Experimental

CONSCIOUSNESS INTERACTIONS WITH REMOTE BIOLOGICAL SYSTEMS: ANOMALOUS INTENTIONALITY EFFECTS

William G. Braud, Ph.D. & Marilyn J. Schlitz, M.A.

ABSTRACT

This paper describes a 13 year long, and still continuing, series of laboratory experiments that demonstrate that persons are able to exert direct mental influences upon a variety of biological systems that are situated at a distance from the influencer and shielded from all conventional informational and energetic influences. The spontaneously fluctuating activity of the target system is monitored objectively during randomly interspersed influence and noninfluence (control) periods while, in a distant room, a person attempts to influence the system's activity in a prespecified manner using mental processes of intentionality, focused attention, and imagery of desired outcomes. The experimental design rules out subtle cues, recording errors, expectancy and suggestion ("placebo") effects, artifactual reactions to external stimuli, confounding internal rhythms, and coincidental or chance correspondences. Distantly influenced systems include: another person's electrodermal activity, blood pressure, and muscular activity; the spatial orientation of fish; the locomotor activity of small mammals; and the rate of hemolysis of human red blood cells. The experiments are viewed as laboratory analogs of mental healing.

KEYWORDS: Healing, mental healing, remote influence, intentionality, attention, imagery

INTRODUCTION

Findings from the areas of hypnosis, autogenic training, biofeedback training psychophysiological self-regulation, placebo, meditation, and imagery research indicate that mental processes, especially intentionality, can have dramatic somatic effects. These effects, which may be observed at many levels of functioning (behavioral, autonomic, neurological, immunological, and endocrinological), are typically understood and explained in terms of a network of anatomical, hormonal, biochemical, and (perhaps) electromagnetic connections that exist between the central nervous system and the various organs, tissues, and cells of the body.

Additional evidence indicates that, under special conditions, mental influence may extend even beyond the body. Under controlled laboratory conditions, the thoughts, images, and intentions of one person may influence those of a second person even under conditions of screening or isolation that preclude conventional sensorimotor interactions between the two persons. Some of the most compelling evidence for these anomalous cognition effects may be found in several recently published meta-analyses that indicate strong and consistent interpersonal mental influences in large numbers of experiments conducted under conditions of perceptual isolation (using a ganzfeld procedure),[1] hypnotic induction,[2] forced-choice precognition,[3] and extraversion/introversion[4] testing. Accumulated evidence also points to consciousness-related anomalies in physical systems; here, small but consistent intentional influences upon remote random mechanical[5] and random electronic devices[6] have been observed.

In this paper we describe a now 13 year long, and still continuing, research program in which we have extended the remote mental influence procedure to animate rather than inanimate systems. In these experiments, the ongoing, freely varying activity of a living organism is monitored objectively while a remotely situated and suitably screened individual attempts to exert a direct mental (intentional) influence upon that activity. The monitored activities have included the autonomic and muscular activity of another person, behavioral activities of fish and small mammals, and the rate of hemolysis of human red blood cells. The goals of this remote influence have included both increments and decrements in the monitored systems' activities. Our aim is to summarize the research program and describe some of the experimental protocols in detail in order to encourage independent replications of this work by other investigators.

Living systems possess a number of advantages as target systems for direct mental influence research. They provide methodological advantages in that, unlike the subjective reports used in anomalous cognition experiments,[7] the behavioral and physiological activities of biological systems may be directly monitored by physical measuring devices. The use of living target systems also provides motivational advantages. For many experimental participants, the possibility of influencing living systems such as other people, animals, or living cells is more appealing than influencing inanimate devices. Principles discovered in the course of investigations of direct mental influence of living systems (DMILS) are relevant to our understanding of the processes underlying certain forms of unorthodox healing (i.e., mental, spiritual, or absent healing) and may even enhance our understanding of at least some of the cases in which prayer is efficacious in promoting physical healing or recovery. It may also be the case that animate target systems are inherently more susceptible to direct mental influence than are inanimate systems. Discussions of additional advantages of DMILS research and further background information may be found in other publications.[8]

GENERAL DESIGN CONSIDERATIONS

The experiments to be described share certain common features. One begins by arbitrarily selecting an organism and a response system in which activity changes will be assessed. Systems characterized by a moderate amount of freely varying activity are recommended. Labile systems may be more susceptible to direct mental influence than are more inert systems.[9] It is not yet known whether physical lability itself or perceived lability is the critical factor. On the one hand, freely varying activity may reflect underlying randomness (or, perhaps, chaotic activity) which may be essential to the occurrence of direct mental effects. On the other hand, the perception of varying target activity may instill confidence that the target system can indeed change, and perhaps it is this psychological factor that is favorable to success. This important distinction (of physical versus psychological lability or "randomness") has received virtually no experimental attention. It could, however, be easily investigated using appropriate analytical designs that could separate these usually perfectly confounded factors.

Both excessively sluggish and excessively active systems may be nonoptimal. The former are inappropriate because of relative insusceptibility to change and because the system's low baseline activity level would be near a "floor" below which changes could not be observed. The latter are inappropriate because excessively "driven" systems also possess a form of "inertia" that render them difficult to change and because the system's high baseline activity would be near a "ceiling" above which changes could not be observed. The most appropriate systems may be those with moderate departures from homeostasis or balanced activity. In such cases, a directional influence consistent with a return to homeostasis could be maximally effective. Here, suitable precautions would be taken to deal with possible "regression to the mean" artifactual changes.

Once a suitable response system has been selected, experimental participants are instructed to attempt to exert directional influences upon the system's activity level. Incremental aim, decremental aim, and non-influence aim (i.e., control or baseline) periods may be scheduled in various combinations, but their sequence must always be determined by an accepted random process (such as a table of random numbers or a computer's pseudorandom algorithm). The influence and non-influence epochs during which the system's spontaneous activity is to be continuously recorded should be numerous enough to permit efficient statistical analysis yet not so brief as to produce confusion or discomfort in the influencer (due to a need to switch intentions or mental states too frequently). We have typically used ten 30-second influence epochs randomly interspersed among ten 30-second noninfluence (control) epochs with success. If each recording epoch is preceded by a 30-second rest/preparation period, an experimental session is usually 20 to 25 minutes in duration.

We design our experiments so that, in the absence of a direct mental influence, the living target system's cumulative activity for the influence and non-influence epochs should be equivalent much as flipping a coin should, over time, produce an equal number of heads and tails. In a design in which a number of decremental aim periods (i.e., periods in which the participant intends for the system to exhibit decreased activity) are randomly interspersed among an equal number of non-influence (control) periods, 50 percent of the system's spontaneous activity would be expected (by chance alone) to occur during decremental aim periods and 50 percent during control periods. Our experiments typically involve a sufficient number of sessions to permit conventional statistical analyses to definitively determine whether the total decremental aim activity is indeed significantly lower than control period activity.

In analyzing our experiments, we have used the conservative strategy of reducing all of the epoch measurements to a single session score and using such session scores as the units of analysis. For a given session, we calculate a *percent influence score* which is the percentage of total activity that occurred in the prescribed direction during the entire set of influence (decremental or incremental aim) periods. A percent influence score for an experiment involving ten incremental aim epochs and ten control epochs would be calculated by summing the activity scores for the ten incremental aim epochs and dividing this sum by the total activity exhibited in the session as a whole (i.e., the sum of activity scores for all twenty epochs). In the absence of direct mental influence, the expected value of a percent influence score is 50 percent. A set of percent influence scores can be compared with mean chance expectation (MCE) of 50 percent using a single-mean *t*-test. This is equivalent to directly comparing the influence and non-influence (control) scores for the respective sessions by means of matched *t*-tests. Of course, equivalent nonparametric tests (Wilcoxon matched-pairs signed ranks tests; Mann-Whitney U tests) could be used instead.

We use percent influence scores in an effort to standardize measurements for different response systems so that results for various systems can be more readily compared. We use the more conservative session score (a kind of single, "majority vote" score) in order to bypass criticisms based on possible non-independence of multiple measures taken within a given session (and generated by the same individual organism). While it would be possible—taking a more "liberal" statistical view—to analyze individual epoch scores using, for example, a repeated measures analysis of variance (ANOVA) procedure, such an analysis assumes that the autocorrelations among the measures within each session (i.e., within each responding organism) are constant across epochs, and that the same autocorrelation applies to all sessions[10] (responding organisms), we prefer a more "conservative" approach. These assumptions can not definitively be said to hold in all our experiments, so we prefer to use the more conservative session-based (rather than epoch-based) analyses, even though the former are more wasteful of data and result in tests with reduced statistical power.

During an experimental session, it is essential that the target system be shielded from all possible conventional influences from the experimental participants. This is accomplished by placing the target system and the influencer in separate, non-adjacent rooms (with several intervening walls and closed and locked doors) and by preventing verbal or other forms of communication between the two rooms. Floor plans of laboratory spaces in which the experiments were conducted are presented in Figures 1 and 2.

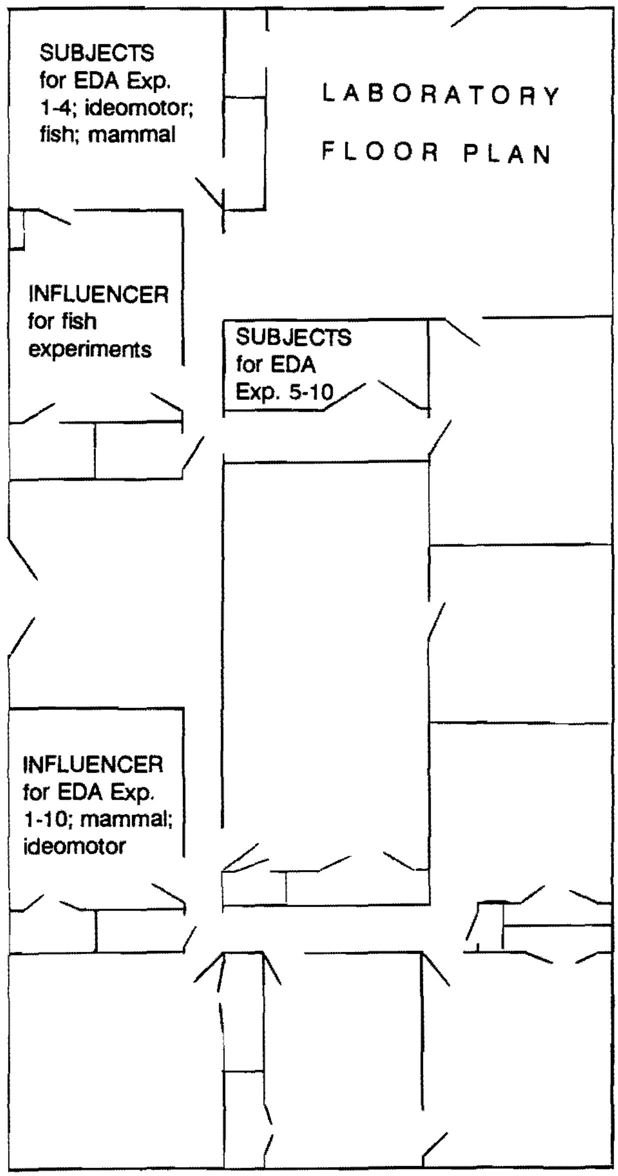

Figure 1. Floor plan of the laboratory in which the first 11 electrodermal influence experiments were conducted. This arrangement was also used for the ideomotor, fish orientation, and mammal locomotion experiments.

