14/08

INSTITUTO DE
PSICOLOGIA
PARANORMAL

BIAL FOUNDATION RESEARCH PROJECT
2008-2009

FINAL REPORT

ENHANCING PSYCHOKINESS TASK PERFORMANCE: VOLITION AN OTHER ATTEMPTS TO STUDY PK PERFORMANCE THROUGH THE PRACTICE OF IMAGERY STRATEGIES

By Alejandro Parra, Juan Manuel Corbetta & Irma Caputo

INSTITUTE OF PARANORMAL PSYCHOLOGY, Inc.
Salta 2015 (C1137ACQ) Buenos Aires, Argentina.
rapp@fibertel.com.ar

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ABSTRACT

Two studies were done exploring the effectiveness of two PK imagery strategies derived from a survey of popular writings on how to develop psychic skills. Goal-oriented imagery involves visualizing only the final outcome or desired goal; process-oriented imagery involves visualizing some sort of process gradually leading up to the desired final outcome.

In the first study, 16 subjects were asked to bias the behavior of a visual display controlled by a random number generator, using each imagery strategy half the time (8 runs of 16 trials for each strategy). There was significantly positive overall evidence for PK ($p < .02$) and for PK during goal-oriented imagery ($p < .01$). If one considers the subject as the unit of analysis, subjects' overall scores differed significantly from chance ($p < .05$); neither imagery strategy produced scores that differed significantly from chance, and goal-oriented scores did riot differ significantly from process-oriented scores. In a second study, 20 new subjects attempted the same PK task, using each imagery strategy half the time. Ten of these subjects had previously experienced some sort of mental development training (the MD group) and 10 had not (the NMD group). An analysis of variance revealed that goal-oriented imagery scores were significantly greater than process-oriented scores, that prior training was not itself a significant factor, but that imagery strategy and prior training interacted significantly ($p < .02$). MD subjects showed little difference in imagery scores; NMD subjects showed a strong difference in favor of goal-oriented imagery. Subjects in this study were asked to practice concentration enhancement exercises and return in two weeks to repeat the PK procedure, this time using their preferred imagery strategy for all 16 runs. Eight subjects chose the goal-oriented strategy; their scores were significantly above chance ($p < .01$). Eleven subjects chose the process-oriented strategy; their results were at chance. The difference between the two groups was significant ($p < .02$). Thus the goal-oriented imagery strategy appears to be more effective than the process-oriented Strategy, at least for those with no prior exposure to mental development training.

In the second study, we investigate the effects of two psychologically distinct techniques of attempting to influence falling dice. In the first technique ("conscious concentration"), the subject was requested to attempt, by consciously focusing his willpower and inducing a tension in his muscles, to force the dice to fall with the target face upward. In the second technique ("visualization"), the subject was asked merely to visualize the desired face while in a state of relaxation. Marginally significant evidence of psi-missing was obtained in the conscious concentration condition ($p < .04$), but chance results under the visualization condition. The difference in scoring rate between the two conditions was significant at the .05 level. The author, a graduate student in psychology, is unable at present to continue what he regards as a promising pilot study.

PROJECT BACKGROUND AND CONCEPTION

Introduction

There are many studies that have explored methods that might enhance the operation of psychokinesis. The studies are divided into six main categories: (a) hypnosis, (b) yoga and meditation, (c) relaxation, (d) feedback, (e) negative reinforcement and punishment, and (f) visual imagery. A distinction is made between training studies and studies conducted to explore the effectiveness of certain methods. Most of the studies investigated methods that might facilitate the operation of PK on a single occasion. The designs of the studies are described, and their results are presented and discussed. Several improvements and suggestions are considered for future research into methods of enhancing and potentially training PK.

A large body of controlled studies is available on possible ESP-conducive methods in the experimental environment. (See Honorton, 1977b, for a review of yoga and meditation work; see Honorton, 1985, and Stanford, 1984, for Ganzfeld work; see Honorton & Krippner, 1969, and Schechter, 1984, for hypnotic-induction work; see George & Krippner, 1984, for mental imagery work; see Honorton, 1977b, and Mishlove, 1983/1988, for relaxation work; see Palmer, 1978, 1986, for feedback training work.) However, less attention has been paid to potentially PK-conducive methods. This chapter surveys studies that have explored methods to facilitate PK. Research in this area may eventually enable us to bring PK phenomena to such a level that they may become more reproducible on demand and therefore more readily available to scrutiny.

The solutions to many problems facing parapsychology, such as building and testing theories, depends on the researchers having a reliable procedure to generate measurable psi. Not enough reliable high-scoring participants turn up in experiments, and those who do are liable to lose their ability to score highly after a period of time (Thouless, 1964, p-71). John Beloff (1967) states: "Progress is possible in science only when the relevant phenomena are available for research" (p.120). Gardner Murphy (1969, p.3) wrote that the problem of

Cultivating "good psychic participants" was really the beginning and the center of all Psychical research. According to Murphy, the cultivation of the "paranormal gift" (p.10) was similar to the cultivation of almost any other kind of gift –whether playing the piano or learning to wiggle one's ears.

The assumptions behind the studies in this review are that "trainable" PK ability may exist, and that this ability can possibly be brought to such a level through practice that it becomes amenable to systematic research. It is possible to distinguish between a training study and a study conducted to explore the effectiveness of a certain method. The term "training" denotes, generally, the process of bringing an organism's performance, such as making specific response(s) or engaging in complex skilled activity, to a previously agreed upon improved end state of proficiency by a specific instructional program or structured manner of practice. The experiments cited here were not necessarily aimed at training PK. Most of them explored methods that might facilitate the operation of PK on a single occasion. Strictly speaking, a training study would involve repeated sessions and emphasize a process with actual training goals in mind.

The studies of potential PK-facilitating methods have been broken down into six main categories: (a) hypnosis, (b) yoga and meditation, (c) relaxation, (d) feedback, (e) negative reinforcement and punishment, and (f) visual imagery. These particular methods were selected because, if they can be shown experimentally to be PK-conducive, they could be used without too much difficulty in a specific instructional program aimed at bringing participants' PK performance to a high and consistent scoring level. It should be noted that each method does not necessarily demand a facility specific to a given form of psi. In fact, the faculties called upon to perform each method do not appear to be independent; most methods explicitly or implicitly call for one or more of the others (e.g., meditation probably involves relaxation to some degree).

The questions of primary concern were:

(a) what studies can be regarded as having explored potentially PKconducive methods,

(b) how were they designed, and W what, if anything, do they suggest regarding future research into the possibility of training PK?

Hypnosis-PK Studies

Rhine (1946) reported an exploratory study examining the effects of hypnosis on PK performance. Five participants participated individually, aiming to influence the fall of 96 dice at a time. The session began with a prehypnotic control series. Each participant was then hypnotized. While in that state, the participant was instructed that he or she would have great confidence in his or her ability to make the dice behave as he or she willed and would be able to influence the dice by concentrated effort. Following these suggestions, the participant was dehypnotized, and he or she then carried out the same PK task as before. Although the participants' PK scores were above chance before hypnosis (mean scores = 4.19, MCE = 4.00), the scores dropped close to chance following the hypnotic suggestions (mean scores = 3.99). Two participants were rehypnotized and given suggestions that they would take part in further tests but this time they would feel free and easy about the tests, be relaxed and would throw the dice in the spirit of a game that they would enjoy. Both participants scored above chance (both with mean scores of 4.29) and significantly higher than on the first posthypnotic occasion (where one obtained a mean score of 3.74, and the other a mean score of 3.70).

Breederveld and Jacobs (1979) conducted a study to test whether hypnosis combined with suggestions of high scoring would lead to better PK results compared to no hypnotic induction. The PK test was a public German lotto game, in which six winning numbers were chosen on a weekly basis from numbers between 1 and 49. The selection was broadcast live on television. Five experimental series were conducted, each with about 10 sessions. Prior to the first experiment six numbers were chosen as the target, and the same six numbers used each session. The single participant observed the results of the drawing usually on TV, either under hypnosis or in a waking state. The assigned condition depended upon circumstances, hypnosis usually being carried out when the participant was at home. When hypnotized, the participant was told that he would observe the selection of the winning lotto numbers and that

these numbers would match the preselected target numbers. After observation of the lotto numbers the participant was dehypnotized. The results showed an impressive difference in hits between hypnosis and the waking state (p diff. = .002) in favor of hypnosis. However, on closer examination, the psi-missing that occurred in the waking condition contributed more to the difference in scores than the psi-hitting under hypnosis.

Yoga and Meditation

As with hypnosis, which originated in Western culture, yoga, which originated in Hinduism in India, and meditation have often been regarded as techniques for facilitating psi. The idea that psychic abilities manifest as a by-product of meditation can be traced back to the early writings on yoga (Eliade, 1954/1971; see also Josephson, 1983; Shearer & Lannoy, 1982). Research attempts to validate ESP claims made specifically for yoga have been minimal but apparently successful (Dukhan & Rao, 1973; Motoyama, 1969; Schmeidler, 1970); the majority of studies available are on claims made for meditation in general (Honorton, 1977b; Mishlove, 1983/1988). Honorton (1977b) put both meditation and yoga studies under the heading of "meditation." The combined results for all of the studies involving psi tasks during or following "meditation" were highly significant (Honorton, 1977b, p.442). See also Braud (1990) for a brief review of the studies presented in this section.

Winnett and Honorton (1977) reported an experiment with 10 recent initiates of Ajapa yoga. Ajapa meditation combines an alteration in breathing with a concentration on a mantra. The testing apparatus PSIFI (PSI Feedback Instrument), had a noise-driven binary random number generator (RNG). The PIC task was a standard binary outcome "coin-flipping" type of test (p = .5). PSIFI could present various types of feedback sounds for each hit and physiological biofeedback (see details in May, 1976). Besides a manual choice, PSIFI had an optional auto-alternating mode that automatically reversed the target definition between heads and tails every (p = .003), thus supporting the authors' hypothesis that meditation facilitates the operation of the alleged PK faculty.

Schmidt and Pantas (1972a) reported two experimental series using an electronic RNG machine. The machine had a panel with four lamps, four corresponding pushbuttons, and two display counters. Whenever a button was pressed, the RNG randomly lit one of the four lamps. If the button press corresponded to the lamp that was lit, the trial was a hit; if it did not correspond, it was a miss. Only the second experimental series is of concern here because it involved Zen meditation (see also Schmidt & Pantas, 1972b). It was done with a single participant, Pantas, who had found in *self-tests that* he scored exceptionally high when he was in a very relaxed but alert state, and that he could induce such a state with the help of Zen meditation. Before each of 20 sessions, Pantas practiced Zen meditation for about 20 minutes in front of the test machine. Then, while remaining in a *relaxed, alert* state, he completed 25 trials on the machine. The PK results proved to be positively significant ($P<.005$, one-tailed).

Schmeidler (1973b) *tested three* participants, one of whom had "had considerable experience with meditation" (p.64). The target apparatus was a thermistor that was placed at some distance from the participant. Instructions were to make this target hotter or colder in a counterbalanced sequence. The scores of the meditator showed a significant difference in accordance with instructions (psi-hitting) in his first halfsession ($p<.001$) and a significant difference counter to instruction (psi-missing) in his second half-session ($p<.001$). In this study the "psychic" Ingo Swann was involved as one of the three participants. Although Swann was not the meditator his results are worth mentioning *because he* used a novel way to influence the target. Out of 10 half-sessions, *seven showed* significant differences in accordance with instructions. (The overall results are not provided in the report.) Swann had previously been involved in an unconventional form of mind training associated with Scientology. He felt he was able to dissociate his consciousness from his body at will (Stanford, 1977a, p.344; Swann, 1975). Swann *reported that* he used PK by "exteriorizing" (or going "out of the body") to mentally inspect or "probe" the target (Schmeidler, 1973a, pp. 331, 335).

Braud and Hartgrove (1976) *reported a* study in which 10 long term practitioners of Transcendental Meditation (TM) were matched with 10 nonmeditators (control group) who were selected from individuals attending introductory lectures on TM. Each group was given

clairvoyance tests and a PK test that involved influencing a Schmidt RNG without feedback. For the PK task, the RNG produced sequences of binary random numbers, +1 or -1. Half of the meditator and nonmeditator participants attempted to increase the frequency of +Is, and the other half attempted to increase the frequency of -Is. The PK trials occurred during a 20-minute meditation period for meditators or a 20-minute rest period for nonmeditators. A fiveminute period followed during which the participant was to gradually terminate his or her meditation or rest. Although meditators scored significantly higher than nonmeditators on the clairvoyance task, the two groups did not differ significantly in PK scores. Neither group attained PK scores differing significantly from chance. Combining the two groups yielded significant PK-missing overall ($p = .034$, twotailed).

Honorton and May (1976) did a study with 10 participants who received both auditory and visual feedback on the PSIFI binary RNG previously described. All runs were performed in the auto -alternating mode, which automatically reversed the target definition ("heads" or "tails") every other trial. Six of the participants were meditators. Each participant completed five high-aim runs trying to score above chance level and five low-aim runs trying to score below chance. The participants scored significantly above chance in the high-aim condition ($p = .009$, one-tailed), but nonsignificantly below chance in the low-aim condition. The difference between the two conditions was significant ($p = .035$, one-tailed). Post hoc analysis showed that five of the participants obtained individually significant differences in the expected direction ($p = .00006$), of which four were meditators (Honorton, 1977b, p.442). The probability that four of the six meditators would obtain independently significant results at the .05 level was itself highly significant ($p = .00009$). Honorton and May noted a significant decline effect even though participants received both auditory and visual feedback.

Honorton (1977a) reported a PIC pilot study with a single practitioner of TM. The PIC task was PSIFI in the auto -alternating mode. Trial-by-trial auditory feedback was provided in pre- and postmeditation phases. In the first half of the 10 experimental runs of the pre- and postmeditation phases, the feedback signal was associated with hits (high aim); it was associated with misses for the second half of the runs (low aim). The participant was blind as to the feedback contingencies. In the premeditation phase, neither the five high aim nor the

five low aim runs differed significantly from MCE. PIC trials during a 25-minute meditation period without any feedback were also nonsignificant. Postmeditation PK scores were significantly above MCE during the high aim period (p = .024, two-tailed) and nonsignificantly below MCE during the low-aim period. the difference between the two periods being significant (p = .0054, two-tailed). Honorton concluded that PIC can be guided by directional feedback and that a nearly significant PIC effect obtained during meditation without feedback suggested that feedback may not be a necessary condition for P1C.

Schmidt and Schlitz (1989) reported a study in which 96 meditators were cornpared with 181 nonmeditators on PK tasks involving prerecorded random events (see, e.g., Schmidt, 1976). Signals from a binary RNG were recorded and transferred to cassette tapes as sequences of different types of tones/sounds. The tapes were mailed to each of the participants, who listened to them at home while trying to affect the tones/sounds (and by doing so, actually trying to affect the binary sequences). The study was divided into eight experiments, each with different forms of tonelsound displays and different tasks for the participants. In one study, for instance, each cassette tape contained 320 random length intervals of melodic tone alternating with 320 random length intervals of a tumbling notse. The alternating tone and noise intervals were divided into 10 runs of 32 tone-noise pairs each. The participants' task in this experiment was to extend the melodic tones and to shorten the noise intervals. At the start of the study, Schmidt and Schlitz sent the participants a questionnaire asking whether the participants had ever practiced meditation. (Only those cassette tapes that were used after a participant had completed and returned the questionnaire were included in the analyses.) As predicted, the meditators scored above chance (p = .00047, one-tailed), whereas the others obtained a near-chance score. The difference between scores of meditators and nonmeditators was significant (p = .00074, one-tailed). Control prerecorded RNG sequences, which nobody attempted to influence, were at chance.

