FEEDBACK CONSIDERATIONS IN ANOMALOUS COGNITION EXPERIMENTS

By Edwin C. May, Nevin D. Lantz, and Tom Piantineda

ABSTRACT: To determine from what time frame the data from anomalous cognition (AC) originate, we have examined the role of precognition and feedback on the quality of AC. In an otherwise standard AC protocol, we displayed feedback tachistoscopically to receivers. The cognitive awareness of the feedback experience was minimal, and 2 of the 8 intensities used for visual display of the feedback were below subliminal threshold. We hypothesized a number of possible relationships between feedback intensity and AC quality, including one based on precognition (i.e., the data originated from the future feedback). Four viewers contributed 40 trials each (5 at 8 different intensity bands). Using a sum-of-ranks statistic, 2 viewers produced independently significant evidence of remote viewing (i.e., the binomial probability of 2 hits in 4 trials with an event probability of .05 is .014). None of the data showed significant correlation of feedback intensity with AC quality. This result is discussed with regard to precognition in general and the troublesome unfalsifiability aspect of truly goal-oriented precognition.

Beginning in 1986, we conducted a 2-year investigation of the dependency of the quality of anomalous cognition (AC) on the feedback to the participant (hereafter called the receiver). The experiment was conceptually quite simple, but to address precognitive issues the experiment became technologically complex. With regard to the general feedback issue, we were interested in determining from what time frame a receiver gains access to the target.

One model of AC, which is based on precognition, is that the data originate from the future feedback to the receiver (Feinberg, 1975). If we are to understand the process of AC from this perspective, we must examine and understand precognition. One view is that precognition is simply a "clean" methodology for conducting free-response experiments. For the purposes of this paper we have assumed that precognition is real. We cite Honorton and Ferrari's (1989) meta-analysis of the

We would like to thank Beverly Humphrey for her valuable contribution as an analyst and Thane Frivold for creating the tricky computer control code. Thanks also to the remainder of the Cognitive Sciences Laboratory for their tireless effort in target selection and technical administration.

1 The Cognitive Sciences Laboratory has adopted the term anomalous mental phenomena instead of the more widely known psi. Likewise, we use the terms anomalous cognition and anomalous perturbation for ESP and PK, respectively. We have done so because we believe that these terms are more naturally descriptive of the observables and are neutral in that they do not imply mechanisms. These new terms will be used throughout this paper.
forced-choice experiments from 1935 to 1987 as at least prima facie evidence for the phenomenon. Using 309 studies, they found overall significance \( z = 11.4, \ p \leq 2.4 \times 10^{-30}, \ ES = 0.020 \pm 0.002 \), and they examined a variety of variables, including file-drawer and quality considerations.

Targ and Targ (1986) conducted an experiment to explore the relationship between feedback and precognition: Do individuals have access to actualized or probable futures? Their evidence suggests that precognition is independent of a priori target probabilities. However, in a similar experiment, Radin (1988) subsequently found significant evidence contradicting their result.

In a carefully constructed experiment, Vassy (1986) found that a goal-oriented model of precognition did not fit his data; however, our analysis (May, Spottiswoode, Utts, & James, 1995) demonstrated that the timing parameters Vassy used in his experiment could not exclude a goal-oriented interpretation of the results.

We will discuss the apparent contradictory results of these experiments in the Discussion section of this paper. We note that neither the Targ and Targ nor the Vassy studies explored the functional relationship between feedback and AC. Nonetheless, because of their more recent investigations and because of the importance of the question about feedback, we are presenting an updated and more complete version of our 1986 experiment that appeared earlier (May, 1993).

**Conceptual Approach**

In a schematic protocol for a typical AC trial, a receiver and monitor (i.e., interviewer) are sequestered in a laboratory. An assistant randomly selects a target from a predefined set (i.e., target pool) and, at a pre-determined time, the receiver attempts to describe the target. At the end of the session, the AC data are secured, and the intended target is shown to the receiver as feedback. Normally the feedback includes a presentation of the target and involves a complete debriefing of the session experience.

In our experiment, we attempted to inhibit as many potentially open precognition channels as possible so that we could assess the impact of the visual intensity of the feedback display on the quality of the AC. Therefore, we eliminated all debriefing of the AC experience during the feedback periods and presented visual feedback tachistoscopically. The display intensities for the feedback presentation varied from zero to a level that just exceeded the visual recognition threshold (i.e., some
cognitive details can be recognized). Even the strongest display intensity was insufficient to provide a "satisfying" study of the target material.