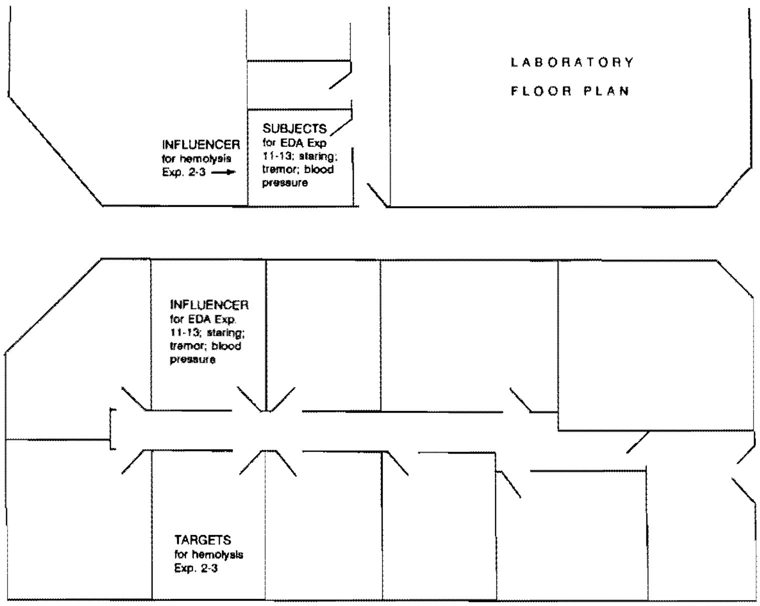

Figure 2. Floor plan of the laboratory in which the last 4 electrodermal influence experiments were conducted. This arrangement was also used for the electrodermal attention (autonomic staring detection), muscular tremor, blood pressure, and hemolysis experiments. The subject and influencer rooms are in separate suites of the same building, separated by an outside corridor and several closed doors.

If the living target system is a person, that person remains unaware of the manner in which the various epochs are scheduled (i.e., the person does not know the number, duration, or sequencing of the randomly scheduled epochs). This "blindness" eliminates the possibility of "placebo" effects or physiological self-regulation on the part of the target person based upon knowledge of the influencer's intentions. The experimental protocol specifies that no experimental personnel who interact with the target person before a session have any knowledge of the influence/non-influence epoch schedule for that session. In cases in which the target system is an animal, no one is present in the animal's test room during the actual session; scoring is accomplished automatically by equipment in another room (interconnected with the animal's test apparatus by means of shielded cables). Thus, inadvertent cueing of the animal is not possible. In cases in which the target system is a cellular preparation (i.e., in the hemolysis trials), the human measurer uses automatic equipment and is blind with respect to the influence/control epoch schedule.

Precautions against measurement errors include objective, computer-based assessments of activity scores and double- or multiple-checking of data reduction and computations. In early experiments in which measurements were made manually (i.e., in Experiments 1 through 4 of the electrodermal series described below), the measurements were blind-scored from objective chart tracings.

Deliberate cheating on the part of subjects is prevented by guaranteeing that the experimental protocol is never "broken", i.e., assuring that subjects are never allowed access to information to which they should remain blind or access to any laboratory personnel who have knowledge of such information. We also employ the strategy of working with a large sample of unselected subjects who would have minimal motivation to cheat, and the experimental protocol itself eliminates the possible effectiveness of accomplices.

In most of the experiments, the person attempting direct mental influence of the living target system (i.e., the "influencer") is provided with real-time feedback regarding the target system's activity. This feedback takes the form of a chart tracing of the target's ongoing activity. The provision of feedback allows the influencer to try different influence strategies and to have immediate knowledge of the results of those strategies. She or he may use this knowledge to continue using apparently successful methods or to shift to alternative methods. Some subjects make use of this continuously available feedback throughout a measuring epoch. Others attend to the feedback indicator only upon completing their epoch activity. Still others prefer not to use feedback at all. Our findings, and those of certain other investigators, indicate that feedback may be useful to some influencers but does not seem essential to the occurrence of DMILS and related effects.[11]

THE ELECTRODERMAL INFLUENCE SERIES

Most of our DMILS work has involved influences by one person upon the ongoing, spontaneous electrodermal activity of another, remotely situated person. We shall review the general characteristics of these experiments; detailed information is provided elsewhere.[12]

Experimental Participants

Three categories of participants are involved in these experiments: subjects, influencers, and experimenters. The *subjects* are the persons whose ongoing physiological activities are monitored and objectively assessed. The *influencers* are individuals who use mental processes of intention, focused attention, and imagery in order to bring about prespecified changes in the physiological activities of the remotely situated subjects. The *experimenters* supervise the experiments and sometimes also function as influencers.

The subjects have been unpaid volunteers from the San Antonio community who learned about the research through announcements, newsletter and newspaper articles, lectures, media presentations, and information from previous participants. Approximately equal numbers of males and females have participated, and they have been between 16 and 65 years of age. Generally, no special inclusion or exclusion criteria were used other than interest in the studies, willingness to participate, and the ability to schedule the requisite laboratory visits. In one experiment (Experiment 5), we wished to study subjects with greater than average electrodermal activity levels (in addition to those with "average" levels), and so we chose persons who presented stress-related somatic complaints for a particular subgroup. In all experiments, all essential details of the experiments were described to the volunteers beforehand, and the volunteers gave their informed consent to participate. In all, 271 persons have served as subjects for these electrodermal influence studies.

The influencers typically have had the same characteristics as the subjects and, therefore, were also "unselected". In other experiments, the experimenters served as influencers. In still other experiments, influencers were specially selected based upon their interests and skills in unorthodox healing, mental healing, therapeutic touch, Reiki healing, meditation, and self-exploration. A total of 62 influencers participated in the entire series. An interesting finding was that results were fairly comparable for the different types of influencers.

The authors served as experimenters for this series of studies and in some experiments were assisted by experimenter J.C. (who had research experience in nursing) and experimenter H.K. (a local college student participating in a research *practicum* at the Foundation). The first author has extensive research experience in experimental psychology, physiological psychology, and parapsychology. The second author has extensive experience in anthropological and parapsychological research. Overall, four experimenters participated in the series.

Precautions Against Conventional Communication, External Stimuli, and Subtle Cues

Conventional communication between the influencer and the subject was precluded through the use of independent, nonadjacent rooms (separated by a distance of 20 meters or more and several intervening rooms, walls, and closed doors–see Figures 1 and 2) and a strict protocol that eliminated cueing possibilities. There were no active microphones through which unauthorized communication could occur and, further, the experimenter and influencer maintained silence during the experiment sessions.

Precautions Against Suggestion, Expectancy, Placebo Effects, and Confounding Internal Rhythms

The subjects remained blind regarding the nature, number, and scheduling of the influence attempts. They knew that influence attempts would be made, but they were unaware of the directions or timing of the attempts. This information was unknown even to the influencer and experimenter until after all pre-session interactions with the subject had been completed and the participants were stationed in their respective rooms. Influence periods were randomly interspersed among an equal number of non-influence (control or baseline) periods. The random scheduling of the two types of periods was accomplished through use of truly random electronic random event generators[13], tables of random numbers, pseudorandom computer algorithms, or adequately shuffled cards. The random schedules were prepared by persons who had no further roles in the studies, and the schedules were kept in sealed envelopes in secret locations until needed. These random schedules prevented any internal rhythms or extraneous, systematic, time-varying factors from contributing in a biased fashion to either type of period.

Subject's Procedures

During a 20-minute experimental session, the subject's spontaneously fluctuating electrodermal activity was monitored while the subject (a) remained in as normal a condition as possible and made no deliberate, conscious attempts to relax or become more active, (b) observed for brief periods and then gently dismissed all thoughts, feelings, and images that spontaneously came to mind, (c) made himself or herself open to and accepting of any direct mental influences from the influencer (whom the subject had already met before the session), and (d) kept "in the back of the mind" a "gentle wish" that the experiment would have a successful outcome. Subjects followed these four instructions in every experiment. Subjects were told to avoid unnecessary movements (especially of the electroded hand and arm), but otherwise they were to maintain an everyday, ordinary state of consciousness.

Influencer's Procedures

Before each of twenty 30-second electrodermal activity recording epochs, the influencer was issued instructions about what to do during the epoch. Epochs were signalled to experimenter and influencer (through headphones) by special tones audible only to them and not to the distant target person (the subject). During non-influence (control or baseline) epochs, the influencer attempted not to think about the subject or about the experiment. During decremental aim periods, the influencer created and maintained a strong intention for the remote target person to be calm and relaxed and to exhibit very little electrodermal activity. The influencer supplemented this decremental intention by calming herself or himself, visualizing the target person in calming settings, and visualizing polygraph tracings indicative of relaxation or lowered arousal (i.e., infrequent pen deflections, low amplitude pen deflections). Complementary strategies were used for incremental aim epochs, with increased activation and physiological arousal substituted for calmness and quietude.

