

Exploratory PK Experiments with Light as the Stimulus for Rodents, Insects, and a Plant

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1979

(Copy edited in 2007)

Published on the internet in pdf at
<http://jeksite.org/psi/lightpkf1.pdf>

(An abstract of this paper was published in the
Journal of Parapsychology, 1979, Volume 43, pp. 358-359,
and is available at <http://jeksite.org/psi/lightpk.pdf>)

If psi is a widespread property of life, then psi might be manifest in animals and possibly even plants. Methods need to be developed for testing a variety of living organisms.

After considering previous parapsychological research with animals, a method with the following characteristics was desired for testing rodents:

1. A PK test in which no conditioning or pre-testing is needed.
2. The stimulus would be such that the animals would not be under intense stress before or during testing.
3. The animals could be tested in their home cages and thus not required to adapt to a new environment or to be handled or gentled.

The use of light as an aversive stimulus met all the desired qualifications. It is well established that rats find bright light to be aversive -- particularly during the periods the rat is accustomed to darkness on a fixed daily light-dark cycle (e.g., Lockard, 1963; Campbell & Messing, 1969; Messing, 1972). The degree of averseness of light depends on the intensity of the light, the animals' previous light-dark maintenance, and the type and strain of rodent.

Light can also be used to test other organisms. Light is adverse for insects such as cockroaches and is beneficial for plants. This paper reports various exploratory PK tests were carried out using light as the stimulus.

Methods

A testing chamber 3 feet long by 2 feet wide by 2.5 feet high was constructed. A fixture with a 24" SunGro™ sunshine fluorescent light bulb was placed 25" above the bottom of the chamber. The SunGro bulb has a light spectrum close to that of the sun.

The light was turned on and off by a relay which was controlled by a time sharing computer. For each trial the computer collected a binary RNG decision from a Schmidt RNG interfaced to the computer and the light in the test chamber was either turned on or off.

The initial rats for testing were from the animal colony at the Institute for Parapsychology. The animal colony was maintained on a 12-hour darkness cycle with darkness from 9:00 PM to 9:00 AM. The light in the animal colony room was provided by four 48" fluorescent lights, two of which were SunGro bulbs and two were General Electric daylight bulbs.

The primary testing involved 3 Long Evans rats that were housed in separate cages (15" x 9" metal cages). Each of the 3 rats had unlimited access to a running wheel (14" diameter). A fourth rat was housed identically but was never tested for PK. Each revolution of the four running wheels was recorded on counters and also on a chart recorder.

As expected, the rats were essentially completely inactive during the light hours but ran heavily when the lights went out and then ran less through the later hours of darkness. The running wheels were intended to provide information about individual differences among the rats and possibly to give an idea of the disruptive effects of the testing sessions.

Each testing session began within 30 (usually 15-30) minutes after the room lights went out (at 9:00 PM) and consisted of 100 trials. Every three minutes an RNG decision was collected. If the decision was for the light to come on (i.e., a miss), the light was turned on for 45 seconds. Thus, the test animal was in darkness during most of the 5-hour test session. The timing parameters for the testing sessions were selected somewhat arbitrarily, based largely upon observation of the behavior of these and other rats when various parameters were used in preliminary sessions. There were at least two days, and often longer periods, between test sessions for any animal. The testing depended upon when I was available at that time of night.

Results

The PK results for the three hooded rats are summarized in Table 1. For the first study rat C1 showed missing on his six sessions, $t = -5.86$, 5 df, $p < .005$, two-tailed (i.e., the light came on more frequently than expected). Rat C2 showed suggestive hitting ($p = .06$, two-tailed), while the results for C3 were chance. In the second study, rat C1 showed significant positive scoring ($p < .02$, two-tailed) while C2 and C3 gave chance scores. In the third study only C1 was tested and the results were chance.