To lessen the impact of other potential precognitive leakage paths, we took extreme care to ensure that the receiver was the only individual who was simultaneously aware of both the intended target and the response. That is, during the course of the experiment and to date, no individual except the receiver has been consciously aware of the target that matches any given response.

Under these conditions we hypothesized four potential outcomes, which are displayed schematically in Figure 1. Under the null hypothesis of no AC, the quality is low and does not depend upon the intensity of the feedback. If precognition of the feedback is the underlying mechanism, then we would expect a linear relationship: the more information in the feedback, the higher the quality of the AC. That is, the more information in the receiver's future, the more AC in the session. Suppose, however, that the information is acquired exclusively in "real-time"; that is, none of the information arises from the future feedback. Since by definition there is no dependency on the feedback, we might expect significant evidence for AC like the one labeled "real-time" in Figure 1. A combination of both mechanisms is also shown. For example, if the feedback is not cognitive (i.e., subliminal), there is little information in the feedback so that the only open channel is real-time, whereas the opposite might be true for large amounts of feedback information.

Figure 1. Idealized relationships between AC quality and intensity of feedback.
In this discussion, we have assumed that the feedback experience is proportional to the cognitive awareness of the visual feedback in our proposed experimental outcomes. On the basis of this assumption, we used the amount of information available (i.e., the visual intensity) for feedback as the independent variable in an otherwise straightforward AC experiment.

Experiment Details

In this section, we describe the methodological and technical details of an experiment to determine the degree to which the quality of the AC depends on the intensity of the visual feedback.

Tachistoscope Calibration

The crucial independent variable is the amount of visual feedback displayed tachistoscopically to the receiver. The magnitude of the stimuli is directly proportional to the duration of the receiver's exposure for a given level of luminance. In a calibration experiment, volunteers were presented with slides and were asked to say when they were aware of the presentation. We manipulated the magnitude of the stimuli from zero to a value at which the volunteer could recognize the gestalt of a scene. Each stimulus slide was presented for 50 milliseconds (ms), and the magnitude of the stimulus information was adjusted by attenuating the luminance of the slides over a range of two logarithmic units. In adjusting the magnitude, we relied on Bloch's Law, which says that for presentation time shorter than about 100 ms, the product of time and intensity is constant (Marks, 1975). Thus, varying the luminance of the stimuli is equivalent to varying its duration. In addition, each slide was appropriately masked with random intensity patterns.

For the luminance calibration, a two-field projection tachistoscope (Gerbrands G1170) was loaded with 80 color photographic 35-mm slides (5 opaque and 75 having various luminance contrasts) showing natural and manmade scenes, which were randomly chosen from our larger pool of 200 photographs from magazines (May, Utts, Humphrey, Luke, Frivold, & Trask, 1990). We varied the luminance contrast of the slides by duplicating them at one of 12 f-stops (including zero) to provide a target pool having variations in the intensity covering two logarithmic units. The contrast in luminance for each slide, which may be considered to be the ratio of the brightest to the darkest part of the slide, was further attenuated in the calibration trials so that some of the slides were above and others below the observer's detection threshold. To avoid any
possible audio cue to the presentations, the individuals were presented with white noise coming from a large, comfortable headphone set and the tachistoscope was located in an adjacent room.

The calibration slides were tachistoscopically back-projected onto a 14-inch-square frosted glass window. Figure 2 shows the floor plan that was used both for the calibration and for the AC measurements. During the calibration experiments, the window cover was fully open; however, during the AC sessions, the cover was positioned to prevent the monitor from seeing the frosted glass screen.

![Figure 2. Schematic floor plan.](image)

The tachistoscope was programmed to present each calibration stimulus in numerical order for 50 ms, followed by a 5-second pause during which the next slide was cycled into position. Slides were attenuated by projecting them through a pair of plane polarizers, one fixed and the other variable. The luminance of the projected image varied as the cosine of the angle between the two polarizers.

Visual detection, however, is not related to luminance alone. For a fixed luminance, scenes with different contrasts will be detected with differing probabilities. At the same luminance, for example, a photograph of a checkerboard will be easier to detect than a photograph of a mountain cabin in a snow storm. Thus, each of the candidate target slides had to be calibrated with human observers in order to determine the empirical relationship between detectability and luminance.

Two naive female volunteers participated in the calibration. A complete data set was obtained from one volunteer, and data trends were confirmed by the second volunteer.

