OBSERVATIONAL LEARNING BY CATS

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Received October 2, 1943

THE PROBLEM OF 'IMITATION'

Theorists explaining cultural transmission of behavior have often emphasized the importance of the learning, by young individuals, from observation of the behavior of others. A few decades ago animals were generally conceded to show this type of learning, which was explained by an instinct of imitation. Psychologists who accepted the interpretation investigated imitation to get evidence for or against instincts; others merely wished to discover where in the animal hierarchy there was first evidence of imitative capacity. As instinct theories lost favor many psychologists preferred to explain imitation as an example of social facilitation, but despite many studies of the subject there is little agreement on the nature or extent of imitative learning,—perhaps because it has been approached as an all-or-none phenomenon. A survey of the experimental studies reveals such a variety of definitions and criteria that it is not surprising that most textbooks avoid the issue as to whether or not animals can learn by imitation.

Thorndike (9) performed the first controlled experiment on imitation, using chicks, dogs and cats. In the experiment with cats the problem-box door (leading to food) was released if the cat clawed a string stretched across the top of the box or pulled a wire loop hanging inside the box. One cat was taught the problem and then four other cats observed the performance either from an adjoining cage or by being present in the cage with the demonstrator. In neither case did the observing cats solve the problems or establish the "association between the string and the total situation." In the light of later investigations it seems likely either that the problems were unnatural and difficult for cats, or that the observing cats had not observed enough.

Hobhouse took violent issue with Thorndike's views, citing many instances of 'imitation' by cats, as observed by himself and others. But Small (8) found no evidence of imitation in rats, nor did Davis (3) or Shepherd (7) find evidence of it in raccoons, although the studies left much to be desired in control of problems, criteria, and motivation.

Berry (1) denied Thorndike's contention that cats can not imitate, giving evidence from the following nine problems:

1. jumping from box to table,
2. opening a door by pulling a knot,
3. turning a button and pulling a loop on the door,

[1] The experimental work was done by Mr. Herbert while at the University of Nebraska, in 1942.

4. turning a button to get food,
5. raising a small trap door,
6. rolling a ball into a hole on the floor,
7. learning to catch mice,
8. getting meat out of a bottle,
9. descending from the top of a cage.

Berry used the same four cats on all problems. If one cat failed in solving a problem another cat, which had already solved the problem, was placed in the same box to demonstrate. Berry's criterion was not mimicry but merely a general solution of the problem soon after the demonstration. Thus the control on gradual learning was far from satisfactory, but it is significant that Berry's best results came from problems 5, 6, 7, and 8, which appear to be rather natural activities for a cat, as compared to the more difficult problems 2, 3, and 4, which are more like Thorndike's problems.

Investigations with primates have seemed more promising. Thorndike (10) was the first to test monkeys for imitation, using problem boxes with himself as demonstrator. By the criterion of "a similar act attempted, though unsuccessfully, in cases where it had not been before" (10, p. 41) he denied evidence of imitation in monkeys. A year later Kinnaman (4) claimed evidence that a female Macacus Rhesus imitated the actions of a male. The problems involved opening the door of a puzzle-box to reach in and obtain food. The various catch devices were latch, push button, cross-bar, lever, and pull-plug. In two problems, the lever and pull-plug, the male learned but the female failed. Kinnaman then placed the female where she could watch the male, and after observing she was able to solve the problem.

Watson (12) and Shepherd (6) acted as demonstrators for monkeys on such problems as pulling in food with a rake, taking food from a bottle with a fork, opening a latch of a puzzle-box, opening a door by pushing a button, and pushing food from a glass cylinder with a plunger. Both writers denied any conclusive evidence of imitation, although Shepherd concluded that some monkeys could imitate. Yerkes (14) reported that a gorilla learned to use a spoon and to eat certain foods after watching Yerkes demonstrate them. He concluded that primates may imitate when the problems are within the animal's capacity. Again, in studying suggestibility in chimpanzees, Yerkes (15) had partial success in convincing animals to eat strips of filter paper after seeing him do it. Age, sex cycle, and pregnancy influenced the suggestibility of the animals, and Yerkes states (15, p. 271) that "there can be no imitation of behavior without suggestion, and all effective suggestion appears as social facilitation." This suggests that failures to show imitation might result merely from poor social relations between observing and demonstrating animals.

