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METHODS FOR INVESTIGATING GOAL-ORIENTED PSI

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ABSTRACT: Experimental research in parapsychology may be of little value if psi is goal-oriented and the sources of psi focus on certain types of goals. Experimenters and research participants may focus on particular outcomes from a hierarchy of goals that can include wanting successful outcomes for: individual trials, individual subjects, individual experiments, lines of research, personal careers, and the field of parapsychology. There is strong evidence that goal-oriented psi applies on the lowest level of this hierarchy of goals, the level of individual trials. The normal statistical assumptions of experimental design and analysis and of communication theory do not apply for outcomes that are below the goal of the psi sources on the hierarchy of goals. This fact is intrinsic to the concept of goal-oriented psi and is clearly demonstrated by majority-vote studies, particularly a study that found approximately equal scoring rates on a direct, blind comparison of psi scoring on single-event and majority-vote trials. Goal-oriented psi can be investigated by finding where the normal statistical assumptions stop applying on the hierarchy of goals. If the goal of the psi source is a successful experimental outcome, or higher on the hierarchy of goals, then the assumptions for statistical research break down. Available evidence from meta-analyses is consistent with this hypothesis, but is not compelling at present because of possible confounding factors. Majority-vote studies also reveal consistent internal patterns that suggest psi achieves goals efficiently. These internal patterns also reflect the nonapplicability of normal statistical assumptions and can be used to investigate goal-oriented psi. The concept of efficient goal-oriented psi operating in a hierarchy of goals suggests that the elusive, capricious nature of psi may sometimes reflect psi efficiently achieving goals relatively high on the hierarchy.

The traditional experimental approach in parapsychology may provide little scientific progress if the hypothesis of goal-oriented psi is true in an extreme form. The basic goal-oriented psi hypothesis assumes that psi phenomena (a) depend on a person's motivation for or benefit from the outcome of a random event, and (b) do not depend on the complexity or information-processing aspects of the random process. In essence, goal-oriented psi bypasses normal information-processing steps to achieve a goal. However, if the information-processing steps that are bypassed include steps that are important assumptions for statistically based research, then experimental research is undermined.

In one problematic form, goal-oriented psi could operate as a psi-mediated experimenter effect. The entire experiment would be influenced as one complex random event with an a priori probability of a successful

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outcome (significant result) by chance of .05. In this situation, experimental efforts to identify optimum conditions for psi and to study the relationship between psi and other variables would be misleading and basically meaningless because an experimenter with psi ability could produce whatever experimental outcome he or she wanted (Kennedy, 1979, 1994).

However, goal-oriented psi could take a variety of less extreme forms that would be more amenable to experimental methods. In fact, most writers on the topic of goal-oriented psi have assumed that it could be meaningfully investigated with experimental methods (e.g., Schmidt, 1974; Stanford, 1977). Of course, the degree to which psi is a goal-oriented process that is intractable to experimental methods must be answered empirically. Unfortunately, most previous writings on goal-oriented psi, including mine, have not clearly distinguished the different degrees or forms of goal-oriented psi.

The purpose of this paper is to describe (a) different forms or degrees of goal-oriented psi, and (b) research strategies for determining which ones apply and under what conditions. First, key evidence that psi is goal-oriented to some degree is noted. Then research strategies based on a hierarchy of goals are described, followed by discussion of research strategies based on the apparent efficient operation of psi. The appendix to this paper summarizes several aspects of information-processing that are relevant to the concept of goal-oriented psi and then discusses how these various concepts relate to research on precognitive timing (May, Radin, Hubbard, & Utts, 1985; Vassy, 1985, 1986) and lability of systems (Braud, 1981).

