

## EFFECTS OF BELIEF IN ESP AND DISTORTED FEEDBACK ON A COMPUTERIZED CLAIRVOYANCE TASK

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**ABSTRACT:** In a fully computerized experiment 229 University of Iceland students were administered a 12-item questionnaire on attitudes toward ESP and related phenomena, and a 40-trial clairvoyance computer game (probability of a hit: 1 in 4). A test of the effect of belief and interest in psychic phenomena on the clairvoyance task revealed a significant reversal of the sheep-goat effect ( $p = .002$ , two-tailed). To test the hypothesis that feedback about their success, or lack of it, would affect their scores, we randomly divided subjects into three groups, each group getting different play-by-play feedback for their guesses in the game by having displayed to them either a reduced, correct, or increased number of hits. The hypothesis, that different amounts of distorted feedback would affect the number of correct guesses, was not confirmed.

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It may be argued that belief in ESP is one of the best predictors of ESP performance that have been found. Since Schmeidler's research (Schmeidler & McConnell, 1958), the relationship between results on ESP tests and belief in ESP—in the test situation or in the abstract—has come to be known as the sheep-goat effect. This relationship has been confirmed several times (Palmer, 1971), although few confirmations have been conducted in recent years using modern testing techniques and numbers of subjects as large as those Schmeidler used. At the University of Iceland we have found a predicted sheep-goat effect in large groups of students (Haraldsson, 1975, 1980). The results of these experiments are summarized in Tables 1 and 2. The effect was significant in one experiment with 449 subjects (Table 1), and was in the expected direction in the other, with 393 subjects (Table 2).

In most experiments of this type, the main concern has been the attitudes of the subjects *before* any test has been administered. A few researchers have also aimed at manipulating the subjects' attitudes. Taddonio (1975), for example, did an experiment in which she tried

TABLE 1  
 SCORES ON A PRECOGNITION TEST AND BELIEF IN THE EXISTENCE  
 OF ESP (1980 SERIES)

Belief	No. of subjects	No. of hits	Mean score	Dev.	<i>z</i>	<i>p</i>
ESP is:						
Certain	90	1841	20.46	+ 41	+ 1.08	n.s.
Possible	331	6565	19.38	- 55	- 0.76	n.s.
Unthinkable	28	511	18.25	- 49	- 2.32	.02
Total	449	8917	19.86	- 63		

to affect personal attitudes of the subjects a short time before a clairvoyance test was administered. Correct answers were kept in closed envelopes. The subjects were divided into two groups: One group was told that previous subjects had scored well above chance on the test; the other group was told that former subjects had shown only chance performance and that it was thus not a particularly good test for eliciting psi. The former group performed better than chance, as had been hypothesized ( $t=2.31$ ,  $p < .05$ , two-tailed). The other group obtained results below chance ( $t=2.47$ ,  $p < .05$ , two-tailed). These results indicated that it might be possible to affect results in clairvoyance tests by manipulating the expectancy of the subjects in this way.

A few experiments have also been concerned with the feedback of guesses given to the subjects. Rhine (1938), for example, and later, Woodruff and Murphy (1943) reported a relationship between feedback and performance in an ESP test when subjects were told after each guess whether the guess was right or wrong (Palmer,

TABLE 2  
 SCORES ON A PRECOGNITION TEST AND BELIEF IN THE EXISTENCE  
 OF ESP (1975 SERIES)

Belief	No. of subjects	No. of hits	Mean score	Dev.	<i>z</i>	<i>p</i>
ESP is:						
Certain	82	827	10.09	+ 7	+ 0.19	n.s.
Possible	277	2699	9.74	- 71	- 1.42	n.s.
Unthinkable	34	327	9.62	- 13	- 0.56	n.s.
Total	393	3853	9.80	- 77		

1978). Similar results were obtained in an experiment by Tart, Palmer, and Redington (1979).