Working with rhesus monkeys Warden and Jackson (11) introduced the 'duplicate cage' method. The food, contained in identical problem boxes in the adjacent cages, could be obtained by pulling a chain, turning a knob, or raising one or more latches to open the problem box door. One animal was the demonstrator in all experiments and was thoroughly trained on each problem. In the test trial the untrained animal watched the demonstrator open the puzzle-box in the adjacent cage five times in succession, within thirty seconds. He was then given one minute in which to show imitative manipulation of the box in his own cage. Each of fifteen monkeys was given six tests, two per day, on each of four problems. Of all the tests, 46 per cent showed imitation within one minute, and 25 per cent showed no interest in the problem-box. Some animals were quick to imitate whereas others were consistently distracted by sex interest in the demonstrator. Successes after the first trial are questionable evidence of 'immediate imitation'; nevertheless the authors are justified in concluding that for monkeys, as for men, observational learning is more economical than ordinary trial-and-error learning.

Crawford and Spence (2) have demonstrated imitation in chimpanzees by means of a discrimination problem. The two discrimination plates and the holes through which food pans were presented were on a platform between the cages of the demonstrator and of the imitator. Both animals were familiar with the apparatus from previous problems, and the demonstrator mastered a new problem before being observed by the imitator. Success was judged from a high proportion of correct choices (by the imitator) out of ten trials, with no mention of control for the natural preferences of the animals. Those authors objected to problem-box tests of imitation in that (2, p. 133) "the activity of the demonstrator simply enhances certain aspects of the stimulus situation, which the imitator later attacks in his own way." This is important in the discussion of mimicry, but is, of course, no argument against the effectiveness of observational learning. And although Crawford and Spence delimited their problem to a 'single differential response' they did not really meet their objection to the problem box, for their animals could succeed without exactly copying the behavior of the demonstrator, in that the imitator could sit or stand differently, touch a different part of the stimulus plate, or use the other hand. It could be argued that the demonstrator's manipulation of one of the two plates merely enhanced the 'imitator's' interest in that plate, to which the 'imitator' than made an already habitual response. There would seem to be less convincing evidence of imitation here than in the problem boxes of Warden and Jackson.

CONFUSION OF CRITERIA

That many psychologists doubt the occurrence of imitation in animals below primates may be partially attributed to the disagreement on criteria of 'imitation'. Thorndike (10, p. 34) leniently defines it as "forming an association between sight of an object and the act toward it, through an idea gained by watching." This admits of a wide range of behavior, as does also Yerkes' definition (13, p. 395). At the other extreme Warden and Jackson's criteria of 'intelligent imitation' (11, p. 103) require immediate performance of the identical act, without practice and with chance success controlled.

Concerning the time element, it is generally agreed that delayed responses are more difficult than immediate responses. By analogy delayed imitation should be more difficult than simultaneous imitation, yet few persons have recognized the distinction between experiments in which the demonstrating animal was removed from the scene before the observing animal had a chance to perform, and those experiments in which the imitator could perform simultaneously with the demonstrator. Social facilitation is especially important in the latter case, and studies of cooperation are probably pertinent, as suggested by Miller and Dollard (5, p. 322).

Concerning the similarity of response, there is often a considerable difference between learning to achieve a general aim (or reach a goal) and learning to mimic another individual in approaching the goal. Yet both extremes have been called imitation. Furthermore, most investigations have required that the imitator make the same discrimination as does the demonstrator, but Miller and Dollard (5) have dealt with imitation as merely following a leader, in which case the follower makes a much simpler discrimination than does the leader. In their experiment with rats the leader was taught to make a white-black discrimination on a one-unit T maze. An untrained observer rat, put on the starting platform with the leader, was in some cases rewarded only if it followed the leader, in other cases rewarded only if it took the turn opposite to that taken by the leader. Thus the observers did not learn the black-white discrimination but rather learned either to follow or not to follow the leader. Further investigation revealed that the rats generalized the tendency to follow a leader, and would follow other rats of quite different appearance. This suggests, then, that some investigations might fail to reveal imitation if the previous experiences of the animals had discouraged imitation.

Although Miller and Dollard's study is very significant for discussions of 'social' following of leaders, it leaves open the question as to whether or not the animals could learn, from observation of a demonstrator, to perform similarly in the absence of the demonstrator. It is this latter problem that is the specific interest of the present investigation. The distinction may be rather arbitrary, but other investigators have recognized several kinds of imitation, which may at least represent levels of difficulty. Davis (3, p. 482) distinguishes "(*a*), high grade, in which the imitation is undertaken with a view to the accomplishment of a definite result, and (*b*), low grade, in which the imitation is executed for the satisfaction which it itself gives." It seems likely that social facilitation or following a leader could be of either type, depending upon the motivation of the animal, but mimicry would probably be 'low grade' imitation. Shepherd (7, p. 583) distinguishes instinctive, gregarious, and inferential imitation. Both of the above classifications seem to depend largely upon theories about the animal's motivation. Admittedly, motivation is important in imitative learning, but it can not profitably be studied by debating whether or not the animal's intent is voluntary or its inference 'conscious'.