Immediate, sensory, analog feedback regarding the subject's electrodermal activity was provided to the influencer in the form of a chart recorder tracing of the activity on a polygraph before which the influencer was seated. Influencers used this available feedback of the chart recording in various ways (see Page 8). Results of some electrodermal influence sessions and, more importantly, from several entire experiments involving different target activities (see the following sections) indicate that such feedback is not essential to the occurrence of the direct mental influence effect.

In some experiments, ten epochs with calming (decremental) orientation were compared with ten non-influence, control epochs within each session. In other experiments, ten epochs with activating (incremental) orientation were compared with ten non-influence, control epochs within each session. In still other experiments, ten decremental aim epochs were compared with ten incremental aim epochs within each session.

In the various experiments of this series, periods ranging in duration from 15-seconds to 2-minutes separated the 30-second recording epochs. During these intervening periods, the influencer could rest and prepare for the next epoch.

Physiological Measurements

We chose electrodermal activity fluctuations as our physiological measure because such measurements are readily made, are sensitive indicators, and are known to be useful peripheral measures of the activity of the sympathetic branch of the autonomic nervous system. We measured the phasic, AC component of the fluctuating electrical resistance of the skin, known technically as *skin resistance reactions* (SRRs). The equipment automatically corrected for drift in baseline level (basal skin resistance) so that our measures were sensitive to changes in the subject's state and were not biased by individual differences in baseline. The occurrence of many or of high amplitude spontaneous SRRs is indicative of increased sympathetic nervous system activation or arousal, which may in turn reflect increased emotionality.[14] The occurrence of few or of low amplitude spontaneous SRRs indicates decreased sympathetic activation or arousal, which may in turn reflect decreased emotionality and, therefore, a greater degree of emotional and mental quietude and calmness. Illustrative electrodermal activity chart tracings are presented in Figure 3. The output of the skin resistance amplifier was rectified (by a diode) before it was displayed and assessed.

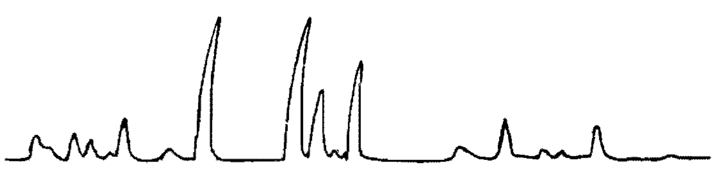

Figure 3. A typical chart tracing of spontaneous skin resistance reactions. The activity has been rectified, and the chart speed is 0.25 cm/sec.

Different skin resistance amplifiers, types and placements of electrodes, and chart recorders were used in the various experiments; details may be found elsewhere.[12] These changes did not appear to affect the results in a significant way.

In Experiments 1 through 4, an individual who otherwise was not involved in the research quantified the electrodermal activity by blind-scoring the pen tracings (measuring each deflection with a millimeter rule). Special precautions were taken to preclude subtle cues that might influence scoring. This was done by obscuring possible visual cues with multiple layers of opaque tape, by keeping the random influence sequence hidden, and by preventing the scorer's contact with anyone knowing the target sequence until scoring had been accomplished. In Experiments 5 through 13, scoring was completely automated by sampling the electrodermal activity at 100 msec. intervals through use of an analog-to-digital converter interfaced with a microcomputer, and averaging these values. Since electrodermal activity changes relatively slowly, this sampling rate is quite satisfactory. The computer printed a permanent paper printout of these integrated measures for each epoch at the end of each session.

Scoring of Measurements

The treatment of activity scores has already been described (see General Design Considerations section above). Percent influence scores were calculated using the electrodermal (SRR) measures for the various recording epochs of a session. The mean chance expectation for these percent influence scores was 50 percent. A significant departure from 50 percent was taken to be an indication of a direct mental influence upon ongoing, spontaneous electrodermal activity, if the direction of the departure corresponded with the aim. Therefore, one-tailed *t*-tests generally were used in these assessments.

Results

We have completed 13 studies of direct mental influence of electrodermal activity using the protocol just described. Some of the experiments (Experiments 1, 2, 3, 4, and 11) had only one component and were conducted simply to test the effectiveness of the method with different samples of subjects and influencers. We describe these five experiments as "nonanalytical studies" since they did not assess variables other than the influence/non-influence factor. The remaining experiments were "analytical studies" conducted to explore the role of additional physiological and psychological variables. Since some of these analytical studies contained subcomponents, more than 13 sets of results were generated. We have used the following *a priori* rule in presenting the results: In cases in which significant differences obtained between different subconditions and/or in cases in which it had been decided in advance to evaluate certain subconditions

Table I

Statistical Summary of Electrodermal Influence Experiments

Experiment	Influencer(s)	Number of Sessions	Mean % Influence	*t*	*p*	Type of Study
1	Experimenter	10	59%	3.07	.0065	Nonanalytical
2	Selected subject	10	59%	2.04	.035	Nonanalytical
3	10 unselected volunteers	10	58%	2.96	.0077	Nonanalytical
4	10 unselected volunteers	10	47%	-0.76	.736	Nonanalytical
5a	Experimenters	16	60%	2.40	.014	Analytical
5b	Experimenters	16	50%	-0.09	.537	Analytical
6	24 unselected volunteers	24	57%	1.77	.043	Analytical
7	Experimenters	32	53%	1.15	.13	Analytical
8	Experimenters	30	52%	0.45	.33	Analytical
9	Experimenters	30	51%	0.44	.33	Analytical
10	Experimenters	16	53%	1.31	.10	Analytical
11	3 healing practitioners	15	51%	0.62	.28	Nonanalytical
12	5 selected volunteers	40	51%	0.21	.41	Analytical
13a	8 selected volunteers	32	57%	2.41	.02	Analytical
13b	8 selected volunteers	32	48%	-0.53	.70	Analytical

Note: In this and in all subsequent tables, one-tailed *p*-values are given (for purposes of Stouffer *z* determinations).

separately, results are presented for each subcondition; otherwise, results are combined across subconditions and presented for the experiment as a whole. This rule generated 15 sets of results. For convenience, each set is called an "experiment". The number of sessions contributing to each experiment ranged from 10 to 40.

Summary statistics for the 15 experiments are presented in chronological order in Table I. For each experiment, the primary analysis was the comparison of the sessions' percent influence scores with MCE (50 percent); single-mean *t*-tests were used for these comparisons. Since percent influence scores indicate the percentage of the session's (subject's) total electrodermal activity that occurred in the expected or predicted direction, scores greater than 50 percent indicate "successful" direct mental influence outcomes while scores less than 50 percent indicate "unsuccessful" outcomes. The *t*-tests yielded independently significant ($p \leq .05$) results for 6 of the 15 experiments. This obtained 40 percent experimental success rate is to be compared with a 5 percent experimental success rate to be expected on the basis of chance alone. The overall significance of the entire series may be determined using the Stouffer (or combined *z*) method which involves converting the obtained *p*-values into *z*-scores, summing these *z*-scores, and dividing this sum by the square root of the number of studies being combined; the result is itself a *z*-score that can be evaluated by means of its associated, highly significant, *p*-value.[16] The overall *z*-score for this entire 15-part series is 4.08, which has an associated $p = .000023$. The individual *z*-scores contributing to this assessment are depicted graphically in Figure 4.

In behavioral and biomedical statistics, there is currently an increased emphasis on the effect sizes observed in experiments and the consistency of these effect sizes, rather than significance levels alone.[15] For this reason, an effect size (r) was calculated for each experiment according to the formula

$$r = \sqrt{\frac{t^2}{t^2 + df}} \qquad (1)$$

These effect sizes are also given in Figure 4, next to their respective *z*-scores. The effect sizes (r) vary from -.24 to +.72, with a mean effect size (r) of +.25, which compares favorably with effect sizes typically found in behavioral and biomedical research. An appealing presentation of effect size is the *binomial effect size display* (BESD) which converts an effect size to the change in success rate (e.g., survival rate, improvement rate, etc.) that would be expected if a treatment or procedure having

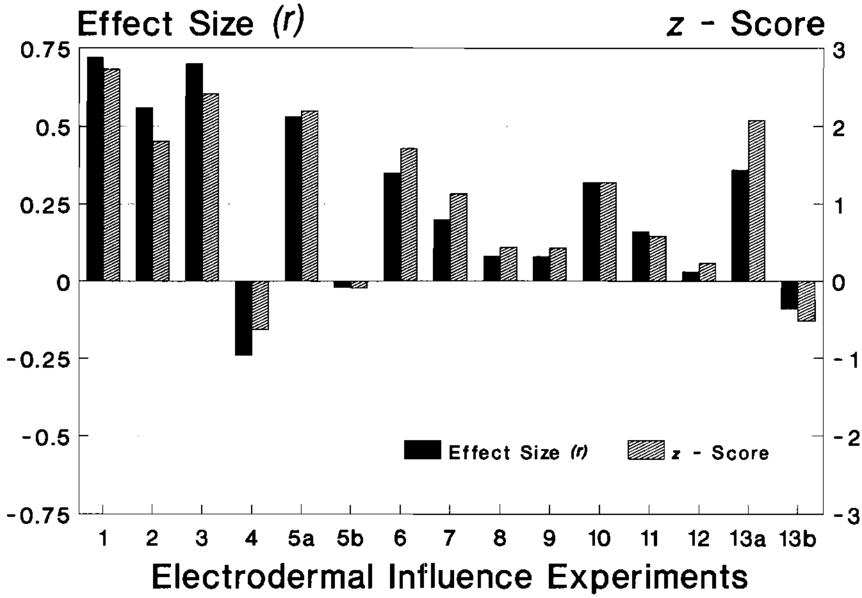

Figure 4. Effect sizes (r) and z-scores for the 15 successive electrodermal influence experiments.

that effect size were to be instituted.[16] According to a BESD, a baseline treatment which ordinarily produces, e.g., a 37.5 percent survival rate in some population can be augmented by another treatment with an effect size of +.25 (the effect size of the mental influence in these experiments) to a 62.5 percent survival rate. This is hardly a trivial effect. It is illuminating to compare the experiment results within the series we are reporting with those of recent placebo-controlled studies of the cardiovascular effects of the drugs propranolol and aspirin conducted by the National Heart, Lung, and Blood Institute and the Physician's Health Study Research Group, respectively.[17] Both studies, each employing very large sample sizes (2108 subjects and 22,071 subjects, respectively), were terminated prematurely because their results were deemed so favorable to the efficacy of the drugs being tested. The researchers felt that it would be unethical to continue the study and thereby deprive the placebo subjects of the benefits of the drugs. The effect size in the propranolol study was .04. A BESD analysis would indicate that a treatment with such an effect size would be expected