Evidence for Goal-Oriented Psi

Reviews of the literature have indicated that the data as a whole support the goal-oriented psi hypothesis for the trials in psi experiments (Kennedy, 1978, 1979; Stanford, 1977). Similar conclusions have appeared throughout the history of parapsychology. Early experimental researchers described psi as “unitary” or “diametric” because success on psi tasks seemed to be achieved directly, without adhering to the usual properties of information-processing (Foster, 1940; Pratt et al., 1940). For example, comparisons of the scoring rates on blind matching ESP tasks (in which the subject matched two unknown cards) with normal clairvoyance (in which the subject guessed one unknown card) suggested that blind matching was a unitary or one-step process rather than a two-step process of first identifying each card as in normal information-processing. The results of blind PK tasks (in which the identity of the

target for a PK trial must be obtained by paranormal means) compared with normal PK also supported the unitary or goal-oriented nature of psi (Kennedy, 1978; Stanford, 1977). More generally, Stanford (1977) pointed out that success on PK tasks does not depend on the degree to which the subject understands the workings of the random process that must be influenced. Thus, psi appears to bypass many normal information-processing steps and limitations.

Schmidt's (1974) direct comparison of majority-vote trials and single-event trials is one of the most definitive experiments on goal-oriented psi. In this study, the subjects initiated each PK trial with a button press and attempted to influence which of two lights came on. On about half the trials the decision for the lights was determined by one event from an RNG, and on the other trials the decision was determined by the majority vote of 100 events from a different RNG. The two types of trials were randomly mixed, and the subject and experimenter were blind as to which type of trial was occurring on any button press. Schmidt carried out the study specifically to investigate the goal-oriented psi hypothesis and apparently expected the results to support this hypothesis.

Consistent with the goal-oriented psi hypothesis, the scoring rates were approximately the same on both types of trials and were significantly different from the usual signal-enhancement assumptions for majority votes. The scoring rate in the single-event condition was 55.93% (z = 5.55). Given this scoring rate on individual events, one would expect a scoring rate of over 90% on the majority-vote trials under the usual communication theory assumptions for signal enhancement with majority-vote procedures (Kennedy, 1978). The observed scoring rate on the majority-vote trials was 53.16% (z = 2.89), which is not significantly different from the single-event trials, but is very significantly different from 90%.[1]

Although the available data strongly support the goal-oriented psi hypothesis for certain aspects of information-processing, the data are

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[1]Schmidt (1974) did not discuss the signal enhancement aspect of majority votes. Rather, he considered the majority-vote trials to be more complex or difficult than the single-event trials because a greater number of individual RNG events would have to be influenced on majority-vote trials to give the same scoring rate found in single-event trials. With this perspective, lower scoring rates are expected on the majority-vote trials because the individual RNG events comprising the majority votes are viewed as diluting a psi effect on a fixed number of trials rather than as opportunities for psi to occur as assumed under the signal-enhancement assumption. The majority-vote scoring rate was suggestively lower than the single-event rate (p = .07). However, the majority-vote scoring rate was significantly higher (p < .02) than the rate of 50.5% expected under the assumption that majority-vote trials are more difficult and complex (see Kennedy, 1978, for details of the calculation of the expected rate.

much less clear for other aspects. Goal-oriented psi appears to apply with tasks that involve (a) redundant opportunities for psi to operate, as in majority-vote procedures, and (b) varying amounts of information about the psi task, as with blind PK. However, task complexity or information-processing pertaining to the a priori probability of a hit remains relatively unexplored despite the long recognition that this factor provides important insights into the psi process (Kennedy, 1978; Scott, 1961; Thouless, 1935). Various aspects of information-processing are summarized in the appendix. The main body of this paper focuses on redundant opportunities for psi to operate because this factor has profound implications for scientific research and the evidence is strong that psi can function in a goal-oriented manner relative to this factor.

The strong evidence that psi can be goal oriented on the level of individual trials suggests the logical extension of the goal-oriented psi hypothesis to problematic areas such as experimenter effects. However, this extension requires empirical verification. The determination of what exactly constitutes a goal is a vital issue.

HIERARCHIES OF GOALS

Virtually all experimental research involves a hierarchy of goals. As shown in Figure 1, experimenters and participants may focus on successful outcomes for: (a) individual trials or RNG events, (b) groups of trials for within subjects designs, (c) individual subjects, (d) groups of subjects for between subjects designs, (e) individual experiments, (f) the line of research (i.e., groups of experiments), (g) the research institution, (h) their personal careers, and (i) the field of parapsychology. The existing evidence for goal-oriented psi is evidence that psi sources sometimes focus on goals that are not at the bottom of this hierarchy.

