# DISRUPTION OF ATTENTION AND PK-TASK PERFORMANCE

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This study tested the hypothesis that an unexpected disruption of the subject's attention during a PK effort produces a shift in PK-task performance (relative to an earlier period of uninterrupted effort) when this shift in performance is evaluated relative to control groups intended to insure against reasonable alternative interpretations Twenty unpaid, volunteer college students were randomly assigned to each of three conditions (total $N = 60$). All subjects initially tried to influence the outcomes of a noise-based random event generator during a one-minute period of effort that was signalled by a constant tone. A second one-minute, tone-signalled PK effort then occurred for all three groups, as follows: Subjects in the disruption condition unexpectedly heard the tone broken up at short, random intervals; subjects in the obviated disruption condition heard the same thing but had been prewarned that during the second effort period the tone would be interrupted due to circuit shorting while the tone was being recorded; subjects in the nondisruption condition heard the second-period tone without any interruprions. As expected, the two control groups (obviated disruption and nondisruption) did not differ meaningfully in shift in PK performance from the first to second periods ($Z = .88$ for the difference by Wilcoxon Rank-Sum Test), so their outcomes were pooled for contrast with the disruption-condition shift. The Wilcoxon Rank-Sum test showed that the disruption group showed a greater shift (downward) than did the pooled control groups; $Z = 1.963$, $p < .05$, two-tailed. The decline for the disruption condition was highly suggestive; $t\,(19) = 2.025$, $p = .057$, two-tailed. Only the nondisruption condition showed significant PK test-retest reliability between the periods of effort ($r = +.44$, $p < .05$, two-tailed, for the nondisruption condition). These and earlier results, as well as theoretical considerations, indicate the need for systematic work on attention and PK performance.

There are a number of indications in the literature that attention-related factors may be important determinants of PK performance Stanford (1977), for example, in his review of the experimental PK literature found at least some indications (although there were some exceptions) that a period of deliberate release of effort following an effort to exert PK influence favoured successful PK performance. Recently, Palmer and Kramer (1984) found

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support for this release-of-effort effect. In a related vein, there are some indications in the literature that when a subject has an objective in a PK task but is forced by the experimenter's instructions to focus upon it only secondarily (and upon an independent objective, primarily or deliberately), that the bulk of the PK effect occurs on the secondary objective but that it is manifest as psi missing (Cox, 1951, 1954; see also a review by Stanford, 1977). Recently Stanford (1981) also found singnificant psi missing in an experimental condition wherein the subject was not allowed to focus deliberate attention upon the PK task. He wondered whether the apparent occurrence of PK in such situations was related to the absence of deliberate, egocentric effort, but whether its direction (psi-missing) might be due to doubts or anxieties about the occurrence of PK in a situation wherein one is not allowed to direct one's conscious attention to the desired objective. Certainly, we do not know the answers to the questions posed by such work, but they do point to the need for additional, systematic work on how the deplovment of attention affects PK performance. They also suggest the need for work upon how our manipulations of such attentional factors infuence the meaning of the test situation for the subject, for example how they influence subjects' expectations about success.

The present study was intended to examine the question of whether and, if so, how PK performance is influenced by a circumstance intended to disrupt attention to the PK task. Although earlier work had suggested that if the subject is instructed not to consciously focus upon the goal during a PK task, psi-missing is often the result, and although a disruption of attention would actively interfere with such conscious focus and thus might promote psi-missing, the lack of previous work on disruption of attention caused us to stop short of actually hypothesizing a decline in PK performance upon introduction of a disruption of attention. The plan of the present study called for taking measures of PK performance both before and during an effort to disrupt the subject's attention to the PK task. (Our plan for disrupting the subject's attention was deemed to be more effective if the subject had previously experienced a period of effort without disruption; also, a baseline of performance for each subject could be had from the early period of testing.) According to the experimental plan, the central dependent measure in the study was to be the subject's *shift* in performance from the pre-disruption period to the period of disruption. (Obviously–see below–a control condition is needed to insure that the shift in performance is not due to such factors as fatigue, warm up, or whatever may covary with time.)