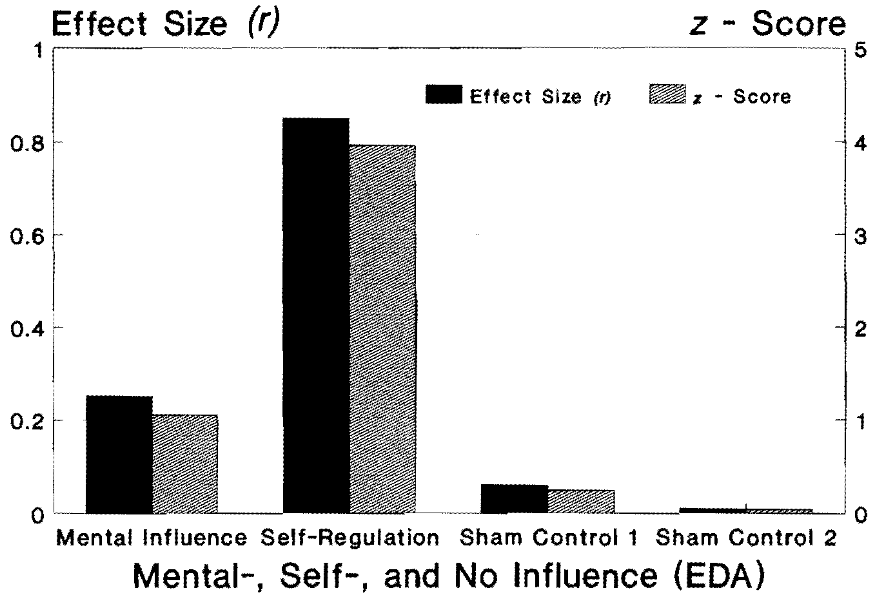

Figure 5. Mean effect sizes (r) and z-scores for electrodermal direct mental influence, self-regulation, and sham (control) experiments.

to change success rate from 48 percent to 52 percent. The aspirin study yielded an even smaller effect size (r = .03).

Figure 5 provides still another perspective of the present results. In this figure, the mean z-score and mean effect size (r) for all 15 electrodermal influence experiments are plotted along with the corresponding scores for an electrodermal self-influence experiment and two electrodermal sham-experiments.[18] In the self-influence experiment, subjects attempted to reduce their *own* electrodermal activity, compared to baseline conditions, using psychophysiological self-regulation techniques.

In the sham-experiments, electrodermal measurements were made under conditions comparable to those of the real direct mental influence studies, and the measurements were assigned to two conditions in a manner that mimicked that of the real experiments. The important difference was that the "influence" and "non-influence" designations were nominal only, and did not involve the participation of an actual influencer. The sham-experiments were conducted to determine whether it would be likely, by chance alone, to obtain differences as large of those found in the real experiments. For these three sets of experiments, all variables other than the source of the influence (i.e., remote mental influence, self-influence, or no influence, respectively) were virtually identical and therefore permit direct comparisons. As expected, the direct mental influence values are considerably larger than those generated under sham control (chance) conditions, but not as large as those generated through self-influence procedures.

ELECTRODERMAL CORRELATES OF REMOTE ATTENTION

In this section, and in the next six sections, we shall present brief summaries of related experimental series in which we explored DMILS effects using the same general protocol but different types of animate target systems.

Additional electrodermal studies were conducted using a protocol identical to that described in previous sections, but with two important changes. First, no polygraph feedback was supplied. Second, rather than attempt to actively influence the subject in a particular direction, the "influencer" simply devoted full attention to the distant person whose electrodermal activity was being continuously monitored. During half of the recording epochs, the "influencer" directed full attention toward ("stared at") the subject's image as it appeared on a closed-circuit television monitor. During the other (control) epochs, the influencer did not look at the monitor and did not think about the subject or the experiment. The subject, of course, was blind to the random sequence of the two types of epochs.

Four such experiments were conducted, along with a sham-experiment in which electrodermal measurements were collected during epochs that were to be analyzed as "staring" and "nonstaring" periods, but which did not involve actual staring.[19] The results are summarized in Table II. As expected, electrodermal activity scores during the "staring" and "nonstaring" periods did not differ during the *sham*-experiment. However, significant electrodermal differences between staring and nonstaring periods did emerge in each of the four "real" experiments. In three of

Table II

Statistical Summary of Electrodermal Remote Attention Experiments

	Number of Sessions	Mean % Influence	t	p
Untrained subjects	16	59.38%	-2.66	.0089
Trained subjects	16	45.45%	2.15	.024
Replication 1	30	45.15	1.92	.032
Replication 2	16	45.66	2.08	.028
Sham Control	16	49.16	0.30	.38

Percentages > 50% indicate activation effects;
Percentages < 50% indicate calming effects
(see text for explanation of negatively-signed t-value)

the experiments, electrodermal activity was lower (i.e., in the direction of calming) during staring than during nonstaring periods; in one experiment, staring was associated with increased electrodermal activity (i.e., activation). These calming and activating effects are understandable in the context of the psychological conditions present in the starers and "starees" in the different experiments; however, a discussion of these patterns is beyond the scope of this paper.

In the meta-analysis of scientific experiments, there is a convention of assigning negative scores to results that differ in direction from the bulk of the findings. Therefore, we have assigned negative scores, t-tests, and effect sizes to the experiment with the "staring activation" results. The z-scores and effect sizes are shown in Figure 6.

STUDIES OF IDEOMOTOR REACTIONS

Ideomotor reactions are automatic reactions that are associated with thoughts; they are often subtle and unconscious. A familiar example is the "Chevreul pendulum"

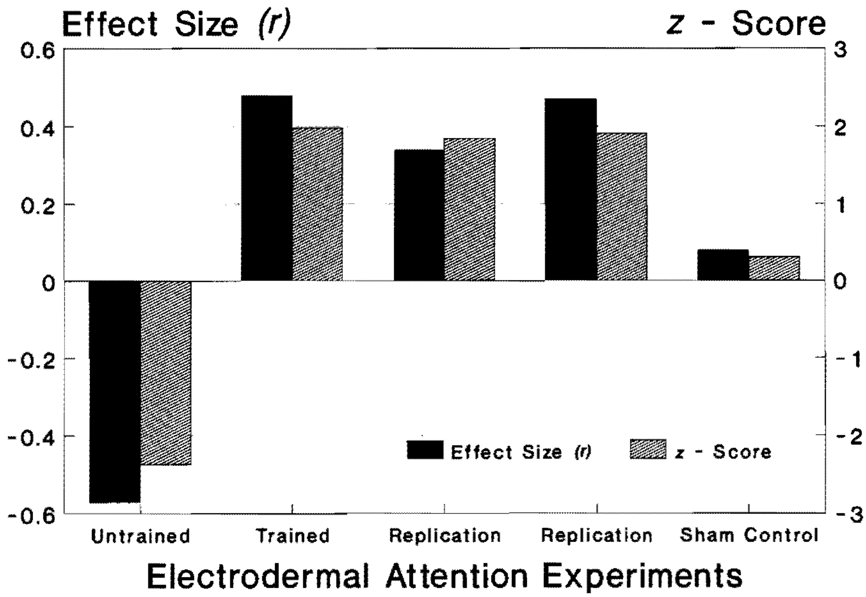

Figure 6. Effect sizes (r) and z-scores for the electrodermal attention (remote staring detection) experiments.

Table III

Statistical Summary of Ideomotor Influence Experiments

	Number of Sessions	Mean % Influence	*t*	*p*
Experiment 1	10	55.55%	2.54	.0158
Experiment 2	15	71.65%	6.23	.000011
Experiment 3	15	47.35%	-1.29	.891

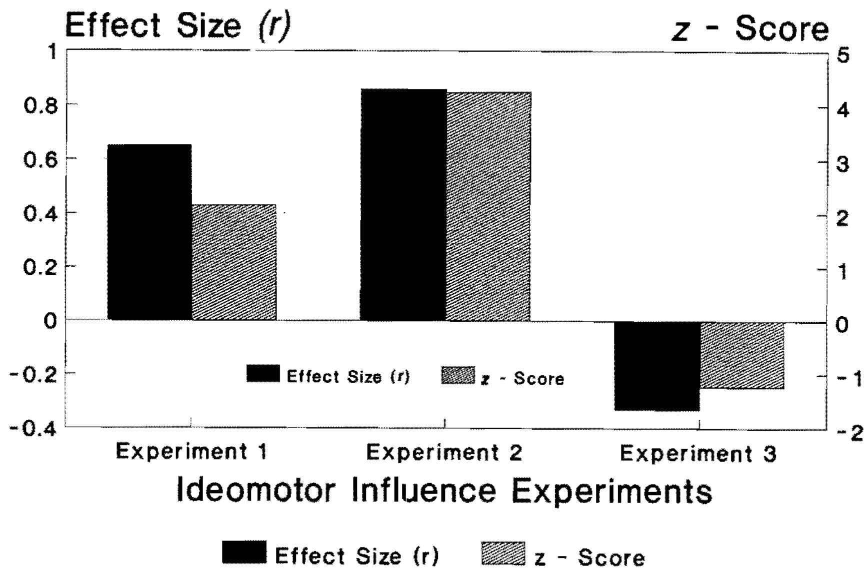

Figure 7. Effect sizes (r) and z-scores for the ideomotor influence experiments.

in which information (typically yes/no answers to questions) in translated into subtle muscular movements of the arm, hand, and fingers, then amplified by a hand-held pendulum (a small weight suspended by a thread) to give a visible indication.[20] In three experiments, we explored the possible direct mental influence by one person of the unconscious, muscular movements of a second, remotely situated and isolated, person.[21] Circular versus linear movements of a hand-held pendulum served as the target ideomotor reactions, and circular versus linear directional aims of a distant influencer were randomly scheduled.

The pendulum movements were scored by the target persons who were blind regarding the influence aim of each recording period. The recording periods were signalled to the target persons by means of white noise (which was present during the trials, but absent during the inter-trial rests). The influencers received no immediate feedback in these experiments. Two of the three experiments yielded significant outcomes. The results are presented in Table III and in Figure 7.