Each of the different levels of the hierarchy of goals involves a higher level of data aggregation. A majority vote is an aggregation of random events or guesses. An experiment is an aggregation of data for trials and subjects.

Statistical research methods and communication theory are based on the assumption that data aggregation follows certain properties. The key property is that the reliability or accuracy of estimation improves as more data are aggregated or combined. This property occurs because each event or outcome in the sample is assumed to be an opportunity to measure the effect. In essence, each measurement or observation is redundant. However, data aggregation under goal-oriented psi does not result in increased reliability or accuracy of estimation in certain

—Higher Level

-The field of parapsychology
-A personal career
-The research institution
-The line of research (groups of experiments)
-Individual experiments
-Groups of subjects for between subjects designs
-Individual subjects
-Groups of trials for within subject designs
-Individual trials or RNG events

—Lower Level

Figure 1. Hierarchy of goals for psi experiments. The motivations and goals of psi sources may focus on wanting certain successful outcomes from this hierarchy.

situations because psi basically ignores or bypasses the redundant opportunities.

The goal-oriented psi concept implies that this key assumption of communication theory does not apply for outcomes below the psi source's goal on the hierarchy, but does apply for outcomes above the goal. Under the normal assumptions of communication theory, each RNG event in a majority vote is a redundant opportunity for psi to operate, and therefore a majority-vote procedure will enhance the accuracy or scoring rate of psi. However, Schmidt's (1974) study shows that when the goal of the psi source is the outcome of the majority vote (or a higher level on the hierarchy), psi bypasses the redundant opportunities and applies directly to the outcome of the goal as a unit. Thus, majority-vote processes do not lead to enhanced scoring when majority-vote outcomes are the goal of the psi source. Presumably, if the goal of the psi source was success on each individual event that comprised the majority vote, then the assumptions of communication theory would apply—that is, communication theory applies on the hierarchy above the goal of the psi source.

Similarly, with goal-oriented psi, a key statistical assumption for experimental design and analysis does not apply to outcomes that are below the psi source's goal on the hierarchy, but does apply above the goal. Under the usual assumptions of statistics, larger sample sizes give more reliable results and greater statistical significance. With these assumptions, the sample size represents multiple measures of the effect under study and thus is a form of redundancy. As discussed in a previous

paper and in the appendix, the significance level (e.g., *z* score) is expected to increase linearly with the square root of sample size (Kennedy, 1994). On the other hand, goal-oriented psi experimenter effects will bypass this type of redundancy and cause a significant result direcdy on the experimental outcome as a unit, independent of the sample size. Here too, if the goal of the psi source was the outcome of each trial or subject, then the usual statistical methods would apply.

The critical question of what determines the goal of the psi source has yet to be answered. Psychological factors such as motivation presumably play a decisive role. On a commonsense level, the goal is the outcome that the psi source has the strongest motivation to obtain. Observational theories (Millar, 1978) propose that feedback is a necessary factor, an idea consistent with Schmidt's (1974) study. However, the conditions that constitute an act of observation are poorly understood and are probably interwoven with the concept of psychological motivation. A psi source may devote minimal attention or motivation to a physical feedback event if the psi source is focused on a different outcome.

These questions can be investigated directly by examining where on the hierarchy of goals the usual assumptions for statistical analysis stop (or start) applying. Schmidt's (1974) study, combined with other majority-vote studies discussed in the next section, provide strong evidence that goal-oriented psi can operate on the level of groups of trials. These results are evidence that the goal of the psi source (s) was not the lowest level of the hierarchy, but the results do not indicate which of the higher levels was the goal—for example, the goal could have been the majority-vote outcome or the experimental outcome. As discussed previously (Kennedy, 1994), the lack of relationship between z score and sample size in meta-analyses of RNG and ganzfeld studies tentatively supports the hypothesis that goal-oriented psi widely applies to the experimental outcome as a whole. However, a variety of potentially confounding factors must be resolved before conclusions can be made about goal-oriented psi experimenter effects. A more in-depth evaluation and reporting of the expectations and motivations of experimenters and other research participants are also needed to answer these questions. Research investigating various levels of data aggregation, feedback, and psychological motivation should provide valuable evidence about the goal-oriented psi hypothesis.

