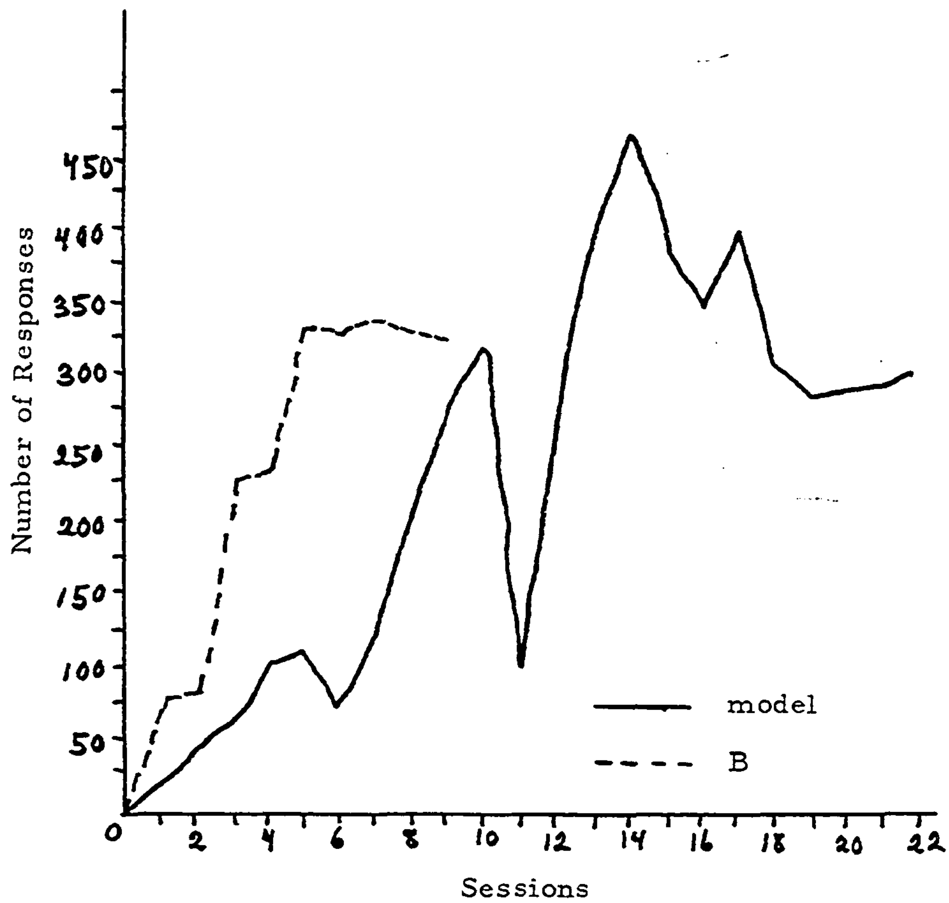

Figure 2. Total responses per session emitted by the model and learner B to stabilization.