The calibration procedures were as follows: The volunteer was seated approximately 3 ft. from the projection screen, which was positioned at
eye level in the wall between the room in which the apparatus was housed and the room in which the volunteer sat (see Figure 2). The volunteer was permitted to view the screen and the other contents of the room freely for several (i.e., more than 5) minutes to ensure that she adapted to the ambient illumination level. To screen the sound of the tachistoscope, the volunteer listened to white noise through earphones. The response was registered by a foot switch that the volunteer pressed to indicate detection of the stimulus slide. In a typical session, the variable polarizer was set at a predetermined value, and each of the 80 slides was presented five times. Two sessions were conducted at each polarizer setting, providing 10 data points per slide per polarizer setting. An alternative procedure was used when the variable polarizer was set near one of the extremes of the experimental range.² To reduce the tedium for the volunteer, only those slides near the detection threshold were presented.

Each time a new slide was presented, the volunteer reported whether the presentation was detected (i.e., sensed at all, regardless of target content). Counters recorded whether a particular slide was detected as well as the proportion of slides detected. From these records, a psychometric function was generated relating the proportion of the time each slide was detected to the contrast in luminance for that slide. This function, which relates the contrast in luminance for the slide to its detection threshold, is an index of the detectability of the geographic scene depicted in the slide. By using this psychometric function, it was possible to specify not only which slides were subliminal (i.e., never detected) but also how far above or below the detection threshold each slide lies.

Figure 3 shows a sample of the psychometric curves generated from these data. Six of the 80 slides are shown by plotting the probability of detecting a given slide as a function of the variable polarizer setting. We generated a set of curves similar to the ones shown in Figure 3 for all target slides.

Normally, data would be collected from a large sample of individuals in order to arrive at an average function, but in this experiment data from two persons were sufficient for several reasons. First, pilot studies indicated that interperson variability of stimulus slide detection was quite low. Second, to collapse interperson variability even further, we generated a steep psychometric curve by sampling the abscissae coarsely. For example, if we sampled stimulus slide contrast at only two values—0 and 100% contrasts—all observers would respond identically, thus

² With the extreme settings, the volunteer saw nearly all of the slides or very few of them.
eliminating interperson variation if the observers possessed normal or corrected vision. In this study, we sampled stimulus target contrasts at intervals that were found in pilot studies to produce low interperson variability. Finally, for the purposes of this study, interperson variability was not significant because it only shifts the psychometric function along the abscissa by some unknown amount without changing the shape of the function. Thus, interperson variability could only result in an erroneous estimate of feedback magnitude. Although these errors may influence the intercept of the function relating the dependent variable (AC performance) to feedback magnitude, the slope of the performance versus magnitude of the feedback is independent of these errors.

Figure 4 shows an idealized relationship between visual detectability and luminance for this experiment. To lessen the sensitivity to individual differences in perceiving the feedback, we required that the psychometric curve rise rapidly through the 50% detection level. We identified eight levels of feedback intensity that would be used as the values of the independent variable in the experiment. Two were subliminal (i.e., .0 detection probability); one was completely opaque; one was nominally at threshold; three were at 25%, 50%, and 75% detection threshold, respectively; and two were above recognition threshold (i.e., 100%). These points are shown as arrows in Figure 4.

The following example illustrates the procedure that was used for all target slides to select those that met the criteria shown in Figure 4. We notice in Figure 3 that one of the slides is 50% detectable when the
polarizer was set at 50 degrees, which is one of the detection bands required as illustrated in Figure 4.

Suppose we wished to include the candidate slide, which was detected 50% of the time when the polarizer was set at 87.5 degrees, in the 50% detection group. We notice a difference of 37.5 degrees in the polarizer setting between this candidate and the original slide. To account for this difference, we compute $\cos^2(37.5 \text{ degrees}) = 0.629$. When we then reduce the exposure of the candidate slide by this factor, it will also be detected only 50% of the time when the polarizer is set at 50 degrees.

In actual practice, we could only change exposure by an integral number of f-stops, so changes of intensity always occurred by factors of 2. Working backward, however, the position of all the target slides on the curve shown in Figure 4 could be determined. Furthermore, all the slides were grouped into bands as close as possible to the arrows shown in Figure 4.

*Experimental Protocol*

Forty targets, which were randomly selected from the original 80 used in the calibration, were prepared into eight intensity groups of five targets each, using the calibration data and technique described above. Each intensity group represented the cognitive awareness that each
receiver would experience (on the average) from the feedback. The top two intensities were sufficient to recognize major features, but insufficient to discern details. By definition, those intensities below the visual recognition threshold could not be cognitively sensed, and one group constituted no feedback whatsoever (i.e., zero luminance).

