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DO KITTENS INSTINCTIVELY KILL MICE?¹

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The observations which we here report supplement in certain respects the results obtained by Berry² in this laboratory, and suggest the need of alterations in his conclusions concerning the reactions of kittens to mice. Upon his study of the behavior of a litter of Manx kittens Berry based the following statements, which we wish the reader to consider in connection with the facts which it is the purpose of this paper to present. "I am also led to believe that cats are credited with more instincts than they really possess. It is commonly reported that they have an instinctive liking for mice, and that mice have an instinctive fear of cats. It is supposed that the odor of a mouse will arouse a cat and that the odor of a cat will frighten a mouse. My experiments tend to show that this belief is not in harmony with the facts. When cats over five months old were taken into the room where mice were kept they did not show the least sign of excitement. A cat would even allow a mouse to perch upon its back, without attempting to injure it. Nor did the mice show any fear of the cats. I have seen a mouse smell of the nose of a cat without showing any sign of fear."

"It was not until the mouse began to run that the interest of the cat was aroused. The cat then ran after it, playfully striking it with her paw, becoming rougher the longer she played with it. The instinct seems to be for the cat to run after anything which runs from it. I think it is evident that it is through imitation that the average cat learns to kill and eat mice. If this is true, it shows the extreme importance of imitation in the mental development of the cat. Further-

¹From the Psychological Laboratory of Harvard University.

²Berry, C. S., 'An Experimental Study of Imitation in Cats,' *Jour. of Comp. Neurol. and Psychol.*, Vol. 18, pp. 1-25, 1908.

more, it indicates that much that has commonly been attributed to instinct is, in reality, due to imitation" (pp. 24-25).

Believing that the experiments upon which the above generalizations are based should be repeated with younger kittens than those observed by Berry, we have systematically studied the reactions of eight kittens when in the presence of mice.

The kittens belonged to two litters. Of these, the first, consisting of four kittens, was born in the laboratory on March 2, 1910, of a black and white cat which had been obtained through an animal dealer in Boston a few days previously. The second litter, also of four kittens, was born on May 11, 1910, of a maltese and white cat which had been furnished by the same dealer two weeks previously. Hereafter we shall refer to the several kittens by number as follows:

First Litter		Second Litter	
Born March 2, 1910.		Born May 11, 1910.	
No. 1	Male	No. 5	Female
No. 2	Male	No. 6	Male
No. 3	Female	No. 7	Male
No. 4	Female	No. 8	Male

The cats, and later the kittens also, were kept in the animal-room of the laboratory, with the freedom of the room much of the time. No other animals were kept in the room, and special precautions were taken to make the room mouse-proof, so that the observers might obtain complete histories of the kittens' experiences with mice. The diet of the cats consisted of fresh milk, beef (usually cooked), and fish. The kittens were given fresh milk as soon as they would accept it, which was during the fourth week. All of the individuals were in perfect health throughout the experiments and exhibited normal development, but the members of the first litter were better nourished, more active, energetic, and aggressive than those of the second.

In reporting our results we shall describe first the experiments with the eight kittens previous to the opening of their eyes.

Each individual was tested, in the presence of both observers, at least twice during the first week of life, with the odor of mouse. This was done by bringing a live mouse near to the nose of the kitten. In no instance was a reaction observed which differed essentially from the reactions to such odors as weak ammonia, sour yeast, leather, and the experimenter's hand. The animals gave no evidence of special interest in the odor. Usually there occurred twitching of the nose; rarely opening of the mouth; and still more rarely, something between hissing and spitting.

From these observations, which we report thus briefly because of limited space, we conclude that during the period of post-natal blindness kittens tend to avoid the unfamiliar odor of mouse, just as they avoid other strange odors, and, further, that the odor has no special significance with which a definite instinctive reaction is correlated.

In stating the results of our tests with the animals after they had gained their sight, we shall deal with the litters separately.

These tests consisted in placing each kitten separately in a cage with wire mesh sides and cover, 45 cm. by 30 cm. by an average of 20 cm. deep, in which a mouse had been placed. Here the kitten was kept under continuous observation for fifteen minutes. The eyes of the members of the first litter, nos. 1-4, were fully opened on March 14, and on that date the animals were tested, at the age of twelve days. They exhibited no reactions to the mouse, beyond looking at it momentarily as it happened to approach or touch them. Neither the olfactory nor the visual stimuli from the mouse called forth anything which resembled an instinctive reaction. In general it may be said that the kittens paid no other attention to the mouse than to a bit of dry bread in the cage.