Table IV

Statistical Summary of Muscular Tremor Influence Experiments

	Number of Sessions	Mean % Influence	t	p
Experiment 1	10	47.91%	-0.92	.81
Experiment 2	9	50.09%	0.04	.48

STUDIES OF MUSCULAR TREMOR

We conducted two experiments in which more conscious muscular responses served as the target reactions.[22] The subject (situated in a distant room and "blind" regarding the random epoch sequence) held a metal stylus within a small opening in a metal plate. The subject's aim was to be as steady as possible. Small movements of the hand (caused, for example, by nervousness) caused the stylus to contact the metal plate and were automatically registered as "errors". The subject was quite aware of these errors which could be felt and which were made even more noticeable by a small lamp that flashed each time the stylus contacted the metal. The influencer attempted to increase or decrease the number of errors (unsteadiness indications) made by the remote subject during incremental and decremental aim periods, respectively. The influencer received immediate, ongoing feedback regarding the effects of his or her intentions: The target subject's error rate was converted to gong-like tones that the influencer could hear through headphones. The pitch of the gongs was proportional to the remote subject's error rate.

These two experiments did not yield significant overall results. (Other analyses revealed significant correlations between tremor influences and nearby random event generator influences in these sessions, indicating that direct mental influences did occur in the study; a description of these analyses is beyond the scope of this paper.) Statistical summaries are given in Table IV and in Figure 8.

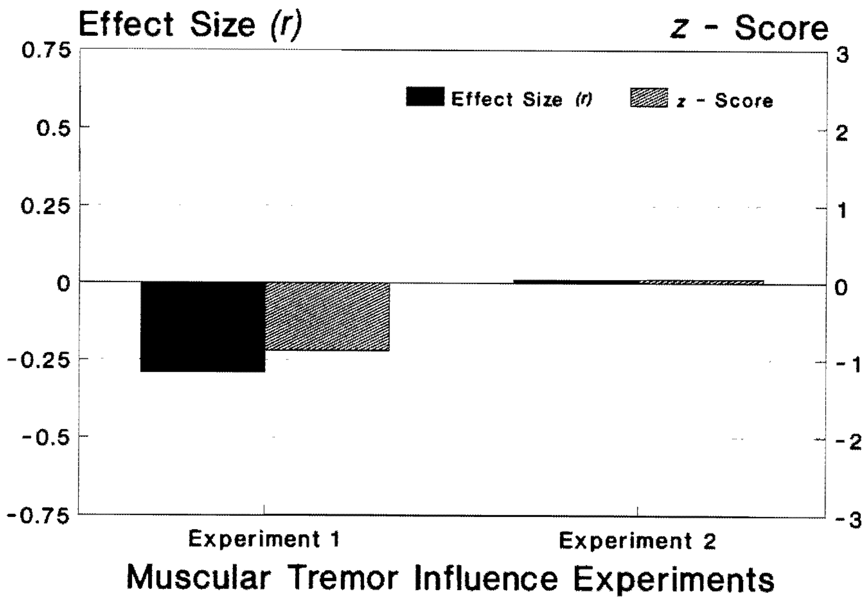

Figure 8. Effect sizes (r) and z-scores for the muscular tremor influence experiments.

STUDIES OF BLOOD PRESSURE INFLUENCE

Two direct mental influence experiments were conducted in which blood pressure served as the targeted reaction.[23] The experimental protocol for these studies was similar to that used in the electrodermal influence series described above, with three important exceptions: (a) there were eight 2-minute epochs rather than twenty 30-second epochs, (b) blood pressure was substituted for electrodermal activity, and (c) the influencer did not receive immediate feedback regarding the remote subject's blood pressure. At the conclusion of each epoch, blood pressure was measured automatically by an IBS Model SD-700A electrosphygmomanometer (Industrial & Biochemical Sensors Corporation, Waltham, MA). The dependent variable was mean arterial pressure (MAP), calculated from the systolic (S) and diastolic (D) values according to the standard formula MAP = 1/3 (S - D) + D. Decremental aim and noninfluence (control) periods were randomly sequenced. Significant results were obtained in one of these two experiments. The results are summarized in Table V and in Figure 9.

Table V

Statistical Summary of Blood Pressure Influence Experiments

	Number of Sessions	Mean % Influence	*t*	*p*
Experiment 1	1*	51.77%**	2.45*	.025
Experiment 2	40	50.10%	0.75	.23

* The eight absolute blood pressure measurements of this pilot session of Experiment 1 were analyzed by means of a two-samples *t*-test with 6 *df.*

** The percent influence equivalent of the absolute measurements is given for Experiment 1 for comparative purposes only; they were not used in the two-samples *t* analysis.

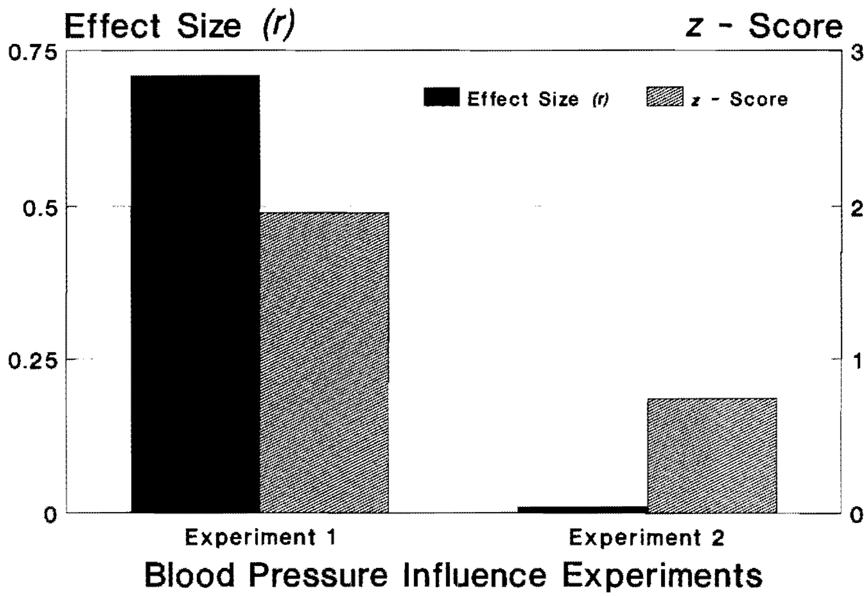

Figure 9. Effect sizes (r) and z-scores for the blood pressure influence experiments.

SPATIAL ORIENTATION OF FREELY SWIMMING FISH

In addition to the studies of human physiological response systems described above, we have conducted experiments with other living organisms. In four experiments, persons attempted to influence the spontaneous swimming behavior of a small knife fish.[24,25] This fish (*Gymnotus carapo*) emits a weak electrical signal that is believed to be used for navigational purposes in its native habitat. If the fish is allowed to swim freely in a small container with metal electrodes fastened to the container's end walls, the fish's continuous AC signal arrives at those electrodes at different strengths, depending upon the fish's distance from and orientation toward the electrodes. The varying signal can be amplified, rectified, and electronically integrated. It may also be displayed on an oscilloscope screen, where it appears as a "randomly" rising and falling tracing. This oscilloscope tracing can provide immediate feedback, to an influencer, regarding the spatial orientation of a target fish that is isolated in an enclosure in another room. The integrated voltage from the fish/electrode system can be treated similarly to the changing electrical activity of the electrodermal experiments and can be compared for randomly scheduled incremental aim *versus* noninfluence (control) epochs. In this case, the incremental aim was for high amplitude oscilloscope tracings, which corresponded to a fish's perpendicular orientation toward the metal end electrodes. The results (presented in Table VI and in Figure 10) were significant for three of these four experiments.

Table VI

Statistical Summary of Fish Orientation Influence Experiments

	Number of Sessions	Mean % Influence	t	p
Experiment 1	10	52%	3.26	.00492
Experiment 2	10	53%	3.34	.00433
Experiment 3	10	54%	2.12	.0315
Experiment 4	10	51%	0.50	.314

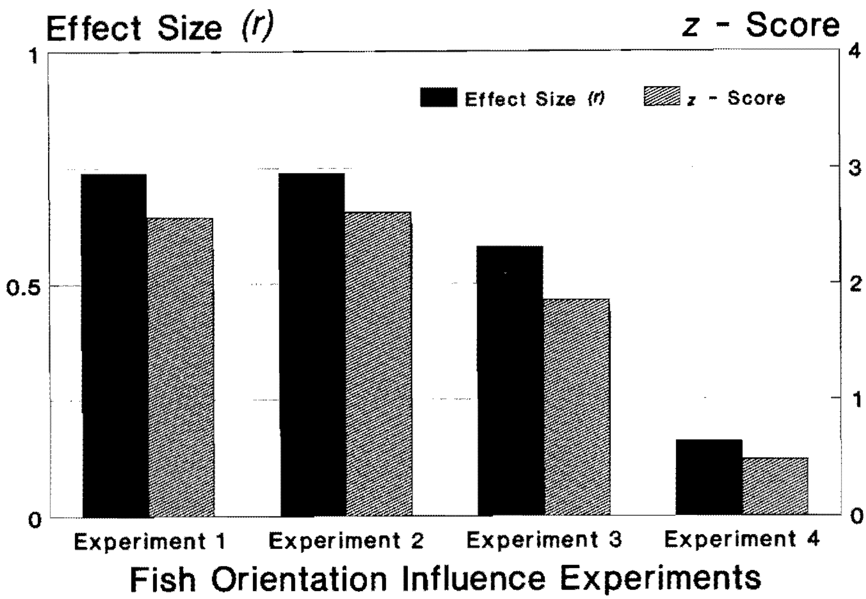

Figure 10. Effect sizes (r) and z-scores for the fish orientation influence experiments.

LOCOMOTOR BEHAVIOR OF SMALL MAMMALS

In four experiments, persons attempted direct mental influence of the locomotor behavior of Mongolian gerbils (*Meriones unguiculatus*).[24,25] The gerbil could run freely in an activity wheel. Each revolution of the wheel activated a switch that deflected an ink-writing event marker on a polygraph located in the distant room in which the influencer was stationed. Total activity (wheel revolutions) during randomly scheduled incremental aim and noninfluence (control) epochs was quantified by blind-scoring the number of pen deflections occurring during each epoch. In these experiments, the incremental aim was for frequent pen deflections (which could be viewed by the influencer and therefore provided immediate feedback), which corresponded to high activity levels (many activity wheel revolutions). The results are presented in Table VII and in Figure 11. Three of the four experiments yielded significant outcomes.

