FURTHER STUDY ON THE BEHAVIOR OF THE CAT TOWARD THE RAT[1]

ZING YANG KUO

Yale University

Received for publication February 17, 1937

INTRODUCTION

In a previous communication which was published in this JOURNAL some years ago (Kuo, '30), the results of a series of experiments to determine the effects of different environmental conditions on the behavior of the kitten toward rats and mice were reported. The results showed, among other things, that if a kitten was raised in the same cage with a rat since it was very young, it, when grown up, became tolerant of rats: not only it would never attack a rat, but it adopted the rat as its "mate," played with it, and even became attached to it. Even frequent observation of killing and eating of rats by other cats could not induce such a kitten to change the type of reaction toward the rat which it had acquired in its early post-natal life.

In the experiment which is to be reported below, the condition was modified so that the new born kitten lived not only with rats in the same cage but also with two or three other kittens. The purpose was to find out whether the kitten, living under such changed conditions, would behave toward its rat mates differently from the type of responses found in the kitten which was raised alone in the same cage with a single rat as reported in the previous article.

In addition, we shall include in this report the result of another experiment in which kittens were kept in the same cage with sparrows since they were young.

[1] The experiments were performed at the National University of Chekiang, Hangchow, China.

COMPARATIVE PSYCHOLOGY, VOL. 25, NO. 1
FEBRUARY, 1938

EXPERIMENT I

Methods

This experiment deals with the behavior of kittens raised in the same cage with rats. There were 17 kittens used in this experiment. They were divided into four groups, three groups having four kittens each, and one having five. Kittens in each group were of the same litter. Soon after the kittens were born, they were kept together (without their mother) in a cage in which a pair of albino rats, one male and one female, were living. At the time the kittens were introduced into the rats' cage, the latter were about one month old. Neither gray mice nor dancing mice were used in this experiment. Other conditions of the experiment were the same as those reported in the former paper.

The kittens were separated from the rats after nine months. One month after separation, each kitten was tested for its reaction to the adult albino rat. The test was made once a month for four months. The rats used for such tests were the kitten's original cage mates. But in some cases in which the original mates had been killed or died, substitutes of approximately the same size and same age were employed.

Four and a half months after separation those cats which were still indifferent to the presence of the albino rat were tested for imitation of rat killing response. The procedure of the imitation test will be described in its proper place.

Results

The results of this experiment may be briefly stated as follows:

1. During those nine months stay with two rats in the same cage all the kittens were indifferent and tolerant with reference to the rats. They let the rats run about in the cage, climb over their back or head and eat with them in the same dish (see fig. 1). Many of the kittens would let the rats pull a piece of meat or fish away from their mouth. Seven kittens of seventeen made attempts to play with the rats.

2. None of the kittens were attached to a rat as it was the case in the previous experiment in which only one kitten was

kept in the same cage with a single rat. The separation of the rats from the cage at any period and for any length of time did not cause any "seeking" or "restless" movements. Nor did the returning of the rats to the cage change the behavior of the kittens. Not a single kitten ever showed any response which might be regarded as protection for the rat. All such reactions are quite a contrast to those found in the kitten which was kept alone in the same cage with only one rat. In the latter case the kitten was generally attached to the rat. To quote from the former report, "After the cage-mate—the rat—was taken from

FIG. 1. NEARLY FULLY GROWN CATS WITH TWO ADULT ALBINO RATS AT MEAL TIME

the cage, the kitten began to mew continuously, became restless and search from corner to corner until the rat was returned to the cage." The kittens of the present experiment never exhibited such kind of responses with reference to the rat.

However, every kitten was attached to its own sisters and brothers in the cage; they played, ate, and slept together. If one of the kittens was left alone in the cage, it became restless and mewed until at least one of them was returned. The presence of the two albino rats in the cage did not alter the restless movements of the kitten, "seeking" for its missing sisters and brothers.