Relaxation

According to Honorton (1977b, p.452), the first systematic experimental investigation of the possible role of relaxation in extrachance ESP performance was initiated by Schmeidler

(1952; for an earlier suggestion of the importance of relaxation, see Sinclair, 1930/1962, pp. 116-128). Taking up the thread about 20 years later, Brand and Braud (1973) reported a series of exploratory experiments in which they attempted to assess the effects of a modified Jacobson's progressive relaxation technique on ESP. Since then, a growing body of evidence has suggested that relaxation techniques may in fact facilitate positive ESP scoring (for overviews, see Honorton, 1977b; Mishlove, 1983/1988). A group of models have been developing hand in hand with contemporary relaxation-ESP research (Brand, 1975, 1978c; Braud & Braud, 1974, 1977). These models are by and large an elaboration and extension of Honortor~s "noise reduction" model (Honorton, 1974a, 1974b), which proposes that ESP may be facilitated by the reduction of external and internal stimulation or "noise," and a concomitant redistribution of attention inwardly on internally mediated mental processes.

Honorton and Barksdale (1972; see also Honorton, 1972) published three exploratory PIC experiments. In the first experiment, six participants simultaneously attempted to exert a group PK influence on the frequency of red versus green light flashes produced by a Schmidt binary RNG. The participants did 80 16-trial runs under two conditions: muscle tension and muscle relaxation. Within the two conditions, half the runs were carried out under instructions for active concentration (i.e., exerting conscious effort toward the target light), and the other half of the runs for passive concentration (i.e., no conscious effort directed toward controlling the target light). The experimenter (Honorton) always activated the generator for the group. Overall results were statistically significant ($p<.04$, two-tailed), as was the difference between the muscle tension and relaxation conditions ($p<.02$, two-tailed). Runs following muscle tension suggestions were independently significantly above chance ($P< .00\ 5$, two-tailed). The only significant interaction effect involved the passive concentration-muscle tension runs, which yielded a positive deviation from MCE ($p<.002$).

A replication was attempted in a second experiment with 10 participants working individually. Barksdale served as the experimenter, but no significant results were obtained. The muscle tension runs were slightly but nonsignificantly higher than the relaxation runs. In the third study, Honorton served as the only participant. He not only scored significantly above chance

on the muscle tension runs (P<.00005), but the relaxation runs were significantly below chance (p<.0005). The difference between the two conditions was significant (p<.0005).

Apart from the Honorton and Barksdale study, there does not seem to be any study on record that has explored directly the effect of relaxation on PK performance in comparison with a different condition. Although the possible relationship between PIC and relaxation has received little empirical testing, a few researchers in the literature have employed relaxation suggestions as a part of their PK experimental design in one form or another and are thus relevant. Braud, Smith, Andrew, and Willis (1976) reported three studies involving an electromechanical RNG. The device had a series of eight lights that started by flashing rapidly but came to a halt randomly, resulting in one of the eight lights remaining on. The task was to try to make the remaining light stop on either the right or left side of the display panel, whichever was the target side. In the first experiment (see also Andrew, 1975), 10 participants listened to a tape recording of nonanalytical, 11 noninterpretive" sounds including music, natural environmental sounds, and electronically synthesized sounds suggesting depth and imagery (Mode 1). Ten other participants engaged in analytical, verbal, logical, and mathematical tasks (Mode 2). Before engaging in Mode I or Mode 2 activities, during which they attempted to influence the RNG, the participants listened to a 10-minute version of a progressive muscular relaxation tape. The participants in Mode I showed significant PK-hitting (p = .02), whereas the participants in Mode 2 demonstrated significant PK-missing (p = .011), and the difference between the groups was significant (p<.002, two-tailed).

In the second experiment, 20 participants were assigned to each group. Before listening to the 23-minute long Mode 1 and Mode 2 tapes, during which they attempted to influence the RNG, the participants listened to a brief tape of progressive muscular relaxation. There was significant PK-hitting in Mode I (p = .025, one-tailed), chance performance in Mode 2, and a significant difference between the two conditions (P<.05, one-tailed). In a third experiment, both groups scored at chance levels, although Mode I subj(~cts did slightly better (and showed nonsignificant PK hitting) than Mode 2 participants.

Braud and Braud (1978,1979) conducted two experiments, the second of which is relevant because it involved relaxation. The PIC task was a Schmidt binary RNG attached to a display consisting of 12 small lamps in a circular clock-face array where one of the lights would randomly turn on either clockwise or counterclockwise next to the previous light th4t was lit. The second experiment was conducted in the absence of immediate trial-by-trial feedback (i.e., the display was darkened). Twenty participants were instructed to maintain an attitude of "passive volition" toward the PK task. A 57-minute instructional audio tape was played to the participants that consisted of a musical introduction, progressive muscular relaxation exercises (with alternate tension omitted), autogenic phrases, suggestions for mental stillness and quietude, "effortless intention" instructions, and so forth. Significant above chance scoring was obtained ($P<.05$, one-tailed).

Debes and Morris (1982) tested 32 participants on a computer test called "Horizon," in which pyramid-shaped lines from the top center of the computer screen simulated a sort of reclining panel. A trail of randomly behaving dots descended down the screen, and the participant's task was to attempt to deflect the trail to either the left or the right side of the pyramid panel, depending on which side was the assigned target. Half of the participants were encouraged to use PK by adopting relaxed and noncompetitive strategies (nonstriving instructions). The other half were asked to adopt active and competitive strategies (striving instructions). The latter group was also asked to engage in active imagery, such as putting an imaginary wall in the center that prevented the target line of dots from crossing to the nontarget side. An ANOVA showed that scores were significantly higher for participants instructed to relax than for those instructed to strive and engage in active imagery. Scores for participants instructed to relax were significantly above chance ($p<.002$), whereas scores for participants instructed to strive for success were significantly below chance ($p<.01$).

In addition to the above studies, some studies have examined the relationship between alleged PK and anxiety (Broughton & Perlstrom, 1985a, 1985b) and disruption of attention (Stanford & Kottoor, 1986). These studies suggest that high anxiety and disruption of attention may lead to lower PK scoring than do relaxed mental states. Schmeidler (1987, p.17) suggested that such studies can be regarded as indirect research into the role of

relaxation, because anxiety implies tension, and low anxiety implies relaxation, and disruption of attention implies the opposite state to that of relaxation.

In a dice-throwing experiment, Pratt and Woodruff (1946) noticed that when the two participants threw for a new target face, there was suggestive evidence of a "lag effect," that is, a tendency to score a hit for the face used immediately before as the target. The number of hits made upon the preceding target face was significant ($p = .03$).

Some 30 years later, Stanford and Fox (1975) conducted an experiment in order to test whether there may be a release-of-effort effect in PK. They hypothesized that PK scoring might be enhanced immediately after participants cease attempting to consciously exert PIC influence as contrasted with any PIC effect shown during the period of intention or effort. Thirty-six participants individually attempted to influence the electrical resistance of a light-stimulated photocell placed in a light-tight box. The changes in the photocell were registered by a polygraph, both when the participants attempted to exert PK influence on the target box as well as when they ceased concentrating (to measure the effect of release-of-effort). During the effort period, 12 participants received no feedback on their performance, 12 obtained false positive feedback followed by negative feedback, and 12 got continuous false negative feedback. The results showed significantly greater activity during the release-of-effort period than during the effort period for all three conditions (for the nonfeedback condition the difference between the two periods yieldedp<.02, for the false positive feedback followed by the negative one p<.001, for the false continuous negative feedback P<.05).

Subsequently, Millar (1976) conducted a study in which 20 participants attempted to generate a PK effect on a thermistor by making it hotter or colder according to instructions. Temperature changes were recorded both when the participants tried to influence the target as well as during rest periods to test for release-of-effort effects. Only one participant obtained results significant at the .05 level (which is about what is expected by chance). This result was in the opposite direction to the instructions and was attained in the release-of-effort period. Stanford (1977a, p.336) pointed out that the periods of effort and release-of-effort in the Millar

study did not appear to be comparable to those in the Stanford and Fox study, but he did not elucidate further.

Palmer and Kramer (1984) conducted a complicated study to examine the effect of various conditions on PK. The 48 participants were each assigned to one of three conditions, and each participant completed one session with three 2,500-trial sets. The PK task was an electronic noise RNG that on each trial sent eight binary digits to a microcomputer. The most significant digit constituted the PK target. Three induction tapes were made: One had drum beats intended to promote effortless focusing of attention on the target, another contained suggestions for progressive relaxation (this tape was in two parts, A and B), and the third tape included the playing of lively music. In Condition 1, participants first listened to drums (for Sets I and 2), and then to the Relaxation A tape (for Set 3). In Condition 2, participants listened to Relaxation tape A (Set 1), followed by music (Set 2), and then to the drum tape (Set 3). In Condition 3, participants first listened to Relaxation A and B (for Sets I and 2, respectively) and then the drum tape (Set 3).

All participants attempted to influence the RNG during silence following the relaxation tape and also during the drumming. To test for a release-of-effort effect, PK data were collected immediately after Set I without the participants' knowledge. The end of Set I was marked by a signal to stop concentrating on the RNG. The results showed that the absolute CR scores of the sets (i.e. the score regardless of its sign) were significantly higher in the experimental series than in baseline tests. The baseline tests were made by one of the experimenters and were significantly below chance. The PK scores that were collected during Set 2 (without the participants' knowledge) were significantly above chance in the experimental series, thus confirming the releaseof-effort hypothesis. The drum beat did not seem to facilitate PK scoring.

In a follow-up study, Palmer and Kramer (1987) tested 48 participants on the same RNG-PK microcomputer test that was used in their previous study. In a single session, three sets of 2,500 PK trials were generated. Set 1 was generated when participants attempted to influence the RNG immediately following a progressive relaxation tape. The participants were

instructed to merge their consciousness with the computer while focusing on the target number. The end of the effort period was signaled by a tone after which music began playing. To test for the release-of-effort effect, Set 2 was generated during this period without the participants' knowledge. Following the music, a tape of loud drum beats started playing during which Set 3 was generated. The participants were instructed to influence Set 3 in the same manner as they did for Set 1. The prediction that the trials of Set 2 would deviate positively and significantly from chance was not confirmed, and the scores were in a nonsignificant, opposite direction from that predicted ($z = -0.30$).

Related to the release of effect is the so-called "linger effect," which Watkins, Watkins, and Wells (1973; see also Wells & Watkins, 1975) noted in their experimentation. They had participants, who had demonstrated PK ability previous to the experiment, attempt to awaken one of two anesthetized mice lying on a table, one on each side. They noticed that the participants failed to produce a significant effect when the assigned target side (left or right) was randomly varied from trial to trial, but did well when one side was used as a target throughout half of a given run. This led them to predict that a target area may become "sensitized," or retain some sort of effect that may have been previously imposed on it. To test this hypothesis, they conducted two series of experiments in which the participants exerted their influence in the first half of the given runs but the participants were absent during the second half of the runs. The first halves of the runs showed significant faster awakening for the mice on the target side (for Series I and 2, $p = .003$ and $p = .04$, respectively), and in the second halves the mice on that particular side continued to awaken first (for Series I and 2, $p = .002$ and $p = .05$, respectively), thus confirming their hypothesis.

Feedback

Tart (1966; see also Tart, 1975, 1976, 1977) has suggested that providing immediate trial-by-trial feedback of ESP-hitting can increase correct ESP responses as long as the participant has some psi ability to begin with. Reviews of studies that have been conducted to test the efficacy of Tart's feedback training method have been provided by Palmer (1978,1982), Tart et al. (1979), and others. Given the reported tendency for psi scoring to

decline over time, Palmer (1978, p.187) concluded that feedback did indeed have a tendency to stabilize ESP scoring and perhaps to enhance it in some cases.

Most of the work on PK has involved essentially immediate feedback regardsuccess. Tart has argued that providing participants with immediate trial-by-trial -.zdback might be the same as reinforcing them. Gissurarson (1990) pointed out, w,-ever, that it is possible to distinguish between feedback and a reinforcer, and providing participants with feedback about their performance is not necessarily the 7ne as reinforcing them.

In the PK situation, "feedback" refers to the information provided to a PK agent the consequences of his or her PK efforts. The feedback may take different forms. instance, Braud (1978a) reported a PK design involving "biological" feedback. agent's task was to attempt to after the amount of galvanic skin response (GSR) z,f t participants. Feedback provided instantaneous and continuous feedback to the who watched an analog recording (polygraph tracing) of the target participant's a pilot study, Braud acted as the agent. The 10 target participants who participated in a clairvoyance task were not aware of the attempted PK influence upon their GSR. At various randomly assigned times, the agent attempted through PK either to activate (increase) or relax (decrease) the amplitude of the target participant's GSR. The results indicated that the GSR amplitude was higher during the increase periods than during the decrease periods ($p<.02$, two-tailed). In a confirmatory experiment, a new set of 10 target participants participated, and again Braud acted as the only agent. The results showed greater GSR activity during the increase periods than during the decrease periods, the difference between these periods being significant ($p<.01$, one-tailed).

A few studies previously discussed were to some degree designed to examine the effect of feedback. Honorton's (1977a) study suggested that feedback was not a necessary condition for PK; Winnett and Honorton (1977) and Honorton and May (1976) reported a significant decline in PK score involving immediate feedback. The Braud and Brand (1978) study suggested that immediate trial-by-trial feedback did not appear essential to the occurrence of PK. They argued that under certain conditions, the absence of such feedback may actually

facilitate PK performance by preventing participants from becoming discouraged upon seeing unsuccessful results. The release-of-effort studies of Stanford and Fox (1975) and Palmer and Kramer (1984) also seem to suggest PK effects in the absence of feedback. Morris and Garcia-Noriega (1982) pointed out that a display providing simple feedback of PK scoring may perhaps be more psi-conducive than a complex display. Braud (1978b) categorized his earlier PK experiments in terms of the feedback they provided. Some gave immediate trial-by-trial feedback to both participant and experimenter, some only to the experimenter but not to the participants, and others only gross, average results to the experimenter. All three types yielded significant PK data. Brand's conclusion was that immediate trial-by-trial feedback was not a necessary condition for the occurrence of PK.

Some studies have reported significant bias in "hidden," "silent," or "control" RNG data collected unknown to the participants while they were engaged in some other task (e.g., Berger, 1988; Berger, Schechter, & Honorton, 1986; Stanford & Fox, 1975; Terry & Schmidt, 1978; Varvoglis & McCarthy, 1986; also relevant are studies that reported no such psi effects, e.g., Edge & Burke, 1980; Gissurarson, 1986; Millar & Mackenzie, 1977). However, it may be more parsimonious to propose only unintentional PK effects by the experimenter (who unwittingly influences the test), rather than to propose unconscious psi processes (the participants find out about the hidden test without conscious awareness), in addition to unintentional PK effects (the participants influence the test without conscious awareness). In these studies, the experimenter is the only one who knows about the hidden task, hence there is no need for unconscious psi processes on his part.

Stanford (1977a, p. 360) points to one study done by Thouless that utilized immediate feedback as a "training method" for PK. Thouless's (1945) method was to spin 10 coins on their axes and to observe whether they fell with heads or tails facing up. Thouless was the only participant, and he did 10 sessions over a period of two months. The results he obtained were above chance overall, albeit nonsignificant. He noticed that a significant positive deviation from chance expectation occurred in the first four sessions (over 300 to 1 against chance), and he also noticed that his score showed a decline across sessions (the significance level dropping down to a value of 4 to I against chance at the end).