On April 1, when slightly over four weeks old, nos. 1-4 were again tested. The first three reacted to the mouse only by following it now and then with their eyes as it happened within the field of vision. They neither chased nor made attempts to touch it. The behavior of no. 4 contrasted markedly with that of the others. She noticed the mouse, soon after she had been placed in the cage, as it moved near her, and quickly seized it in her mouth, growling the while. The mouse escaped and the kitten gave chase, but failed to recapture it before it had climbed to the top of the cage. In this position the kitten seemed unable to recognize it, and she made no further attempts to find it during the fifteen minute interval.

In the behavior of no. 4, a female, at the age of four weeks, we thus have unmistakable evidence of the presence of the killing instinct. Had the mouse been smaller, or had the cage rendered it more easily accessible, it certainly would have been killed. It was evident that the kitten's stage of visual development did not enable it to follow the rapidly moving mouse or to recognize it at a distance of twenty to thirty centimeters.

Five days later, on April 6, the kittens of the first litter were tested for the third time.

No. 1 approached the mouse and smelled of it, but he drew back quickly when his nose touched it. He seemed to be startled, mewed

loudly, and tried to escape from the cage. Later he several times approached the mouse and smelled of it as at first. There was no evidence of a killing instinct. We have repeatedly seen the kittens react similarly to inanimate objects.

No. 2 smelled of the mouse, when the latter's movements had attracted its attention. It also followed it about the cage with its eyes for brief periods. Interest soon failed and the kitten mewed persistently to be let out of the cage.

No. 3 at first tried to escape from the cage. Upon seeing the mouse move she trembled noticeably, as if in fear. Later, when the mouse happened to touch her, the kitten spit and hissed vigorously.

No. 4 smelled about the cage as though searching for something. She finally saw the mouse in one corner of the cage and made for it, but she was too slow to catch it, for the mouse had quickly darted to the top of the cage as the kitten began to move. The kitten continued to the place where she had seen the mouse an instant before, and after feeling and smelling in the corner where the mouse had been she licked her paw. Soon she located the mouse at the top of the cage. She approached, reached up with one paw and touched the mouse, then drew back. This was repeated three times. Had the mouse run from its position, the kitten doubtless would have attempted to catch it. After a few minutes the kitten again noticed the mouse, this time nibbling at a bit of dry bread on the floor of the cage. She immediately approached it, and as it ran she pursued and tried to catch it. As the time for the test had elapsed the kitten was now removed to the animal-room.

On April 8, the fourth test was given kittens nos. 1-4.

No. 1 showed more interest in the mouse, by following it readily and persistently with the eyes and moving about after it. When he happened to touch it, he spit and struck at it with his paw playfully (?). The mouse was not afraid of the kitten and did not run away.¹

No. 2 attended immediately to the mouse and began to play with it. After a time he accidentally sat down on the mouse, whereupon it squeaked. This aroused the kitten and caused it to strike with its paw and lick its lips. It then followed the mouse about the cage at intervals.

¹ These experiments have revealed marked differences in the behavior of mice toward kittens. We have used wild gray mice, and laboratory gray, black, and agouti mice. Under the conditions of our experiments, the wild mice always exhibited extreme fear, whereas of the laboratory mice some were obviously fearful and others fearless of the kittens. Whether the differences are due to experience or to inheritance we have not attempted to determine.

No. 3 behaved as in the previous test. When the mouse came near her, she would spit and move away.

No. 4 exhibited characteristically interesting behavior. On being placed in the cage, with back arched she pursued the fleeing mouse to a corner and then spit and struck at it with her paws. Next she bent her head low and sniffed at it. She watched it closely for a time, showing sustained attention. When the mouse finally attempted to escape from the corner, the kitten made a dash for it, hissing and growling. On overtaking her prey, she drew back slightly, spitting and repeatedly unsheathing and sheathing the claws of a paw which she extended toward the mouse. The mouse next made a sudden dash across the cage. Like a flash the kitten was upon it mouth and claws. With the mouse held firmly by the head, the kitten began to growl. In a few seconds she shifted her hold and taking the nose of the mouse she bit it repeatedly. Then followed a period of worrying during which the mouse several times tried to escape only to be seized by some part of its body and vigorously chewed or struck with the paws of its captor. Within fifteen minutes of its capture the mouse had been bitten and worried to death. The kitten immediately began to chew at one of its legs, which it finally succeeded in eating, but the skin of the mouse was so tough that the kitten soon abandoned its attempt to eat its prey.