Table 1.
Summary of PK Results with Three Hooded Rats

| Rat | Study | Hits/Trials | % | CR | t |
|-----|--------------------|-------------|-------|-------|-------------------------|
| C1 | 1 (8/1975-9/1975) | 276/600 | 46.0% | -1.92 | -5.86, 5 df, $p < .005$ |
| | 2 (11/1975-5/1976) | 630/1200 | 52.5% | 1.70 | 2.83, 11 df, $p < .02$ |
| | 3 (10/1975-3/1977) | 758/1500 | 50.3% | ns | .55, 14 df, ns |
| C2 | 1 (8/1975-9/1975) | 270/500 | 54.0% | 1.74 | 2.53, 4 df, $p = .06$ |
| | 2 (11/1975-5/1976) | 509/1000 | 50.9% | 1.23 | ns |
| C3 | 1 (8/1975-9/1975) | 302/600 | 50.3% | ns | ns |
| | 2 (11/1975-5/1976) | 651/1300 | 50.1% | ns | ns |

Several aspects of these studies are interesting. In Table 2 the average scoring rate and the average number of revaluations ran per night are given for each rat for each month during the first year of testing. Two points are immediately apparent from Table 2. First, rat C1 showed a consistent incline in PK results from missing to hitting through the first eight months of testing, and then the results were chance in latter testing. Second, a particularly interesting finding is that rat C1 behaved conspicuously different than the other rats, as evidenced by the fact that during the first two months of testing, rat C1 ran almost twice as much as the other rats. These results are in line with the idea that special subjects are needed for successful animal research, a suggestion also arising from other experimental work with animals (see Davis, 1979).

It is perhaps noteworthy that the most interesting results were obtained with the first animal tested in the experimental series. As is obvious from Table 2, for all rats the amount of running decreased dramatically over the year of monitoring, indicating that aging was clearly having effects upon the rats' behavior. The amount of running varied widely between rats and from night to night for a given rat. The testing sessions had no noticeable effect on the amount of running. The running wheels occasionally jammed and would not turn, however, the wheels were checked at least once a day and usually two or three times, so jamming was not a significant factor in the variability in the monthly amounts of running.

Table 2.
Running-Wheel Activity by Month

| Month | Rat C1 | | | Rat C2 | | | Rat C3 | | | Rat C4 |
|-------|------------|------------|--------------|------------|------------|--------------|------------|------------|--------------|--------------|
| | N PK Tests | Ave. Score | Wheel Cycles | N PK Tests | Ave. Score | Wheel Cycles | N PK Tests | Ave. Score | Wheel Cycles | Wheel Cycles |
| 8/75 | 1 | 44.0 | 4652 | 1 | 53.0 | 2417 | 2 | 52.5 | 2304 | 2177 |
| 9/75 | 4 | 46.0 | 4391 | 2 | 56.0 | 2642 | 2 | 47.5 | 1381 | 1472 |
| 10/75 | 1 | 48.0 | 3074 | 2 | 52.5 | 2894 | 2 | 51.0 | 463 | 418 |
| 11/75 | 1 | 50.0 | 1684 | 2 | 45.5 | 3111 | 2 | 47.0 | 359 | 336 |
| 12/75 | 2 | 52.0 | 482 | 2 | 47.5 | 849 | 2 | 50.5 | 171 | 204 |
| 1/76 | 1 | 56.0 | 529 | 1 | 55.0 | 338 | 1 | 54.0 | 171 | 110 |
| 2/76 | 2 | 52.5 | 218 | 2 | 55.5 | 205 | 1 | 50.0 | 161 | 69 |
| 3/76 | 2 | 57.0 | 258 | 2 | 52.5 | 180 | 3 | 51.3 | 94 | 110 |
| 4/76 | 1 | 53.0 | 224 | 1 | 52.0 | 175 | 1 | 48.0 | 180 | 82 |
| 5/76 | 3 | 49.3 | 208 | * | | 148 | 3 | 50.0 | 171 | 87 |
| 6/76 | | | 298 | | | 127 | | | 167 | 75 |
| 7/86 | | | 204 | | | 114 | | | 169 | 65 |
| 8/76 | | | 89 | | | 89 | | | 123 | 44 |

Note: with 14 inch diameter running wheels, 1441 revolutions is equal to one mile.

* Rat C3 was tested 3 times in May, 1976. All 3 sessions had scores of 100/100. The RNG was an early model made by Helmut Schmidt. If the RNG was unplugged from its power supply or if the line voltage flickered, the oscillator would stop and have to be restarted by pushing a button. This is apparently what happened because the RNG functioned normally after the button was pushed. Various randomness tests before and during the testing showed no evidence of nonrandomness. A few sessions had to be discarded because of other equipment problems.

Other Tests

Several other rodents of various types, both laboratory animals and captured wild mice and rats, were tested individually or in pairs. Not having to handle the animals was a decided methodological advantage in dealing with the three large, vicious wild rats. The results are summarized in Table 3. All results were nonsignificant.

