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PK EXPERIMENTS WITH ANIMALS AS SUBJECTS[1]

By HELMUT SCHMIDT

ABSTRACT: The general purpose of these experiments was to use pleasant or unpleasant stimuli to activate the possible PK ability of animals and lower forms of life. The basic apparatus was a binary random number generator (RNG). In some exploratory tests with a cat, the RNG was connected to a heat lamp placed with the cat in a cold room. A total of 9,000 numbers generated resulted in 4,615 occasions on which the lamp turned on and provided the cat with heat (a deviation of +115, CR = 2.42).

In another exploratory experiment, the test animals were cockroaches which were placed on a shocking grid, also connected with the binary RNG. The objective in this case was to see if the cockroaches could influence the apparatus so as to avoid the electric shock. It was found that they received more, not less, than the expected number (CR = 2.7). A confirmatory test showed the same direction of scoring: a total of 25,600 numbers generated by the RNG resulted in 13,109 shocks, a deviation of 309 more than expected by chance (CR = 3.85, $P = 10^{-4}$).—Ed.

INTRODUCTION

The writer's interest in the possibility of psi in primitive organisms led to the following design for a PK experiment which can be adapted to a very large variety of test subjects.

The central part of the test equipment is an electronic binary random number generator (1) which produces the numbers +1 and −1 in random sequence. This generator is coupled to the test subject in such a way that when, and only when, a +1 is generated the subject receives a certain stimulus.

[1] This work was first presented at the Autumn Review Meeting of the Institute for Parapsychology on Sept. 5, 1970.

Consider as the first example the possible case in which we have a human subject and the stimulus is a short, unpleasant electric shock. Let a test run consist of a sequence of N generated numbers. Then the subject's desire to obtain as few shocks as possible is equivalent to motivation for obtaining a small number of +1's in the sequence, and correspondingly a high number of −1's. This test situation might activate the subject's PK so as to force the generator into producing more +1's than −1's, but certainly the possibility of psi-missing rather than psi-hitting might have to be considered.

The experiment could also be designed in such a way that the human subject receives pleasant stimuli whenever a +1 is generated. For example, one could confine the subject to a cold room and use as the stimulus the temporary turn-on of a heat lamp. In this case the subject would desire to increase the turn-on rate of the heat lamp, i.e., to obtain an increased number of +1's.

A notable feature of experiments such as these would be that PK would have a chance to work at an unconscious level. It might not be necessary for the subject to make any conscious effort; it might be just enough for him to react to the offered stimulus. This feature makes the method applicable for many other than human test subjects.

The first experiment to be discussed was some exploratory work in which the subject was a cat kept in a cold room, and the stimulus was warmth from a heat lamp. The main experiment to be reported used cockroaches as subjects and electric shocks as stimuli.

Test for Randomness in the Random Number Generator

The random number generator (RNG) used for the main experiment carried out with cockroaches is the same as the RNG used in a PK experiment with human subjects reported previously (2). It was shown there that this generator has satisfactory randomness properties. The RNG used in the exploratory experiments with the cat was similarly built and was tested independently for randomness by methods described before (2). One more randomness test with this generator done before the actual experiment might be worth mentioning:

A 200-watt lamp was connected to the RNG, so that after each generated +1 the lamp was turned on and stayed on until a −1 was generated. The numbers were generated at the rate of one per second. The test was done during 24 nights (8 hours per night), and the lamp was stationed in a large garden under a clear sky. Among the total of 691,200 generated numbers, the +1 was generated 345,276 times and the −1 occurred 345,924 times, which did not suggest any bias in the generator under these conditions.

Exploratory Tests with a Cat

For this experiment a 200-watt lamp, connected as just described, was mounted inside a cold (0° C) shack which housed a cat (one year old, female, pet). This lamp seemed to provide the pleasant stimulus mentioned, because the cat settled down immediately next to the lamp and obviously enjoyed the generated heat when the lamp was on. The purpose of the experiment was to see whether the cat's feeling of pleasure when the lamp was lighted might cause the lamp to light more than the expected 50% of the time, which in turn would require the RNG to generate more +1's than −1's.