Kelly and Kanthamani (1972) carried out three kinds of preliminary tests with gifted participant Bill Delmore. One of these tests may be relevant here because it involved repeated practice with feedback. It was conducted with the Schmidt four-button RNG machine described earlier. The participant's task was to predict which of four lights the RNG would select next. The prediction was registered by the participant by pushing a corresponding button. (An alternative explanation is that the participant forced the machine to select that light by means of PK.) The light served as immediate feedback and indicated to the participant whether each trial was successful or not. When the trials were not being recorded automatically on paper tape, Delmore's performance was above chance ($p<10\text{-}10$). Connecting the tape produced a drastic, immediate decline in Delmore's scoring rate and caused him great irritation. Thereafter, he resolved to defeat the machine, and over a period of eight days, he progressively raised his scoring to almost his regular rate. This documented recovery in scoring rate seems to suggest a "learning" effect, although there is reason to believe that it was precognition and not PK that was "learned," because the instructions were to use precognition.

Isaacs has devoted several years to programs designed to train measurable PK abilities (Isaacs, 1983b; see also on participantive aspects of his training program, Isaacs, 1986a, 1986b, 1986c). He reported some apparent success in "training" psychokinetic metal-bending (PKMB) as measured by a special PKMB instrument or sensor that recorded piezoelectric effects (Isaacs, 1983b). The instrument consisted of three channels," two of which were used to detect possible sources of artifact (such as airborne sound" or mechanically transmitted vibration), and the third was designed to detect PKMB effects. The sensor's output was amplified such that it provided a continuous auditory tone as immediate feedback, which increased in pitch with increases in the voltage output of the PKMB channel. Although it is not clear in the report, it appears that the participant's task was to produce marked twists or bursts of activity in the sensor (as amplified via the auditory feedback). In a preliminary study, 12 sessions were held at the home of each of five participants. One of the participants showed a striking incline in performance, and three of the other four showed an increase in

output, although inconsistently maintained. All participants were encouraged to develop iheir own PK-facilitating strategies.

Tart (1983) suggested that although his original presentation of the feedback training method focused on ESP, almost all aspects of it could apply directly to the possibility of improving PK ability. Tart examined the PK literature (33 studies on mechanical systems such as dice and 35 studies on electronic RNGs) to see if his learning theory had been adequately tested. His conclusion was that although the provision of immediate feedback of results to motivated agents in PK tasks may lead to improved levels of performance on theoretical grounds, the rarity of talented agents in PK experimentation had not allowed adequate test of this possibility.

Negative Reinforcement and Punishment

To the best of my knowledge, there are no studies that have directly attempted to increase the frequency of correct ESP responses with humans via negative reinforcement and/or punishment (in the learning theory sense). There are however three studies on record that have utilized an aversive stimulus in an attempt to increase the operation of the PK function. Camstra (1973) attempted to condition the PK faculty in two experiments by rewarding participants every time a certain number was generated by an RNG. During a single session in the first experiment, each participant was required to listen to pop music that was disturbed by loud white noise. An RNG was placed in front of the participant. Each time the number 99 was generated from the range 1 to 99, which occurred by chance approximately once in 20 seconds, the participant was reinforced by removing the noise for 10 seconds. The participant completed three 20-trial phases. Conditioning was measured as the difference between success rates on the first and last phase periods. As predicted, participants who were asked to concentrate on their task were "not conditionable" (p.26), whereas participants who were not asked to concentrate produced a significant increase in the generation of the target number. (It is not stated in the report why this was predicted or to what "not conditionable" refers.) Participants who were told that the test was a telepathy task were significantly "better conditioned" than participants who were told the truth about its being a PK test. In a second

study, a disturbing video program was introduced as an additional aversive stimulus that was removed when the target number was generated, and a control group was included. The results of the second study did not show any significant influences of any of the factors studied.

Although the following study was not specifically aimed at testing negative reinforcement, it seems to have the essential features of a negative reinforcement PK study, that is, it involves the removal of an unpleasant stimulus when a certain PK response has been emitted. In testing aspects related to the PMIR model (Stanford, 1974), Stanford, Zenhausern, Taylor, and Dwyer (1975) conducted a single-session experiment with 40 male participants. The PK test was an RNG that generated one trial per second ($p = 1/6$ for a hit). Electric counters recorded the number of trials and the number of hits. Participants were tested individually. Each participant completed 180 trials on the RNG in an attempt to increase the number of hits as indicated by the counter (the "conscious" PK task). Then the experimenter took the participant to an adjoining room where he was introduced to a presumably boring motor task that could last for 45 minutes. Unknown to the participant, the RNG was started again in the first experimental room (the "unconscious" PK task). When/if seven hits occurred in one of successive blocks of 10 trials, the experimenter released the participant from the unpleasant task and introduced him to a presumably pleasant task of rating sexually arousing pictures for the remainder of the 45-minute period. Eight participants "escaped" from the dull task, whereas the expected mean, number of escapes was 2.9 ($p = .0069$). Scores on the "conscious" PK task were at chance, but scores on the "unconscious" PK task were significantly above chance ($P<.05$). According to the report, the results seemed to suggest that some participants might have unconsciously realized through ESP how to escape from the dull task, and then used their PK to accomplish desired cffect. Stanford et al. were careful to note that an interpretation such as tentative because of possible experimenter psi effects.

Broughton, Millar, and Johnson (1981) reported two studies in which they applied an aversive stimulus after PK misses as an attempt to decrease participants' frequency of PK-missing. The experiment employed an ABA design common in behavior modification research. For each condition, each participant performed eight sessions of 24 runs per session. The device

was a binary RNG computerized test called "The Head of Jut." It mimicked the test of strength found in carnivals and amusement parks and consisted of a number of lights in a column (topped with a bell), which were illuminated successively from the bottom for PK hits (see details in Broughton, 1979). There was a predefined point on The Head of Jut scale below which any run score was considered an unacceptable response. In both of the A conditions, scores falling below the criterion had no aversive consequences, but in the B condition every below criterion run score was punished by a strong (as strong as the participant could stand in prior testing), electric shock administered automatically by a computer to the back of the participant's wrist through wrist-band electrodes. Four participants participated in the pilot study, but no evidence of significant above-chance scoring was found in any of the three conditions. Three participants participated in the confirmatory study, in which no evidence of any PK increase was found.

Visual Imagery

The possible importance of the role of imagery in the generation of PK had been noticed by some researchers for some time. Forwald's (1969) experience, for instance, suggested to him that a person with the ability to produce strong mental images of physical events might well succeed in obtaining PK results.

Stanford (1969) gave each of 20 participants a total of 36 trials in a PK test that used a single die. The apparatus used was an enclosed vertical shaft that the die fell down. At the top of the shaft, the die was mechanically released on each trial. Each participant alternated between two methods for attempting to influence the die. Eighteen trials were conducted under visualization instructions. The participants were told to visualize the die as it fell down the shaft and to see it in their "mind's eye" as coming to a stop with the appropriate die face turning up. The other 18 trials were done under instructions for an "associative activation of the unconscious." Prior to the throw of the die, the participant gave free associations for a period of two minutes to the target die face. The participant then attended to matters other than the PK task during the actual throw of the die, such as reading a book. Both strategies

yielded results at chance, each producing 61 hits, whereas 60 was expected by chance in each condition.

Steilberg (1975) investigated the PK effect of two different conditions on a dicecasting device that consisted of a chute, into the upper end of which was inserted a funnel with a hole at the bottom. When four dice were thrown into the funnel they started their way down the chute at almost the same point in space. In the first condition, "conscious concentration," the participant sat in front of the apparatus watching the dice. He or she was instructed to influence the dice by consciously focusing his or her willpower and by inducing tension in the muscles of his or her whole body, ,is if to force the dice to come to a stop with the chosen die-faces on top. In the secmd technique, which involved visualization, the participant sat relaxed in a chair with his or her back to the apparatus. He or she was to visualize vividly in his or her "mind's eye," in a state of relaxation, the dice with the desired target die-face upward. Each of the 10 participants carried out three series for conscious concentration and three for visualization. Significant psi-missing was obtained in the conscious concentration condition ($p<.04$, two-tailed). The visualization technique produced nonsignificantly positive results. The difference between the two conditions was significant. A similar effect to that of the "conscious concentration" (resulting in significant psi-missing) was observed, for example, by Debes and Morris (1982), who found psi-missing related to a "striving for success" strategy.

Stanford (1981) did a conceptual replication of his earlier research on "associative activation of the unconscious" and visualization with 32 participants. A number chosen by an RNG was displayed on a digital counter. The participants attempted to obtain through PK a digit 0 through 9 that was produced by the RNG. Each participant used both methods, association and visualization, the order being counterbalanced across participants. The visualization method, which was done while the RNG was running (approximately one minute for each trial), involved visualizing the desired goal event, the target digit, as the outcome, at the end of the test run. The free-association method involved participants associating to a given target, and then reading aloud from a magazine to distract their conscious minds from the PIC task while the RNG was running. All participants checked the outcome of the RNG and thus

got feedback at the end of each trial. The results demonstrated significant psi-missing for the association condition ($p = .041$, two-tailed), but they yielded nonsignificant above-chance results for the visualization condition. The difference between the two conditions was significant ($p = .035$, two-tailed).

Morris, Nanko, and Phillips (1979,1982) explored in two studies the effectiveness of two imagery strategies that were derived from a survey of popular writings on how to develop psi skills (Morris, 1977, 1980a). Their test display consisted of a ring of 16 red lights (see details in Placer, Morris, & Phillips, 1977). An RNG was employed to advance an illuminated light one step clockwise or counterclockwise. The participant's task was to influence the illuminated light such that it "moved" either clockwise or counterclockwise, depending upon in which direction the target was. One strategy was considered to be process-oriented imagery: The participant was instructed to visualize "energy" building up inside his or her body and then flowing out to the testing instrument and assisting in the PIC task. The other strategy was considered to be goal-oriented imagery: The participant was asked to point a finger at the light he or she wished to become illuminated and to visualize vividly the light being lit. In a pilot study, 16 participants were asked to bias the behavior of the lights using each imagery strategy half the time. Which strategy came first was counterbalanced across participants for order. The results showed overall significant positive results ($p<.02$, two-tailed). Almost all of the positive scoring occurred with the goaloriented imagery, which was independently significant ($p<.01$, two-tailed).

In the confirmatory study, 20 new participants participated for two sessions. The procedure III the first session was the same as for the pilot study, the participants using each strategy half of the time. An ANOVA of the results of the first series revealed that the imagery strategy was a significant factor ($p<.05$): The goal-oriented imagery produced scoring of 51.8% above chance (where chance was 50), whereas the processoriented method resulted in below-chance scoring of 48.4%. Participants selected their preferred imagery strategy to use exclusively for all 16 runs in the second session, which took place two weeks later. Eleven participants chose the process-oriented imagery, and their results were at chance. Eight participants chose goal-oriented imagery and their results were significantly above chance

(p<.01, two-tailed). The difference between these two groups was statistically significant (p<.02, two-tailed).

Levi (1979) explored how the presence and absence of feedback interacted with three conditions: process-oriented imagery, goal-oriented imagery and a control group. Fifty-one participants participated, 17 in each condition. Each participant completed 24 trials on a Schmidt RNG that employed radioactive decay as the random source. The chance mean of the final Geiger counter outcome was 16. The participant's task was to try to get a number higher than 16. The feedback factor was manipulated by turning the RNG either toward or away from the participant. About half of the participants in each group received the feedback condition first, and the other half got the nonfeedback condition first. The control group listened to a tape containing information about chance events while conducting their trials. In the goal-oriented imagery condition, participants could use any mental device to form a clear mental image of a number higher than 16. In the process-oriented imagery condition, participants could use any mental device to picture the machine's inner workings leading to a number higher than 16. A factorial ANOVA yielded a highly significant interaction between imagery strategy and feedback (p<.001). The goal-oriented imagery led to higher PIC scoring with feedback than without feedback (the mean scores being 18.79 and 13.90, respectively, the difference being significant at p = .0008). The PK results of the processoriented condition were higher without feedback than with feedback (the mean scores being 17.43 and 14.75, respectively, the difference approaching significance at p = .056). The control group was not affected by the feedback. Only the goal-oriented group deviated significantly from chance in both feedback (PK-hitting) and nonfeedback conditions (PK-missing).

Morris and Reilly (1980) reported a study with 24 participants in which only a goaloriented imagery strategy was used. The PIC display was a single light-emitting diode (LED) that blinked on and off during the course of a run in accordance with decisions of a noise diode-based RNG. Each time the participant pressed a button, the LED would turn off and on with decisions made at the rate of approximately 50 times a second for a total of 4,096 trials in the run. A run would last about eight seconds, during which time the LED would appear to glow with fluctuating brightness. There were eight runs per session. For half of the runs, the

participants were asked to visualize the light glowing brightly (glow), but for the other half the participants were asked to put their thumb (physically) over the light and experience darkness (dim). The order of target conditions, dim versus glow was counterbalanced. The probability of hit was also varied. The results of the study were nonsignificantly above chance. The report does not give any PK score means or p values.

Nanko (1981) reported a one-session study in which 10 of the participants from the Morris et al. (1979) study participated. The same type of circle display of 16 lights Nvas used as in the Morris et al. study. The participant's task was to bias the lights to move either clockwise (CW) or counterclockwise (CCW), depending on which direcrion was the target. Each participant did 10 experimental runs. Within the 10 runs, each participant was required to influence the lights in the CW direction for half of the runs and CCW for half of the runs. The participant was asked to relax through deep-breathing exercises and to practice his or her goal-oriented imagery until he or she felt comfortable with it and was able to generate a vivid image at will. The number of hits was significantly higher than chance expectation ($p<.002$, one-tailed).

Morris and Hornaday (1981) conducted a two-session study with 31 participants. They used the same PK device that Morris et al. (1979) had used (a display of 16 lights where a binary decision from an RNG determined whether the illumination of the light would step clockwise or counterclockwise). The target direction was counterbalanced for participants and assigned prior to the session. The participant started the first session by doing four runs of 16 trials each. He or she was then given written instructions on mental Practice and attempted to imagine for a few minutes being successful at influencing the lights. Following this, the participant did four more runs of 16 trials each. Before the second session, which would take place a week later, the participant was required to engage in the mental practice procedure once a day. In the second session, the participant's PK was again tested on the device. The overall results were nonsignificantly above chance. There was no significant difference between the first and second sessions. There was a "general trend towards improvement from first session through the first half of the second session, but the second half showed negative scoring" (p.104). No meaningful correlations were found between PK performance

and the number of home practice sessions, average duration of session or vividness of experience.

Braud (1983) reported a pilot investigation of the use of prolonged imagery training to facilitate PK. Seven participants tried individually to exert a PK effect on a visual display attached to a thermal noise-based binary RNG. The display provided illumination feedback for hitsl but no feedback for misses. Each participant did five 100-trial runs preceding the imagery training program (pretest) and five 100-trial runs following the training (posttest). For both the pretest and posttest the participant's imagery was assessed by Paivio's Individual Differences Questionnaire, Marks' Vividness of Visual Imagery Questionnaire (VVIQ) and Gordor~s Test of Visual Imagery Control. The training program, originally developed by George (1981b), emphasized various visualization exercises. Early exercises were simple and static, where later exercises were more complex and "dynamic." The training consisted of weekly group meetings as well as daily home practice for a period of six *weeks. Before* training, PK scoring did not differ significantly from chance, but following training PK scores *were significantly* above chance ($p = 3.66 \times 10 - 6$, two-tailed). As predicted, the PK score for the group as a whole increased significantly from *pretest to* posttest ($p = .0044$, two-tailed). Furthermore, a significantly positive correlation between amount of imagery practice and *increase in* PK scores across training was also reported ($r = .84$, $p<.02$, two-tailed). Finally, all imagery scores on the questionnaires changed in the *expected direction* across training (presumably towards *greater use* and control of more vivid imagery), as was also evidenced on the Gotdon test to a significant *degree (p = .026,* two-tailed).