Evidence about goal-oriented psi may come more from the patterns of results for a line of research rather than from a few definitive studies. This is particularly true for goals on the higher levels of the hierarchy of goals. Because psychological factors such as motivation presumably dominate the goal-setting process, different researchers can be expected to have different goals and therefore obtain different results on experi-

ments. Further, the goals may shift over time. Evidence for the goal-oriented experimenter-effects hypothesis would likely come from consistent patterns of results for individual researchers (including changes over time), combined with consistent differences between experimenters.

EFFICIENT OPERATION OF PSI

Several researchers have suggested that internal patterns in majority-vote studies may indicate the efficient operation of psi (Cox, 1974; Kennedy, 1979; Radin, 1990-1991). The concept of efficient psi operation implies that psi is goal oriented because efficiency is only meaningful when evaluated relative to achieving a goal. Remarkably consistent internal patterns have occurred in several majority-vote studies that were carried out with the specific goal or expectation that majority votes would enhance the accuracy of psi.

Six studies found significant results on the majority-vote outcomes, but nonsignificant results for the raw data comprising the majority votes (see Table 1, derived from Kennedy, 1978, 1979). This pattern is completely unexpected under the usual assumptions for majority votes. The z score for the raw data normally should be larger than the *z* score for the majority votes because information about the magnitude of the majorities is lost during the data reduction.[2] In calculating the *z* score, the higher scoring rate on the majority-vote outcomes normally is offset by the reduced number of outcomes or sample size.

Higher *z* scores for the majority-vote outcomes suggest that information was created rather than lost with the majority-vote process. This is evidence for goal-oriented psi. In fact, the presence of any pattern in the data for majority-vote studies that does not occur when data are collected for other purposes is evidence for some type of goal-oriented effect.

The lack of evidence for psi in the raw data suggests that the significant majority-vote outcomes were achieved efficiently. The low z score on the raw trials occurred in the Brier and Tyminski study because the majority-vote hits were concentrated on trials with the smallest majorities. Cox (1974) attributed his results to the same mechanism but did not present internal analyses to substantiate his position. Two recent

[2] For example, with a 55% scoring rate on the raw trials, over half of the majorities should be 55/100 or larger. However, these majorities have the same majority-vote outcome as majorities of 51/100. The information reflecting the magnitude of the majorities is discarded in the majority-vote process, but is utilized in the analysis of the raw data.

sequential sampling majority-vote studies also found psi focused on the majority-vote trials with the lowest scoring rate on the raw trials (Puthoff, May, & Thompson, 1986; Radin, 1990-1991; also see Kennedy, 1994). As suggested by Radin, this unexpected pattern likely reflects some type of efficient psi operation, but the varying numbers of trials in the majority votes and the discarding of large amounts of data in the sequential sampling procedure complicate the interpretation. The patterns that apparently reflect efficient psi have been found in cases when the experimenters did not expect them (Brier & Tyminski, 1970; Puthoff, May, & Thompson, 1986), as well as when the experimenters predicted them (Cox, 1974; Radin, 1990-1991); however, in all of these cases the experimenters collected the data with the intention or expectation that majority votes would lead to signal enhancement.

TABLE I
COMPARISON OF Z SCORES FOR MAJORITY-VOTE OUTCOMES AND FOR THE RAW DATA

Author	Type of psi task	*z* for raw events	*z* for majority votes
Cox, 1965	PK	.43	3.14
Cox, 1966	PK	1.10	2.57
Cox, 1974	PK	1.11	2.48
Morris, 1965	PK	1.50	2.48
Bierman & Houtkooper, 1975, 1978	PK	1.86	2.42 2.71[a]
Brier & Tyminski, 1970	ESP	.58	2.88

[a]This study had two levels of majority votes.