Three distinct testing conditions, with separate subjects in each, were deemed useful for the present purposes. In one such condition (the *disruption* condition), after the subject had worked for an initial uninterrupted period at the PK task, circumstances were to be presented that were intended to disrupt attention to the PK task during a second such period. In another condition *(obviated disruption)*, after the initial uninterrupted period, the same physical circumstances were to be presented that led to disruption in the disruption condition, but the intention was to obviate such disruption by prior instruction to the subject that would eliminate or drastically reduce the surprise and possible concern of the disruption and would generally prepare subjects to cope with the potential distraction. This control condition was intended to insure that any effects of the disruption condition were not due simply to the administration of the physical stimuli involved or, perhaps, to the passage of time, but were due to the psychological impact of those stimuli in context. In another condition (*nondisruption* condition), after the initial uninterrupted period, a second uninterrupted period of effort at the PK task was to be provided. This control condition was intended to insure that any observed effects were not due merely to the passage of time.

Since the two control conditions (obviated disruption and nondisruption conditions) were not expected to yield differential PK outcomes, their results were to be pooled for comparison with the disruption condition unless statistical analysis (with a liberal alpha error of .10 to detect emergent differences) showed that they produced different levels of PK performance. Thus, the (nondirectional) hypothesis of the study was that the disruption condition would produce a different degree of shift from the first to the second period of effort than would the pooled control conditions.

## METHOD

### Subjects

Subjects were 60 unpaid students from a large, urban Roman Catholic university. All participated voluntarily and not for course credit. They were recruited through announcements in classes and individually by the experimenter (T. Kottoor). Each participated in only one of the three experimental conditions, and assignment to conditions was determined randomly (see Procedure section). At the time of recruitment they were simply invited to participate in a study of psychokinesis; the latter term was briefly explained for them.

### Design

The independent variable was manipulated on a between-subjects basis, with 20 subjects per condition. Subjects in all three conditions first attempted to exert a PK influence upon a random event generator (REG) for a one-minute period of time (see details of the task below) which was signalled by a tone of one-minute length heard through a headset. Following a one-minute period silence, the tone was again introduced for a one-minute period during which they were again to influence the REG. It was during this second, one-minute period of tone and PK effort that the independent variable was manipulated. For the disruption condition subjects unexpectedly heard the tone break up at random times, sounding much as though there were a short in the audio system. (They knew ahead of time that the effort was for one-minute periods, so they could not have confused these interruptions for a signal to terminate effort; the interruptions were, in any event, of no more than a fraction of a second in duration. For the obviated disruption condition, subjects were forewarned that there would be interruptions in the tone during the second one-minute effort period; they were being told this so that they would not be bothered by it. For the nondisruption condition, subjects heard the second one-minute tone without disruption of its signal. The dependent variable for the major analyses was the change in REG hit rate from the first to the second period of effort. Control data (see PK task below) were gathered from the REG contemporaneously with subject testing, that is, on the same days and, usually, at times interspersed between the appearance of subjects.

**The PK task and REG data**

The PK task was to influence the output of an REG so as to favour one of two lights on its front panel (or, equivalently, to favour the creation of a large number on the cumulative, illuminated digital counter on its front panel). The REG was the noise-based, programmable machine used in a previously reported study (Stanford, 1981). It was programmed to make one-half probability random choices at the rate of roughly 4 trials per second and to make 240 such choices before stopping. The internal event constituting a "hit" or success was switched automatically between trials (i.e., alternating) to obviate any effects of "side bias." For successful trials the appropriate light came on and the illuminated digital counter on its front panel was incremented by one count. The machine was started by the experimenter pressing a button (at the onset of the signal tone); it then ran for about 57 seconds in order to complete the 2 i0 choices.

To further insure against the possibility of REG-related biases or temporal patterns confounding the study, the order of testing of the three experimental conditions (disruption, obviated disruption, and nondisruption conditions) was based upon a random permutation of those conditions (for additional details see Prcedure section)

Additionally, control runs of the same length were made regularly during the period of testing subjects. Control runs were made, for the most part, on the actual days of testing subjects, and some of the runs were done before subjects appeared, some interlarded between subjects, and some at the end of the test day. In order to assess any possible electrical induction effects (upon the REG) of playing a particular tape used for an experimental condition, the two tapes thus used (the tape with the interruptions was used for two experimental conditions, namely disruption and obviated disruption) were played while the REG was run without a subject being present; thus, control data were obtained for each of the two tapes. Because the interrupted-signal tape had been used for twice as many subjects as the noninterrupted-signal tape, twice as much control data were developed for the former tape. Thus, the interrupted-signal tape was run 200 times to develop control data (the REG started once for each of the two one-minute periods on it), whereas the noninterrupted-signal tape was run 100 times (the REG started once for each of the two one-minute periods on it).