Table VII

Statistical Summary of Locomotor Behavior Influence Experiments

	Number of Sessions	Mean % Influence	*t*	*p*
Experiment 1	10	55%	1.50	.0839
Experiment 2	10	53%	2.12	.0315
Experiment 3	10	55%	2.33	.0224
Experiment 4	10	52%	2.89	.00894

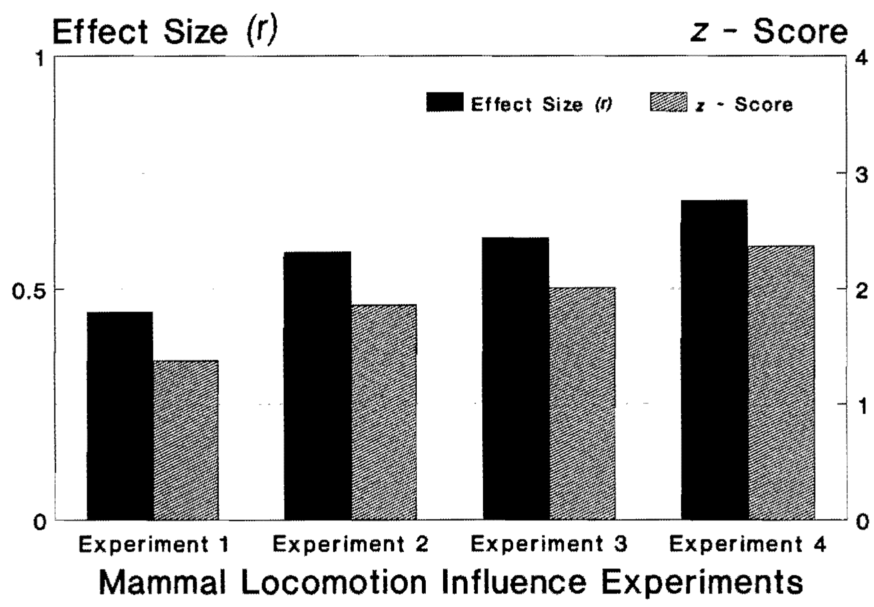

Figure 11. Effect sizes (r) and z-scores for the mammal locomotion influence experiments.

STUDIES OF AN IN VITRO CELLULAR PREPARATION (HEMOLYSIS)

In three experiments, we worked with an *in vitro* cellular preparation (human red blood cells) rather than an intact organism.[24,26] If red blood cells are placed in a solution having the same salinity as the blood plasma, their membranes will remain intact and the cells will "survive" for relatively long periods. If, however, the cells are osmotically stressed by a solution with too little or too much salinity, compared with blood plasma, the membranes become fragile and burst, spilling the cells' hemoglobin into the solution. The rate at which this process (*hemolysis*) occurs can be controlled by varying the salinity of the solution. Since the solution of blood cells becomes increasing transparent to light as hemolysis proceeds, the time course and extent of hemolysis can be tracked and quantified by measuring the amount of light transmitted through the solution by means of a spectrophotometer.

We used such a measuring procedure in experiments in which persons attempted to "protect" human red blood cells by retarding their rate of hemolysis, mentally and at a distance. Rates of hemolysis of several tubes of blood were measured spectrophotometrically by a person who was unaware of which tubes were being influenced and which were noninfluence (control) tubes. The light measurements (i.e., the analog output of the spectrophotometer) were analyzed on line by means of an analog to digital converter interfaced with a microcomputer. Tubes were measured during randomly scheduled decremental aim and noninfluence (control) epochs. The influencer, who was stationed in a distant room, did not receive immediate feedback about the condition of the cells, but simply maintained a strong intention and image of the desired outcome during the decremental aim periods. The desired outcome was a reduced hemolysis rate, i.e., "healthy" cells with intact membranes that transmitted little light. Results (presented in Table VIII and Figure 12) were significant for two of the three experiments.

OVERALL STATISTICAL SUMMARY

Direct mental influences of living systems were examined in eight areas. An overall statistical summary is presented in Table IX. The data in this Table, along with the effect sizes indicated in Figures 4 through 12, provide strong evidence that persons

Table VIII

Statistical Summary of Hemolysis Influence Experiments

	Number of Sessions	Mean % Influence	*t*	*p*
Experiment 1	10	57.46%	8.70	.0000056
Experiment 2	32	49.55%*	-1.26*	.89
Experiment 3	32	50.01%*	4.80*	.000019

* Equivalent mean % influence scores and *t*-scores for Experiments 2 and 3 are given for comparative purposes only; actual analyses were by analysis of variance and by exact binomial tests (see original articles for details).

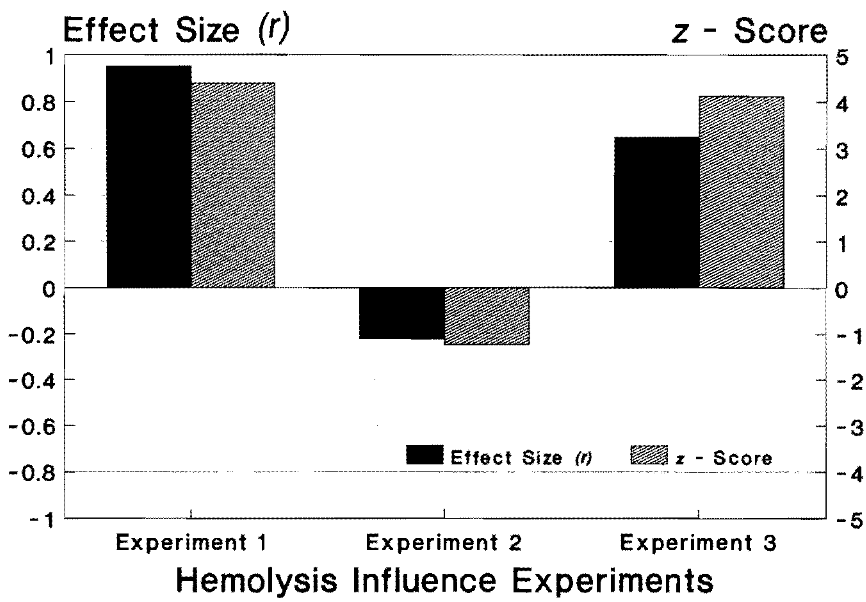

Figure 12. *Effect sizes (r) and z-scores for the hemolysis influence experiments.*

Table IX

Overall Statistical Summary of Direct Mental Influence Experiments

Living Target System	Number of Sessions	Mean z	Stouffer z	Mean Effect Size	Percent of Experiments Significant
Electrodermal activity (influence)	323	1.05	4.08	.25	40%
Electrodermal activity (attention)	78	0.84	1.68	.18	100%
Ideomotor reactions	40	1.72	2.98	.39	67%
Muscular tremor	19	-0.42	-0.59	-.14	0%
Blood pressure	41	1.35	1.91	.36	50%
Fish orientation	40	1.88	3.78	.56	75%
Mammal locomotion	40	1.90	3.81	.58	75%
Rate of hemolysis	74	2.43	4.20	.46	67%
All systems combined	655	1.34	7.72*	.33	57%

* $p = 2.58 \times 10^{-14}$ (one-tailed)

are indeed able to exert direct mental influences upon a variety of living systems. Overall, this research program has included 37 experiments, 655 sessions, 449 different "influencees", 153 different influencers, and 13 different experimenters.

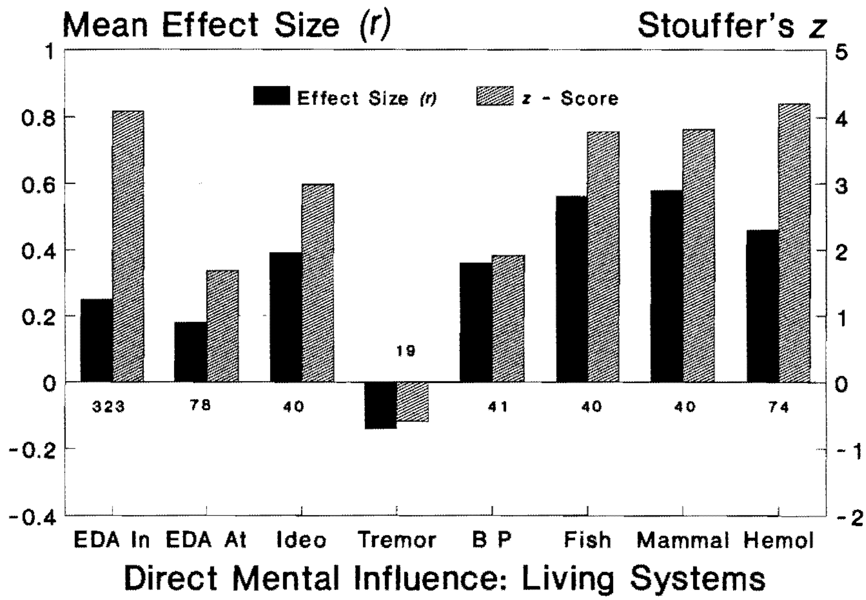

Figure 13. Mean effect sizes (r) and Stouffer z-scores for influences of all eight living target systems.

The reader may prefer to consider the eight subcomponents of the database separately since they involved different response systems. It is legitimate, however, to aggregate the entire body of studies if one is interested in the *general* issue of direct mental influence of living systems.[27] Indeed, the experimental protocols, analysis procedures, and mental strategies of the influencers are virtually identical across the various studies. Summary statistics for all systems combined are given in the bottom row of Table IX; overall results are depicted graphically in Figure 13.

RIVAL HYPOTHESES

In order to conclude that the results described above are indeed attributable to direct mental influence it is necessary to rule out all alternative rival hypotheses, potential artifacts, and possible confounding variables. In this section, we indicate how rival hypotheses may be dismissed for the various influence series.

1. *The results are attributable to coincidental or chance correspondences between the target system reactions and the influencer's intentions.* The probability values of the conventional statistical tests, as well as the overall non-zero effect sizes in the intended direction, effectively rule out coincidence.