To attempt to maintain some control over precognitively available "answers," we arranged that at no future time would a response be knowingly compared to its intended target. For a complete answer to exist in the future, three pieces of information are needed: (1) the target, (2) the response, and (3) the comparison between them. The target system was prepared by individuals who had no access to the responses, and the AC monitor and the assistant had no access to the targets. Finally, the analysts were never informed which were the correct results on a trial-by-trial basis. Thus, in the experiment and forever after only the receiver has had access to all three pieces of information.

The slide tray in the tachistoscope was controlled by a computer (Sun Microsystems 3-160) in such a way that all participants were blind to target selection during a trial. To avoid cuing, for example, the tray always began and ended in the zero position. When the computer moved the tray, an independent electrical unit, which could be accessed by the computer, counted the tray steps to ensure that the intended target was displayed at the correct time. After the session, the computer repositioned the tray to zero.

Two very experienced receivers (receivers 009 and 177), one moderately experienced receiver (105), and one novice (137) each contributed 40 trials (five at each of the eight intensity levels) at an average rate of about five trials per week. All receivers except 009 possessed normal vision; receiver 009 is color blind. The receivers were all in their thirties; 009 and 177 were male, and 105 and 137 were female. All receivers were completely informed about the nature of the experiment and were asked to sign a consent form indicating that they were aware of its potential risks. The protocol had been approved by an appropriate Institutional Review Board.

All receivers believed strongly that feedback was not necessary for success, but they were uncertain about the degree to which feedback might contribute to success.

A random order of intensities of the feedback was determined once by a pseudo-random number generator, which was based on a shift-register algorithm by Kendall and has been shown to meet the general criteria for randomness (Lewis, 1975); a different order was determined for each receiver prior to the start of the receiver's first trial. Once the order had been set, the trials cycled through the list of intensities until
the 40 trials were complete. The sequence of events for each trial was as follows:

1. A monitor and a receiver entered a laboratory that contained a table, two chairs, a computer terminal, and a covered 14-inch-square frosted glass window. The window served as a projection screen for the tachistoscope in the adjacent laboratory. (See Figure 2.)

2. The monitor initiated an automatic target selection program on the terminal.

3. Using the standard feedback shift-register algorithm, which was seeded from the system clock, the computer randomly selected (with replacement) a target from within the set of five for the given intensity, stepped the slide tray to that target, and notified the monitor that the trial could begin. Because of the closed tachistoscope shutters, no illumination of the slide was present on the frosted screen, and the time to position the slide tray was always set to the time that was required to reach the most distant slide, regardless of the target slide’s actual position. Thus, there was no time cuing.

4. The monitor indicated that the trial should begin. For the next 10-15 minutes, the receiver drew and/or wrote responses to the intended target.

5. At the conclusion of the session, the monitor collected the response, and the receiver opened the screen cover in such a way as to shield the monitor from the feedback material.

6. When the receiver was ready, he or she pressed a button that initiated a single tachistoscope display of the target. One, and only one, 50-ms display appeared on the translucent window screen. (Electronics prevented the receiver from receiving more feedback after the first button press.) The monitor was instructed not to discuss the experience with the receiver in any way at any time.

7. The monitor ended the session and notified the control program from the computer terminal. After the computer had returned the slide tray to zero, then and only then did the monitor and receiver leave the room. All target data were preserved in a computer file.

Data Analysis

The rank-order analysis was used in this experiment. Using cluster analysis, we had previously assigned all 200 targets to relatively orthogonal clusters of nearly equal numbers of similar targets. An assistant prepared packages (one for each receiver) consisting of all the responses randomly ordered. Next, the assistant computer-generated a list ordered by target number of seven targets for each response, consisting of the actual target and six decoys, a different set of seven for each response. The decoy clusters were chosen randomly, but uniquely, from the
complete set minus the one from which that actual target was selected; that is, no two decoys were chosen from the same cluster. Once a cluster was selected, the decoy was randomly selected from within the cluster.

The response material and the target/decoys set of seven photographs (one target, six decoys) were presented to two analysts for judging. The analysts arrived at a consensus to rank order each set of seven targets for each response in accordance with the best to the worst response/target match. For each receiver, a sum-of-ranks statistic was computed for the sessions. In addition, the data were plotted as AC quality (i.e., 8 minus the assigned rank) versus the feedback intensity.