At this point, in order to determine the effect of delaying for several weeks the development of the ability of a kitten to kill mice, tests with nos. 1 and 3 were discontinued and only nos. 2 and 4 were used.

On April 14 the latter individuals were given their fifth test. No. 2 smelled of the mouse and drew back. He followed it momentarily with his eyes, but soon lost interest and paid no further attention to it. No. 4 chased the mouse, as in the previous test, spitting, striking with exposed claws and otherwise exhibiting excitement. Owing, however, to the ability of the mouse to keep out of reach most of the time, the kitten did not succeed in capturing it within fifteen minutes.

April 20 was the date of the sixth test. No. 2 watched, followed, and struck at the mouse repeatedly. He showed more sustained attention than previously. No. 4 behaved as in the foregoing test. She did not succeed in capturing the mouse.

On April 22 the tests were made in the mouse-room of the laboratory instead of in the experiment room which had been used for the other tests. No. 2 exhibited no new reactions. He did not follow the mouse persistently. No. 4 seized the mouse immediately by the head, growling as she chewed at it. She had eaten it completely within six minutes.

Again on April 25 no. 2 was tested in the mouse-room. From the first he followed the mouse and struck at it with his paw. Soon he succeeded in cornering it and seizing it by the neck and back. Growling he chewed vigorously at its head and back until it was dead. Within five minutes he had eaten his prey. In this test the kitten's interest in the mouse increased greatly when the latter showed fight.

Finally, on April 27 both no. 2 and no. 4 were again tested in the mouse-room. No. 2 at first attended to the mouse playfully, but suddenly as the mouse ran across the floor of the cage this playfulness was replaced by the killing instinct. The kitten gave chase, seized the mouse, and by biting it through the head killed it immediately. When another kitten was brought near the cage no. 2 growled warningly.

No. 4 immediately began to sniff about the cage. As soon as she caught sight of the mouse she ran and seized it. The mouse managed to escape, whereupon the kitten excitedly gave chase and again caught it. This time she bit its head so severely that it was helpless. Later the mouse was killed and eaten.

On May 16 a different sort of test was given. Each kitten was set free in the mouse-room with a mouse. No. 2 was interested in the mouse, but he showed only slight ability to keep track of it among the furnishings of the room (cages, table, radiator, boxes, etc.). Nevertheless, he had discovered it, by reason of its movements, within a few minutes, and he immediately captured it. Subsequently, after playing with the mouse for several minutes — repeatedly allowing it to escape and then recapturing it, tossing it into the air, clawing, and striking it with its paws, etc. — the kitten killed its prey by biting it about the head, and ate it. No. 4 also had difficulty in keeping track of the mouse. She spent much time smelling about the room as if in search of it. Finally she saw the mouse move. Capture followed. The captive was then played with for a while, after which it was killed by being bitten through the head and neck, and eaten.

This concludes our brief description of the behavior of nos. 2 and 4. We have shown that these two kittens — the female within a month after birth and the male in less than two months — without opportunity for imitation and without other experience with mice than that described above, began to kill and eat mice. We feel fully justified, in view of the characteristics of the behavior, in calling it instinctive.

With the thought that the instinctive tendency to kill mice might wane or become increasingly difficult to develop as kittens aged, we postponed tests with nos. 1 and 3 until May 26. These kittens were

therefore almost three months old when we resumed our tests with them.¹

On May 26 nos. 1 and 3 were given their fifth test, the fourth having been given on April 8. This test was given in the mouse-room. No. 1 appeared to be aroused by the odor of mouse in the room and ran about when brought into the room, as if searching for something. This observation, which we made in connection with several of the kittens, would seem to indicate that the odor of mouse may become significant to the kitten even before it has made its first kill. When placed in the experiment box with a large gray mouse, the kitten smelled of it several times, followed it about the cage, and finally struck at it with his paw, immediately thereafter springing back as the mouse moved. Nothing further of interest happened during the interval of experimentation.

No. 3 smelled about, located the mouse, and watched it intently. She hissed as it moved. Subsequently she followed the mouse closely and struck at it with claws exposed. Once she brushed it from the top of the cage with a paw. As it ran to one corner of the cage, she followed and struck it several times with her paw: her tail switched and her ears twitched a great deal during this activity. During the remainder of the interval, she clawed at the tail of the mouse as it cowered in a corner of the cage.