2. *The results are attributable to reactions to uncontrolled external stimuli or to sensory cues.* The experimental protocols eliminated these possibilities. Target systems were isolated from the influencers through the use of separate, nonadjacent rooms, distance, and intervening barriers. There were no known or obvious environmental stimuli that could have been associated differentially with the different aim conditions and that could have impinged upon the target systems.

3. *The results can be attributed to common internal rhythms that could have influenced both influencer and target.* Possible contributions of naturally occurring internal rhythms were ruled out by actively manipulating the influencer's aims on the basis of random schedules. The random schedules were based upon adequate randomization methods using electronic random event generators, tables of random numbers, pseudorandom computer algorithms, or well-shuffled cards.[28]

4. *The results could have been due to systematic biases contributed by recording errors or motivated misreadings of records.* In 21 of the 37 experiments reviewed in this paper, target system activity was assessed by automated equipment that provided permanent numerical records that could be double-checked for accuracy. In 11 of the 37 experiments, target activity was manually assessed, by individuals who were blind regarding the nature of the trials (i.e., the scorers did not know which records were for control periods and which were for influence periods); further, the scoring was easy and straightforward (e.g., measuring permanent polygraph tracing deflections with a millimeter rule). Special precautions were taken to eliminate any subtle cues that could have compromised the blindness aspect of the protocol. In 5 of the 37 experiments, automated equipment was used but the equipment provided a numerical display that had to be read by a non-blind experimenter, rather than providing a permanent record. We believe that recording errors were effectively excluded from all of our experiments. Nonetheless, we can perform a conservative analysis to determine whether the results of

only the most "rigorous" experiments (i.e., those in which permanent records were produced by completely automated equipment) remain independently significant even when contributions of less rigorous experiments are completely removed. The 21 most rigorous experiments include Experiments 5 through 15 of the electrodermal influence series, the four electrodermal attention experiments, the two muscular tremor experiments, the two blood pressure experiments, and the second and third hemolysis experiments. These combined experiments yield a mean effect size (r) = .17, a mean z-score = .84, and a Stouffer z = 3.84, which has an associated one-tailed p = 6.15 x 10^{-5}.

Because they comprise such a large component of our work, the 15 electrodermal experiments themselves were submitted to a similar rigor analysis. In order to provide a conservative analysis of that series, the first four experiments (in which polygraph records had been manually but blindly scored) were removed completely and an analysis was done to determine whether the computer scored experiments (Experiments 5 through 15) remained independently significant when the hand-scored results were eliminated. The electrodermal direct mental influence effect remains and is significant even under these stringent conditions (Stouffer z = 2.86, p = .0021, mean effect size = .18).

5. *The "target subjects" knew, at the beginning of a session, when influence attempts were to be made and therefore could have "cooperated" by changing their activities to fit the influence schedule.* The subjects were not told beforehand when or how many influence attempts would be made. Additionally, the experimenter who interacted with the subjects did not become aware of the influence schedule until all pre-session subject interactions had been completed and the experimenter had been isolated in a separate room. The subjects did not know of the existence of, or have access to, the envelopes containing schedule information. Thus, possible suggestion, expectancy, or "placebo" effects (of a conventional sort) were eliminated. It is not inconceivable that the "placebo effect" itself may be an everyday life manifestation of the very processes that are being studied in this research program.

6. *The "target subjects" could have learned about the non-influence/influence schedule during the session and used this information to produce artifactual activity changes.* The sensory isolation aspects of the experimental protocol prevented this.

7. *Target system activity differences for influence versus non-influence (control) periods could have reflected some systematic error, i.e., some progressive change in activity over time.* The use of randomized or counterbalanced sequences of influence and noninfluence periods assured that any time-dependent changes (e.g., due to equipment warm-up, adaptation, habituation, electrode polarization, fatigue, etc.) would not contribute differentially to the two types of periods. Additionally, the experimental protocols were deliberately designed to eliminate such time-dependent changes, and formal statistical analyses of earlier *versus* later periods indicated that the protocols were indeed effective in eliminating them.

8. *The findings are due to arbitrary selection of data.* For each experiment, the total number of trials and subjects were specified in advance, and the analyses reported in this paper include all recorded data.

9. *The findings are due to fraud on the part of the subjects.* The findings are based upon results obtained from a large number of volunteer subjects and influencers who, it would seem, would have no motive for trickery. However, even if they were motivated to cheat, no opportunities for cheating were provided. Cheating would have required knowledge of the precise sequence and timing of the various experimental epochs or the assistance of an accomplice. Both of these requirements were eliminated by the experimental protocols.

10. *The findings are due to fraud on the part of the experimenters.* No experiment, however sophisticated, can ever be absolutely safe from experimenter fraud. Even in cases in which an experiment is controlled by outside supervisors, a hostile critic could still argue that collusion were involved. The hypothesized degree of such collusion would be limited only by the imagination and degree of paranoia of the critic. In some cases, our use of multiple-experimenter designs assured that one experimenter's portion of an experiment served as a kind of control for another experimenter's portion. Only the successful replication of this work by independent investigators in other laboratories will reduce experimenter fraud to a non-issue. One of our motives in publishing this paper is to encourage such replication attempts.

CONCEPTUAL REPLICATIONS

Although, to our knowledge, there have been no exact replications of this work, several *conceptual* replications have appeared. Successful electrodermal influences were reported by researchers at Brooklyn's Maimonides Medical Center,[29] heart rate influences were reported by San Bernardino State College researchers,[30] animal behavior influences were reported by an investigator at the Institut fur Grenzgebiete der Psychologie und Psychohygiene in Freiburg, Germany,[31] and influences upon the activity of an electric fish were reported by investigators at the A. N. Severtsev Institute of Evolutionary Morphology and Animal Ecology in Moscow.[32]

In addition, in the English-language scientific literature alone, there are approximately 100 published reports of experiments in which persons have been able to influence, mentally and at a distance, a variety of biological target systems including bacteria, yeast colonies, fungus colonies, motile algae, plants, protozoa, larvae, woodlice, ants, chicks, mice, rats, gerbils, cats, and dogs, as well as cellular preparations (blood cells, neurons, cancer cells) and enzyme activity[33] In human "target persons", eye movements, gross motor movements, electrodermal activity, plethysmographic activity, respiration, and brain rhythms have been influenced[33]

The experiments described in this paper are, in fact, conceptual replications of human distant mental influence experiments conducted many years ago in the Soviet Union (by Bekhterev, Vasiliev, and their co-workers) and in France (by Joire, Gibert, Janet, and Richet).[34] The direct mental influence effect appears to be a widespread and robust phenomenon.

INFLUENCING FACTORS

An extended discussion of the rationales and results of investigations of factors that influence the likelihood or strength of direct mental influence effects is beyond the scope of this paper. However, we felt it important to at least mention some of the physical, physiological, and psychological variables that we have studied.

Physical Factors

In our own studies of direct mental influence and in those of other investigators, physical variables have not been found to have important influences upon experimental outcome. The effects do not appear to be modulated significantly by physical distance, physical barriers or screens, or the physical constitution of the target system. There are two possible exceptions to this general conclusion.

One of these is the degree of free variability of the target system. Direct mental influence appears to occur more readily in labile systems than in inert ones. As alluded to in an earlier section of this paper, it is not yet clear whether this is truly a physical effect in which a target's susceptibility depends upon its degree of randomness, chaotic behavior, or variability, or rather, a psychological effect in which *perceived* system change encourages facilitating psychological factors of enhanced belief, confidence, and expectation of success.[35]

The other physical factor is the character of the earth's geomagnetic field (GMF) at the time of an experimental session. We have found preliminary indications that the susceptibilities of certain of our target systems (i.e., electrodermal activity, rate of hemolysis) to direct mental influence, as well as the activity levels of these systems, are higher during periods of high GMF activity than during periods of low GMF activity.[36] Complementary findings relating low GMF activity and anomalous cognition effects have already been reported[37] This is quite interesting in view of other findings that suggest that anomalous cognition and anomalous influence processes may be affected in complementary ways by certain psychological and physiological variables and that the two processes themselves may be complementary ones.[37]

Physiological Factors

We have found indications of greater susceptibility to electrodermal direct influence in persons whose spontaneous electrodermal activity levels are relatively high, compared to those with relatively low activity levels.[18] This finding is consistent with a hypothesis that living systems characterized by a greater degree of departure from homeostasis may be more susceptible to direct mental influences aimed at restoring physiological balance. This hypothesis, which implies much more than a mere "regression to the mean" artifact, has important implications for healing practice and healing research and is one that deserves more extensive investigation. The optimal physiological conditions of *influencers* in direct mental influence experiments have not yet been adequately explored.

Psychological Factors

We are more knowledgeable about some of the psychological factors that facilitate or impede direct mental influence effects. The effect appears to be enhanced by the presence of a felt need to be influenced (in an "influencee") or by the perception (by the influencer) of such a need in an influencee.[18] Immediate, trial-by-trial, analog sensory feedback regarding the momentary state of the target system (e.g., viewing polygraph tracings of an influencee's ongoing electrodermal activity) may be facilitating for certain influencers. However, the direct mental influence effect can occur in the absence of such feedback.[19,21,26] Direct mental influence may be focused upon particular subsystems of the target system through directed intention and directed attention[38] Persons may be able to "block" unwanted direct mental influences upon their own physiological activities.[38] The magnitude of certain direct mental influence effects may be influenced by certain "personality" factors such as the influencee's degree of extraversion/introversion, degree of social avoidance and anxiety, and the degree to which one is comfortable and nondefensive about the possibility of being strongly "interconnected" with others.[19] Direct mental influences may occur in persons who are conventionally unaware that such influences upon their physiological activities are being attempted.[12]

In our experiments, persons have rarely expressed concern about the possibility of influencing another person's physiological activity or about the possibility of being influenced in this manner. Informational congruences may occur in the influencer/influencee dyad. For example, during an experimental session, an influencee may experience certain thoughts, feelings, or images that are identical or quite similar to those experienced by the spatially remote influencer. Such anomalous cognition effects may occur whether or not direct physiological influences occur in the same sessions.[12]

It has been suggested that perhaps the ostensible "changes" in activity levels in the various target systems were not really "produced" at all, compared with what would have occurred anyway in the absence of influence attempts. Rather, it may have been the case that certain anomalous cognition processes may have resulted in optimal timing of sessions so that greater target activities happened to occur during high aim than during low aim recording epochs.[39] While this possibility cannot be ruled out unequivocally at present, explicit tests in the DMILS context have yielded outcomes that are not consistent with this "intuitive data sorting" hypothesis.[26,40]

Time-Displaced Effects?