In accordance with the goal-oriented psi hypothesis, the results of majority-vote studies appear to vary with the experimenters' goals at the time of data collection. When Cox did a post hoc majority-vote analysis on data previously collected without signal enhancement in mind, the z score for the raw trials ($z = 2.94$) was larger than for the majority-vote results ($z = 2.68$), as expected with normal communication theory (see Kennedy, 1978). However, he found a very different pattern on the three subsequent studies noted in Table 1 when he collected data with the specific intent to use majority votes to enhance psi accuracy. Likewise, the absence of signal enhancement with majority votes in Schmidt's (1974) study is in accordance with his expectations at the time, but other experimenters have expected and found increased scoring rates with majority votes.

The hypothesis of efficient goal-oriented psi has profound implications when combined with the hierarchy of goals. The majority-vote studies indicate that a goal can be achieved with minimal or no psi effect on lower levels of the hierarchy. If this principle applies at the higher levels of the hierarchy of goals, an experimenter could, for example, obtain the goal of a successful line of research with minimal psi effects for individual experiments. Also, the experimenter's goal may shift to a higher level on the hierarchy as the research is replicated. For example, an experimenter may focus on success on the individual subjects in the first study, on the experimental outcome in the second study, and on the line of research in the third study. If each of these sequential goals is achieved efficiently, the statistical significance of the experimental outcomes would be expected to decline across studies.

Perhaps the often discussed elusive, capricious nature of psi actually reflects goals being achieved very efficiently, with minimal psi effects on the lower levels of the hierarchy of goals. Decline effects within and/or across experiments might be expected with shifting goals. The declines in significance across studies that frequently have been found in parapsychology and historically have been attributed to declines in enthusiasm by the experimenters (see Kennedy & Taddonio, 1976) may be a manifestation of a more fundamental aspect of psi operation.

The concept of efficient psi provides a methodology to investigate goal-oriented psi in a variety of situations that would otherwise be difficult to investigate. In the studies using majority-vote methods to enhance psi accuracy, the apparent patterns of efficient psi revealed the nonapplicability of normal statistical assumptions below the psi source's goals on the hierarchy of goals. This provides evidence for goal-oriented psi and a means to investigate it. In general, the hypothesis of efficient goal-oriented psi can be tested by exploring the most efficient way to achieve a goal or outcome. For example, one might explore hypotheses about the most efficient way (i.e., minimal psi effects) to obtain hits on free response trials, differences between two conditions, or successful lines of research.

CONCLUSIONS

The motivations of experimenters and experimental participants form a hierarchy of goals that ranges from wanting success on individual trials to wanting success for the field of parapsychology. The goal-oriented psi hypothesis implies that key assumptions for usual statistical methods do not apply for outcomes that are below the psi source's primary goal in the hierarchy of goals. Majority-vote studies provide

strong evidence that goal-oriented psi and the associated nonapplicability of normal statistical assumptions can occur on the lower levels of the hierarchy. If the psi sources have goals that are high on the hierarchy, the usual experimental research methods may be undermined. Psi may influence the experimental outcome as a unitary event to obtain the result that the psi source favors. Thus, experimental methods may not provide meaningful results, other than evidence that psi occurred. The available evidence from meta-analyses is consistent with the hypothesis that goal-oriented psi frequently operates on higher level goals such as goal-oriented experimenter effects. However, the data are not compelling at present because of possible confounding factors.

Goal-oriented psi can be investigated by determining where on the hierarchy of goals psi bypasses normal statistical assumptions about the properties of data aggregation. In addition, the evidence from majority-vote studies that psi achieves the goals in an efficient manner provides a basis for investigating goal-oriented psi in many situations and at many different levels of the hierarchy of goals. However, research may be complicated by shifting goals in the hierarchy and different patterns for different researchers.

APPENDIX

SUMMARY OF INFORMATION-PROCESSING CONCEPTS RELATED TO GOAL-ORIENTED PSI

This appendix was prepared in response to a request by a reviewer that I discuss the relationship between goal-oriented psi as described in this paper and other writings on task complexity and information-processing. This discussion is presented as an appendix because it is a technical digression from the primary purpose of the paper. Four fundamental aspects of information-processing that are relevant to task complexity and goal-oriented psi are summarized below, followed by a discussion of how they apply to several topics relating to psi information-processing.

