

## Psychokinesis

### Rhine's Early Studies



**J. B. Rhine conducting a PK experiment using dice in a mechanical dice tumbler.**

(Courtesy Foundation for Research on the Nature of Man)

In 1934, several months prior to publishing his famous paper on Extra-Sensory Perception, Dr. J. B. Rhine received a visit from a young gambler. After comparing notes on conditions for success in psychic testing, he remarked that similar conditions seemed to favor his luck in gambling. Furthermore, he claimed that he himself was sometimes able to exercise a mind over matter effect on dice-throwing games. While belief in such an influence on dice was both common and ancient, until then it had not been deemed a serious problem for scientific study. Rhine discovered that preliminary experimentation would be quick, easy, and inexpensive. The results proved encouraging enough to warrant further research.

Experiments continued during the next decade using protocols that systematically eliminated bias from unbalanced dice. The dice were placed in special cups, so subjects could not use special tricks to throw them. Still later, the dice were placed in electrically-driven rotating cages and were also photographed automatically in order to eliminate experimenter error. In general, the tests entailed asking the subjects to will the fall of the dice with selected target faces showing. Numerous throws were made in succession for each target before another target was chosen.

By the end of 1941, a total of 651,216 experimental die throws had been conducted. The combined results of these experiments pointed to a phenomenon with 10115 to 1 odds against chance occurrence. Nevertheless, Rhine hesitated to publish his results. The scientific world was still reacting emotionally to his announced proof of ESP, and he felt no need then to raise eyebrows by announcing another unorthodox discovery.

In 1942, with most of the staff at the Parapsychology Laboratory called away to war, continued experimentation in PK proved difficult. At this time, Rhine went over the records of earlier experiments so conducted that an analysis of position effects could be made, similar to the decline of high ESP scoring toward the end of experimental sessions, detected a few months earlier. If the above chance results had been caused by probability, artifacts, or illegitimate means, one would expect the distribution of hits would be consistent throughout the experiment and would not decline.

The results of this survey indicated there were more hits near the beginning of each run of 24 die throws. There were also more hits during the earlier runs of each

experimental session which would typically last for ten runs. These results were not expected or even considered by the experimenters and subjects at the time of the experiments. The odds against such distribution occurring by chance were about a hundred million to one. This evidence of a presumably psychological effect, similar to that noted with ESP, made a case for psychokinesis strong enough to warrant publication. The first of the papers appeared in the *Journal of Parapsychology* in 1943. Many others followed.

In 1946 a study was published that pitted the psychokinetic skills of veteran gamblers against those of divinity students. In this contest atmosphere, both groups scored well above chance expectations.

### **PK With Random Number Generators (RNGs)**



**PK test equipment**  
(Courtesy Helmut Schmidt)

The random number generator experiments pioneered by Helmut Schmidt, previously described as tests of precognition, have also been used extensively as tests for psychokinesis. As mentioned earlier, it seems theoretically impossible to clearly distinguish between psychokinesis and precognition in quantitative research. Generally, the tests for psychokinesis are those in which the experimenter instructs the subject to will or intend that a particular target be selected by the RNG. This reduces the possibility that the subject could be using precognition, but does not eliminate the possibility of experimenter precognition. The hypothesis of intuitive data sorting suggests that the subject might use precognition to start the RNG at the exact time required to match the preselected PK target sequence.

One interesting version of the Schmidt RNG studies involved the cooperation of Robert Morris and Luther Rudolph at Syracuse University, with the experimental protocol published prior to the beginning of the experiment. These studies, which used prerecorded targets, were reviewed by skeptic James Alcock in a report for the National Research Council's study on methods for enhancing human performance. Alcock, who had access to the pertinent raw data, admitted that this study was much better executed than other studies by Schmidt and merited further replication attempts.

An elegant and sophisticated research program involving Random Event Generators has been underway for a number of years at Princeton University under the aegis of Dean Emeritus of Engineering, Robert Jahn, and management of psychologist Brenda Dunne. Other staff members include psychologists Roger Nelson and Angela Thompson, electrical engineer John Bradish, and physicist York Dobyns.

In the formal test series, generation rates of either 100 or 1000 per second are used, and each trial comprises 200 binary samples. The count data are

permanently recorded on a strip printer as well as being entered on line into computer memory. The subject receives immediate feedback via electronic displays which show the number of trials, the number of hits in the last trial, and the average number of hits since some predetermined starting point. The REG and the on-line IBM PC/AT computer independently calculate the mean of each trial and the standard deviation for every block of fifty trials.



**REG Testing at the Princeton Engineering Anomalies Research Program**

The equipment can be run in one of two modes, either manual or automatic. In the former case, the machine will generate a trial only when a switch is pressed; while in the automatic mode, once started, the machine will automatically initiate a block of fifty trials.