Gissurarson (1989) reported two experiments that attempted to increase PK scores of participants through the practice of three visual imagery strategies. The PK task was a computer test called Synthia. Each trial was initiated by pressing the spacebar, upon which the computer randomly selected one number. If this number corresponded to a target number randomly generated by the computer, the trial was counted as a hit. A blue star appeared on the screen each time a hit was made in the feedback mode of Synthia. No such feedback was provided in the nonfeedback mode. The three strategies were process-oriented imagery (PO), goal-oriented imagery (GO), and end-oriented imagery (EO). In PO, participants were

instructed to visualize energy building up inside their bodies and then sending it into the computer screen. In GO, participants were told to imagine the blue star provided for hits. In EO, participants were asked to visualize the final number of hits they wanted to achieve in each run on Synthia, which was shown on a display at the end of a 40-trial run.

A total of 24 participants in the first study were divided into three groups of eight participants each. Each group practiced one of the three imagery strategies for six sessions. The 52 participants in the second study were divided into four groups of 13 participants each. Three groups each practiced one of the three imagery strategies for four sessions. The fourth group was a control group that also completed four sessions. For both experiments, the three imagery strategies did not result in significant PK scoring or in an increase in PK scores across sessions, either in the feedback mode or in the nonfeedback mode. The condition most resembling prior studies (i.e., Levi, 1979; Morris, Nanko, & Phillips, 1982; Nanko, 1981) was the feedback mode of GO. In the GO condition, participants scored nonsignificantly below chance in Experiment I and nonsignificantly above chance in Experiment 2. In the second experiment, Gissurarson noticed that the sheep showed a nonsignificant incline in PK scores between the first and second half of the experiment, whereas the goats declined significantly ($p = .009$, two-tailed). The difference between incline with sheep and decline with goats was significant ($p = .007$, two-tailed).

Morris and Hornaday (1981) did not report whether participants indicated that imagery got significantly better (e.g. more vivid) after one weeks practice, or if they attempted to assess that at all. Brand (1983) reported a significant increase in PK scores after imagery training and a significant change in the individual's reported participantive experience of imagery in the expected direction after training, as measured by Gordon's Test of Visual Imagery Control. Thus, Brand's study seems to yield some confirmation of the hypothesized relationship between imagery and PK, in that imagery training significantly affected imagery, and PK performance improved to a significant degree. Furthermore, the significant correlation between the amount of imagery practice and the degree of PK improvement is consistent with the idea that the practice may have played an important role in the PK outcome. It is, how-e%~er, unfortunate that Braud did not have a control group. Therefore it is not cer.ain whether

the tendency to report better imagery control after prolonged practice to practice or something else. In the Gissurarson (1989) studies, participants were required to practice their strategy at home between sessions along with some mental exercises (relaxation, visualization, concentration, and positive thinking exercises). However, those participants who practiced did not improve the vividness of their imagery strategies significantly, in which case their results may not be directly relevant to the hypothesized relationship between imagery and PK.

The assumption behind the role of imagery in ESP research, in which ESP impressions are thought of as possibly manifesting as images, is somewhat different from the assumption behind imagery in PK research. Although it is not clear in the literature, it would seem that the assumption behind the importance of imagery for PK is that imagery and visualization play a large role in wishing and willing. Of the 11 studies reviewed in this section, eight can be viewed as having explored the role of some form of goal-oriented imagery in the production of PK. With the exception of Gissurarson's (1989) first experiment of two, seven of the eight studies yielded PK scores in the expected direction for goal-oriented imagery, and the scores were significantly above chance in three studies in which immediate feedback of performance was provided (Levi, 1979; Morris et al., 1979; Nanko, 1981). Hence, it appears that goal-oriented imagery may be important in the generation of extrachance PIC scoring. However, we must acknowledge that although goal-oriented imagery appears important in the generation of PK, the two Gissurarson (1989) studies, which attempted to increase PK scoring over a period of time via repeated practice of goal-oriented imagery and other mental exercises, did not result in such an increase.

Rationale for the Use of Training Techniques

In general, we want to locate conditions, if such exist, that will yield consistent PK performance in a variety of participants so that we can then do process-oriented research, including the systematic variation of volitional variables. To do this, there are at least three strategies for selecting participants. One strategy is to work with "gifted" participants who are already reputed to have strong PK skills. Another is to work with participants who have already participated in some sort of PK-training program. A third is to work with people trained

by the researchers themselves. In the present paper, we have chosen the third strategy, which appears to have several advantages. The researchers can have details of the recruitment process, the initial characteristics of the participants (e.g.. expectations, attitudes, and scores on various psychometric instruments), the training environment (including the trainer), and so forth. There will also be more information available about the course of the training itself, how thoroughly each individual participated, what their reactions were to various aspects of the training, daily life consequences of participating in the training, and so on. As a result, the researchers will, one hopes, have a more complete understanding of the training process and how it interacts with individual differences in participants. In addition, the researchers are more likely to be able to share more of the phenomenological aspects of the psi process with the various participants.

Given that a major goal of the research is to uncover participants for further process-oriented studies, the latter strategy means that the researcher will know far more about the history of the participants and will be better able to match them with the compatible experimental protocols. The participants, in turn, will be familiar with the idea of controlled experimental research and the need for tight procedures. When working with groups of former trainees, researchers will have some idea of the diversity of their backgrounds and approaches and will thus be better able to estimate the degree of generalizability of any resultant findings. One of the main drawbacks of working with isolated gifted participants, as noted by Morris (1982) in his discussion of working intensely with specific individuals, is that the results may be very difficult to generalize beyond that individual.

In addition, research that uses training techniques enables an evaluation of the worth of such techniques in and of themselves. We can assess if any of them works and can be used to train more people. By learning the specifics of what techniques seem to work for what kinds of people, we may be able to learn more about the psi process itself. In turn, by building on what we may learn about the training process, we are in a good position to explore beyond the existing techniques, to extend them to meet the specific demands of our research purposes as well as particular applications. Although the ideal research participants would perform positively and consistently, we may find that training may accomplish less than that, for

example, by providing either consistent but relatively weak psi performance or sporadic but occasionally quite strong performance. Different research strategies could be devised to accommodate either situation.

There are also disadvantages to working with individuals trained by researchers, especially in the short term. The researchers will need training themselves, and it may not be sufficient (or even appropriate) for them to mimic what commercial trainers do in popular psychic development courses because such courses rarely trouble to provide participants with adequate techniques for assessing their progress objectively. We obviously have much to learn about training, and initial efforts may well fail as would seem to have been the case for ESP (George & Krippner, 1984; Morris, 1980). Groups of related studies that systematically explore participant, experimenter, and training-technique variables will be necessary to help us evolve a full picture of the efficacy of any of the training methods that have been developed and advocated in the past. It could even be argued that, in the usual sense of the term, it is presently inappropriate to use the term *training,* that at this stage we are merely exploring individual exercises purported to enhance psi performance (see Gissurarson, in press). Whether they can be woven into a cohesive training program remains to be seen. (For a more detailed discussion of training research in parapsychology and its problems, see also Mishlove, 1983)

PK IMAGERY RESEARCH: EXPLORATORY STUDY

In the experimental literature, very little attention has been paid to the role of specific volitional activities-the mentation involved in intending, wishing, willing, wanting the target to behave in accordance with the instructions. The only systematic exploration of volitional activities has consisted of a few studies conducted to explore the effect of visual-imagery strategies on PK performance. These studies have mainly examined two strategies: goal-oriented imagery, which is a visualization of a desired goal or outcome of a PK trial; and process-oriented imagery, which is a visualization of a process leading to a desired goal or outcome of a PK trial. There are six studies on record that can be considered to have explored the role of goal-oriented imagery in the generation of PK (Levi, 1979; Morris & Reilly, 1980; Morris, Nanko, & Phillips, 1982; Nanko, 1981; Stanford, 1981; Steilberg, 1975). All six studies yielded PK scores in the positive direction for goal-oriented imagery. The PK scores were significantly above chance in three of the six studies when trial-bytrial feedback of performance was provided (as an experimental variable in Levi, 1979, but as the essential experimental design in the studies by Morris et al., 1982, and Nanko, 1981).

In general, what the imagery PK studies have suggested can be summarized as follows:

(1) Goal-oriented imagery may be important in the generation of extrachance PK scoring;

(2) Goal-oriented imagery does not seem to produce first-session effects (Morris et al., 1982; Nanko, 1981);

(3) Goal-oriented imagery may be associated with higher PK scoring than process-oriented imagery under trialby-trial feedback conditions (Levi, 1979; indirect suggestion from Morris et al., 1982, who only used the feedback condition);

(4) In the absence of trial-by-trial feedback, process-oriented imagery may do better than goal-oriented (Levi, 1979).

Two experiments will be carried out at the parapsychology laboratory at the Instituto de Psicología Paranormal to attempt to replicate these findings and to explore the possibility of using volitional imagery strategies as a method of enhancing PK scoring from session to session. PK success will be measured by an RNG-based computer test which it will be designed for one of us.

An attempt will be made to design the experiments such that the results could be examined with respect to two prominent models in parapsychology, which serve as alternatives to the usual notion of real-time trial-bytrial volitional effects:

(a) One was the before-mentioned IDS model of May et al. (1985), which attempts to explain anomalous bias in RNGs without invoking PK. IDS refers to individuals being able, for instance, to select locally deviant sub-sequences from a longer random sequence by using psi-acquired information. According to the IDS model, the psi mechanism behind RNG results is intuitive data sorting of some sort, such as precognition.

(b) The other was Schmidt's (1982, 1984) quantum collapse (QC) model, a refined version of what have often been referred to as observational theories (OTs). Central to the QC model is the assumption that it should be possible for human observers to influence the output of a RNG by affecting the "collapse of the state vector" of binary probabilities. According to the QC model (and to OTs in general), the psi mechanism behind RNG results is PK that is triggered at the moment of observation.

Psi research on unselected subjects appears to produce sporadic results, too inconsistent at present to allow development of an effective process-oriented research program. Although research with "gifted" individuals can produce impressive results, they seem limited in their generalizability and often dependent upon the unique interpersonal dynamics of the research team involved. For a variety of reasons (Child, Honorton, Kelly, Morris, & Stanford, 1980) we have therefore chosen to focus on techniques for training individuals to develop and maintain

psychic functioning. To this end, we have conducted a preliminary survey of the popular literature by over fifty authors on such techniques (Morris, 1977). The present study is an attempt to explore two different visual imagery strategies that this literature advocated for the intentional production of PK phenomena.

As we examined this literature, we looked for common themes. Almost all of the writings on PK advocated the use of visualization oriented toward the subject`s intended goal. Two kinds of visualization strategies appeared very frequently and seemed to be amenable to a variety of experimental situations. One strategy involves selecting the final goal or outcome that one wishes to produce, then picturing that outcome vividly in the mind's eye. If one wishes to heal a wart on a knuckle, one visualizes the knuckle skin in perfect health, without the wart, looking as one desires it to look (the goal). We have referred to such strategies as "goal-oriented" strategies since it is the final goal or outcome that is visualized. The other strategy involves selecting some sort of process or series of happenings that naturally lead up to the desired outcome, then visualizing those processes taking place. In healing the wart, one visualizes ointment dripping on the wart and gradually dissolving it, a knife slicing away the wart, or any other process, realistic or fictional, that can be conceptualized as leading to the outcome desired. This strategy, which we have referred to as "process-oriented," can be employed in a greater variety of ways, generally involving visualization of something happening rather than a static snapshot as in the goal-oriented strategy.

Although several studies have asked research participants to employ one or more specific mental strategies in PK tasks, only two have incorporated visualization specifically. Stanford (1969) compared visualization with a release-of-effort strategy. He asked his participants to visualize dice coming to a stop with the desired number of pips showing on top, for half of their runs. For the other half they were asked to free-associate to the desired number for two minutes preceding the run, then divert their attention during the actual run itself. Both strategies yielded results very close to chance. However, those who tended to give concrete sensory associations to the numbers tended to do better on the visualization task. Stellberg (1975) compared visualization with "focusing willpower." For half of the runs in his experiment, participants were asked to visualize the target face of the dice while looking

away; they could have eyes open or closed and were allowed to generate imagery associated with the target numbers. For the other half, participants were asked to watch the dice, tense their muscles, and "focus their willpower" to make the dice conform. The visualization strategy produced nonsignificantly positive results; the focused willpower strategy produced significantly negative results.

Each study thus contrasted visualization with a strategy not necessarily involving visualization, and the results may be strongly dependent upon the nature of the nonvisualization task. In the present research we decided to examine the process- and goal-oriented strategies as described earlier in order to explore whether either or both would be useful in affecting the observed outcome of a random number generator (RNG). We chose as our outcome display a smaller version of the -circle of lights" display developed by Schmidt (1970) because Schmidt had had considerable success with it and it was easy to adapt our two imagery strategies to it.

The importance of psi training research lies in attempting to find means of producing measurable psi. However, in order to be able to establish a psi training procedure, it can be argued, we need to know more about how psi can be controlled.

When there is a suggestion that research on a topic has reached a promising level, we might try to take the research one step further and use the available data in some form of a training procedure. This encourages the hope that we may look in this direction for one solution of the problem of psi control, which may lead to replicability. Whether this is the case or not must be discovered by research.

We may want to investigate whether use of this mental procedure results in increasingly strong and stable psi scores with continuous practice. Whether participants were successful because they practiced the mental procedure, or whether this technique merely served to trigger some latent natural abilities, or simply boosted their motivation, confidence, and so forth, are other questions that have to be answered by yet further research.

If we are to evaluate the traditional idea of PK as a volitional effort that in itself contributes causally to target outcomes, then we must focus attention in part on those volitional acts themselves, and we must go beyond merely varying the nature of the assigned volitional task. If differences in the real-time volitional activities do seem to matter, if there is some evidence that certain assigned volitional strategies or styles seem to produce better results than others, then:

(a) it supports the hypothesis that those volitional activities are themselves causally involved after all in some way, and

(b) it contributes to a more effective experimental protocol for producing positive results. Thus, one aim of the present study is to extend earlier research suggesting that some assigned volitional strategies seem to work better than others.

Thus, our strategy for exploring the nature of PK involves:

(a) focusing on volitional variables, especially those already mentioned within the literature;

(b) deploying those variables within a "training" context by providing participants with exercises drawn from the training literature;

(c) collecting considerable individual-differences data; and

(d) varying conditions of theoretical importance for the assessment of the role of volition in a standard PK testing procedure.

FIRST EXPLORATORY STUDY

In our first study we hypothesized that each strategy would be effective in influencing the RNG; we had no expectations as to whether one would be significantly better than the other.