Again on May 28 the kittens were tested in the mouse-room. No. 1 was attentive to the mouse from the first. He watched and followed it, growling the while. It was evident that the movement of the mouse attracted him. At last the mouse attempted to run across the cage. The kitten made a sudden dash for it, seized it by the back, and at once killed it by biting through the spine in several places. He then switched his tail, growled, and hissed as he stood over his prey. Repeatedly he picked up the body, sometimes tossing it into the air, and each time striking it with his paw as it fell to the floor. The mouse was not eaten.

No. 3 licked her lips when placed in the cage, and her ears twitched noticeably as she crouched and watched the mouse. Occasionally she spit. As the mouse ran to the top of the cage she followed and struck it. With back arched she watched it intently and steadily for a few seconds, then she brushed it down with a paw. This happened a number of times. At the end of the interval the kitten was closely watching and following the mouse.

¹ It is to be remembered that the kittens studied by Berry were at least five months old when he first tested them with mice.

The eighth test was given to nos. 1 and 3 on June 1. No. 1 caught the mouse as soon as he saw it. He growled as he bit through the back of the mouse and killed it. About half of the body was eaten at once. No. 3 behaved as in the previous test. She did not attempt to kill the mouse.

On June 3 only no. 3 was tested. She smelled about the cage, and when she discovered the mouse at the top she crouched. She then stealthily approached and struck with exposed claws. As the mouse retreated she followed. In less than a minute she had seized it and so severely bitten its neck that it was helpless. The kitten growled, hissed, and otherwise exhibited excitement the while.

The results of these tests with two kittens three months old, when considered in connection with those of Berry on kittens five months old, suggest that the killing instinct (of the existence of which we are convinced by our observations) tends to become increasingly difficult to evoke as the animals age. This in part, doubtless, accounts for the fact that some cats will not kill mice at all, whereas other are more or less eager to do so.

We are inclined to believe that Berry's results would have led him to quite another conclusion (he definitely states "that cats do not instinctively kill and eat mice, but learn to do so by imitation," p. 25) had he tested his Manx kittens at the age of one to two months in a cage which did not permit the mice readily to get out of sight or reach of the kittens.

The behavior of the members of the second litter, Nos. 5-8, will be described only with respect to certain points in which it differed from that of the kittens of the first litter.

As previously stated, the reactions of Nos. 5-8 while yet blind furnished us with no indications of an instinctive adjustment to the odor of mouse. After the opening of their eyes, these individuals were systematically tested on May 26 and 29, and on June 1 and 3. In none of these tests did anything noteworthy which has not already been recorded appear.

Beginning with the test of June 7, when the kittens were about four weeks old, we may describe the behavior of the several individuals. For this test small gray mice about ten days old were used.¹ Their eyes were not yet open and they of course could not run from the kittens. They crawled about the cage considerably during the experiments.

No. 5 sniffed when placed in the cage, in the mouse-room. Her attention was taken by the movements of the mouse and she looked at

¹ In all previous tests well grown mice had been used.

it for several seconds. Although she did not touch it with her paws at first, she several times placed her nose close to it, and finally licked it gently with her tongue. Next she took it in her mouth and bit it hard enough to make the mouse squeak, but not sufficiently to break the skin. This was repeated three times. Then the kitten left the mouse. She gave no signs of excitement or of an instinct to kill. Rather her behavior was indicative of mild interest and playfulness.

No. 6 looked at the mouse momentarily as it crawled about and touched it with his nose, but he paid no further attention to it.

No. 7 was attracted by the movements of the mouse and touched it with his nose. He then left it. After twelve minutes he happened to be so placed that he could see the mouse as it began to move. For a few seconds he watched as if fascinated by the sight. Then he moved directly and quickly, in spite of shakiness of his legs, to the mouse, and seized it in his mouth by the middle of the back, at the same time biting hard, and bending his head to the floor so that one paw could be placed firmly on the body of the mouse. In a few seconds, he had bitten the mouse to death. Without pause the process of eating was begun. It proved a difficult task, notwithstanding the tenderness of the mouse, but after ten minutes of diligent effort and much gagging it was completed.

Here we have a kitten one month old, still so feeble and unpracticed that he tottered as he attempted to walk, seizing, placing his paw upon, and eating a small mouse after the manner of cats. Anything more striking in the way of an exhibition of the killing instinct would be difficult to imagine. The observation proves that given conditions which favor its appearance—namely, a mouse suited in size and strength to the size of the kitten and a cage which does not permit it to get beyond the kitten's field of vision—the killing instinct may appear even during the first month of life. Although meat had been fed to the mother, it is extremely improbable that this kitten had ever before tasted meat of any sort, and it is certain that he never before had tasted mouse flesh. Indeed, he had only a few days before the test begun to lap milk from the food dish.