RESULTS

Table 1 shows the average rank (\(<\text{Rank}\>)\), effect size (\(ES\)), \(z\) score, and its associated \(p\) value for each receiver in this experiment.\(^5\)

<table>
<thead>
<tr>
<th>Receiver</th>
<th>(&lt;\text{Rank}&gt;)</th>
<th>(ES)</th>
<th>(z)</th>
<th>(p) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>177</td>
<td>2.600</td>
<td>0.700</td>
<td>4.43</td>
<td>4.43 (\times) 10(^{-6})</td>
</tr>
<tr>
<td>009</td>
<td>3.275</td>
<td>0.363</td>
<td>2.29</td>
<td>.011</td>
</tr>
<tr>
<td>137</td>
<td>3.975</td>
<td>0.013</td>
<td>0.08</td>
<td>.468</td>
</tr>
<tr>
<td>105</td>
<td>4.550</td>
<td>-0.275</td>
<td>-1.74</td>
<td>.959</td>
</tr>
<tr>
<td>Total</td>
<td>3.600</td>
<td>0.200</td>
<td>2.53</td>
<td>.004</td>
</tr>
</tbody>
</table>

The effect size was computed from:

\[
ES = \frac{\bar{R}_e - \bar{R}_o}{\sqrt{(N^2 - 1)/12}}
\]

where \(N\) is the number of possible ranks, which was seven in this experiment; \(\bar{R}_e\) and \(\bar{R}_o\) were the expected and observed average rank. The \(z\) score was computed from \(ES \times \sqrt{m}\) . For the individual receivers, \(m = 40\), and for the total, \(m = 160\).

Receivers 177 and 009 produced independently significant results (one-tailed). We can combine data for all receivers in many ways, but the

\(^5\) The numbers in Table 1 differ slightly from the table on page 137 of May (1993). The results here were checked against the recorded sum of rank from which the average rank was computed. We believe these results to be correct.
most conservative is a binomial calculation assuming an event probability of .05. A result of two significant trials in four attempts corresponds to an exact \( p \) value of .014. The totals shown in Table 1 were computed from the total sum of ranks. The important point, however, is that this experiment produced strong evidence for AC.

![Graph](image)

**Figure 5. Combined data: Quality vs. feedback luminance**

Figure 5 shows AC quality plotted against the intensity of the feedback for the four receivers. The lowest possible quality was one and the maximum was seven (i.e., 8 – rank). The least squares best fit line is also shown.

We computed a Spearman’s \( r_s \) correlation for each of the receivers and for the combined data. Table 2 shows the results of these calculations.

**Table 2**

<table>
<thead>
<tr>
<th>Receiver</th>
<th>( r_s )</th>
<th>( t )</th>
<th>( df )</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>177</td>
<td>.112</td>
<td>0.695</td>
<td>38</td>
<td>.245</td>
</tr>
<tr>
<td>009</td>
<td>-.297</td>
<td>-1.917</td>
<td>38</td>
<td>.969</td>
</tr>
<tr>
<td>137</td>
<td>.065</td>
<td>0.402</td>
<td>38</td>
<td>.345</td>
</tr>
<tr>
<td>105</td>
<td>.150</td>
<td>0.935</td>
<td>38</td>
<td>.178</td>
</tr>
<tr>
<td>Total</td>
<td>.004</td>
<td>0.050</td>
<td>158</td>
<td>.480</td>
</tr>
</tbody>
</table>
To place these correlations in perspective, we provide a power analysis for 40 trials. One-tailed correlations of .26 and .48 would lead to 50% and 80% chance, respectively, of reaching statistical significance (Cohen, 1977, p. 86).

Figure 6 shows the quality versus feedback luminance for the two independently significant receivers, 177 and 009. As seen in Table 2, receiver 177 demonstrated a slightly positive correlation with the intensity of the feedback, whereas receiver 009 showed a significantly negative correlation.

![Figure 6. Correlations for the two significant receivers.](image)

**DISCUSSION**

The relationship that is easiest to understand is Hypothesis 1 in Figure 1: increased performance with increased feedback intensity. We did not observe any such correlation overall or with either of the significant receivers. Receiver 009 produced a significant amount of negative correlation between performance and feedback, and at this time we have no explanation for this result.