Apparatus

The apparatus consisted of a four-module multipurpose testing system designed for a variety of studies (Placer, Morris, & Phillips, 1977). In its main console, it maintained an internally generated source of random binary decisions by amplifying Zener diode noise with a two-transistor amplifier, then converting the amplified noise to logic levels with an LM 330 comparator. The resulting logic signal was then divided by 2 to insure that equal time would be spent in the high and low states. This random logic signal oscillated at frequencies up to about 200 kHz, and it could be sampled and clocked into a shift register whenever a new random decision us desired. A counterdecoder sequencing circuit then interfaced this information with two other consoles. One console was the target console. Whichever outcome/ decision was to be designated as target for a given set of trials was entered by keyboard in advance of the trials. After each trial, the target outcome was compared with the outcome of the RNG by a logic circuit. If they matched, a hit-counter on the main console registered a tally; a second counter tallied each irial: and the two counters together provided a cumulative tall of trials and hits.

A second console was the display console. The display to the subject consisted of a ring of 16 lights. each light being a red light-emitting diode that was .4 cm in diameter. The entire ring was 7 cm in diameter, mounted on a D) 10 x 4 cin gray metal box attached to the subject console. The binarv random decisions were employed to advance the illuminated one step clockwise or counterclockwise, thus producinz a random back and forth around the circle. Input to the console followed input to the counters in the main console and wats accomplished through a second circuit. Treatment of the display console in no way could affect input to the counters, given the wav the cii7ciiitry- svas arranged. The display console could be disconnected without affecting the counters. The main console and tarcret console

were housed in 45 10 South Hall, on the UCS15 campus: the console, including display, was housed two rooms awav in -5 1 -1 South Hall.

Participants

The sample included 62 participants, both 40 females (71.4%) and 22 males (28.6%), their ages ranged from 19 to 77 years (Mean= 48.47; SD= 11.02). Subjects were recruited by announcements in newspapers and magazines and by brochures distributed in conferences hold at the Institute of Paranormal Psychology and other centers. Interested persons were in touch by phone, e-mail, or by letter with the Institute in order to request an interview for the experimental session. We designed a web page and host it in our web site for recruit subjects to add to the sample (*http://www.alipsi.com.ar/talleres.asp?id_taller=5*), from which we selected only the inquiries of the Argentines. The receiver did not receive information about characteristics related to the hypothesis of the experiment before the session.

Procedure

The procedure of each session was as follows. Each subject was met by Experimenter 1 and shown the main console containing the Zener diode and processing circuitry. The subjects were told that this was an exploratory test of PK, that they would be asked to influence the output of an RNG by focusing their attention on the circle-of-lights display since it would give them feedback and represented the outcome of the electrical events they were attempting to influence. They were told that successful studies had been done using such procedures, that some people seemed successful at the task, and that we were exploring the effectiveness of two specific imagery strate for such a task. Each subject was then taken down a hall to Institute of Paranormal Psychology, two rooms away from the first room (and about 18 feet from the Zener diode and main console), and was seated in an office chair in front of the subject console and the circle of lights. The subject was shown how to initiate a run by pressing a button on the subject console so that the illuminated light would shift around the circle 16 consecutive times at the rate of one shift per 1.75 seconds. The subject was then told that the task was to bias the lights for each run of 16 trials in either the clockwise or the

counterclockwise direction, depending on the instructions given the subject in a concealed target envelope.

The subject at this time was also given two specific imagery strategies, a process-oriented strategy which involved visualizing "energy" building up inside the body, then flowing out to the circle of lights and assisting their progression in the desired direction; and a goal-oriented strategy which involved the subject's pointing a finger at the light he wished to be illuminated next and vividly visualizing the light being lit, i.e., visualizing the goal for the trial (see the Appendix for the exact instructions). The subject was told that both imagery strategies had been suggested by a search of the literature and that we felt that each would be useful for the present task. The strategies were referred to as goal-oriented strategy and process-oriented strategy rather than process-oriented and goal-oriented, in order to avoid biasing the subject.

The subject was then shown the target envelope, which Experimenter 2 (Parra) had earlier selected at random and placed on the table. The subject was told that it contained the experimental target order plus instructions to use either PK 98 for the first el ght runs and PK 99 for the second eight runs, or the reverse. He was asked to relax and take two or three minutes to build up imagery between eight runs he would be allowed five minutes to relax and prepare mentally for the next imagery strategy. Thus each subject used each imagery strategy for half the session, with the clockwise vs. counterclockwise target direction balanced across conditions. There were eight target envelopes, each of which contained a different specific order of directions (clockwise and counterclockwise) for each of 16 runs (the length of the experimental session). This order was counterbalanced for direction within the first eight runs (four clockwise and four counterclockwise) and the last eight runs such that each subject would be asked to influence the behavior of the lights in a clockwise direction for half the runs and counterclockwise for half the runs. Half of the available target orders listed M 98 first and the other half listed PK first. In advance of each session, Experimenter 2 combined a random component ofthe weather information for the previous day with a set of random digits between 1 and 8 obtained from the RNG before the study to select which of the eight target instruction sheets would be target for the session and which of the eight envelopes would be used to enclose the targets. Experimenter 2 placed the target envelope by the subject's console in

Room 4514just before the start of the experimental session. Thus Experimenter 1 did not know the target order for each session and could not infer it, either from the appearance of the target envelope or from keeping track of which target orders had been used previously. Subjects were told only that their target envelope had been selected randomly from a set and that Experimenter 1 was unaware of the contents.

If subjects had no further questions, they were then asked to sign a consent form in which it was made clear to them that they could terminate their participation at any time, that we were investigating a potential new form of communication whose existence was still debated, and that their success or failure in this study should not be taken as an indicator of their abilities to succeed at such tasks in other contexts. The subject was told not to open the target envelope until Experimenter 1 left the room. Experimenter 1 then returned to the main console room.

Upon his return, he checked to make sure that the target console was set to tally only clockwise steps as hits, in order to eliminate biased recording errors, as explained below. He gave the subject five minutes to prepare, and then instructed him over a one-way intercom to begin run 1. When the trial counter on the main console registered 16 trials, it stopped automatically. Experimenter 1 recorded the number of trials and the number of clockwise steps taken (as registered on the hit counter). At the end of each run he notified the subject of the run number just completed and the number of the next run. At the end of 16 runs, Experimenter 1 retrieved the target order sheet from the subject, entered the key number of the target sheet, recorded the target directions for all 16 runs, scored the record for total number of decisions in the assigned direction, and gave the subject some general feedback. At the end of the session, Experimenter 1 turned over a carbon copy of the unscored record to Experimenter 2 for independent tallying. Experimenter 2 then verified that the number of the target sheet matched that assigned randomly to the session and that the target order had been properly recorded. All critical variables such as length of run were specified in advance and were not changed during the experiment.

Note that since the hit counter always tallied clockwise decisions and Experimenter 1 was unaware of whether the target for a given run was clockwise or counterclockwise, we do not

have to be concerned with biased recording errors. Experimenter 1 recorded the number of clockwise decisions, then converted these scores to number of hits by comparing them with the target order obtained from the subject. This conversion of scores to hits was independently checked by two other scorers.

Results

Since this study was designed as a pilot study, we asked several descriptive questions of the data. First, was there evidence for PK overall or in any of the conditions. The random event generator produced decisions in accordance with the subject's instructions (hits) 51.9% of the time ($Z = 2.38$, $p < .02$, two-tailed). Almost all of the positive scoring occurred with the goal-oriented imagery, which produced 52.9% hits and was independently significant ($Z = 2.6$ 1, $p < .0$ 1, two-tailed). The Z score (or critical ratio) has been used traditionally to assess whether or not an overall extrachance effect is taking place; it is a general statistical test in that it does not discriminate between strong effects manifested by a few individuals vs. weak effects by many individuals.

Of more direct interest was whether or not the PK scores throughout the subject sample were meaningfully different from chance, either overall or within each of the imagery conditions: thus at statistic was used in evaluating these scores. In contrast to the former procedure, the latter procedure incorporates consistency across subjects into the assessment of statistical significance. For example, an above-chance but nonsignificant overall scoring rate would yield a significant t statistic if all subject scores were at or near the average, while a significant overall rate could be nonsignificant by the t procedure if obtained by averaging a few very high subject scores with other scores that were at or below chance. The mean deviation from chance of the total scores for all subjects was + 4.75 (see Table 1); this deviation was statistically significant at $p < .05$, two-tailed ($t = 2.36$, with 15 df). The mean deviation from chance of the goal-oriented imagery PK scores was +3.69; this deviation was not significantly different from chance ($t = 1.84$, with 15 df., $.05 < p < .10$, two-tailed). The mean deviation from chance of the process-oriented imagery PK scores was + 1.06; this deviation was riot significantly different from chance ($t = .99$, 15 df, $.20 < p < .40$, two-tailed). The difference in

number of hits per session per condition between the two procedures was not significant ($t = .872$, $< p < .40$, two-tailed). Thus there is suggestive evidence that these imagery procedures may be able to produce PK results. Of special interest are the goal-oriented imagery strategies.

A second study was carried out to confirm these results and to explore both imagery strategies within the context of a potential training procedure. At this stage, although we were more encouraged by the goal-oriented results, we were still interested in the possibility that each strategy could be useful in helping people develop PK abilities. Perhaps individual differences in some variable such as past exposure to mental development techniques or imagery ability, we thought, might affect preference for one technique over the other, as well as success with one technique more than the other. Those already exposed to mental development techniques might find it easier to become involved with the more complex process-oriented imagery technique than those who had not, for instance. One kind of PK training procedure of interest to us involved exposing trainees to both techniques, then letting them choose which one they wished to focus on during their training.

Procedure

The procedure for the first session was the same as for the previous study. Following the first session, Experimenter 1 asked the subject to select a preferred imagery strategy and to use it exclusively during the second session two weeks later. The subject was then taken in to Experimenter 2, who gave him instructions for two simple concentration exercises which were to be practiced daily until the second session. One exercise involved concentrating on the sweep second hand of a watch for ten minutes; the other involved counting one's breaths for five minutes. In each case subjects were told ' that whenever they found their attention wandering, they should gently but firmly return their attention to the assigned stimuli. During the second session, the sub . ect repeated the experimental procedure, this time using the preferred imagery strategy for all 16 runs. The experimenter was not blind to which imagery strategy was used. At the end of the session the subject was invited to describe the experiences in detail and was given specific feedback as to results.

FIRST EXPERIMENT:
A COMPARISON OF TWO POPULARLY ADVOCATED VISUAL IMAGERY STRATEGIES IN A PSYCHOKINESIS TASK

Psi research on unselected subjects appears to produce sporadic results, too inconsistent at present to allow development of an effective process-oriented research program. Although research with "gifted" individuals can produce impressive results, they seem limited in their generalizability and often dependent upon the unique interpersonal dynamics of the research team involved. For a variety of reasons (Child, Honorton, Kelly, Morris, & Stanford, 1980) we have therefore chosen to focus on techniques for training individuals to develop and maintain psychic functioning. To this end, we have conducted a preliminary survey of the popular literature by over fifty authors on such techniques (Morris, 1977). The present study is an attempt to explore two different visual imagery strategies that this literature advocated for the intentional production of PK phenomena.

As we examined this literature, we looked for common themes. Almost all of the writings on PK advocated the use of visualization oriented toward the subject's intended goal. Two kinds of visualization strategies appeared very frequently and seemed to be amenable to a variety of experimental situations. One strategy involves selecting the final goal or outcome that one wishes to produce, then picturing that outcome vividly in the mind's eye. If one wishes to heal a wart on a knuckle, one visualizes the knuckle skin in perfect health, without the wart, looking as one desires it to look (the goal). We have referred to such strategies as "goal-oriented" strategies since it is the final goal or outcome that is visualized. The other strategy involves selecting some sort of process or series of happenings that naturally lead up to the desired outcome, then visualizing those processes taking place. In healing the wart, one visualizes ointment dripping on the wart and gradually dissolving it, a knife slicing away the wart, or any other process, realistic or fictional, that can be conceptualized as leading to the outcome desired. This strategy, which we have referred to as "process-oriented," can be employed in a greater variety of ways, generally involving visualization of something happening rather than a static snapshot as in the goal-oriented strategy. Although several studies have asked research participants to employ one or more specific mental strategies in PK tasks, only two

have incorporated visualization specifically. Stanford (1969) compared visualization Nvith a release-of-effort strategy. He asked his participants to visualize dice coming to a stop with the desired number of pips showing on top, for half of their runs. For the other half they were asked to free-associate to the desired number for two minutes preceding the run, then divert their attention during the actual run itself. Both strategies yielded results very close to chance. However, those who tended to give concrete sensory associations to the numbers tended to do better on the visualization task. Steilberg (1975) compared visualization with "focusing willpower." For half of the runs in his experiment, participants were asked to visualize the target face of the dice while looking away; they could have eyes open or closed and were allowed to generate imagery associated with the target numbers. For the other half, participants were asked to watch the dice, tense their muscles, and "focus their willpower" to make the dice conform. The visualization strategy produced nonsignificantly positive results; the focused willpower strategy produced significantly negative results.

Each study thus contrasted visualization with a strategy not necessarily involving visualization, and the results may be strongly dependent upon the nature of the nonvisualization task. In the present research we decided to examine the process- and goal-oriented strategies as described earlier in order to explore whether either or both would be useful in affecting the observed outcome of a random number generator (RNG). We chose as our outcome display a smaller version of the "circle of lights" display developed by Schmidt (1970) because Schmidt had had considerable success with it and it was easy to adapt our two imagery strategies to it.

In our first study we hypothesized that each strategy would be effective in influencing the RNG; we had no expectations as to whether one would be significantly better than the other.

Part 1

Participants

Sixteen college-age subjects were used, 10 males and 6 females, recruited by notices posted on campus at the University of California, Santa Barbara (UCSB), and from personal acquaintances of Experimenter I (Nanko). Subjects were told in advance that they would be asked to use visual imagery in attempts to influence the output of a random number generator.

Apparatus

The apparatus consisted of a four-module multipurpose testing system designed for a variety of studies (Placer, Morris, & Phillips, 1977). In its main console, it maintained an internally generated source of random binary decisions by amplifying Zener diode noise with a two-transistor amplifier, then converting the amplified noise to logic levels with an LM 330 comparator. The resulting logic signal was then divided by 2 to insure that equal time would be spent in the high and low states. This random logic signal oscillated at frequencies up to about 200 kHz, and it could be sampled and clocked into a shift register whenever a new random decision was desired. A counterdecoder sequencing circuit then interfaced this information with two other consoles. One console was the target console. Whichever outcome/ decision was to be designated as target for a given set of trials was entered by keyboard in advance of the trials. After each trial, the target outcome was compared with the outcome of the RNG by a logic circuit. If they matched, a hit-counter on the main console registered a tally; a second counter tallied each trial; and the two counters together provided a cumulative tally of trials and hits.

A second console was the display console. The display to the subject consisted of a ring of 16 lights, each light being a red light-emitting diode that was .4 cm in diameter. The entire ring was 7 cm in diameter, mounted on a 10x10x4 cm gray metal box attached to the subject console. The binary random decisions were employed to advance the illuminated light one step clockwise or counterclockwise, thus producing a "random walk" back and forth around the circle. Input to the display console followed input to the counters in the main console and was accomplished through a second circuit. Treatment of the display console in no way could affect input to the counters, given the way the circuitry was arranged. The display console

could be disconnected entirely without affecting the counters. The main console and target console were housed in *45* 10 South Hall, on the UCSB campus; the subject console, including display, was housed two rooms away in *4514* South Hall.