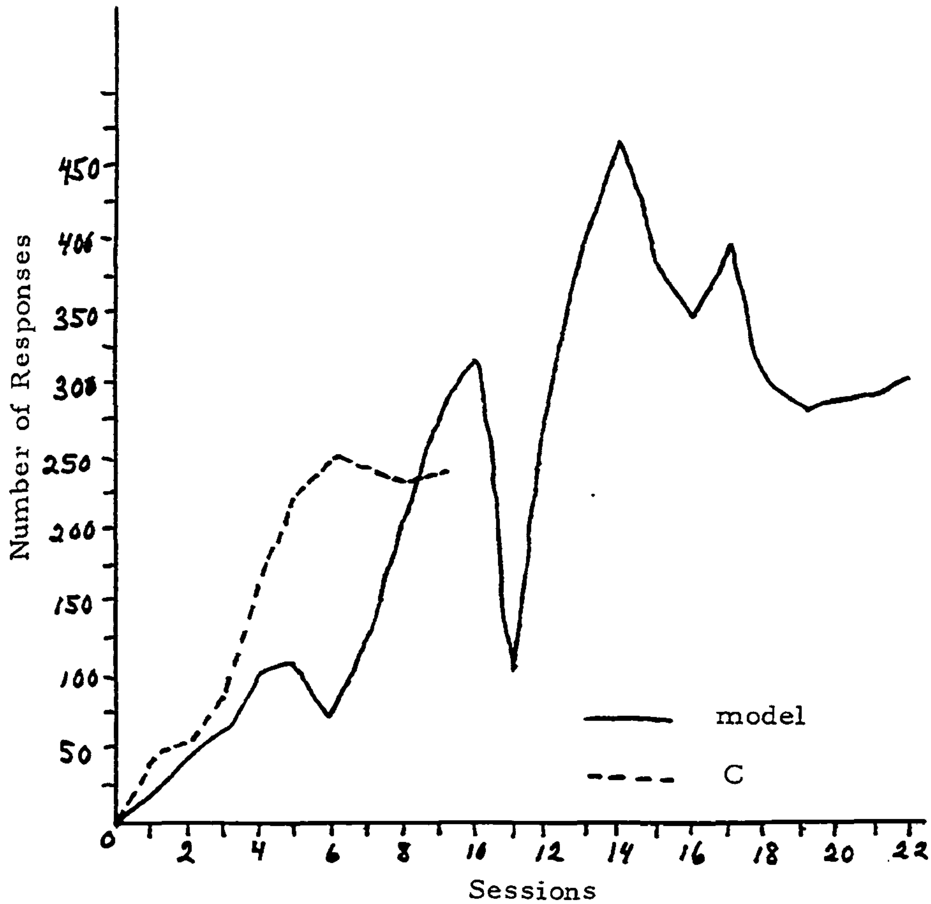

Figure 3. Total responses per session emitted by the model and learner C to stabilization.

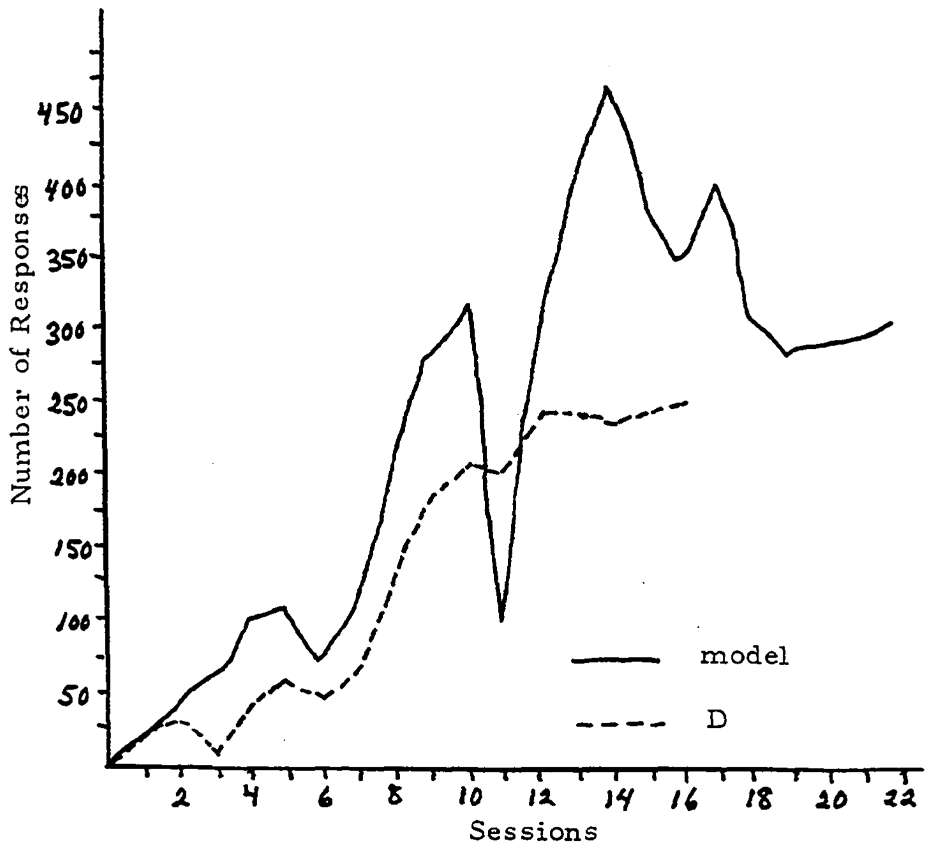

Figure 4. Total responses per session emitted by the model and learner D to stabilization.

DISCUSSION

The general object of the present study was to evaluate the effect of observational sessions on learning the key pecking response. Specifically, the investigator was interested in his contention that increased numbers of observational sessions would be followed by reduced time and decreased response measures during shaping of the learner birds.