The RNG was stationed inside a house about 60 feet from the shack. For the purpose of optimal shielding against electrical disturbances, the RNG was operated by batteries and, together with the batteries, was enclosed in a grounded wire cage. Two small lamps inside the cage indicated the generated numbers (+1 and −1). This signal was transmitted with the help of two photocells (mounted outside the cage) to two relays which operated two corresponding 200-watt lamps, one inside the shack with the cat and one in a box outside the shack. One of these lamps, the +1 lamp, was turned on after each generated +1 and stayed on until a −1 was generated. The symmetric −1 lamp was turned on whenever the +1 lamp was turned off. The lamps were interchanged each day. The output of the RNG connected to the lamp in the shack was always called the +1 output. (Both outputs served, therefore, as +1 outputs equally often.) Electromechanical counters (two pairs, one pair of reset and one pair of nonreset counters) were mounted on the RNG.

The experiment was done in half-hour sessions on consecutive days in the afternoons. The numbers were generated at the rate of one per second, and each session comprised 1,800 trials. The cat was kept in the shack only during the sessions. Between sessions,

the machine was kept running continuously in order to verify its proper operation once more. During the sessions, the experimenter did not see the cat nor the test equipment. At the end of each session, the score was read from the counters and recorded.

Each of the first five sessions gave an above-chance scoring rate on the +1's; i.e., the lamp was on more than 50% of the time. Among the total of 9,000 numbers generated in these five sessions, 4,615 were +1's. This number is 115 above the expectation value, corresponding to a $CR = 2.42$.

At the end of each of these five sessions, the cat sat quietly next to the light bulb; at the end of the sixth, however, when the door to the shack was opened, the cat was hidden in a corner and raced out immediately. Four more sessions were held. In none of them did the cat again settle quietly next to the lamp. It seemed to have developed a dislike for the flashing lamp.

The generation rate of +1's in these last five sessions was no longer above the chance value but insignificantly lower.

The result of this experiment, although not highly significant statistically, suggested that a further study of PK involving animals might be worth while. Since the outside temperature had risen soon after the termination of the 10 sessions, however, this particular experiment was discontinued.

Tests with Cockroaches

The test animals in this experiment were cockroaches, and the stimulus was an unpleasant one, an electric shock. The numbers generated by the RNG, the same one that was used in an experiment with human subjects described earlier (2), were indicated by two small light bulbs. Whenever a +1 or a −1 was generated, the corresponding lamp was lighted for approximately 1/5 sec. Opposite one of these light bulbs a photocell was mounted which activated a battery-operated relay. This relay, in turn, applied a voltage to a shocking grid formed by aluminum foil strips 5 mm. wide and 2 mm. apart, glued on a plexiglass plate. The voltage was supplied by a 300-volt battery in series with a large resistor (usually between 5 and 20 megohms) such that the total current through the cockroaches would be prescribed. The grid was cleaned regularly with alcohol.

A. Exploratory Tests

These tests were done with 20 cockroaches (American cockroach, some adults and some nymphs). The smallest animals used were 15 mm. long.[2] Usually two (in a few cases, more or less) were placed on the shocking grid and were confined by a plastic box (10 cm. in diameter) with greased walls and open top.

The RNG was set to generate a total of 64 random numbers per run at the generation rate of typically one number per second. Whenever a +1 was generated, the cockroaches received an electric shock of 1/5 sec. duration. The shock level was adjusted so that the cockroaches reacted strongly but were not paralyzed. The experimenter watched the animals during the run, partly to keep the shock level well adjusted and partly to return to upright position the animals which had fallen on their backs.

Four runs, separated by short intermissions (typically two minutes) formed one session. Up to three sessions, separated by five-minute rest periods, were done with the same cockroach group on one day. The shock level usually had to be increased from one session to the next, sometimes even within the sessions, since the animals got somewhat habituated to the shock. If the cockroaches showed serious signs of paralysis at the end of one session, no new session was begun. After one day's rest, no after-effects from the shocks were observed.