Procedure

The procedure of each session was as follows. Each subject was met by Experimenter I and shown the main console containing the Zener diode and processing circuitry. The subjects were told that this was an exploratory test of PK, that they would be asked to influence the output of an RNG by focusing their attention on the circle-of-lights display since it would give them feedback and represented the outcome of the electrical events they were attempting to influence. They were told that successful studies had been done using such procedures, that some people seemed successful at the task, and that we were exploring the effectiveness of two specific imagery strategies for such a task. Each subject was then taken down a hall to Room 4514, two rooms awav from the first room (and about 18 feet from the Zener diode and main console), and was seated in an office chair in front of the subject console and the circle of lights. The subject was shown how to initiate a run by pressing a button on the subject console so that the illuminated light would shift around the circle 16 consecutive times at the rate of one shift per 1.75 seconds. The subject was then told that the task was to bias the lights for each run of 16 trials in either the clockwise or the counterclockwise direction, depending on the instructions given the subject in a concealed target envelope.

The subject at this time was also given two specific imagery strategies, a process-oriented strategy ("PK 98") which involved visualizing "energy" building up inside the body, then flowing out to the circle of lights and assisting their progression in the desired direction; and a goal-oriented strategy ("PK 99") which involved the subject's pointing a finger at the light he wished to be illuminated next and vividly visualizing the light being lit, i.e., visualizing the goal for the trial (see the Appendix for the exact instructions). The subject was told that both imagery strategies had been suggested by a search of the literature and that we felt that each would be useful for the present task. The strategies were referred to as "PK 98" and "PK 99" rather than process-oriented and goal-oriented, in order to avoid biasing the subject.

The subject was then shown the target envelope, which Experimenter 2 (Parra) had earlier selected at random and placed on the table. The subject was told that it contained the experimental target order plus instructions to use either PK 98 for the first eight runs and PK 99 for the second eight runs, or the reverse. He was asked to relax and take two or three minutes to build up imagery between runs.

After eight runs he would be allowed five minutes to relax and prepare mentally for the next imagery strategy. Thus each subject used each imagery strategy for half the session, with the clockwise vs. counterclockwise target direction balanced across conditions. There were eight target envelopes, each of which contained a different specific order of directions (clockwise and counterclockwise) for each of 16 runs (the length of the experimental session). This order was counterbalanced for direction within the first eight runs (four clockwise and four counterclockwise) and the last eight runs such that each subject would be asked to influence the behavior of the lights in a clockwise direction for half the runs and counterclockwise for half the runs. Half of the available target orders listed PK 98 first and the other half listed PK 99 first. In advance of each session, Experimenter 2 combined a random component of the weather information for the previous day with a set of random digits between I and 8 obtained from the REG before the study to select which of the eight target instruction sheets would be target for the session and which of the eight envelopes would be used to enclose the targets. Experimenter 2 placed the target envelope by the subject's console in Room 4514 just before the start of the experimental session. Thus Experimenter I did not know the target order for each session and could not infer it, either from the appearance of the target envelope or from keeping track of which target orders had been used previously. Subjects were told only that their target envelope had been selected randomly from a set and that Experimenter I was unaware of the contents.

If subjects had no further questions, they were then asked to sign a consent form in which it was made clear to them that they could terminate their participation at any time, that we were investigating a potential new form of communication whose existence was still debated, and that their success or failure in this study should not be taken as an indicator of their abilities to

succeed at such tasks in other contexts. The subject was told not to open the target envelope until Experimenter I left the room. Experimenter I then returned to the main console room.

Upon his return, he checked to make sure that the target console was set to tally only clockwise steps as hits, in order to eliminate biased recording errors, as explained below. He gave the subject five minutes to prepare, and then instructed him over a one-way intercom to begin run 1. When the trial counter on the main console registered 16 trials, it stopped automatically. Experimenter I recorded the number of trials and the number of clockwise steps taken (as registered on the hit counter). At the end of each run he notified the subject of the run number just completed and the number of the next run. At the end of 16 runs, Experimenter I retrieved the target order sheet from the sub ect, entered the key number of the target sheet, recorded the target directions for all 16 runs, scored the record for total number of decisions in the assigned direction, and gave the subject some general feedback. At the end of the session, Experimenter I turned over a carbon copy of the unscored record to Experimenter 2 for independent tallying. Experimenter 2 then verified that the number of the target sheet matched that assigned randomly to the session and that the target order had been properly recorded. All critical variables such as length of run were specified in advance and were not changed during the experiment.

Note that since the hit counter always tallied clockwise decisions and Experimenter I was unaware of whether the target for a given run was clockwise or counterclockwise, we do not have to be concerned with biased recording errors. Experimenter I recorded the number of clockwise decisions, then converted these scores to number of hits by comparing them with the target order obtained from the subject. This conversion of scores to hits was independently checked by two other scorers.

Results

Since this study was designed as a pilot study, we asked several descriptive questions of the data. First, was there evidence for PIC overall or in any of the conditions? The random event generator produced decisions in accordance with the subject's instructions (hits) 51.9% of the

time (Z = 2.38, p < .02, two-tailed). Almost all of the positive scoring occurred with the goal-oriented imagery, which produced 52.9% hits and was independently significant (Z = 2.6 1, p < .01, two-tailed). The Z score (or critical ratio) has been used traditionally to assess whether or not an overall extrachance effect is taking place; it is a general statistical test in that it does not discriminate between strong effects manifested by a few individuals vs. weak effects by many individuals. For further discussion of its usage in this context see D. Burdick and E. Kelly (1977).

Of more direct interest was whether or not the PK scores throughout the subject sample were meaningfully different from chance, either overall or within each of the imagery conditions: thus a *t* statistic was used in evaluating these scores. In contrast to the former procedure, the latter procedure incorporates consistency across subjects into the assessment of statistical significance. For example, an above-chance but nonsignificant overall scoring rate would yield a significant t statistic if all subject scores were at or near the average, while a significant overall rate could be nonsignificant by the t procedure if obtained by averaging a few very high subject scores with other scores that were at or below chance. The mean deviation from chance of the total scores for all subjects was + 4.75 (see Table 1); this deviation was statistically significant at p < .05, two-tailed (t = 2.36, with 15 *df).* The mean deviation from chance of the goal-oriented imagery PK scores was + 3.69; this deviation was not significantly different from chance (t = 1. *84,* with 15 *df,* .05 < p < . 10, two-tailed). The mean deviation from chance of the process-oriented imagery PK scores was + 1.06; this deviation was not significantly different from chance (t = .99, with 15 *df,* .20 < p < .40, two-tailed). The difference in number of hits per session per condition between the two procedures was not significant (t = .872, with 15 *df;* .30 < p < .40, two-tailed). Thus there is suggestive evidence that these imagery procedures may be able to produce PK results. Of special interest are the goal-oriented imagery strategies.

Part 2

A second study was carried out to confirm these results and to explore both imagery strategies within the context of a potential training procedure. At this stage, although we were

more encouraged by the goal-oriented results, we were still interested in the possibility that each strategy could be useful in helping people develop PK abilities. Perhaps individual differences in some variable such as past exposure to mental development techniques or imagery ability, we thought, might affect preference for one technique over the other, as well as success with one technique more than the other. Those already exposed to mental development techniques might find it easier to become involved with the more complex process-oriented imagery technique than those who had not, for instance. One kind of PK training procedure of interest to us involved exposing trainees to both techniques, then letting them choose which one they wished to focus on during their training. Accordingly, our main study attempted to explore each imagery strategy in the context of such a training procedure, comparing trainees who had prior mental development training with those who had not.

Participants

Subjects were 20 UCSB undergraduates, 9 males and 11 females, recruited from a parapsychology class. Ten subjects had indicated on a questionnaire given in class that they had previously been involved for at least three months in one or more mental development courses such as transcendental meditation, yoga, or est. They were the mental development (MD) group. Ten others had indicated no such involvement and made up the no-mental-development (NMD) group. Experimenter I was not informed of which group any subject was in.

Procedure

The procedure for the first session was the same as for the previous study. Following the first session, Experimenter I asked the subject to select a preferred imagery strategy and to use it exclusively during the second session two weeks later. The subject was then taken in to Experimenter 2, who gave him instructions for two simple concentration exercises which were to be practiced daily until the second session. One exercise involved concentrating on the sweep second hand of a watch for ten minutes; the other involved counting one's breaths for five minutes. In each case subjects were told that whenever they found their attention

wandering, they should gently but firmly return their attention to the assigned stimuli. During the second session, the subject repeated the experimental procedure, this time using the preferred imagery strategy for all 16 runs. The experimenter was not blind to which imagery strategy was used. At the end of the session the subject was invited to describe the experiences in detail and was given specific feedback as to results.

Results

The first and second sessions were analyzed separately, since different questions were being asked of the data. For the first session, we wished to examine whether goal-oriented results continued to be better than process-oriented, whether having prior mental development training affected results, and whether there was an interaction between imagery strategy and prior training experience. Thus we analyzed the first session data with a two-way between-within analysis of variance (Ferguson, 1976, pp. 314-320), with imagery strategy and prior training as factors and RNG hits as the dependent variable, Imagery strategy was a significant factor ($F = 5.19$ with I and 18 *df,* $p < .05$); the hit rate during goal-oriented imagery was 51.8% as opposed to only 48.4% during process-oriented imagery (see Table 1). Prior training was not a significant factor ($F = .67$, with I and 18 *qf,* p = ri.s.). However, there was a significant interaction between imagery strategy and prior training ($F = 7.81$, with I and 18 *qf,* $p < .02$). Close inspection of the results revealed that the subjects with prior mental development training showed relatively little difference between imagery strategies, whereas those without showed a strong difference in favor of goal-oriented imagery. A post hoc analysis showed that the difference between the two imagery conditions for the nontrained subjects alone was statistically significant ($t = 3.41$, with 18 *df,* $p < .01$, two-tailed). Thus the results of Session I confirmed the mild success of the goal-oriented imagery procedure and indicated that the lack of success with process-oriented imagery may have been in part due to a negative response toward it by those who had not received prior exposure to mental development procedures.

The results for the second session were consistent with those of the first session with regard to imagery strategy. No analysis of variance comparing imagery strategy with prior training

experience was attempted on the second session data because of the small number of data points that would be in each cell. Our focus instead was on the success of each imagery strategy and on whether goal-oriented imagery would continue to be better than process-oriented imagery. One subject declared that his imagery the second time around was a combination of the two strategies, and his data are therefore not included in any analyses comparing imagery strategies in the follow-up session. Eleven subjects chose to employ process-oriented imagery throughout the session; their hit rate was 49.3% (t = -.71, with 10 *df-, P > .40,* two-tailed). Eight chose goal-oriented imagery and their hit rate was 52.6%, which was significantly above chance *(t = 4.41,* with 7 *df, p < .01,* two-tailed). The difference between these two groupsis statistically significant *(t = 2.46,* with 17 *df, p < .02,* two-tailed) and appears to be independent of prior training as can be seen from Table 1.

Discussion

The significant departures from chance observed in the present studies appear to constitute good additional evidence for a PK effect. The results cannot easily be interpreted as due to a first-order bias in the source of randomness. In the present study, the RNG generated clockwise decisions 50.398% of the time, a nonsignificant departure from chance (.40 > p > .30). Additionally, since target direction was completely counterbalanced within each condition within each subject, any bias in the RNG would cancel out and not contribute to the results. If there were a first-order bias of great size, it might inflate the variance of scores between subjects and/or conditions; in the present study, we obviously need not be concerned about this possibility.

Subject fraud also appears unlikely. Subjects were not provided with information about the actual workings or circuitry of the machine. Although subjects were left alone with part of the apparatus, they could not affect the tallies on the trial or hit counters by any actions upon that part of the apparatus. Target generation and scoring both occurred through specific circuitry in the main console, independent of interaction with the subject's console. At the start of each run the subject would set the target generation and tallying process in motion by a button-press, but once that initial press took place no further actions (e.g., additional rapid

button- pressing, disconnecting the console, etc.) had any effect upon the generation and tallying process. Since the number and content of the target list given the subject was always double-checked against Experimenter *2's* records after the session, there was no way that the subject could observe the movement of the lights and then construct a false target list that would resemble the observed movements of the lights. Even if one posits that subjects did somehow find a way to cheat, one would then have to explain why subjects apparently only cheated during goal-oriented imagery runs.

Experimenter-biased recording errors also appear unlikely. As explained above, Experimenter I was always unaware of target direction when recording the tally of clockwise steps and thus had no direct knowledge of whether or not a high score or a low score was desirable for any given run. All other steps in deriving a hit count for each subject were double-checked at least twice by two more people.

The major additional finding of the present study is the scoring difference between goal-oriented and process-oriented imagery strategies, and the suggestive evidence that this difference is strongest for those who have had little prior exposure to mental development training. The finding occurs both within and between subjects; however, all subjects were initially exposed to both strategies. We cannot generalize at this time to subjects who may be exposed initially only to one of the two strategies; a follow-up study using the latter design is necessary to assess whether our findings are in part produced by a differential effect (see Stanford, 1969, for a discussion of differential effects in comparing mental strategies on a PK task using within-subject designs).

It is possible that the differential was also produced in part by an experimenter effect. Although Experimenter I was hopeful that each of the two strategies would produce good results, he personally preferred the goal-oriented strategy when informally working with the apparatus himself. Perhaps his interactions with subjects conveyed his own preference and they responded accordingly.

One problem with any interpretation of the results which posits a subject preference for goal over process is that when subjects were allowed to choose which strategy they would use, more chose the process strategy. Since these subjects had all been students of Experimenter 2, we were able to interview some of them about their reasons for choosing the process strategy even though the first time around the goal strategy had in fact worked best for them. Their comments indicated that they chose the process-oriented strategy either because it somehow seemed logically the one most likely to succeed or because it seemed more interesting or because (in two cases) they had seen more deviation from randomness with it the first time and were thus more confident that it could produce an effect of some sort.

Although for some subjects their initial failure with the processoriented response may have involved preference of goal over process, it seems more likely that for others the attempt to employ the process-oriented strategy may well have led to an internal state that is not as psi-conducive. Perhaps the increased complexity of the process strategy may have provoked more a feeling of conscious striving, whereas the goal-oriented strategy may have allowed easier adoption for some of a passive volitional strategy. Stanford (1977) summarizes evidence suggesting that the latter seems preferable for success in PK tasks. Whatever the answer, much further research is needed, with more descriptive data taken from individuals about what strategies they have used and how they have employed them.

Afterword

A short version of this paper was presented at the 1978 Parapsychological Association convention and thus was available in abstract form in *Research* in *Parapsychology, 1978,* It is presented here in more detail, with additional analysis and discussion, at the suggestion of colleagues who wished to see a publicly available presentation in more detail. It has been written to reflect the knowledge we had at the time. Since this research was completed, there have been at least two studies published which have achieved further PK success with goal-oriented imagery. Nanko (1981) employed essentially the same procedure as described above, with Experimenters 1 and 2 in their familiar roles, but employing only goal-oriented imagery instructions to subjects. Subjects were 10 high-scorers from the study reported

above. Overall significant positive evidence for PK was obtained, further suggesting that goal-oriented imagery strategies do notjust produce first-session effects. Levi (1979), using a digital display rather than a circle of lights, found that goal-oriented imagery worked significantly better than process-oriented imagery, but only when subjects could see the display. When they could not see the display, process-oriented imagery did better than goal-oriented. His subjects were unselected undergraduates. The latter study is especially important in indicating a generalization of the finding to another type of display; but perhaps equally important, it indicates that we should not expect the relationship when subjects do not have visual access to the display.