SUGGESTED REORIENTATION

Rather than continue the controversy as to whether or not 'imitation' means immediate, intentional mimicry, it would seem more profitable to study the general mechanisms of observational learning. One primary problem then is to determine what kind of observation, and how much, is required to facilitate learning. Yerkes long ago noted (13, p. 401) that "most observers of imitative action expect an animal to watch, to get the idea immediately, and to imitate what it has seen. Almost invariably they are disappointed, for this is apparently not the way of animals . . . even certain types of voluntary imitation may have as their necessary condition the witnessing of an act many times as it is performed by another individual." With animals, as with humans, the observer's act is limited by his perception of the demonstrator's act. The perception may be enhanced by several factors:

1. closer attention to the demonstrator's goal-directed behavior,
2. familiarity with the movements involved,
3. repeated observations,
4. slow-motion demonstration, or
5. observation of the elimination of errors during the learning process of the demonstrator.

The animal's capacity for observational learning can not adequately be determined unless most of these aids to perception have been tried. Without attention, observational learning is impossible, yet some investigators have not controlled motivation or field of view well enough to obtain the desired attention of all subjects. Many investigators have recognized the need for repeated observation or repeated tests, but few have considered the familiarity of movements required of the animal. Only Crawford and Spence have tried to make sure that the movements were familiar to the observers. Factors 4 and 5 are known to aid human learning but have not been utilized in animal studies. Both factors may aid the observer in delimiting the correct response, but the slow-motion picture demonstration would probably be uninteligible to animals. Factor 5, however, seems promising. In all previous animal studies the demonstrator has mastered the problem before the 'imitator' observes. Yet it seems plausible that animals might benefit more from observing the mistakes of another animal than from merely observing a few rapid performances of the skilled act. In humans this ability to profit from vicarious experience is considered a sign of intelligence. We should like to know if animals likewise profit, even though they do not exactly imitate. In the present experiment it was planned to investigate (*a*) the use of more sensitive measures of observational learning, (*b*) the possible occurrence of observational learning by cats, and (*c*) the conditions favoring such learning,—e.g., the nature of the problem, the amount of observation required, and the type of demonstration.

APPARATUS

Five food-getting problems were planned so that they could be presented interchangeably from the same work cage. The top diagram in figure 1 shows the floor plan of the apparatus with the Lever-Cart problem in place. Four observation cages (*B*) permitted the observing cats to see out only through the wire mesh front (*M*) overlooking the 34 x 25 inch work cage (*W*) into which the performing animal was introduced through a side door. The front half of the work cage was marked off into three sections to aid in recording the activity of the animal. The front of the work cage was covered with quarter inch wire mesh (*M*) overlooking the food platform, and beyond that sat the partially screened ex-