Three tubs of cockroaches were also tested. Each tub contained many cockroaches and cardboard pieces for the cockroaches to hide under. The cockroaches definitely preferred darkness, however, no evidence of PK was found (see Table 3) for any of the tubs.

Since the light bulb was designed for growing plants, a plant was also tested. An African Violet which appeared to be dying was tested with the light being on or off for the entire three minute interval. The testing of the plant and the cockroaches was done during the day when the

testing chamber was free. The odd number of trials for the plant is because the plant was tested on some-occasions right up till the time an animal session began.

No evidence for an effect on the RNG was found with the plant. The plant's condition continued to deteriorate. However, when the plant was left in the chamber during the day with the light on continuously (i.e., no PK testing), the plant subsequently began thriving. No further testing of the plant was carried out. This demonstrated the potential need relevance of the light for the plant.

Discussion and Conclusions

The use of light as a stimulus for psi experiments has several desirable features as a testing method and can be used with a variety of organisms.

The first rat tested produced noteworthy results, but the other tests of rodents, cockroaches, and a plant produced chance results. There was clear evidence that the light had need relevance for the cockroaches and plant. The cockroaches avoided the light, and that the plant needed more light for survival.

The suggestion that PK effects may have occurred for one rat that was behaviorally distinct from the others may be of interest to those investigating psi in animals. This work is only of suggestive value since the testing equipment (in particular the old RNG) was not as reliable as would be needed for conclusive work and the interesting results were only a part of the generally nonsignificant results.

If psi were a widespread ability of living organisms that had a significant role in life, the overall results of these experiments would have been expected to be more consistently positive.

The pattern of results may be consistent with experimenter effects rather than psi by the test subjects. In another line of research investigating physiological indications of paranormal anticipation, the author similarly found that that the first subject tested produced the strongest results and results that were independently significant (Kennedy, 1979). This may be evidence of a pattern associated with a particular experimenter that would presumably indicate experimenter effects (Kennedy & Taddonio, 1976).

TABLE 3
Other PK Tests with Light as the Stimulus (All Nonsignificant)¹

| Subject | Time of Testing | Hits/Trials | % ² |
|---|-------------------|-------------|----------------|
| 2 Male Albino Rats | 9/1975 – 12//1975 | 245/500 | 49.0% |
| 1 Male Albino Rat | 9/1975 – 12/1975 | 157/300 | 52.3% |
| 1 Male Gerbil | 9/1975 – 12/1975 | 163/300 | 54.3% |
| 2 Male Gerbils | 9/1975 – 12/1975 | 95/200 | 47.5% |
| Wild Mouse #1 | 9/1975 | 215/400 | 53.7% |
| Wild Mouse #2 | 9/1975 | 101/200 | 50.5% |
| Wild Rat #1, Male | 2/1976 – 3/1976 | 395/800 | 49.4% |
| 2 Male Hooded Rats - Cage #1 | 10/1976 – 3/1977 | 552/110 | 50.2% |
| 2 Male Hooded Rats - Cage #2 | 10/1976 – 3/1977 | 613/1200 | 51.1% |
| 2 Male Hooded Rats - Cage #3 | 10/1976 – 3/1977 | 557/1100 | 50.6% |
| Wild Rat #2, Female | 4/1978 – 5/1978 | 460/900 | 51.1% |
| Wild Rat #3, Male | 4/1978 – 5/1978 | 351/700 | 50.1% |
| Many Cockroaches, Tub #1 | 9/1975 – 10/1975 | 362/700 | 51.7% |
| Many Cockroaches, Tub #2 | 9/1975 – 10/1975 | 613/1200 | 51.1% |
| Many Cockroaches, Tub #3 | 9/1975 – 10/1975 | 557/1100 | 50.6% |
| Sick African Violet Plant (3 Minute trials) | 2/1976 | 375/746 | 50.3% |

¹Various preliminary sessions exploring parameters (primarily by watching the behavior of the test subjects) are not reported here. All data presented here for animals had an RNG decision every three minutes and the light came on for 45 seconds if the RNG gave a miss. (The plant had the light on for the entire three minute period.) A few other test sessions were left out because of equipment failure or because the data file was not properly identified.

²While the fact that 13 of the 16 series were above 50.00% is quite interesting, the randomness tests were not adequate to guarantee that a slight bias such as this could not occur for the over 11,000 trials reported in this table.

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