**Procedure**

After subjects were greeted at the cubicle where the REG was housed, the concept of psychokinesis was discussed, and an effort was made to make the idea seem less alien to them. First, it was noted that many people feel that one person can influence another person's mental activity in unexplained ways and that there was scientific support for that. Similarly, it was suggested, persons may in unexplained ways influence non-living systems, such as machines. It was noted that some people feel that they can influence random-choice devices, such as a roulette wheel and that researchers have studied such abilities for over forty years and have provided strong evidence of such ability. They were told that we were examining conditions favouring the occurrence of psychokinesis and that we know PK can occur among normal college students, since evidence had been found for this in a number of studies.

They were then shown the REG and the PK task was described for them. Since few if any of the subjects had prior experience with such tasks, a strategy was suggested to them, namely that they try to exert the PK effect by imagining that the appropriate light is coming on and staying or by imagining a large number accumulating on the counter which was pointed out to them. The experimenter further explained that they would be taken to a testing room separate from the REG where they would hear through a headset two one-minute periods of tone, during each of which they should try to make the light come on and stay on. They were given a demonstration of how the tone would sound. The experimenter tried to insure that they had understood the task and asked if they had any questions.

Each subject signed the consent form and was then led to the testing room, which was 15 feet distant from the control room. There the experimenter adjusted the headset for them to insure comfort, and he then returned to the room where the REG was housed.

Up to this time the experimenter was blind as to the experimental condition under which each subject would participate. This was in order to insure that knowledge of the experimental condition did not influence his manner or quality of interaction with the subject. Before the study began a master sheet giving the order of testing of the 60 subjects had been prepared by Birgit Stanford. On each of 60 squares of paper she had written one of the three experimental conditions (identified by letter); thus, 20 squares identified the disruption condition; 20, the obviated disruption condition; and 20, the nondisruption condition. These were thoroughly mixed in a bowl by the senior author, and Birgit Stanford then, without looking into the bowl, withdrew squares, one at a time, and recorded their identity on the master sheet for order of conditions in the order of their being drawn. Then, the letter identifying each condition was covered with two, removable, "peel off" labels to insure no "show through." (These labels were also affixed, in double thickness, to the back of the sheet to insure no visibility from that side.) When the experimenter was ready to begin the PK testing, he removed the next label to disclose the condition of testing for that subject. Using that information, he now selected the proper tape (interrupted singal or noninterrupted signal) and placed it on the cassette machine to play for the subject. (He himself would also hear it through a headset in order to know when to actuate the REG.) If the master sheet specified the obviated disruption condition, the experimenter returned briefly to the subject in the testing room and reported that he had forgotten to mention that the subject would hear some interruptions in the signal during the second one-minute period because of a short in the line while taping the signal. He stated that he mentioned this in order to be sure that they were not bothered by it.

Then both the subject and experimenter heard the appropriate tape. Both tapes contained brief initial instructions that reiterated what the subject was to do; these were in the voice of the experimenter. The volume had been preset at a comfortable, but clearly audible, level that was the same for all subjects. At the onset of a one-minute tone, the experimenter pressed the button to actuate the REG, which stopped automatically. At the end of the first one-minute tone, the experimenter recorded the number of hits displayed on the illuminated digital counter—double-checking to insure accuracy, although the counter digits were large and bright—and then reset the counter in preparation for the next one-minute PK-test period. At the onset of the second one-minute tone, he again started the REG and then recorded the counter's number at the end of that pe iod, again double-checking the number recorded. The tape informed the subject that this concluded the PK task, and the experimenter again met the subject to thank him or her for participating.

## RESULTS

An examination of the data showed that it would be inadvisable to analyze the shift-score results through the use of parametric statistics. (Recall that the shift-score is based upon the change in performance from the first period of effort to the second on the PK task.) One of the experimental conditions showed a highly significant variance difference from the first to the second periods, whereas the others did not show it at all. This strongly suggested that using parametric statistics—which assume interval scaling for the dependent variable—would be invalid, for a difference score of a given magnitude in one condition would not be comparable to a difference score of that magnitude in another. The assumption of interval scaling would be far too powerful an assumption in this situation. Also, the difference scores themselves showed variance differences across the experiments conditions—one such comparison being significant—and,although thisconsideration is less important, it underscored the desirability of using a nonparametric statistic for the shift-score analyses.