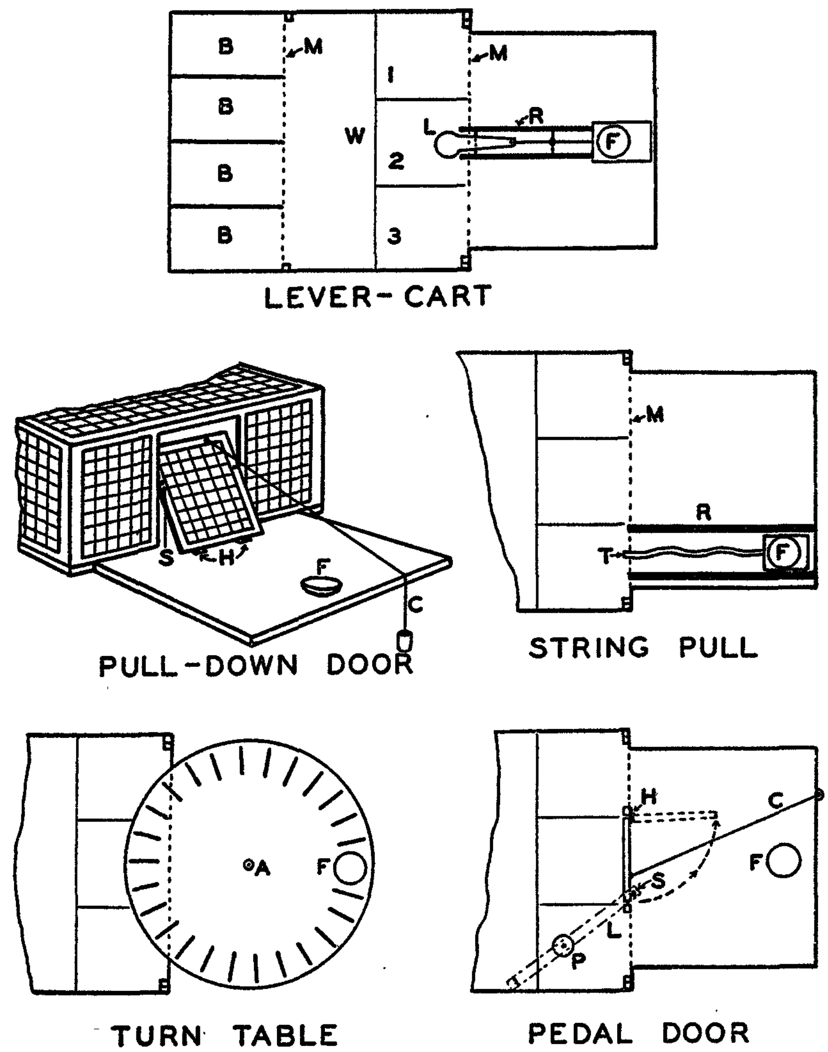

FIG. 1. DETAILS OF THE FIVE PROBLEMS

perimenter at his tilted recording table. The cages and platform were painted dead black, but were well illuminated by two overhead lights. The food dish was a white evaporating dish or a petrie dish on a white board.

Problem 1. Lever-cart. By depressing an articulated lever (*L*) the cat could release the food cart (*F*), which was propelled to him along the runners (*R*) by a weighted cord passing through a hole in the platform near the work cage. The wire mesh front of the work cage had an opening just large enough to permit passage of the food cart (fig. 2, top).

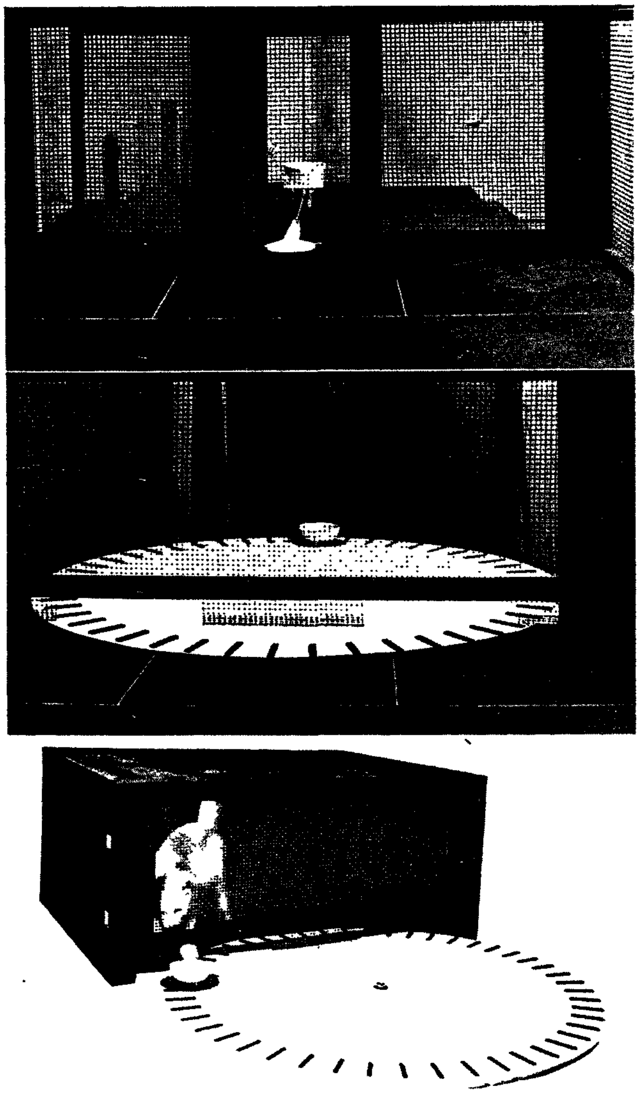

FIG. 2. (*Upper*) CAT'S EYE VIEW OF LEVER-CART; (*center*) CAT'S EYE VIEW OF TURN-TABLE; (*lower*) MISS WHITE WORKING TURN-TABLE

Problem 2. Pull-down door. The door, hinged at (*H*), was held against the stops (*S*) by a weighted cord (*C*). The cat had to pull the door down toward himself and walk over it to reach the food dish (*F*).