APPENDIX: IMAGERY INSTRUCTIONS

Goal-oriented

Relax. Take a deep breath, repeat. Concentrate on the display panel-use your preferred index finger to help guide your concentration and imagery to the first light of your target direction (if clockwise, the first light to the right of 12 o'clock on the panel, etc.). When you feel like starting, press the module button to initiate the run. Now, image and "will" the lights, one by one, to light up in the desired direction-make the lights walk around the display panel completing the circle. You may move your imagery around the panel in sequence to the light 'Jumps" whether the lights follow your imagery or not. When doing it this way, image the lights catching up with your guided imagery.

Instead of completing the circle with or without the lamps lighting up in the sequence with your imagery, you may prefer to be only one jump ahead of the light. Image the light coming on in the desired direction. If or when the light goes the opposite way, go back one lamp and image the light coming back that way. Move on to the next lamp in the desired direction and repeat.

In this imagery you are imaging the world as you would like it to be. You may image that you are pushing or pulling the light to each lamp; a pulling of the light seems to be the best. You may want to image a wire between the lamps and incorporate the wire into your imagery, etc.

Process-oriented

Close your eyes. Breathe in and out slowly and deeply. Allow yourself to relax. Deepen this relaxation by whatever technique works best for you. Go to a level where you can visualize, where images are clear, vivid, and stable. Image energy building up inside of you-flowing from your feet to head. Image this energy coming from you in the form of a white beam. This beam will be emanating from your mind's eye (midforehead). When you have this imagery of an energy beam, direct it in your imagery into the display panel. Allow this image to form for a while in your mind.

Now open your eyes and gaze steadily at the display panel while remaining in a relaxed and focused state. Try to maintain the imagcd energy beam. Next, use your preferred arm and hand to guide your concentration to move the lights in the target direction. Do this by continuously moving your arm/hand in the clockwise or counterclockwise direction. This movement should be faster than the "jumps" of the light. Imagery emphasis: Put energy into the display panel.

SECOND STUDY:
"CONSCIOUS CONCENTRATION" VERSUS "VISUALIZATION" IN PK TESTS

The purpose of this investigation was to repeat the American experiments aimed at having the subject consciously influence the results of dice-throwing in such a way that a certain die-face, selected beforehand as the target, would come up more often than could be expected by chance alone. Apart from the principal aim of the experiment (the demonstration of a PK influence on rolling dice) it was expected that the subjects would show a differential effect in their scoring (Rao, 1966); i.e., that they would score positively during one of two psychological conditions and negatively in the other. Briefly, in one condition, the subject was to try to concentrate on the target face of the die; in the other, he was to try to visualize it. Of the secondary analyses that were planned, one was a comparison of scoring by males and females. Others were a comparison based on expansion-compression in drawings tests, and one based on preferred versus nonpreferred die-faces.

Participants

The subjects were 10 volunteers (five men and five women) who took part in the experiment without receiving any payment. One of the subjects had reached the age of 64 (a man) and one the age of 60 (a woman). The remaining eight subjects were between 21 and 27 years old. None of them had ever before participated in PK or ESP experiments.

Apparatus

The same four precision-made dice, which measured 17 min along each edge, were used throughout the experiment.' Another part of the equipment was the dice-casting apparatus. It consisted of a chute, into the upper end of which was inserted a funnel made of smooth plastic with a hole at the bottom measuring 2.5 cm in diameter. When the dice were thrown into the funnel they started their way down the chute at almost the same point. The chute, I in in length, 20 cin wide, and 13 cm deep, was tilted at approximately a 60-degree angle. Within it were 52 hardwood steps 18.5 cm by I cm. The dice were shaken in a poker cup and thrown

into the mouth of the chute, from which they bounced downward over the steps into a box at the bottom. The inside measurements of the box were .48 in by .30 in. It was. 15 in deep at the sides, and the backstop was. 30 in high. The dice apparatus stood on the floor, and during its construction, great attention was paid to its stability. The die-faces were recorded after each throw on specially designed, four-column record sheets, each column having spaces for listing 24 single die-faces (one run of six throws). Thus, on each record sheet 96 die-faces were recorded. Six sheets (one for each die-face as target) made one series.

Experimental Procedure

Before the commencement of the tests the subject's name, address, sex, and age were written down. Then the subject was asked to name which die-face and combination of die-faces (i.e., 1, 2, 3 or 4, 5, 6) he most preferred. This was thought to be of importance since investigations in the past, e.g., that of Pratt (1947), have indicated that certain target numbers or combinations of such numbers may influence a subject's score.
During the experiment, the apparatus, the experimenter, his assistant, and two subjects were gathered together in the experimental room. The subject sat at the foot of the apparatus, either facing it or with his back to it, depending on which of the two psychological conditions was being used in that part of the experiment. The experimenter and the assistant sat next to the apparatus, and the other subject present, who functioned as a witness, was seated diagonally behind the assistant. Precautions were taken to make sure that the apparatus remained standing on exactly the same spot and that none of those present (who always remained seated in the same places) touched it during the tests.

When all were ready to start the experiment, the selection of the target was made. Complicated procedures have been developed to fix a sequence of random target numbers (Rhine, 197 1) in order to eliminate an alternative explanation to PK, namely, that of precognition. In the tests here described it was considered sufficient to bypass this problem by having the subject throw a die once. The number that showed up was then accepted as the first target number. Thus, if the 3-face showed up, this would be the first target, followed

by faces 4, 5, 6, 1, 2. Rhine and Pratt (1967) state that in this simple procedure an eventual precognitive influence can express itself only by PK influence on the first throw.

The experimenter was the only one who manipulated the poker cup and the dice. He shook the four dice in the cup and threw them into the opening of the chute. When they had come to rest in the dice box, the experimenter, in a clear voice, called out the die-faces from low to high, the numbers being checked by all the other persons present.

The assistant and witnessing subjects did the recording. They were seated in such a position in the neighborhood of the apparatus that they could clearly see the dice lying in the dice box. However, what they recorded remained a secret from each other. It was agreed upon beforehand what was to be done in the event the dice fell outside the dice box or the trial had to be disqualified for some other reason. In these situations, all four dice were to be thrown again.

After each throw, the experimenter took the four dice out of the dice box, shook them in the cup, and threw them into the chute again. When a record sheet had been completely filled in (four runs), both the assistant and the witness counted the hits per run. Their records were checked and compared with each other. The runs were then continued with the next consecutive number as target, and a new record sheet was filled. After a series had been completed, the six sheets were signed by all persons present.

Psychological Conditions

Each subject was tested under two psychological conditions. The choice of which condition should be used first was determined by the throw of a die. If a 1-, 3-, or 5-face turned up, the tests were started with Condition 1; a 2-, 4-, or 6-face meant starting with Condition 2. From then on the conditions were alternated. In the first condition ("conscious concentration") the subject was urged to attempt, by consciously focusing his willpower, to make those die-faces show up that had been selected as the targets. Sitting straight in front of the apparatus, he

attentively followed the tumbling of the dice and tried to force them (while tensing the muscles of his whole body) to come to a stop with the chosen die-faces on top.

In the second condition ("visualization") the subject was directed to visualize the end result (target number). This method required him to attempt to visualize vividly the die with the target die-face upward. In this condition the subject sat with his back to the apparatus, trying to see the target in his "mind's eye" while staring at a brown wall. After the image was stabilized, he gave a signal to the experimenter and the test was started. During the test (96 calls) the subject tried to retain the image of the target while sitting very quietly and relaxed in his chair. Some subjects tried to facilitate the production of the image by closing their eyes, while other subjects tried by symbolizing the target (in the case of the number 2, for instance, by calling up in their minds the image of the two eyes of a cat).

The experimenter's intention was to compare the PK scores in the two conditions. The two above-mentioned strategies for influencing the dice were selected on the basis of their dissimilarity. In both conditions we may speak of a volitional, cognitive task; but in the concentration condition the subjects had to induce a state of strong muscle tension and intense concentration, while in the visualization condition, they had to induce a state of relaxation. The importance of "Imagery" in (qualitative and quantitative) ESP and PK investigations has been discussed recently by Price (1973).

Stanford (1969) found that persons whose thinking was dominated by vivid mental images tended to perform better on a PK task when a 11 visualization" method was used than when an "associative activation" method was used. In Stanford's "visualization" method, his subjects were to "see" the falling-down and turning-up of the die in accordance with the target face for that trial, and not only (as in our case) the desired end result. In Stanford's experiment a free-association test was used to measure the subject's tendency to organize his thinking around sensory imagery. The measure of this tendency was positively correlated with the difference score for the two experimental conditions in Stanford's study. This test was also used in the present investigation, together with the expansion--compression rating of the

subject's drawings. However, neither of the tests yielded significant differences between scoring patterns of the subjects.

Statistical Analyses

Each target sheet contained four columns of calls, with 24 calls per column, altogether making 96 calls per sheet for a single target face. Since there were six target faces, the six sheets made up one series, each of which contained 576 trials. Every subject carried out three series for psychological Condition I and three for Condition 2, making 3,456 trials per subject. The 10 subjects thus made a total of 34,560 calls.

For the statistical analyses within a single condition, the individual trials were used. However, Stanford and Palmer (1972) argue that for comparing the scores of two groups of subjects (or two different conditions) it is best to use the subject's total score. For that reason, in this PK experiment a nonparametric test for correlated data was used. The most suitable statistic was considered to be the Wilcoxon matched-pairs signed-ranks test (Siegel, 1956). All probabilities were two-tailed since no predictions were made regarding the direction of the effects.

Results

The overall results gave a nonsignificant deviation of -43 in the total of 1,440 runs (34,560 trials). The results of the two psychological conditions were as follows. In the conscious concentration condition there was a deviation of - 109 hits (CR = 2.22; p = .04). The 720 runs in the visualization condition resulted in a nonsignificant deviation of +66 hits. The difference in scoring rate between the two conditions was significant by the Wilcoxon test at the level of p = .05 (N = 10; T = 8).

Neither the total results nor the results of the two conditions separately showed any significant differences between males and females, expansiveness and compressiveness in the subjects' drawings, nor preferred vs. nonpreferred die-faces or combinations of die faces. The

overall results produced a chronological effect when the first of the subject's three series were compared with the last of the three. This effect was in the form of an incline of 151 hits from Series I to Series 3, which was marginally significant by the Wilcoxon test (N = 9; T = 4.5; P = .03). (See Table 2.) This finding must be considered to be a post hoc result, however, since a number of other analyses for possible position effects were performed on the data.

Discussion

Before considering possible interpretations of the results, some alternative hypotheses for the observed PK effects should be considered. It is possible, for instance, to advance the hypothesis that the effects were due solely to chance, excluding a parapsychological influence. The negative deviation obtained in Condition 1 and the differential scoring between the conditions indicate that the various effects are unlikely to be due to chance alone. Another counterhypothesis to psi is the possibility that the apparatus was biased in a certain direction. As to this possibility, the reader is referred to the investigation by Albers (1973). The same apparatus was used in his experiments. Furthermore, control tests were conducted that gave evidence that the apparatus was without any noticeable bias. In order to eliminate any possible bias of the dice, it was decided beforehand that in every test series an equal number of throws (96 trials) would be devoted to each target number. The sequence of the target numbers to be used in the course of the series was fixed in a random manner.

Another explanation of the results could be the selection of data. Such an explanation, however, cannot be applied to the present experiment because it was decided beforehand that attention would be given to deviations from chance and to differential effects between the two psychological conditions. Since the results were suggestive of a psimissing effect in Condition 1, a differential effect between the two conditions, and an overall incline between the two conditions, it may be assumed that with the use of our apparatus and experimental set-up, a parapsychological influence seems to have been exerted on the rolling dice.

But then, what could be the explanation of the observed negative deviation in Condition I and the differential effect between the two psychological conditions? The subjects stated after the

tests that they expected more success in Condition I because of the possibility of making more use of their willpower. On the other hand, they indicated that they liked Condition 2 much more because of the quiet, relaxed state in which they were tested. Maybe in this case the tense concentration had a disturbing influence on the psi activation.

But this is in contrast with the findings of Honorton and Barksdale (1972). In their experiments, using an electronic binary random generator, they found a significant difference between muscle tension and relaxation conditions in which the runs following muscle-tension suggestions had independently significant above-chance scores. Also, a study with one subject yielded a significant positive deviation in the muscle-tension condition and a significant negative deviation in the relaxation condition. This study, of course, is not completely comparable with the present one because of different design, apparatus, and so on. However, it is an interesting fact that subjects in their study obtained higher scores following passive concentration instructions (no conscious effort directed toward the target) than following active concentration instructions (consciously trying to exert effort on the target). This effect goes in the direction of that found between our "relaxation" and "concentration" conditions.

In contradiction to the findings of the above-mentioned PK experiments, the ESP experiments reported show a rather consistent picture. W. G. Braud and L. W. Braud (1973) have reported significant performances on a free-response ESP task after the subjects had undergone a procedure combining progressive muscular relaxation, suggestions of mental and physical relaxation, and suggestions that the induced state of relaxation was optimal for ESP. In a recent study Braud and Braud (1974) explored the role of muscular relaxation versus tension as a facilitator of GESP and obtained significant results for the subjects in the relaxation group-, subjects in the tension group scored at chance. The overall outcome of the study by Stanford and Mayer (1974) confirms the Braud work. Here too the fact that there was a positive relationship between ESP performance and mental stillness and quietude at the beginning of the relaxation procedure suggests that psychological relaxation plays an important role in the use of ESP in free-response tasks.

Such consistent results have not yet been found in the exploration of PK-conducive states. Maybe a more profound focusing on the preference of the subjects for several conditions, their mental and physical state at the start of the experiment, will give more information about the process of psi activation. I think also that the personality structure of the subjects, their motivation, task- orientation, and so on may give important cues about this question. One may say that all the components in the setting (experimenter, observers, situation, and recording) may have an influence on the psychological state of t9e subject. To eliminate a great part of these variables (or to keep them under control) is a difficult and complicated task. I think that the results of the present study can be a moderate base for continuing research in this direction, focusing on specific variables.

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BIAL FOUNDATION RESEARCH PROJECT 2008-2009

FINAL REPORT - Addendum

ENHANCING PSYCHOKINESS TASK PERFORMANCE: VOLITION AN OTHER ATTEMPTS TO STUDY PK PERFORMANCE THROUGH THE PRACTICE OF IMAGERY STRATEGIES

By Alejandro Parra, Juan Manuel Corbetta & Irma Caputo

INSTITUTE OF PARANORMAL PSYCHOLOGY, Inc.

Salta 2015 (C1137ACQ) Buenos Aires, Argentina.

rapp@fibertel.com.ar

ABSTRACT

Two studies were done exploring the effectiveness of two PK imagery strategies derived from a survey of popular writings on how to develop psychic skills. Goal-oriented imagery involves visualizing only the final outcome or desired goal; process-oriented imagery involves visualizing some sort of process gradually leading up to the desired final outcome.

In the first study, 62 subjects were asked to bias the behavior of a visual display controlled by a random number generator, using each imagery strategy half the time (8 runs of 16 trials for each strategy). There was significantly positive overall evidence for PK ($p < .02$) and for PK during goal-oriented imagery ($p < .01$). If one considers the subject as the unit of analysis, subjects' overall scores differed significantly from chance ($p < .05$); neither imagery strategy produced scores that differed significantly from chance, and goal-oriented scores did riot differ significantly from process-oriented scores. In a second study, 20 subjects attempted the same PK task, using each imagery strategy half the time. An analysis of variance revealed that goal-oriented imagery scores were significantly greater than process-oriented scores, that prior training was not itself a significant factor, but that imagery strategy and prior training interacted significantly ($p < .02$). Subjects in this study were asked to practice concentration enhancement exercises and return in two weeks to repeat the PK procedure, this time using their preferred imagery strategy for all 16 runs. Eight subjects chose the goal-oriented strategy; their scores were significantly above chance ($p < .01$). Eleven subjects chose the process-oriented strategy; their results were at chance. The difference between the two groups was significant ($p < .02$). Thus the goal-oriented imagery strategy appears to be more effective than the process-oriented Strategy, at least for those with no prior exposure to mental development training.