In the exploratory test, 25 test-sessions were held in order to see if perhaps the cockroaches' obvious dislike of electric shocks[3] might cause the RNG to generate fewer +1's (which trigger the shock) than expected by chance. It was found, however, that in the total of 6,400 generated numbers, there were 109 more +1's than expected by chance. That means that the number of shocks administered by the random device to the cockroaches lay by 2.7 standard deviations above the chance level.

The magnitude of this deviation suggested that it might be a real

[2] Most of these cockroaches had been used in a previous exploratory test in which human subjects tried mentally to influence the animals to turn to the right or to the left in a Y-maze setup. In these tests electric shock was used to get the animals moving.

[3] This "dislike" is implied by the fact that a cockroach which has the choice between a shocked and a nonshocked grid selects the nonshocked grid.

effect, even though it raised the question of why a possible PK ability in cockroaches should work to their disadvantage.

B. The Confirmatory Experiment

This experiment was begun one month after the exploratory tests. Some of the cockroaches, those who had lost legs or antennae in fights, were replaced by new ones. It was decided to make a total of 100 sessions in this experiment. Again one session contained four runs; one run contained 64 generated numbers.

The experimental arrangement was the same as in the exploratory tests, with a few modifications: As before, the scores were copied from the two electromechanical counters (for the numbers of generated +1's and −1's) after each run; but in addition, the whole sequence of generated numbers was recorded automatically on paper punch tape. This provided a second, independent record, giving good protection against recording errors. Although the RNG had been tested extensively (2) when used in a previous experiment, it was left running during each night after a PK test as an additional randomness check. No bias suggesting a deviation from randomness was observed. In order to reduce the effect of any bias in the generator which might have escaped observation, both the generator outputs were used an equal number of times as +1 output, which triggered the shock.

A total of 25,600 random numbers were generated during the whole experiment. The expectation value for the total number of shocks is therefore 12,800. The number of shocks actually administered in the experiment was 13,109; i.e., 3.85 standard deviations above the expectation value. The direction of this deviation is the same as in the exploratory experiment. The probability for obtaining such a high or a higher deviation by chance is less than 10^{-4} (one-tailed).

The scoring rate was fairly steady throughout the whole experiment. Considering blocks of 10 consecutive sessions, the numbers of shocks above chance obtained in the 10 successive blocks were all positive: 44, 39, 22, 22, 26, 46, 29, 30, 38, 13.

A certain decline was observed within each session. The number of shocks administered in the first halves (the first two runs) of all sessions gave a deviation +228, and the number of shocks in all the second halves (second two runs) gave only a +81; but this decline is not statistically significant ($CR_d = 1.84$).

Discussion

In the reported tests with cockroaches, the experimenter was always present observing the animals. This suggests the possibility that the score may be due to PK exerted by the experimenter. In order to reduce such an experimenter influence, a new experiment was designed in which the cockroaches were tested automatically in the absence of any experimenter. These tests, which gave similarly significant results, will be reported later.

The fact that under the particular experimental conditions the cockroaches displayed PK-missing might be interepreted in several different ways. First of all, it might indicate that psi, in primitive animals, as in man, is a very elusive phenomenon. This indication is supported by one experiment, also to be reported later, where under only very slightly different external conditions no PK effect was observed. A second "plausible" reason for the possibility of PK-missing might be that cockroaches in their struggle for survival never encountered electric shocks and are therefore not prepared to cope with shocks effectively.

The mechanism by which the cockroaches could influence the random generator is certainly as unknown and inconsistent with present-day physics as is the mechanism by which a human subject can influence the fall of a die.

Without undue commitment to an unjustified speculative theory, one can say that in these experiments the random generator did not produce the numbers as randomly as physics would predict, but that the generated numbers apparently depended, in a way not accounted for by present physics, on the later effect they caused.

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