Problem 3. String pull. This was a modification of the problem introduced by A. J. Kinnaman (1902). The food cart (*F*), sliding between runners (*R*), could be pulled into the work cage by means of a white elastic tape. The tape was used in preference to a string to permit easier traction by the cat's claws.

Problem 4. Turn-table. A 32-inch circular platform of "Cellutex," rotating on a bicycle wheel axle (*A*), fitted flush with the work platform in an arc cut out of the latter. Black cleats on the white turn-table furnished grips by which a cat could turn the platform either way until the food dish (*F*) entered the work cage through low openings in the wire mesh at section 1 or section 3 of the work platform. Sponge rubber supports under the turn-table added frictional resistance to the turning. (See also figure 2.)

Problem 5. Pedal-Door. A lever (*L*) under the work platform was hinged at one end and carried a door-stop peg (*S*) at the other end. When the connecting white pedal (*P*) in section 3 of the work platform was depressed one half inch (against a sponge rubber resistance) the door-stop was depressed enough to let the door to the food platform be pulled open by the weighted cord (*C*). This problem was assumed to be the most difficult because the mechanism was hidden and because it involved a 'detour' to section 3, away from the door leading to the food.

SUBJECTS AND PROCEDURE

The plan to rotate the cats as original learners and observers on the five problems would have required only five cats, had all gone well. But three cats became ill after a week, and two eventually died. Two other cats escaped through a window opened by some unknown person. Thus replacements had to be made during the experiment and several extra cats were run on the problems to compensate for the loss of rotational control. The thirteen cats used as subjects varied in age, color, temperament, and background. As their learning ability was probably related to some of these factors, the summary in table 1 may be useful. All of the cats were friendly except Big Gray and Mammy, the two oldest farm cats. The animals were kept together in a 9 x 12-foot room with cement floor and cross ventilation. There were two water pans, small individual cages in which the cats could sleep, and a large disposal pan which was cleaned and filled with sawdust each morning.

None of the cats had any acquaintance with the experimental problems before the time of acting as either an original learner or an observer. The cats were given two days of freedom in the animal room to become quieted, acquainted with the other cats, and adapted to the food. Then they were acquainted with the work cage, the white food dishes, and the observation cages. Four cats were placed in the observation cages while a fifth was fed, both on the work platform and on the food platform, from a white evaporating dish and from a petrie dish fastened to a square white board, (both dishes were used in the learning problems). Each cat had two fifteen minute feeding periods each day for two days. After the experiment began each cat was fed from a white dish in an individual cage in the animal room. The ration was about one-third of a can of "Ideal" dog and cat food at 5 p.m., plus an amount the size of a pea given as a reward at the completion of each successful trial during the day. The animals were never in the state of 'utter hunger' of Thorndike's cats (9).

As a preliminary test of the order of difficulty of the problems, one cat had previously been tried on all five problems. This determined the order of presentation as (*a*) Lever-Cart, (*b*) Pull-Down Door, (*c*) String Pull, (*d*) Turn-Table, and (*e*) Pedal-Door. But the average difficulty for the experimental animals proved to be somewhat different.

Once the cats were acclimated, problem 1, the Lever-Cart, was begun. One cat, the original learner (O.L.) was given 30 trials on the problem. Two cats observed throughout all 30 trials, and two other cats were introduced at the halfway point to observe the last 15 trials, which were rapid, skilled performances.

TABLE 1

Data concerning subjects

NAME	SEX	AGE	COLOR	SOURCE	REMARKS
		Months			
Red	M	12–14	Tiger	Biol. Supply	Died 6/27
Tiny	F	8–10	Black and white	Biol. Supply	
Spike	M	12–14	Black and white	Biol. Supply	Died 6/27
Madame X	F	16–18	Persian	House	Escaped 6/24
Miss White	F	10–12	White	House	
Big Gray	M	18–20	Gray	Farm	Active & wild, escaped 6/24
Mammy	F	18–20	Gray	Farm	Lazy & wild
Toughy	M	5	Gray	Farm	} Offspring of Mammy
Babe	F	5	Gray	Farm	}
Blackie	F	6–8	Black	Farm	} All of same litter
Tip	F	6–8	Black	Farm	}
Tige	F	6–8	Tabby	Farm	}
Sis	F	6–8	Tabby	Farm	}

The same practice was followed on the other problems, except that the roles of original learner (O.L.) and of 30-trial observer (Ob–30) and of 15-trial observer (Ob–15) were rotated among the animals. Three extra cats (an O.L. and two Ob–30) were run on the last three problems, and these and other replacement animals were given 30 trials on each of the preceding problems in order that they should not have an experience handicap. The data of these extra original learners (E.O.L.) gave six original learning curves for the first two problems and three original learning curves for the other three problems, for comparison with the learning curves of the observers. Two records of performance were kept: (*a*), activity path, and (*b*), work time. The activity path was traced on mimeographed floor-plans of the work cage. Work time was kept with a stopwatch, and was defined as all of the time that the cat was standing in sections 1, 2, or 3. Total time was rejected as an unfair measure of differences in learning