Accordingly, the Wilcoxon rank-sum test (precisely equivalent to the Mann–Whitney U test) was used in the primary analyses; it is useful for contrasting independent groups. In accord with expectation, the shift scores for the nondisruption and obviated disruption conditions were not significantly different, even with the liberal alpha of .10 set ahead of time to detect a "bad alternative" (i.e., that the groups were sampled from different populations, contrary to expectation); $Z = .88$. Therefore, we contrasted the shift measure for the disruption condition and the combined control conditions The contrast was significant; $Z = 1.963$, $P < .05$, two-tailed. The mean disruption-condition shift was –4.75 hits per run; that is, on the average there were 4.75 fewer hits in the second (interrupted) period of effort than in the first (uninterrupted). The mean shift for the combined control conditions (nondisruption and obviated disruption) was +1.65 hits per one-minute run. Assuming the chance shift as zero, the mean shift for the disruption condition approaches statistical significance; $t\,(19) = 2.025$, $p = .057$, two-tailed. (This analysis is based upon a standard error of the mean derived from the empirical unbiased estimator of the population standard deviation; parametric statistics pose no problem here where two samples are not being contrasted.) Although it was not the focus of this study, some readers may be interested in the fact that PK-task performance for the disruption condition does not differ significantly from mean chance expectation for either the first period of effort (no disruption) or the second period of effort (disrupted effort), though the former showed mean performance that was above chance average and the latter, below.

The random order of testing the three experimental conditions is sufficient control to rule out REG artifact as an explanation of the above significant difference in the shift score for disruption and combined control conditions. However, we also note that the control data gathered contemporaneously showed no significant effects related to the shift measure, and there was no indication of an overall bias in the shift measure in relation to the expected value of zero.

It may also be of interest to report (see Discussion section) that subjects in the nondisruption condition showed significant test-retest reliability in their PK performance, based upon scores from the first and second periods of effort; $r = +.444$, $p < .05$, two-tailed. This is, of course, the circumstance where one should expect such reliability, if it is to be had at all. For the disruption condition, $r = +.14$, which is not significant. For the obviated disruption condition, $r = -.26$; this is not significant.

## DISCUSSION

The results of this study suggest that an unexpected, distracting circumstance during a period of PK effort can result in a marked decline in performance (as contrasted with control conditions not involving that disruption). The control conditions help insure that the decline is not due simply to continued work at the PK task or merely to hearing the break in the tone used to signal effort. The present study was not intended to indicate and does not indicate whether the decline is due to distraction per se, to some kind of affective consequence of the distraction such as fear of failure, or to both distraction and concomitant affect. The instructions to the subject in the obviated disruption condition in all probability obviated many of the potentially distracting effects of the interrupted signal tone and thus, also much of the negative affect presumably associated with unexpected distraction. In future work of this type, assessment of the distracting and affectively negative consequences of the interruption might be useful, for there may be individual differences in the degree to which individuals are distracted and bothered by the interruption. Such measures might be had from post-session questionnaires and, possibly, from ratings by external judge(s) of videotaped behaviour of subjects at the time of the interruption. Such measures should aid in determining the cause of the decline associated with the interruption, assuming the decline is a reliable phenomenon.

The results of the present study, like the results of the research on release of effort and on secondary objectives cited above, should encourage more systematic research on the role of attention in PK performance. Delineation of the role of attention in PK performance is central to theoretical developments in the field. Although this is not the place to discuss the many theoretical ramifications of such research, it can be noted that, for example, attentional factors are critical in Walker's quantum mechanical theory of psi wherein the concepts of "will" and "consciousness" are important (Walker, 1975, 1984).

In the present study we controlled for potential social-behavioural consequences of the experimenter's knowing the subject's experimental condition by keeping the experimenter blind as to that condition until he had completed his briefing of the subject. Due to personnel limitations we were not able, unfortunately, to continue to keep the experimenter blind in this regard while he actuated the REG, so an experimenter-psi contribution to the results cannot be ruled out (and, of course, some parapsychologists would argue that it could not be, in any event, though we do not feel so pessimistic as that about the experimenter-psi issue). We do recommend such blindness whenever it is feasible in psi research, even though it is clear that it has not been implemented in most of the

PK research to date. It is worth pointing out, however, that there are indications in the present study of subject involvement in the PK effects, whatever might have been the role of experimenter psi. The findings on test-retest reliability are the evidence here. Individual differences appear to play a role, as reflected in the significant test-retest reliability when the two measures of PK-task performance are reasonably psychologically comparable (nondisruption condition). On the other hand, the disappearance of that significant test-retest reliability when the periods of testing are psychologically different (disruption and obviated disruption conditions) might suggest that individual differences then play a role only as they interact with the "manipulation" (i.e., interact with the differences in the psychological circumstances in the two test periods).

All definite conclusions must await replication and extension of this work.

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