No. 8 merely looked at the crawling object for a second or two and then lay down for a nap.

On June 16 all of the kittens were again tested. No new reactions appeared. Not one of the individuals except No. 7 made any attempt to follow or capture a mouse. He caught, killed, and ate his mouse in a calm business-like way.

The members of the second litter were further tested on June 26,

27 and 28. On none of these dates did any of them kill a mouse. On the twenty-seventh no. 5 struck and bit one so badly that it lay as if dead, but she paid no further attention to it after once seizing and then dropping it.

After the twenty-eighth of June the experiments had to be discontinued, notwithstanding the fact that the records for the members of the second litter were incomplete.

Rather dogmatically stated, and with meager discussion, our conclusions are as follows:

1. Kittens possess the instinct to kill mice. We are not prepared to say that the reaction to mice differs essentially from that given to other small living things, but we have clearly demonstrated by a variety of tests that the reaction to a mouse differs radically from that given to lifeless objects which are moved before the animal.

2. The instinct to kill may manifest itself in the kitten before the end of the first month of life, while the animal is yet feeble and barely able to eat a young mouse. It more commonly appears during the second month.

3. The instinct appears suddenly. In a moment the playful kitten becomes transformed into a beast of prey. The picture of the play instinct differs as greatly from that of the killing instinct as does the picture of joy from that of rage.

4. The reaction is fairly definite in character, complex, and highly adaptive. It involves the bodily states of attention; muscular tension; bristling of the hair; sometimes erection and sometimes switching of the tail; hissing and, at times, spitting; growling; unsheathing and sheathing of the claws; use of the mouth, teeth, paws, and claws. The picture varies somewhat with individuals.

5. The instinctive reaction is aroused (*a*) by the movement of the mouse (if the animal keeps quiet it is not noticed by the inexperienced kitten); (*b*) by the odor of the mouse (this seems to be relatively unimportant for the first reaction; subsequently it is of great importance). Berry is quite right in saying that the kitten has an instinct to chase any small object that runs from it. If the object when overtaken behaves as does a mouse, the killing reaction is likely to appear. We should say, then, that the visual factor of movement is the primary condition for the initiation of the killing instinct; that the odor of a mouse becomes markedly significant with the first kill and subsequently plays a part; and that the visual impression of the form of a mouse becomes important as the visual ability of the kitten develops. It is almost certain that cats usually recognize mice by their odor and movements and not by their form or markings.

6. The instinct does not completely wane during the first three to five months of a kitten's life, but it apparently becomes increasingly difficult to evoke. The practical inference is: allow a kitten to exercise its killing instinct when young if a good mouser is desired.

7. Although opportunity neither for imitation nor for experience with mice is necessary for the efficient execution of the killing reaction by kittens, there can be no doubt that each of these conditions ordinarily contributes to the awakening of the killing instinct. Cats bring dead or injured mice, or other small animals, to their kittens. Thus, early in life, the animals become familiar with the odors of their natural prey. Undoubtedly, then, the average kitten would react to a mouse during the second month of life more quickly than did those observed in the laboratory.

The whole point of our work, it is to be noted, is the study of the instinct to kill as it is exhibited by kittens which have been deprived of everything in the nature of preparation for dealing with mice.

8. We deem as chiefly important in our observations, the fact that kittens, even in their first kill, so seize the mouse that they cannot be bitten by it. In almost every instance our kittens caught their mice by the head, neck, or back in such a way that the animals were helpless. We present this fact as a point in favor of the specificity of the reaction to mice. An untutored observer certainly would have inferred from the behavior of these kittens that they had learned just how to seize mice in order to prevent them from biting.

9. The killing instinct with surprising rapidity lends itself as the basis for the acquisition of habits of dealing with mice. Racial and individual experience soon become so completely intermingled in the behavior of a kitten toward mice that only in the light of a minute and thorough knowledge of the latter can the instinctive features of the behavior be identified. Whereas at first the kitten tends to kill immediately upon capturing a mouse, it thereafter tends rather to delay the fatal bite. At first the reaction is performed in a business-like way; later the kitten plays with its prey for minutes at a time without seriously injuring it. Again, the beginner attempts to capture a mouse only when it runs, whereas the experienced kitten begins to search for its prey as soon as it sees the box in which it once killed a mouse, or as soon as it detects the odor of mouse.

10. It is our impression, although statistically our results do not justify a statement of fact, that in the female kitten the instinct to kill is more highly developed than in the male.