The effects of observational sessions on the shaping process were evaluated with four measures. The first measure was the time starting with placing the bird in the chamber until the subject first ate from the food mechanism. For this measure the food box was held closed to make food available at all times. The second measure was the time taken for adaptation to the noise of the food mechanism being automatically operated, responding to this noise as a cue for food being available, and successive approximation to key pecking. This time measure started with eating from the food mechanism and ended with the first peck on the key. The number of approximation responses recorded during the second time measure was the third measure of comparison used. Following the first peck on the key the experimental apparatus was turned on for automatic reinforcement.

The subject received one ten-minute session of FR 1, FR 2, and FR 3. Then the subject was put on FR 4 and continued at this level of responding until the total number of responses per session did not differ by more than 30 for five consecutive sessions. The learner's recorded data on the above measures are compared with the teacher's data to ascertain the effects of observational sessions.

Comparison of the teacher's record with learners A, B, C, and D's records during the shaping process points to facilitation of shaping as a function of observational sessions. In Table II, the first column is the measure of time until the subject ate from the feeder. Learners A, B, and C took approximately the same length of time. Learner A in four and a half minutes, with B and C both having taken five minutes. All of these times were a large reduction from the 45 minutes taken by the teacher. Learner D, unlike A, B, and C, acted as control for sheer time spent in the observational chamber without the teacher being present. D's 12 minutes before eating also represented a large decrease from the model's 45 minutes. Sheer time in the chamber permitted habituation to the experimental situation and observation of the food aperture in the adjoining chamber. Thus many fearful and/or exploratory reactions were eliminated from the response pattern which led to a reduction in this measure.

The second column of Table II is the time taken for adaptation to the noise of the automatic feeder and shaping to feed following the noise. The model without observational sessions took 75 minutes. Subject A took 40.5 minutes, and greater reductions were recorded for B and C, 15 and 10 minutes respectively. The control D had a recorded time of 78 minutes which was less than the model's time. But the control's reduction in time was not as great as for the other learners. Control's "observational" sessions were without the presence of the model. The control D had not habituated to the noise of the automatic feeder or observed the noise as a cue for food being accessible. Thus clear evidence that observational sessions facilitated in the learning of the shaping process were shown with the adaptation data.

Further support of facilitation during shaping is found in the last column of Table II. This measure recorded the number of successive approximation responses before actually pecking the key. Both the model and control, without the benefit of observation of key pecking, required 65 and 80 approximations respectively. The learners A, B, and C made notably fewer near responses during shaping to key peck. Learner A's 10, B's 15, and C's 13 approximations were made during learning to key peck after varying numbers of observational sessions of the teacher bird's key pecking.

When each bird had adapted to the food mechanism and was key pecking, the subject was shaped to the criterion of stabilization while on FR 4. The number of sessions necessary and the number of responses for all subjects are given in graphic form. There is a difference between the number of sessions needed for the model and learner A to reach the criterion of stabilization as shown in Figure 1. The nodel required 22 and learner A required 13 sessions. A greater difference is noted between the model and learners B and C in Figures 2 and 3; both B and C reached stabilization with a total of nine sessions. Control D had a decrease in the number of sessions to stabilization in comparison to the model, but not as great a decrease as learners A, B, or C.

SUMMARY

The purpose of this study was to examine the effect of observing key pecking on subsequent learning to key peck. A total of five female Japanese quail were used; one quail acted as a teacher and the other four served as learners. Three of the learners received differing numbers of observational sessions with the teacher bird, while the fourth learner was used as control. The control's "observational sessions" were with no teacher present.

The conclusion that observational sessions facilitated learning the key pecking response is clearly warranted by: A) shorter time period for adaptation to the food mechanism and for shaping the key pecking response, and B) fewer number of approximate responses during successive approximation to shape key pecking as the number of observational sessions increased. Additional support is given by: C) shorter time period until the learner eats from the feeder, and D) fewer sessions for stabilization of the key pecking response.

REFERENCES

Bartlett, L. M. and Lieberman, E. Possible visual imitation in Coturnix quail. Anatomical Record, 1960, 138, 333.

Bayroff, A. G. and Lard, K. E. Experimental Social behavior of animals: 111. Imitational learning of white rats. Journal of Comparative Psychology, 1944, 37, 165-171.

Church, R. M. Two procedures for the establishment of imitative behavior. Journal of Comparative and Physiological Psychology, 1957, 50, 315-318.

Connors, K. R. Operant conditioning and generalization of imitative behavior in a rat. The Anthology of Experimental Psychology of Denison University, 1965, 57-61.

Herbert, M. J. and Harsh, C. M. Observational learning by cats. Journal of Comparative Psychology, 1944, 37, 81-95.

Miller, N. and Dollard, J. Social Learning and Imitation. New Haven: Yale University Press, 1941.