3. The behavior of the rats in the cage toward the kittens was also a sort of indifference. They played with each other, ran about, performed sex act, built nests, gave birth to young rats, and nursed them, as if the kittens were not present in the cage. They ate together with the kittens from the same dish and would sometimes try to pull a piece of meat or fish from the mouth of a kitten, as has been stated before. When some of the female rats were pregnant or nursing the young, they became very spirited and would attack kittens if they came near their nest. The kitten then became afraid of these rats and would not dare approach their nests.

4. The behavior of the kittens towards the new born rats in the cage was striking. Twelve out of the seventeen kittens killed and ate new born rats whenever they happened to come to the rats' nest. This was always done in the absence of the mother rat from the nest. If the mother was in the nest, the kittens kept away from it. The young rats were stolen from the nest and killed and eaten in some other place in the cage. In many cases the mother rat saw the kittens eat her young in a corner of the cage without making any effort to interfere with them as long as they were not near her nest. Some of the mother rats would, however, carry the dead bodies of the young rats back to the nests after they were killed and left alone without being eaten by the kittens. Others would join the kittens and share with them the meat of their own young.

The kittens began to steal and eat new born rats when they were from two to four months old. Once they tasted the meat of young rats, they would repeat the same act each time the mother rat gave birth to a new litter. One group ate as many as five litters during their nine months stay with the rats. The behavior of the kittens toward the adult rats remained the same as before even after they had eaten several litters of their offspring.

5. In view of the fact that the kittens killed and ate new born rats without changing their original behavior toward the adult rats, tests were made to find out whether their reactions to the rats not living together with them in the same cage would be the same as those to the young rats. As the kittens always killed

and ate young rats before hair grew out on their body, the test rats were divided into two groups: in one the fur was completely shaved, while in the other the hair of the rat was kept intact. The ages of the test rats in the two groups were the same: one day old, one week, two weeks, one month, two months, and three months old. The tests were made when the kittens were about five months old. The kittens were tested separately. One test was given every other day. In each test one shaved and one unshaved rat were used. They were of the same age. The unshaved rat was introduced to the kitten first. The shaved rat was put in after the unshaved one was taken out.

The result is noteworthy. Eleven of the twelve kittens which killed new born rats before invariably killed and ate hairless or shaved rats, regardless of the differences in the age of the test rats. But their reactions to the unshaved rats were the same as those to the adult rats living in the same cage with them.

Only one of those five kittens which did not kill new born rats killed two shaved rats, one of which was one month old and the other two months old.

6. The result of the tests of the kittens' behavior toward their former cage-mates—the adult rats—from whom the kittens had been separated for from one to four months was negative for sixteen cats. Throughout the four tests made during the four months of separation these kittens remained indifferent to the presence of the rats although they continued to kill and eat new born and shaved rats.

The only exception was found in one cat which killed one male rat—its original cage-mate—in the fourth test, that is, the test four months after the separation.

7. After these sixteen cats were found to still remain indifferent to the adult white rats even after four and a half months of separation, tests for imitation were initiated. The tests consisted of letting each of these cats see through, in the same cage, the performance of killing and eating rats by another cat. The rat was first put before the cat in the cage under test. If it failed to attack the rat, a rat-killing cat was added to the cage. After the killing act was performed, the killer was taken out and

another rat of approximately the same size was put before the would-be imitator whose reactions to the rat were recorded. This procedure was repeated every day for two weeks or until the act of imitation was observed.

The result of the imitation test was also striking. Of the sixteen cats tested, six attempted, after several times seeing killing and eating of rats by other cats, to attack rats which were their former cage-mates. But only three of these six cats succeeded in killing rats. The other three would not dare to approach a rat again after they were once bitten back by the rat in their first attempt to attack it. These three cats, however, would carry in their mouths a dead rat killed by some other cat, and growl, hiss and play with it. But the dead rat was finally given up without being eaten. All the six cats mentioned in this paragraph killed and ate new born and shaved rats before they were separated from the adult rats with which they lived together for nine months.