Our experiment is a combination of those of Rhine (1938) and Woodruff and Murphy (1943) on the one hand, and Taddonio (1976) on the other hand, differing from the former in the addition of false feedback and differing from the latter by the introduction of false feedback in order to affect the subject's expectancy *during* the clairvoyance task.

This experiment therefore had two objectives: first, to test the replicability of the effect of belief and interest in psychic phenomena on an ESP task, the results to be evaluated by the use of a two-tailed Spearman correlation.

Second, we wanted to test the effects of manipulation and distortion of feedback on success in a forced-choice guessing game (the ESP task). This was to be evaluated by analysis of variance. For this purpose the sample was divided into three groups according to the type of feedback given (i.e., reduced, correct, and increased hits) in such a way that one third of the subjects might think that they obtained considerably fewer hits than they actually obtained; one third would receive feedback for exactly each hit; and one third would be led to believe that they were obtaining considerably more hits than they actually were.

We hypothesized that an increased magnitude of positive feedback, even if a part of it was false, would change the subject's expectancy during the experiment and therefore would tend to increase the number of actual hits, whereas reduced display of hits would tend to reduce actual scoring rate.

## METHOD

The experiment was fully computerized. About 20 terminals, with an equal number in each of two rooms, were available for testing. All terminals were attached to one of the University's mainframe computers. During the day of testing, from a few up to all of the 20 terminals were in use simultaneously. About 70 to 100 cm separated the terminals from one another.

### *Subjects and Experimenters*

The subjects were 229 students at the University of Iceland, all of them volunteers, mostly from the departments of economics,

computer science, and psychology. Subjects were approached at the end of lectures in various halls and were asked to "participate in a psychological experiment meant to study the relationship between attitudes and guessing abilities," without any clear reference to ESP. In a few instances, participating subjects had onlookers who were either waiting for their turn or had just finished their game.

The whole experiment was administered in one day, March 24, 1986, with a few rest breaks for K.R.T. and F.S., who acted as experimenters. The experimenters' main role was to recruit and seat the subjects at the terminals and start the running of the test program.

### *Instructions*

When the subject had sat down in front of the terminal at the beginning of the experiment, he/she was encouraged to try to guess as correctly as possible in the forthcoming computer guessing game. Then a text appeared on the screen asking him/her to answer the questions that would follow by typing "the number of the answer that you consider most appropriate according to your view," and then by pressing <RETURN>. After questions about sex and personal identification number, a 12-item questionnaire followed.

### *Questionnaire on Belief and Personal Experience*

The questionnaire that appeared on the screen (see Appendix A) contained the three-item Icelandic Sheep-Goat Scale (Questions 2, 7, 10); three items on personal paranormal experiences (Questions 5, 9, 11) concerning telepathy, hauntings, and dreams about the future; and six questions on various beliefs and behaviors (Questions 1, 3, 4, 6, 8, 12: Do you believe that some people are more lucky at games? that you have a lucky number? that flying saucers are real? Do you read astrological prophecies? Do you believe that it brings misfortune to walk under ladders? Do you see movies about psychic phenomena?). Each subject had to answer all the questions in order to continue.

### *The Icelandic Sheep-Goat Scale*

The Icelandic Sheep-Goat Scale (Haraldsson, 1981; Thalbourne, 1984) can give scores ranging from 3 to 12 and consists of the following items:

Do you believe that the ability to know the future or to have dreams about it is: (a) certain, (b) likely, (c) unlikely, (d) unthinkable?

Do you believe that the existence of telepathy or clairvoyance is: (a) certain, (b) likely, (c) unlikely, (d) unthinkable?

Do you read books or articles about psychic phenomena: (a) often, (b) sometimes, (c) seldom, (d) never?

Subjects were given 4 points for response (a) and down to one point for (d). Scores 9–12 indicate a sheep; scores 7–8, a middle group; and scores 6 and lower, a goat.