TABLE 2

Work time results on all problems

PROBLEM	SUBJECT	RÔLE	TIME, 1ST TRIAL	AVERAGE TIME 1ST TEN TRIALS
			seconds	
Lever-Cart	Red	O.L.	90	35.7
	Babe	E.O.L.	45	14.7
	Sis	E.O.L.	128	31.0
	Tige	E.O.L.	55	10.7
	Tip	E.O.L.	90	19.5
	Blackie	E.O.L.	110	16.9
	Madame X	Ob-15	28	10.7
	Big Gray	Ob-15	29	9.7
	Tiny	Ob-30	17	10.1
	Spike	Ob-30	3	3.3
Pull-Down Door	Spike	O.L.	282	31.5
	Babe	E.O.L.	93	13.2
	Sis	E.O.L.	232	32.1
	Tige	E.O.L.	70	16.1
	Tip	E.O.L.	110	9.2
	Blackie	E.O.L.	54	11.0
	Tiny	Ob-15	211	38.3
	Red	Ob-15	72	13.2
	Big Gray	Ob-30	48	7.5
	Madame X	Ob-30	14	7.7
String-pull	Toughy	O.L.	95	73.4
	Tige	O.L.	146	21.1
	Tip	E.O.L.	95	14.7
	Babe	Ob-15	27	16.1
	Spike	Ob-15	70	44.5
	Mammy	Ob-30	16	6.3
	Tiny	Ob-30	46	11.4
	Sis	Ob-30	18	6.8
	Blackie	Ob-30	11	5.0
Turn-Table	Tiny	O.L.	30	12.1
	Tip	O.L.	50	16.1
	Sis	E.O.L.	107	22.2
	Toughy	Ob-15	70	17.9
	Mammy	Ob-15	43	25.7
	Babe	Ob-30	15	10.0
	Miss White	Ob-30	13	4.3
	Tige	Ob-30	21	10.0
	Blackie	Ob-30	14	6.7
Pedal Door	Babe	O.L.	53	24.6
	Blackie	O.L.	190	33.0
	Tige	E.O.L.	164	23.1
	Mammy	Ob-15	Failed	
	Tiny	Ob-15	Failed	
	Toughy	Ob-30	Failed	
	Miss White	Ob-30	10	4.5
	Tip	Ob-30	56	10.0
	Sis	Ob-30	Failed	

ability, since motivation varied and some cats spent much time 'washing' or looking at the observing cats.

RESULTS

Work time. Table 2 summarizes the learning performance of the animals on all five problems. For each problem the original learner (O.L.) and all of the extra original learners (E.O.L.) are listed first to show the range of performance of naïve animals. The 15-trial observers are listed next, and finally the 30-trial observers. The crucial evidence is the time taken to obtain food on the first

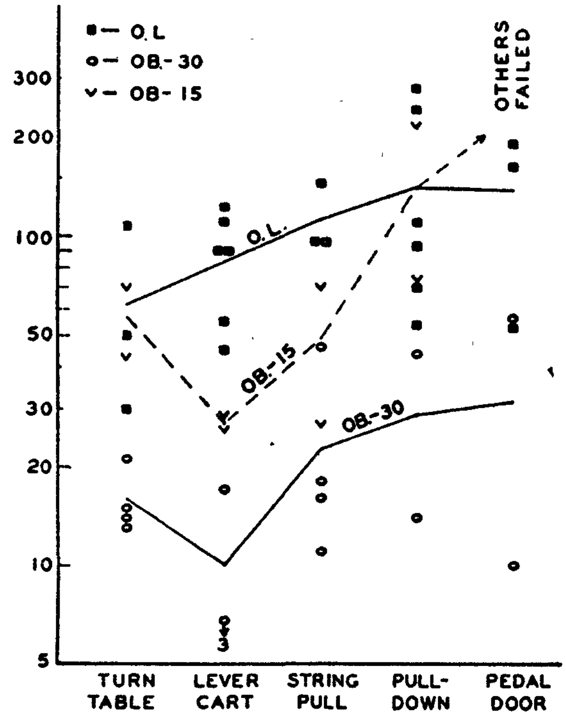

FIG. 3. WORK TIME ON FIRST TRIAL FOR EACH CAT
(Time in seconds)

trial. Each animal had at least ten trials on each problem; this permitted the plotting of learning curves, but they add little to the evidence except to show the consistency of the trend already apparent on the first trial. This consistency is also revealed by the average time per trial during the first ten trials (last column of table 2).