Redundant Opportunities for Psi

The presence of multiple or redundant opportunities for psi to operate is a form of information-processing that is a key assumption for majority-vote procedures and for statistical experimental methodology. Normal statistical methods are based on the assumption that the aggregation of data from multiple or repeated measurements of an effect will lead to increased reliability or accuracy of estimation. Note that the

presence of this redundancy does not change the a priori probability of a successful outcome. For example, the a priori probability of a hit on each trial in Schmidt's (1974) PK study was .5, whether the trial was a majority-vote or single-event trial. Likewise, from the perspective of goal-oriented psi experimenter effects, the a priori probability of a successful outcome is .05 (or the alpha significance level of the experiment) independent of the sample size.

Information about the Psi Task

Blind PK and blind matching are cases where the amount of information to achieve a psi task appears to vary if measured relative to normal sensory information-processing for the task. These are special cases of the general principle that success on PK tasks does not depend on the degree to which the subject understands the details of the random process being influenced. In an extension of this point, Schmidt (1987) proposed the "equivalence hypothesis" that the magnitude of psi effects does not depend on the physical processes or details of truly random processes if the observation or feedback is psychologically identical. As with redundancy, the a priori probability of a hit is the same for the different conditions or tasks.

A Priori Probability of Success

In the quantitative, mathematical use of the term, information refers to the reduction of uncertainty. A task with six equally likely outcomes has a greater amount of uncertainty than a task with two equally likely outcomes. A priori probability is a key aspect of information-processing and has been recognized as an important means to gain insight into the psi process (Kennedy, 1978; Scott, 1961; Thouless, 1935).

The approximately equal deviations in high- and low- aim psi tasks has long been recognized as evidence that psi appears to involve partial information on a relatively large number of trials rather than complete information on a few trials (Thouless, 1935). In general, if psi produces a strong effect on a few trials, then a psi task with a very small a priori probability of a hit due to chance is the optimal means to obtain highly significant results. For example, if ESP provides complete information about the target on 10 of 100 trials, then a task with a probability of a hit due to chance on each trial of .01 (or .000001) will give much more significant results than a task with a probability of .5. The available data generally do not appear consistent with this model; however, the role of a priori probability has received very little research effort, relative to its importance (Kennedy, 1978).

I believe that the partial information characteristics of psi have profound implications that are not yet understood. The goal-oriented psi hypothesis may resolve some of the questions about partial information; however, how psi processes information for low-probability events remains an important question. This question is particularly important for possible goal-oriented psi experimenter effects because the goal of achieving a significant result on an experiment has a relatively low a priori probability due to chance (usually .05).

Information Transmitted or Utilized

The quantitative amount of information transmitted on a psi task is closely related to the resulting chi-square value (Schmidt, 1970; Timm, 1973) and therefore is monotonically related to the statistical significance level of the outcome and to other common statistics such as (absolute value of) *z* and *t*. The chi-square value divided by sample size is a measure of the average information transmitted or utilized per trial.

The assumption that the average information transmitted per trial is constant as more data are aggregated is the basis of normal statistical research methodology. The chi-square value or total information transmitted is expected to increase as the sample size increases. This assumption leads directly to the expectation that the z score (which is the square root of chi-square) is linearly related to the square root of sample size. Thus, the redundancy factor and amount of information transmitted are interwoven.

The relationships among information transmitted, a priori probability of a hit, and partial information on individual trials are important but basically unexplored areas.