There are two types of procedure, either "volitional mode," in which case the subject chooses whether to aim for a high score (PK+) or a low score (PK-) in a given run, or "instructed mode" where some kind of random process determines which way the subject is to aim. There are also baseline runs interspersed ("in some reasonable fashion," the nature of which is unspecified) with the PK runs; in this case the subject is to exert no influence, so that these will serve as a randomization check. The choice of volitional/instructed mode and automatic/manual mode are "normally left to the preference of the operators (subjects), but they are encouraged to undertake additional series employing the other modes for comparison."

The formal data base consists of well over 750,000 trials (or 150,000,000 binary digits) carried out on two different machines by thirty-three different subjects over a period of nearly ten years. Typically, a session had three types of trials: high aim, low aim, and a control series. Pooled, overall results of the high- and low-aim trials are clear: significantly higher scores for high aim; significantly low scores for low aim. The outcome of the control trials was illuminating. Here the subjects were told not to try to influence the REG. Presumably, they hoped their data would be "normal." In fact, although the mean score was almost identical with the theoretical mean, the distribution was unique: a statistically significant surplus of scores at the precise theoretical mean. When control, high-aim, and low-aim series are pooled, the distribution is what would be expected by chance. This result, which may be the consequence of the subjects' intentions to "achieve a baseline" in the control condition, shows the difficulty of conducting psi experiments with a true control group.

Interestingly, both earlier and later calibration trials nicely conformed to a normal statistical curve, showing that the equipment was probably operating properly. If psi is operating in the ostensible control tests, then the critics' demands for additional control tests seems naive.

Ironically, comparable results were obtained using a pseudo-random noise source (i.e., based on both computer algorithms and prerecorded targets). This finding makes it difficult to interpret the Princeton data in terms of a conventional psychokinesis hypothesis. How can one psychokinetically influence targets which have already been determined? For this reason, the Princeton team does not attempt to describe their research program as a test of PK, but simply refers to the program as a study of anomalous man-machine interactions.

The Princeton team has gone to great lengths to try to ensure that their equipment is unbiased. Internal circuits are continually monitored with regard to internal temperature, input voltage, etc. Successive switching of the relationship between the sign of the noise and the sign of the output pulse on a trial-to-trial basis was done to provide a further safeguard against machine bias. Results were automatically recorded and analyzed. Extensive tests of the machine's output and its individual components were also carried out at times separate from the test sessions. The provision of baseline trials interspersed with test trials provided a randomization check which overcame some of the weaknesses of Schmidt's procedure.

Psi researcher John Palmer has drawn attention to the fact that there is no documentation regarding measures to prevent data tampering by subjects. This is of concern since the subject was left alone in the room during the formal sessions along with the REG.

In evaluating these studies, skeptic James Alcock claimed that only one subject (Operator 10) accounted for virtually all the significance departures from chance in the Princeton studies. Noting that details regarding precautions against subject cheating were not specified, Alcock stated:

I am not trying to suggest that this subject cheated; I am only pointing out that it would appear that such a possibility is not ruled out. Had the subject been monitored at all times, such a worry could have been avoided or at least reduced.

The Princeton team has chosen a policy of keeping the identity of all experimental subjects anonymous -- among other reasons, in order to eliminate motivation for subjects to cheat. However, the fact that Subject 10 contributed considerably more to the database than any other subject, suggests that this individual was either a member of the experimental team or someone who had become a close friend of the experimenters. As such, Subject 10 might well have had access to information which would make it possible to tamper with the data recording system.

In response to the criticisms of Palmer and Alcock, the Princeton researchers have prepared a detailed analysis of the equipment, calibration procedures and various precautions against data-tampering. According to the researchers, the automated and redundant on-line recording of data preclude data tampering -- as does the protocol requirement that the printer record be on one continuous, unbroken paper strip. It would appear that all necessary precautions have been taken, short of submitting subjects to constant visual observation. The subjects are submitted to intermittent visual observation which the researchers believe is sufficient to control against tampering with the equipment, given their particular setup.

In further response to Alcock's critique, the Princeton team conducted further

analyses of the data which show that the anomalous RNG effects were contributed by most of the subjects, and were not dependent upon the scores of Subject 10. Several other subjects, who participated in fewer experimental trials, actually had scores with greater chance deviations. By analyzing the data from only the first series of 7,500 trials (1,500,000 binary digits) from each subject, it was possible to level the influence that Subject 10 exerted on the database. In this analysis, with each subject carrying an equal weight, the results were significantly beyond chance. Another analysis was conducted which eliminated all of the data from Subject 10. This, too, was statistically significant.