This lack of positive correlation, in conjunction with significant evidence of AC, complicates the interpretation considerably. The most obvious conclusion is that the receivers obtained their data in real time and not from the feedback. However, because of the conceptual difficulties outlined in the introduction of this paper, alternative explanations must be considered.
One alternative is that the absolute position of the psychometric curve is important. Feedback might be related to the cognitive experience, but only at large values of luminance contrast. If this is true, then we might not expect functional dependence of AC quality on the feedback in this particular experiment.

An important alternative, however, is that precognition may be exclusively goal oriented, and thus we are faced with the unfalsifiability issue. We might not ever be able to interpret process-oriented experiments if this aspect of precognition is true. Therefore, the question of from what time frame AC data originate remains unanswered at the present.

In response to a question from Russell Targ in June 1994, we examined, post hoc, the data when no feedback was presented (i.e., zero intensity). Table 3 shows the effect size for all the trials (ESI), zero-intensity average rank (<Rank>), zero-intensity effect size (ES), z score, and its associated p value for each receiver.

<table>
<thead>
<tr>
<th>Receiver</th>
<th>ESI</th>
<th>&lt;Rank&gt;</th>
<th>ES</th>
<th>z</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>177</td>
<td>0.700</td>
<td>2.60</td>
<td>0.700</td>
<td>1.56</td>
<td>.059</td>
</tr>
<tr>
<td>009</td>
<td>0.363</td>
<td>3.00</td>
<td>0.500</td>
<td>1.12</td>
<td>.132</td>
</tr>
<tr>
<td>137</td>
<td>0.013</td>
<td>6.00</td>
<td>-1.000</td>
<td>-2.24</td>
<td>.987</td>
</tr>
<tr>
<td>105</td>
<td>-0.275</td>
<td>5.00</td>
<td>-0.500</td>
<td>-1.12</td>
<td>.868</td>
</tr>
<tr>
<td>Total</td>
<td>0.200</td>
<td>4.15</td>
<td>-0.075</td>
<td>-0.34</td>
<td>.631</td>
</tr>
</tbody>
</table>

From these results it appears that the most experienced receivers do not require feedback on a trial-by-trial basis; receivers 177 and 009 maintain or increase the effect sizes from their sets as a whole. The less experienced receivers, however, appear to perform considerably below their overall contributions. As Targ and Targ (1986) also found, trial-by-trial feedback is not necessary for significant AC.

One of us (May) has been exploring the nature of precognition and suggests that precognition experiments are relatively easy to construct and nearly impossible to understand. For example, if precognition is goal oriented (i.e., individuals can “peek” into the answer book), then process-oriented experiments are difficult, if not impossible, to interpret. It is always possible to include all the complexity of any given experiment into a “black box” and consider the final result as the “answer book.” Thus, the intervening complexities are simply not apropos.

One obvious problem with this perspective is that goal-oriented precognition is not falsifiable—an unacceptable circumstance in science. For any experiment to be valid, there must be a result. No matter how
cleverly the result is "hidden" from various participants in the experiment or how contrived the protocol is, as long as a result will eventually exist, truly goal-oriented precognition is always possible.

The apparent contradiction among the experimental results from Targ and Targ (1986), Radin (1988), and May et. al's (1995) computation of Vassey's results (1986) could be a manifestation of true goal orientation. Only the Radin study suggests that a priori target probabilities are important. Radin, however, did not consider global goal orientation in his discussion. In his experiment, a pseudo-random number generator determined which face of a computer die would be a priori biased. Since the seed for that decision was taken "as soon as the cursor is moved at least one pixel (~.3 mm)" (Radin, 1988, p. 195), all that Radin (the subject) had to do was to "peek" into his future for the trial and compute when to move the cursor to select the seed to correspond to a biased face that did not land face up. If this were the case, then we could not interpret Radin's significant precognition results as evidence for a dependency upon a priori futures.

There is another technical problem concerning precognition. From a physics point of view, the present does not exist. It is a single geometric point in space-time. (The present is an interval of time with an infinitesimally short duration). All other times are either in the past or in the future, and thus the definition of real-time AC is problematical.

In an AC experiment, what constitutes the "answer book" in the future? The most direct candidate is the reporting of the target material to the receiver after the session (i.e., feedback). It is arguable that providing no feedback to the receiver precludes precognition as an explanation for successful AC experiments. Because there are no examples in physics that are fundamentally anthropocentric and if information from a future time is available to anyone, then certainly it is available to everyone. The implication is that receivers could obtain information regardless of the feedback parameters—including that of no feedback at all.

**References**


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