### *The Computer Game*

Instructions for the computer game<sup>1</sup> appeared immediately after the subject had answered the questionnaire: "Now you will play a guessing game. The computer displays four squares on the screen and selects one of them as a target. To tell which square you think the computer has selected, use the keys 1, 3, 7, and 9 at your right. Each number stands for one square on the screen. When you have made your choice you press the appropriate key and <RETURN>. This will be repeated 40 times. If you guess correctly, the screen will flash and the correct guess will be added to the number in the upper right corner of the screen. READ THESE INSTRUCTIONS TWICE AND THEN PRESS <RETURN>." Oral instructions were given if further explanation was needed.

The 40-trial game was divided into 4 parts with 10 trials each and with 15-second intervals imposed between the parts. With the probability of a hit equal to  $\frac{1}{4}$  for each trial, the actual mean chance expectation was 10 hits. This computer game closely resembles a game originally developed by Richard Broughton and Erlendur Haraldsson and has been used in several experiments at the University of Iceland (Haraldsson, Houtkooper, & Hoeltje, 1987; Johnson & Haraldsson, 1984).

At the beginning of the game the random generator of the mainframe VAX 11/780 computer selected 40 numbers, each from 1 to 4 (for details see Appendix B); each number stood for one of the four squares on the computer screen (see Figure 1). These numbers (targets) were not displayed because it was the task of the subject to guess which one was the correct one. For each trial, the sub-

<sup>1</sup> A print-out of the computer program is available from E. Haraldsson upon request.

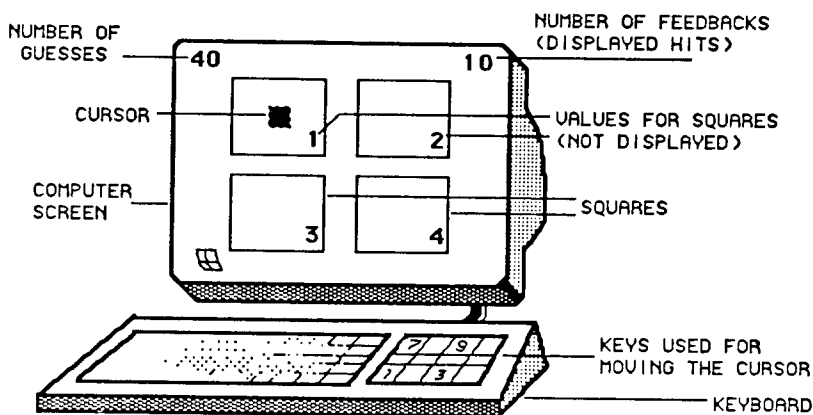


Figure 1. Monitor and keyboard configuration of the terminals used in the experiment.

ject chose one of the squares by moving a dot (with the keys 1, 3, 7, and 9) to the desired square thereby indicating his/her guess as to which of the squares the computer had selected for the trial.

If the subject chose the right target, the screen flashed and displayed a rose tapestry picture. If the subject missed, only small dots appeared in the square that was wrongly chosen. This display was modified according to three different strategies of feedback.

The total number of completed guesses was continually displayed in the upper left-hand corner of the screen. The number of (reduced, correct, or increased) hits was continually displayed in the upper right-hand corner of the screen.

Before and after each subject participated in the guessing game, a string of 10,000 random numbers, ranging from 1 to 4, was made by the random generator. In each of these 10,000 number strings, the four numbers were tested for frequency distribution by chi-square. The analysis revealed no anomalies in the distribution, a value of  $\chi^2 > 9.84$  occurring 6 times ( $df = 3$ ,  $N = 458$ ) all-in-all for the 458 strings.<sup>2</sup>

<sup>2</sup> This is not the customary use of the chi-square, but it can be argued that since 458 random number strings were tested, with 10,000 numbers each (containing the numbers 1 to 4), the odds are that in a binomial distribution the chi-square value of 9.84 should occur 9.16 times. A value of 6 thus does not indicate an abnormality in the distribution.