A comprehensive meta-analytic review of the RNG research literature encompassing all known RNG studies between 1959 and 1987 has been reported by Radin and Nelson, comprising over 800 experimental and control studies conducted by a total of 68 different investigators. The probability 597 experimental series was  $p < 10^{-35}$ , whereas 235 control series yielded an overall score well within the range of chance fluctuation. In order to account for the observed experimental results on the basis of selective reporting (assuming no other methodological flaws), it would require "file drawers" full of more than 50,000 unreported studies averaging chance results.

Some people seem to produce data in random number generator (RNG) experiments that display idiosyncratic patterning that appears to be consistent from one run to the next. To explore the idea of person-unique signatures, Dean Radin, working at Princeton University, used a powerful, new "neural network" computational technique that is proving to be adept at discovering weak patterns in noisy data.



**Dean Radin**

Neural networks are a form of parallel processing based upon research about how the brain encodes and processes information. The power of these networks rests upon the discovery that when numerous elementary processing units are richly interconnected under the right conditions, they can automatically learn to associate arbitrarily complex inputs with arbitrarily complex outputs. Information processing in these networks takes place in the interactions among large numbers of artificial neurons. Learning takes place by changing the interconnection strengths between neurons.

The study involved training a network to associate data with given individuals, then observing whether the trained network could successfully identify these people based upon new data. Two sub-datasets were required for each person: One was used to train the network and the other was used to see whether the trained

network could transfer its knowledge to new data. Thus, each series of 50 runs was split in half, using the first half as the training set and the second half as the transfer set. Results showed that these networks were able to learn to associate data with 32 different individuals, then, in statistical terms, successfully transfer that knowledge to new data.

### **PK Placement Studies**

A number of researchers have conducted studies designed to determine whether naked human intention could affect the movement of moving objects. The most recent version of this approach is the database of studies using a random mechanical cascade at Princeton University's Engineering Anomalies Research program. The experimental apparatus allows 9000 polystyrene balls to drop through a matrix of 330 pegs, scattering into 19 collecting bins. As the balls enter the bins, exact counts are accumulated photoelectrically, displayed as feedback for the operator and recorded by a computer. Subjects are asked to concentrate on shifting the mean of the developing distribution of balls to the right or left, relative to a concurrently developing baseline distribution. Over three thousand experimental runs have been conducted with twenty-five individuals. The results are significantly beyond chance expectation.



The Princeton University researchers note that virtually all of the statistically significant results have come from a deviation of the balls to the left of the baseline. This, they claim, cannot be attributed to any known physical asymmetry in the system.

### **Chinese Reports of Psychokinesis Associated with ESP**

Reports of psi research in China claim that certain subjects showed consistent success in ESP tests.,, A report from the Chinese Academy of Sciences states that if the ESP response was incorrect there was no change at the target; but that, in over 700 trials when the ESP response was correct, there was always an accompanying PK effect at the target location. These effects included clouding of X-ray or photographic film; or pronounced changes in the records of photoelectric tubes, thermoluminescence docimeters, or biological detectors. It should be noted, however, that the quality and reliability of reports of Chinese research is very inconsistent. At least one set of knowledgeable observers believes that some reported results resulted from slight-of-hand.

Scott Hubbard, Edwin May and Harold Puthoff at SRI International in Menlo Park, California, searched for such changes using a detector that the Chinese had found most sensitive -- a photomultiplier tube. ESP targets were slides of scenes from the National Geographic. There were four subjects with six sessions each. The pooled

sessions showed significant ESP success. The researchers then correlated ESP scores with four measures of photomultiplier output: low-amplitude increase and decrease and high-amplitude increase and decrease in number of pulses. One correlation was significant: the correlation with increase in the number of high-amplitude pulses, as the Chinese had reported.

### **PK Metal-Bending**

A renewed interest has recently developed in large-scale (macro) PK effects, particularly metal-bending. The most extensive research on metal-bending has been conducted by physicist John Hasted at the University of London's Birkbeck College.



**John Hasted**

His subjects were mostly adolescents who had developed an interest in metal-bending upon exposure to the public performances of Uri Geller. They were asked to bend or deform latchkeys or bars of aluminum alloy without touching them. The specimens were attached to resistive strain gauges or (in later work) piezoelectric sensors. Signals from these devices were then amplified and registered on chart recorders.

Actual bending was observed in only a minority of sessions, however anomalous signals frequently appeared on the chart records -- from sensors separated up to several feet from each other. This led Hasted to hypothesize an unknown form of conduction of electrical charge from the subjects' bodies through the atmosphere to the sensors.

Hasted claimed that the subjects had no opportunity to interact directly with the chart recorder. Furthermore, he employed dummy loads along with electrical shielding of the test channels to minimize global electrical artifacts.