The results for each animal's first trial can be apprehended better from figure 3. The time (in seconds) is plotted on a logarithmic scale, and the problems are arranged in order of increasing difficulty for the experimental group of cats. The three lines show the averages of the original learners, the 15-trial observers, and the 30-trial observers. It is apparent from these averages that the 30-trial observers solve the problems much more rapidly than do the original learners, and also more rapidly than the 15-trial observers. The results for the Pedal-Door tend to conform to these conclusions, but the case is weakened by the fact that four cats failed to solve the Pedal-Door in one hour. Apparently it is too difficult for some cats.

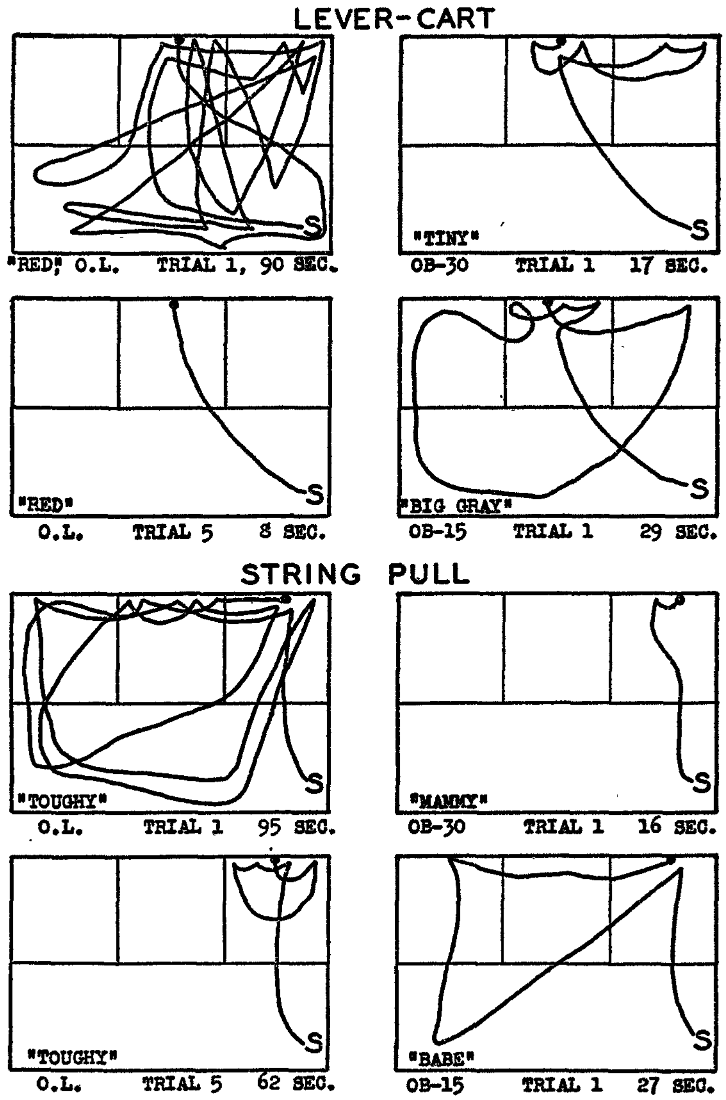

FIG. 4. TYPICAL ACTIVITY PATHS

For the first four problems all of the 30-trial observers performed better than any of the original learners. This strongly suggests that all Ob-30 cats had learned from observation of the learning of another cat. The case is quite different for the 15-trial observers. On the Lever-Cart and the String Pull they seem to have benefited from observation, but on the other three problems the Ob-15 cats perform no better than do the original learners. It may be concluded, then, that on all problems within their ability, cats benefited from observing the learning process of another cat, but only on two of the problems did they benefit from watching fifteen skilled performances of another cat.

Activity path. Some additional evidence is provided by the activity path records, several examples of which are shown in figure 4. The four top diagrams are typical of the activity paths on the Lever-Cart problem. At the upper left is the path for the first trial by Red, the original learner, and directly below it is Red's path on trial five, showing the direct approach to the lever after the problem was learned. *S* marks the start, where the cat entered the work cage, and the circle indicates the attainment of the food reward. The upper right hand diagram shows the path of Tiny, a 30-trial observer. The activity is confined more closely to the vicinity of the lever than in the first trial of Red or the other original learners. The path of Big Gray, a 15-trial observer, shows more tendency to stay near the lever on the first trial than did the original learners, but the tendency is less strong than for the 30-trial observers.