Precognitive Timing

Efforts to use precognitive timing tasks to investigate task complexity and goal-oriented psi are primarily investigations of the a priori probability of a hit factor. In precognitive timing tasks, a pseudorandom number generator generates numbers at a rate much faster than human reaction time. A random outcome or trial is selected when the subject pushes a button. Vassy (1985, 1986) proposed using precognitive timing tasks to study goal-oriented psi by varying the number of pseudorandom outcomes collected for each button press or timing decision. He suggested that with goal-oriented psi the scoring rate on the pseudorandom outcomes would be independent of the number of outcomes collected for a timing decision. However, the a priori probability of obtaining a given scoring rate depends on the number of outcomes. For example, if

100 binary (p = .5) pseudorandom outcomes are collected from one timing decision (button press), the a priori probability of getting a 60% or higher scoring rate on the 100 outcomes by chance is .028. But if 10 pseudorandom outcomes are collected for one timing decision, the probability of getting a 60% or higher scoring rate .38. Thus, this strategy compares conditions that have different a priori probabilities and assumes that goal-oriented psi operates independently of the a priori probability of a hit. This assumption requires that more information is transmitted or utilized for cases with small a priori probabilities of a hit and, as noted in the previous sections, does not appear consistent with available data in other contexts.

The results of a precognitive timing experiment did not support Vassy's assumptions for goal-oriented psi. Vassy (1986) used the precognitive timing methodology to see if either the scoring rate or information transmitted (significance level) was constant for different numbers of pseudorandom events per timing decision. Significant evidence for psi was obtained with one pseudorandom outcome per timing decision, but the results were mixed for two outcomes per decision and nonsignificant for three, four, and five outcomes per decision. Thus, the data did not support either model.

The precognitive-timing methodology is basically a complicated means to investigate the a priori probability of a hit factor. However, this methodology also offers a means to investigate the role of multiple feedback events for one timing decision and the related issue of the amount of psychological involvement in one timing decision.

PK as a Force Versus Precognitive Timing

May et al. (1985) proposed using a similar strategy as an elegant means to investigate the old question of whether PK operates with a force-like mechanism that biases the random process or with a precognitive-timing mechanism that selects favorable random fluctuations of the random process. If PK is actually a precognitive-timing mechanism, then PK tasks using true RNGs will have the same properties as precognitive-timing tasks with pseudorandom number generators. Because psi can operate only on the timing decisions for the precognitive model, but on each RNG event for the force-like model, the number of opportunities for psi to operate (redundancy) is very different in the two models.

Based on the assumption that the amount of information utilized is the same for each timing decision, May et al. (1985) hypothesized that the precognitive-timing model will result in the z score for the RNG outcomes from one timing decision being unrelated to the number of RNG outcomes collected for the decision. On the other hand, if psi

operates as a force biasing the RNG outcomes, then each RNG event would be an opportunity for psi to operate, and the z scores will increase with the square root of the number of RNG outcomes for each timing decision.

The initial meta-analysis results reported by May et al. (1985) were consistent with the precognitive-timing hypothesis and were significantly different from the results expected with the hypothesis of a force-like mechanism.

Unfortunately, these results are not distinguishable from goal-oriented psi if the goal is the outcome of each timing decision or higher on the hierarchy of goals. This strategy is also confounded by the assumption that the same amount of information is utilized per timing decision, regardless of the number of trials, amount of feedback, and related factors of psychological involvement and motivation. As noted in the previous section, Vassy's (1986) direct investigation of this assumption failed to support it. In addition, the analysis by May et al. has several unresolved methodological issues, particularly concerning the simulated data that constituted almost 30% of the data in the analysis (Kennedy, 1994).

Lability

The concept of lability proposed by Braud (1981) apparently includes both the a priori probability and redundancy aspects of information processing. According to Braud, a system with high lability easily changes state, whereas a system with low lability resists change. Thus, a system with high lability apparently has a relatively large a priori probability of changing state, and a system with low lability has a small a priori probability of changing state. Likewise, Braud discusses cases with multiple opportunities for psi to operate to achieve the desired outcome as situations with potentially higher lability.

Braud proposes that systems with high lability are more susceptible to psi effects. However, in the context of goal-oriented psi, the evidence is strong that redundant opportunities for psi may or may not increase psi operation, depending on the goal of the psi source. The lability hypothesis also appears to predict that psi effects will be reduced for events or tasks that have a small a priori probability of occurring by chance. Relevant data for this easily tested hypothesis would be obtained from a general investigation of psi functioning on tasks with different a priori probabilities of success.

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