In the second study, we investigate the effects of two psychologically distinct techniques of attempting to influence falling dice. In the first technique ("conscious concentration"), the subject was requested to attempt, by consciously focusing his willpower and inducing a tension in his muscles, to force the dice to fall with the target face upward. In the second technique ("visualization"), the subject was asked merely to visualize the desired face while in a state of relaxation. Marginally significant evidence of psi-missing was obtained in the conscious concentration condition ($p < .04$), but chance results under the visualization condition. The difference in scoring rate between the two conditions was significant at the .05 level.

PROJECT BACKGROUND AND CONCEPTION

Introduction

There are many studies that have explored methods that might enhance the operation of psychokinesis. The studies are divided into six main categories: (a) hypnosis, (b) yoga and meditation, (c) relaxation, (d) feedback, (e) negative reinforcement and punishment, and (f) visual imagery. A distinction is made between training studies and studies conducted to explore the effectiveness of certain methods. Most of the studies investigated methods that might facilitate the operation of PK on a single occasion. The designs of the studies are described, and their results are presented and discussed. Several improvements and suggestions are considered for future research into methods of enhancing and potentially training PK.

A large body of controlled studies is available on possible ESP-conducive methods in the experimental environment. (See Honorton, 1977b, for a review of yoga and meditation work; see Honorton, 1985, and Stanford, 1984, for Ganzfeld work; see Honorton & Krippner, 1969, and Schechter, 1984, for hypnotic-induction work; see George & Krippner, 1984, for mental imagery work; see Honorton, 1977b, and Mishlove, 1983/1988, for relaxation work; see Palmer, 1978, 1986, for feedback training work.) However, less attention has been paid to potentially PK-conducive methods. This chapter surveys studies that have explored methods to facilitate PK. Research in this area may eventually enable us to bring PK phenomena to such a level that they may become more reproducible on demand and therefore more readily available to scrutiny.

The solutions to many problems facing parapsychology, such as building and testing theories, depends on the researchers having a reliable procedure to generate measurable psi. Not enough reliable high-scoring participants turn up in experiments, and those who do are liable to lose their ability to score highly after a period of time (Thouless, 1964, p-71). John Beloff (1967) states: "Progress is possible in science only when the relevant phenomena are available for research" (p.120). Gardner Murphy (1969, p.3) wrote that the problem of

cultivating "good psychic participants" was really the beginning and the center of all Psychical research. According to Murphy, the cultivation of the "paranormal gift" (p. 10) was similar to the cultivation of almost any other kind of gift –whether playing the piano or learning to wiggle one's ears.

The assumptions behind the studies in this review are that "trainable" PK ability may exist, and that this ability can possibly be brought to such a level through practice that it becomes amenable to systematic research. It is possible to distinguish between a training study and a study conducted to explore the effectiveness of a certain method. The term "training" denotes, generally, the process of bringing an organism's performance, such as making specific response(s) or engaging in complex skilled activity, to a previously agreed upon improved end state of proficiency by a specific instructional program or structured manner of practice. The experiments cited here were not necessarily aimed at training PK. Most of them explored methods that might facilitate the operation of PK on a single occasion. Strictly speaking, a training study would involve repeated sessions and emphasize a process with actual training goals in mind.

The studies of potential PK-facilitating methods have been broken down into six main categories: (a) hypnosis, (b) yoga and meditation, (c) relaxation, (d) feedback, (e) negative reinforcement and punishment, and (f) visual imagery. These particular methods were selected because, if they can be shown experimentally to be PK-conducive, they could be used without too much difficulty in a specific instructional program aimed at bringing participants' PK performance to a high and consistent scoring level. It should be noted that each method does not necessarily demand a facility specific to a given form of psi. In fact, the faculties called upon to perform each method do not appear to be independent; most methods explicitly or implicitly call for one or more of the others (e.g., meditation probably involves relaxation to some degree).

PK IMAGERY RESEARCH: EXPLORATORY STUDY

In the experimental literature, very little attention has been paid to the role of specific volitional activities-the mentation involved in intending, wishing, willing, wanting the target to behave in accordance with the instructions. The only systematic exploration of volitional activities has consisted of a few studies conducted to explore the effect of visual-imagery strategies on PK performance. These studies have mainly examined two strategies: goal-oriented imagery, which is a visualization of a desired goal or outcome of a PK trial; and process-oriented imagery, which is a visualization of a process leading to a desired goal or outcome of a PK trial.

There are six studies on record that can be considered to have explored the role of goal-oriented imagery in the generation of PK (Levi, 1979; Morris & Reilly, 1980; Morris, Nanko, & Phillips, 1982; Nanko, 1981; Stanford, 1981; Steilberg, 1975). All six studies yielded PK scores in the positive direction for goal-oriented imagery. The PK scores were significantly above chance in three of the six studies when trial-bytrial feedback of performance was provided (as an experimental variable in Levi, 1979, but as the essential experimental design in the studies by Morris et al., 1982, and Nanko, 1981).

Two experiments were carried out at the parapsychology laboratory at the Instituto de Psicología Paranormal to attempt to replicate these findings and to explore the possibility of using volitional imagery strategies as a method of enhancing PK scoring from session to session. PK success will be measured by an RNG-based computer test which it was designed for one of us.

Psi research on unselected subjects appears to produce sporadic results, too inconsistent at present to allow development of an effective process-oriented research program. Although research with "gifted" individuals can produce impressive results, they seem limited in their generalizability and often dependent upon the unique interpersonal dynamics of the research team involved. For a variety of reasons (Child, Honorton, Kelly, Morris, & Stanford, 1980) we

have therefore chosen to focus on techniques for training individuals to develop and maintain psychic functioning.

General Aims

To this end, we have conducted a preliminary survey of the popular literature by over fifty authors on such techniques. The present study is an attempt to explore two different visual imagery strategies that this literature advocated for the intentional production of PK phenomena. Thus, our strategy for exploring the nature of PK involves:

(a) focusing on volitional variables, especially those already mentioned within the literature;

(b) deploying those variables within a "training" context by providing participants with exercises drawn from the training literature;

(c) collecting considerable individual-differences data; and

(d) varying conditions of theoretical importance for the assessment of the role of volition in a standard PK testing procedure.

FIRST EXPLORATORY STUDY

Aims

The importance of psi training research lies in attempting to find means of producing measurable psi. However, in order to be able to establish a psi training procedure, it can be argued, we need to know more about how psi can be controlled. We may want to investigate whether:

1. Use of this mental procedure results in increasingly strong and stable psi scores with continuous practice, and

2. Participants will be successful because they practiced the mental procedure, or this technique merely served to trigger some latent natural abilities, or simply boosted their motivation, confidence, and so forth, are other questions that have to be answered by yet further research.

If we are to evaluate the traditional idea of PK as a volitional effort that in itself contributes causally to target outcomes, then we must focus attention in part on those volitional acts themselves, and we must go beyond merely varying the nature of the assigned volitional task. If differences in the real-time volitional activities do seem to matter, if there is some evidence that certain assigned volitional strategies or styles seem to produce better results than others, then (a) it supports the hypothesis that those volitional activities are themselves causally involved after all in some way, and (b) it contributes to a more effective experimental protocol for producing positive results.

Thus, one aim of the present study is to extend earlier research suggesting that some assigned volitional strategies seem to work better than others. Thus, our strategy for exploring the nature of PK involves:

(a) focusing on volitional variables, especially those already mentioned within the literature;

(b) deploying those variables within a "training" context by providing participants with exercises drawn from the training literature;

(d) varying conditions of theoretical importance for the assessment of the role of volition in a standard PK testing procedure.

Participants

The sample included 62 participants, both 40 females (71.4%) and 22 males (28.6%), their ages ranged from 19 to 77 years (Mean= 48.47; SD= 11.02). Subjects were recruited by announcements in newspapers and magazines and by brochures distributed in conferences hold at the Institute of Paranormal Psychology and other centers. Interested persons were in touch by e-mail with the Institute in order to request an interview for the experimental session. We designed a web page and host it in our web site for recruit subjects to add to the sample (*http://www.alipsi.com.ar/talleres.asp?id_taller=5*), from which we selected only the inquiries of the Argentines. The receiver did not receive information about characteristics related to the hypothesis of the experiment before the session.

Results

Since this study was designed as a pilot study, we asked several descriptive questions of the data. The random event generator produced decisions in accordance with the subject's instructions (hits) 51.9% of the time ($z = 2.38$, $p < .02$, two-tailed).

Almost all of the positive scoring occurred with the goal-oriented imagery, which produced 52.9% hits and was independently significant ($z = 2.6\ 1$, $p < .\ 0\ 1$, two-tailed). The Z score (or critical ratio) has been used traditionally to assess whether or not an overall extrachance effect is taking place; it is a general statistical test in that it does not discriminate between strong effects manifested by a few individuals vs. weak effects by many individuals.

An above-chance but nonsignificant overall scoring rate would yield a significant t statistic if all subject scores were at or near the average, while a significant overall rate could be nonsignificant by the t procedure if obtained by averaging a few very high subject scores with other scores that were at or below chance. The mean deviation from chance of the total scores for all subjects was + 4.75; this deviation was statistically significant at $p < .05$, two-tailed ($t = 2.36$, with 15 df).

The mean deviation from chance of the goal-oriented imagery PK scores was +3.69; this deviation was not significantly different from chance ($t = 1. 84$, with 15 df, $.05 < p < . 10$, two-tailed). The mean deviation from chance of the process-oriented imagery PK scores was + 1.06; this deviation was riot significantly different from chance ($t = .99$, 15 df, $.20 < p < .40$, two-tailed). The difference in number of hits per session per condition between the two procedures was not significant ($t = .872$, $< p < .40$, two-tailed).

Thus there is suggestive evidence that these imagery procedures may be able to produce PK results. Of special interest are the goal-oriented imagery strategies.

SECOND STUDY:
"CONSCIOUS CONCENTRATION" VERSUS "VISUALIZATION" IN PK TESTS

Aims

The purpose of this investigation was to repeat the American experiments aimed at having the subject consciously influence the results of dice-throwing in such a way that a certain die-face, selected beforehand as the target, would come up more often than could be expected by chance alone. Apart from the principal aim of the experiment (the demonstration of a PK influence on rolling dice) it was expected that the subjects would show a differential effect in their scoring; i.e., that they would score positively during one of two psychological conditions and negatively in the other.

Briefly, in one condition, the subject was to try to concentrate on the target face of the die; in the other, he was to try to visualize it. Of the secondary analyses that were planned, one was a comparison of scoring by males and females. Others were a comparison based on expansion-compression in drawings tests, and one based on preferred versus nonpreferred die-faces.

Results

The overall results gave a nonsignificant deviation of -43 in the total of 1,440 runs (34,560 trials). The results of the two psychological conditions were as follows. In the conscious concentration condition there was a deviation of 109 hits (CR = 2.22; p = .04). The 720 runs in the visualization condition resulted in a nonsignificant deviation of +66 hits. The difference in scoring rate between the two conditions was significant by the Wilcoxon test at the level of p = .05 (N = 10).

Neither the total results nor the results of the two conditions separately showed any significant differences between males and females, expansiveness and compressiveness in the subjects' drawings, nor preferred vs. nonpreferred die-faces or combinations of die faces. The

overall results produced a chronological effect when the first of the subject's three series were compared with the last of the three. This effect was in the form of an incline of 151 hits from Series I to Series 3, which was marginally significant by the Wilcoxon test (N = 9; T = 4.5; P = .03). This finding must be considered to be a post hoc result, however, since a number of other analyses for possible position effects were performed on the data.

Discussion

Before considering possible interpretations of the results, some alternative hypotheses for the observed PK effects should be considered. It is possible, for instance, to advance the hypothesis that the effects were due solely to chance, excluding a parapsychological influence. The negative deviation obtained in Condition 1 and the differential scoring between the conditions indicate that the various effects are unlikely to be due to chance alone. Another counterhypothesis to psi is the possibility that the apparatus was biased in a certain direction. As to this possibility, the reader is referred to the investigation by Albers (1973). The same apparatus was used in his experiments. Furthermore, control tests were conducted that gave evidence that the apparatus was without any noticeable bias. In order to eliminate any possible bias of the dice, it was decided beforehand that in every test series an equal number of throws (96 trials) would be devoted to each target number. The sequence of the target numbers to be used in the course of the series was fixed in a random manner.

Another explanation of the results could be the selection of data. Such an explanation, however, cannot be applied to the present experiment because it was decided beforehand that attention would be given to deviations from chance and to differential effects between the two psychological conditions. Since the results were suggestive of a psimissing effect in Condition 1, a differential effect between the two conditions, and an overall incline between the two conditions, it may be assumed that with the use of our apparatus and experimental set-up, a parapsychological influence seems to have been exerted on the rolling dice.

But then, what could be the explanation of the observed negative deviation in Condition I and the differential effect between the two psychological conditions? The subjects stated after the

tests that they expected more success in Condition I because of the possibility of making more use of their willpower. On the other hand, they indicated that they liked Condition 2 much more because of the quiet, relaxed state in which they were tested. Maybe in this case the tense concentration had a disturbing influence on the psi activation.

But this is in contrast with the findings of Honorton and Barksdale (1972). In their experiments, using an electronic binary random generator, they found a significant difference between muscle tension and relaxation conditions in which the runs following muscle-tension suggestions had independently significant above-chance scores. Also, a study with one subject yielded a significant positive deviation in the muscle-tension condition and a significant negative deviation in the relaxation condition. This study, of course, is not completely comparable with the present one because of different design, apparatus, and so on. However, it is an interesting fact that subjects in their study obtained higher scores following passive concentration instructions (no conscious effort directed toward the target) than following active concentration instructions (consciously trying to exert effort on the target). This effect goes in the direction of that found between our "relaxation" and "concentration" conditions.

In contradiction to the findings of the above-mentioned PK experiments, the ESP experiments reported show a rather consistent picture. W. G. Braud and L. W. Braud (1973) have reported significant performances on a free-response ESP task after the subjects had undergone a procedure combining progressive muscular relaxation, suggestions of mental and physical relaxation, and suggestions that the induced state of relaxation was optimal for ESP. In a recent study Braud and Braud (1974) explored the role of muscular relaxation versus tension as a facilitator of GESP and obtained significant results for the subjects in the relaxation group, subjects in the tension group scored at chance. The overall outcome of the study by Stanford and Mayer (1974) confirms the Braud work. Here too the fact that there was a positive relationship between ESP performance and mental stillness and quietude at the beginning of the relaxation procedure suggests that psychological relaxation plays an important role in the use of ESP in free-response tasks.

Such consistent results have not yet been found in the exploration of PK-conducive states. Maybe a more profound focusing on the preference of the subjects for several conditions, their mental and physical state at the start of the experiment, will give more information about the process of psi activation.

Future research proyects will exam:

1. The personality structure of the subjects, their motivation, task- orientation, and so on may give important cues about this question. One may say that all the components in the setting (experimenter, observers, situation, and recording) may have an influence on the psychological state of the subject. To eliminate a great part of these variables (or to keep them under control) is a difficult and complicated task.

2. The results of the present study can be a moderate base for continuing research in this direction, focusing on specific variables.