EXPERIMENT II

Methods

In this experiment the purpose was to test the reaction of young kittens to sparrows which were kept in the same cage. Nine kittens from three litters were used. They were divided into three groups. Before their eyes were open each group of kittens were placed in a cage in which four to five adult sparrows had been kept. At first the sparrows were frightened by the introduction of the kittens into the cage, but after from one to three days all of them became adapted to the new situation. In this way the kittens and sparrows were kept together for six months. The behavior of the kittens in the same cage, especially with reference to the sparrows, was observed and recorded from day to day.

Results

The results of this experiment may be summarized as follows:

All of the nine kittens paid no attention to the sparrows in the cage for the first two months. Their behavior toward the sparrow

is almost the same as that of the kittens toward white rats in experiment I. But when they were a little over two months old, five of the kittens began to follow the sparrows in their flight in the cage. As soon as the flight ceased, the pursuit of the kittens subsided. But some of the sparrows became frightened by the pursuit of the kittens and flew in panic. This made the pursuit of the kittens more active and zealous. Three kittens on different occasions happened to each catch one sparrow during flight. One of these kittens (No. 6) later developed a habit of capturing sparrows in flight and playing with them without any attempt to kill them. The other two (Nos. 4 and 7) did exactly the same for the first five to ten days, but later on they killed and devoured the sparrow soon after it was caught in flight. It must be noted in passing that other kittens did not "imitate" the actions of kittens 4, 6, and 7.

After six months all the nine kittens were separated from their birdmates and set free but their reactions to sparrows and other small birds were watched in the garden and elsewhere for two months. Except Nos. 4, 6, and 7, none of the kittens was ever observed to pay attention to sparrows or other small birds. But No. 6 often made attempts to capture sparrows or small birds without success. After five days its "interest" in sparrows and other small birds seemed to have waned. On the other hand, Nos. 4 and 7 continued to capture and eat sparrows and other small birds as they did when they were kept in the cage. These two kittens were seen also to catch and eat frogs and wild mice.

DISCUSSION

The results of these two experiments seem to further demonstrate the view held by the writer many years ago, that other things being equal the behavior of the animal is determined by its early environment in which it is raised. Kittens raised in a "rat-killing environment" are most likely to be "rat-killers"; raised in isolation, the probability of rat-killing is almost fifty-fifty (Kuo, '30). But when one kitten is raised *alone* with one rat in the same cage, it became attached to the rat, and would never attack it, even after having seen through many times the

act of killing rats by other cats (Kuo, '30). On the other hand, if more than one kitten is raised in the same cage with the rat, it develops no attachment to the rat. Instead, its attachment is for its brother or sister kittens. Furthermore, there is a high possibility that after long separation from the rats, these kittens may develop a habit of killing rats either spontaneously or through imitation, as we have seen in experiment I. Such a possibility is almost nil in the case in which only one new born kitten is raised in the same cage with one rat.

Again, while the writer is not as yet able to ascertain the factors which influence the kittens to eat the newly born rats, the fact that they kill and eat shaved rats and pay no attention to unshaved ones points to the same conclusion, namely, that the action of eating shaved rats is a carryover from their early behavior in eating new born rats. The results of experiment II also demonstrate the effects of early behavior which is a direct result of environmental conditions, and its carryover and transfer in later life.

In the case of the chick, the writer has given numerous evidences to show the effects of embryonic behavior upon its life after hatch (Kuo, '32). It cannot be overemphasized that ontogeny, or the developmental study of behavior is one of the most important channels through which causal factors of behavior may be discovered.

REFERENCES

(1) Kuo, Z. Y. 1930. The genesis of the cat's behavior toward the rat. Jour. Comp. Psychol., 11, 1–35.

(2) Kuo, Z. Y. 1932. Ontogeny of embryonic behavior in aves. IV. The influence of prenatal behavior upon postnatal life. Jour. Comp. Psychol., 14, 109–121.

(3) Kuo, Z. Y. 1937. Prolegomena to Praxiology. Jour. Psychol., 4, 1–22.

(4) Rogers, W. W. 1932 Controlled observation on the behavior of kittens toward the rat from birth to five months of age. Jour. Comp. Psychol., 13, 107–125.