Psi researchers have been rather reluctant to accept Hasted's findings. In part, this is because macro-pk effects remain very controversial. In part, as enumerated by psi researcher John Palmer, it is because Hasted's research procedures would benefit from additional refinements:

Even if one grants the paranormal origins of the signals, Hasted's methodology makes it difficult to draw valid conclusions about their nature, including whether or not they truly represent strain. Use of an inadequately fast chart recorder, failure to adopt proper principles of experimental design, and failure to use statistical analyses are the most serious problems. In particular, it is impossible to distinguish

basic physical characteristics of the phenomena from those correlated with preferences, attitudes, etc., of the subject or experimenter.

In general, "non-touching" is considered an essential prerequisite control for a variety of possible conventional influences in PK metal-bending research. However, some studies were conducted which allowed touching of the target specimens and, yet, still merit some scientific consideration.

One test used by Hasted employed a brittle alloy bar that supposedly could not be bent to a particular angle of deformation in less than a certain known time.



**Brittle alloy bars bent in Hasted's experiment**

When excessive force was applied it simply broke. The only way to bend it is to apply a small force slowly over time, which produces bend by a process known as creep. Hasted has reported bending of such alloys in well under the minimum time thought to be possible using a creep process.

Charles Crussard and J. Bouvaist, two French metallurgists whose research was funded by a metals company, took the following experimental measures in PK studies with a magical performer, Jean-Paul Girard:

- (1) All dimensions of metal strips or rods were measured before and after bending;
  - (2) The microhardness of the metal was measured at several points before and after bending;
  - (3) Residual strain profiles (measures of crystalline structure) were examined;
  - (4) Electron micrograph analyses of the fine structure of ultrathin foil specimens were often made;
  - (5) Analyses of the chemical composition at various places along the strip or rod were made.
- Additional precautions included consultations with magicians, video recording of trials, and the marking of test specimens.

Crussard and Bouvaist described eight of 20 trials conducted with Girard. The specimens were bars of aluminum alloys, stainless steel cylinders, and Duralumin plates. During the trials, Girard was allowed to touch and hold the specimens, while at all times being observed by the experimenters. Bending was observed in four of the specimens. Structural changes inconsistent with physical bending were found for a stainless steel cylinder and Duralumin plate.

Since Girard is a conjurer, researchers are cautious in interpreting the above results. In his 1985 evaluation for the U.S. Army, psi researcher John Palmer reached the following conclusion with regard to this report:

Only in the case of the bending of one of the aluminum bars do the controls as reported seem to completely rule out the possibility of Girard substituting previously deformed specimens for the test specimens. Nonetheless, the assumptions that must be made to explain away these results seem rather farfetched.

### **Bio-PK**

A number of studies are suggestive of the possibility that conscious intention can influence the growth and movement of biological targets. One of the first of these involved the one-celled protozoan, paramecium. The organism was centered under the cross hairs of a microscope, and it moved with significant frequency into the randomly selected quadrant of the field. Water fleas observed under a microscope turned in the randomly selected direction, i.e., either right or left, with greater frequency than these crustaceans turned in the opposite direction. Significant results were also obtained in mentally directing ants to carry away matches on the selected side of a wooden slide. Carroll B. Nash conducted an experiment in which bacterial growth was psychokinetically accelerated and retarded according to the intentions of randomly selected college students.



**Carroll B. Nash**

In two separate studies, the growth of fungus was less when an attempt was made to mentally retard it than was the growth in the controls., Physicist Elizabeth Rauscher conducted a study with biochemist Beverly Rubik in which bacteria exposed to an antibiotic grew more rapidly in a sealed tube surrounded, but not touched, by the hands of psychic healer Olga Worrall than in tubes not treated by her.



**Beverly Rubik**



**Elizabeth Rauscher**

(Further experimental work in the area of healing is reported in the section on potential applications of psi.)

In a study following up on his earlier finding correlating students' intentions with bacterial growth, Carroll B. Nash conducted another study looking at mutation rates. He put suspensions of *E. coli* into nine tubes, in a 3x3 arrangement, for each of 52 subjects. He randomly designated one set for rapid mutation into another strain, one set for inhibition of mutation rate, and one set for control. He arranged that the subjects would know the instructions but the student experimenters would be blind. The rapid mutation tubes showed significantly more growth than the inhibition tubes. The promotion tubes had nonsignificantly more growth than the controls; the inhibition tubes had significantly less.

In a computer automated study, Charles Pleass and N. Dean Dey, at the University of Delaware, tried to have subjects use PK to speed or to slow the swimming of algae. They measured swimming speed by the Doppler effect of laser light, which does not affect algae adversely. Each experimental run was preceded by a control run. A run consisted of the collection of 1,000 data points and ordinarily took thirty seconds. Each subject participated in ten runs. Data analysis showed differences in speed, in the anticipated direction, between scores for PK and control runs, and also indicated changes with the subject's mood and with differences in the instructions.

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