The lower four diagrams of figure 4 are typical of the activity paths on the String Pull problem. On the left are the paths for the first and fifth trials of the original learner, Toughy. The diagrams on the right show that the 30-trial observer, Mammy, made a very direct approach to the string, and even the 15-trial observer, Babe, wandered away from the string much less than did the original learners. These are the only two problems on which the 15-trial observers showed activity paths less rambling than those of the original learners; but on *all* of the problems the 30-trial observers showed direct approach to the mechanism and confined their activity to that region more closely than did the original learners.

DISCUSSION

The solution of such problems may be thought to involve two steps,—first, learning the location of the food-getting mechanism, and second, learning how to operate it. It is possible that the observer might benefit merely from learning the location of the mechanism; then the effect would be, in Spence's words, to "enhance the stimulus value of that part of the apparatus, and hence make the imitator more likely to respond to it." But if this were the only effect, the 15-trial observers should have benefited about as much as the 30-trial observers, for the activity paths show that they also started by going directly to the food-getting mechanism. After 'making a pass' at the mechanism and getting no reward, however, the Ob–15 cats usually wandered away from it, as if its enhanced stimulus value had been quickly lost, whereas the Ob–30 cats hovered nearby and soon managed to work the mechanism, (exceptions in the Pedal-Door problem). It seems likely that the Ob–30 cats, observing the trial-and-error of the original learners, had learned the value of persistent manipulation of the mechanism. (With humans we could say that the observer had learned that some manipulations did not bring reward.) The Ob–15 cats, seeing only successful performances, had not appreciated this possibility and hence left the mechanism when it did not immediately work. Thus the advantage of the Ob–30 animals could be explained without assuming that they had learned the correct act, but in several cases the Ob–30 cats performed so quickly as to suggest that they had even learned the correct technique by observation.

That the Ob–15 cats benefit from observation on two problems might be explained by the probability of making the correct response to the mechanism. In the Lever-Cart almost any touch on the lever would release the food cart; and in the String Pull apparently the cats had little tendency to do anything with the tape except to claw at it, which pulled it in. In the Pull-Down Door, however, there were many ways of pushing and clawing at the sides and bottom which failed to open the door. And here the Ob–15 cats showed no benefit from observation. Likewise on the Turn-Table a cat could bite the cleats, push down, or claw along a radius without turning the platform. The results, then, suggest the postulate that when there are more possible ways of manipulating the problem mechanism there will be greater advantage from observing another learner, as compared to observing a skilled performer.

The performance of the cats on the five problems suggests some reasons for the order of difficulty. The Lever-Cart, the Turn-Table, and the String Pull were fairly easy in that the required manipulation was merely a pawing or a clawing movement, either of which is very natural for a cat. The Pull-Down Door may have required somewhat more body coördination, but the difficulty seemed to arise from its conflict with the cat's tendency to push against obstructions and to seek exits near the floor. The Pedal-Door proved to be most difficult, as was expected. The fact that it required a detour from the escape door is a plausible reason, but this is probably less important than the fact that there is no apparent connection between the pedal and the door. An important third difficulty involved the rather firm downward push on the pedal. Such a manipulation was apparently unnatural for the cats, for several cats pawed the pedal and tapped it repeatedly, but without depressing it enough to open the door. When they failed to solve the problem the experimenter later trained them to open the door by pressing hard on the pedal, but in one case it took the cat four hours to learn. The failure of several cats on the Pedal-Door seems to confirm our assumption that the effectiveness of observation is limited by perception of the problem. Many human puzzles are beyond the perceptual capacity of cats, and it seems likely that where Thorndike's cats, (and in some cases Berry's), failed to learn from observation, the problems were just too difficult to make sense to the observer. The clarity of results in the present study is attributed to (*a*) the use of four problems well suited to the abilities of cats; (*b*) the sensitivity of the performance records; and (*c*) the control of the observer's attention by having the performer and the food dish in the same line of vision.

SUMMARY

To investigate some of the conditions favoring observational learning, thirteen cats were run on five problems. Some cats learned a given problem without aid,

whereas others observed an original learner and were then tested on the problem. The work time and the activity path of each performance was recorded. The results suggest that

(1) On problems within their normal range of ability, cats benefit from observing the learning process of another cat.

(2) Observation of fifteen skilled performances is much less beneficial than observation of the learning process.

(3) The relative advantage of observation of the learning process, as compared to observation of skilled performances, is greater when more incorrect manipulations of the problem mechanism are possible.

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