Although we have dealt exclusively, in this paper, with direct mental influences upon living target systems, there exists a considerable literature describing experiments in which persons are able to exert direct mental influences upon inanimate random systems such as electronic random event generators and random mechanical systems.[6] In a series of remarkable experiments, physicist Helmut Schmidt has found evidence that suggests that such influences may be displaced in time. In typical random event generator (REG) experiments, a subject or operator uses mental strategies to attempt to influence the behavior of the generator in real time. In a variation on these experiments, Schmidt's subjects used similar mental methods to successfully influence the probabilities of random events generated *in the past,* i.e., random events that had been prerecorded but had not yet been consciously observed. Apparently, present mental "efforts" were able to influence past events about which "Nature had not yet made up her mind." The subjects did not *change* the past (once events had been generated, they remained in that form), but rather, they seemed able to *influence* the initial generation of one type of random outcome over another. The rationales and details of these experiments, which were suggested by certain principles and problems of quantum mechanics (*viz.*, the time-independent nature of certain laws and the "quantum measurement problem") are too complex to describe in this paper; the interested reader can consult relevant publications.[41]

The success of these time-displaced *physical* effects suggests that similar experiments could be conducted using *living* target systems, especially target systems such as electrodermal activity (mediated by the autonomic nervous system) which was not consciously observed by the target persons themselves at the time the activities initially occurred. Ongoing fluctuating electrodermal activity (of which the target person is "unconscious") could be prerecorded on magnetic tape or on floppy disks or computer memory. The data would remain unobserved until some future session at which time the data are played back to be observed for the first time by an influencer who uses direct mental influence methods similar to those we have been discussing. Would it be possible for someone to influence his or her own prerecorded physiological activity or another individual's prerecorded physiological activity? At the time of initial recording, of course, the influence aims for different recording epochs would not yet have been determined and thus would not be known to the person initially emitting the physiological reactions. Target aims for different portions of the prerecorded record would be randomly selected only after the records had initially been made, but before the later observing/influencing session. If such experiments are successful, what would be the influence of the degree of conscious awareness of the physiological reactions at the moment of their initial generation and initial recording? Would the effect occur for initially "unobserved" autonomic reactions (such as electrodermal activity), but not for strongly observed, fully conscious actions (such as visible muscular responses)?

Schmidt has added an intriguing twist to some of his REG experiments. In some cases, the pre-recorded events are observed by a third party during the interval between their initial generation/recording and the session in which the mental influence is attempted. There are indications that such intervening pre-observation, if it is sufficiently intensive, may prevent subsequent direct mental influence effects. Such effects, in which initial sensory observation appears to reduce or eliminate the susceptibility of a random system to subsequent mental influence, have occurred in cases in which humans, dogs, and goldfish were the sensory preobservers.[42] If these effects are replicable and are indeed what they appear to be, these "conscious preobservation" experiments have striking implications. If degree of consciousness is indeed critical in eliminating a subsequent mental influence effect, this blocking phenomenon could be used as an operational measure of consciousness, and eventually could provide a useful empirical tool in a true comparative psychology of mind. We mention these curious time-displaced effects not only for their basic research possibilities, but also because of their theoretical relevance to issues of health, particularly issues of initial symptom formation and illness prevention. Carefully designed experiments involving pre-recorded physiological events could be used to explore curious practical questions such as the following: Can an individual's mental processes "reach backward in time" to actually influence the initial developmental probabilities of healthful or harmful physical changes?

Thus far, we have conducted only one time-displaced, physiological mental influence experiment of the type being proposed.[24] That study, which involved attempts by one selected influencer to influence prerecorded electrodermal activity over a small number of sessions, did not yield overall significant results. Certain interesting target system changes did, however, co-vary with changes in the influencer's psychological condition during the course of the experiment. For example, scoring improved dramatically during runs immediately following a reminder to the influencer that he had, in fact, succeeded in time-displaced experiments in another lab (which he had forgotten), and scoring dropped precipitously when the influencer (contrary to the protocol) attempted to miss i.e., intended changes in the *opposite* direction). We hope to conduct more extensive future investigations of possible time-displaced mental influences.

UNCERTAINTIES AND REPRODUCIBILITY

The tables and figures presented here have already provided indications of the degree to which these direct mental influence findings have been reproducible within each type of experiment and across the various sets of experiments. Of the 37 experiments conducted, 21 yielded independently significant results. This 57 percent experimental success rate (to be compared with the 5 percent rate expected on the basis of chance alone) is particularly impressive given the generally small sample sizes and resulting low statistical power of the individual experiments.

It is not clear why some experiments succeed while others do not. If target system activity and susceptibility do indeed fluctuate with changing GMF activity, variability in this physical factor could account for some error variance. We suspect, however, that fluctuating psychological and social conditions are more directly responsible for the variable results. A "successful" session may depend crucially upon the presence of certain psychological conditions in the influencer, the influencee, and perhaps even in the experimenter, and these critical psychological ingredients may not always be reproducible. We suspect that factors such as belief, confidence, expectation of a positive outcome, and absence of psychological resistances may facilitate positive outcomes. On the other hand, boredom, absence of spontaneity, poor mood, poor interactions or rapport, psychological resistances or defensiveness, and excessive egocentric striving (excessive pressure or striving to succeed, analogous to performance anxiety) may decrease the likelihood of success.

Some variability in results may be contributed by differences in the degree of lability (free variability) of the target system, i.e., the degree to which the target system is freed from external and internal constraint or structure. A complementary process—the fullness of intention and the intensity or vividness of goal imagery—on the part of the influencer may likewise be favorable to a successful outcome. Greater certainty regarding the importance of these various factors, and the eventual specification of the requisite ingredients for more highly reproducible experiments, will depend upon the satisfactory operationalizing of these factors and a great deal of additional research.

GENERAL DISCUSSION

The 37 experiments reviewed in this paper are variations on a single theme: Persons are able to mentally influence remote biological systems, even when those systems are isolated at distant locations and screened from all conventional informational and energetic influences. The effect appears to occur in a "goal-directed" manner; i.e., the influencer need not understand or even be aware of the specific physical or physiological processes which bring about the desired outcome. Intentionality appears to be a key factor in effecting these changes in remote biological systems. Maintaining a strong intention of a desired goal event, focusing attention upon the relevant aspect of the target system, and filling oneself with strong imagery of the desired biological activity are, under certain conditions, accompanied by a shift in the target system's activity in the intended direction.

The "mechanism" through which this shift comes about is unclear. With one possible exception, conventional physical forces would appear to be adequately ruled out, since the effect survives distance and screening effects that would block or severely attenuate such forces. The possible exception is extremely low frequency (ELF) electromagnetic radiation. ELF magnetic fields could conceivably serve as physical carriers for at least some of the observed effects.[43] ELF radiation would be expected to penetrate the shielding and barrier materials in the experimental environment and is able to propagate for great distances. Problems with ELF carriers, however, are: (a) their inability to rapidly transmit signals that are rich in informational content (i.e., their bandwidths are limited), and (b) we are unaware of plausible mechanisms through which ELF carriers could be encoded ("modulated") by influencer intentions and decoded ("demodulated") into the physical forces necessary to being about appropriate changes at the target site. However, because ELF fields interact with GMF activity (which appears to influence the direct mental influence effect), it may be unwise to rule out ELF fields prematurely.

Several theorists have suggested that remote mental influence could occur through a reorganization of the randomness or "noise" inherent in the target system.[44] The process through which such reorganization would come about, however, remains unclear.

Regardless of how the effect is mediated, its very occurrence presupposes a profound interconnectedness between the influencers and the influencees in these experiments.

The mental processes of the influencers are able to have nonlocal effects. This, in turn, suggests that these mental processes themselves may be nonlocal, rather than restricted to a particular spatiotemporal locus within the brain of the influencer. These considerations have important implications for our understanding of the nature of "mind" itself.

The results of this DMILS research program suggest certain useful methodological applications. It is possible that direct mental influence effects could be used as novel operational measures of volition or intentionality. "Unconscious" physiological responses could be used in addition to or instead of the conscious verbal reports typically used in anomalous cognition experiments; the former could provide indicators of successful information transmission that are more "primitive" and perhaps more sensitive and less prone to possible filtering and cognitive distortions.

In the experiments reported in this paper, persons influenced an arbitrarily selected response system of an arbitrarily selected organism in an arbitrarily selected direction. The successful outcomes of these experiments suggest that, in principle, judiciously selected directional mental influences could be focused upon particular organs, tissues, or cells of specific persons in ways that could be medically relevant. Thus, our findings become relevant to issues of mental healing. In fact, the experiments described in this paper may be viewed as schematized mental healing analog experiments. These healing analog studies can be modified systematically to yield information which could have useful clinical applications. Evidence continues to accumulate regarding the role of mental processes in physical health and well-being. Investigations in areas of hypnosis, biofeedback and self-regulation, and psychoneuroimmunology have documented the profound somatic impact of images, thoughts, and feelings.

Typically, these mental influences are understood and explained in terms of the biochemical and anatomical interconnections among the central nervous system, the autonomic nervous system, and the immune system. The experiments reviewed in this paper suggest that mental processes such as attention and intention can have influences that are more direct and immediate than has previously been recognized. Direct mental influence may provide an additional control system that can function in parallel with anatomical, chemical, and electrical influences within the body. It may also complement these conventional physical influences by acting, in their absence, outside of the body.

We hope other investigators will join us in elucidating these subtle energetic and informational influences.

CORRESPONDENCE: William G. Braud, Ph.D. • Psychology Laboratory • Mind Science Foundation • 8301 Broadway • Suite 100, San Antonio • TX 78209

ACKNOWLEDGMENTS: We are indebted to Charles Honorton for suggesting the term "direct mental influence" as a general descriptor for these experiments and to Bruce Pomeranz, M.D., Ph.D., for his suggestion that living systems that have departed from homeostasis might provide optimal targets for direct mental influences of a balancing nature.

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