*Distortion of Feedback*

Without their knowledge the subjects were randomly assigned by the computer to one of three strategies of feedback related to their guessing performance on the 40-trial clairvoyance computer game that followed. The feedback gave either the reduced, correct, or increased number of hits.

The subjects were kept ignorant of the different feedback strategies because awareness of them would have destroyed the potential effects of the feedback manipulations. If subjects asked about the chances for a hit they were told that chances were one correct in every four trials. Careful observation of all subjects before and during the experiment was a precaution taken to prevent any access of the subjects to the computer program or anything else that was kept in the computer. The manipulation of the feedback was produced by our random number generator (see Appendix B) as follows:

*a. Reduced-hit feedback.* Feedback indicating a hit was only given in approximately 40% of the cases when an actual hit was made. Theoretical mean chance expectancy of displayed hits was thus reduced from 10 to 4 for the 40 trials.

*b. Feedback of correct hits.* Whenever a subject selected a target produced by the computer, it was displayed as a hit on the screen.

*c. Increased-hit feedback.* All hits were displayed, but in addition approximately 20% of all misses were also displayed as hits, thus increasing the theoretical mean chance expectancy of displayed hits to 16.

The experimenters did not know which feedback strategy the computer chose for each subject.

## RESULTS

The distribution of the number of correct guesses in the clairvoyance computer game was negatively skewed to a slight extent, with a mean of 9.90 and a standard deviation of 2.85 ( $N = 229$ ). The highest score was 20 hits and the lowest, 3. No sex differences were found ( $t = 0.78$ , two-tailed).

*The Sheep-Goat Effect*

There was a significant negative correlation between ESP scores and the Icelandic Sheep-Goat Scale ( $r_s = -.1863$ ,  $N = 229$ ,  $p = .002$ ,

TABLE 3  
 SPEARMAN CORRELATIONS ( $r_s$ ) BETWEEN ITEMS IN QUESTIONNAIRE (SEE APPENDIX A) AND NUMBER OF HITS IN THE CLAIRVOYANCE COMPUTER GAME

Question	Correlation ( $r_s$ )
( 1) Some people luckier in games...	.07
( 2) Existence of precognition...	-.12*
( 3) Do you have a lucky number...	-.01
( 4) Flying saucers are real...	-.15*
( 5) Been aware of hauntings...	-.16**
( 6) Read astrological prophecies...	.12*
( 7) Existence of telepathy...	-.12*
( 8) Misfortune to walk under ladders...	-.06
( 9) Experienced dreams about the future...	-.14*
(10) Read books about psychic matters...	-.17**
(11) Experienced telepathy...	-.02
(12) See movies about psychic phenomena...	-.03

\* $p < .05$

\*\* $p < .01$

two-tailed). This is a reversal of the sheep-goat effect; believers should have obtained higher ESP scores than the disbelievers. For the individual items the correlations were  $-.12$  ( $p < .05$ ) for belief in telepathy,  $-.12$  ( $p < .05$ ) for belief in precognition and psychic dreams, and  $-.17$  ( $p < .01$ ) for reading articles and books on psychic phenomena.

The correlations with each of the 12 items of the questionnaire are given in Table 3.

#### *Manipulation of Feedback*

No significant differences were found in the guessing performance of the three feedback groups. As can be seen in Table 4, the mean for the increased-hits feedback group was 9.90; for the non-distortion group, 9.94; and for the reduced-hits feedback group, 9.86. No significant interaction was found in ESP scores between the sheep-goat and the feedback-distortion variables ( $F = 2.16$ ,  $df = 4, 220$ , n.s.).

#### DISCUSSION

Of the two hypotheses that were tested, neither was confirmed in the form in which it was stated. Of particular interest, though, is



TABLE 4  
 MEAN NUMBER OF HITS IN THE COMPUTER GAME FOR SHEEP, MIDDLE  
 GROUP, AND GOATS RECEIVING INCREASED, CORRECT, AND DECREASED  
 HITS

	Feedback strategies			Total
	Increased no. of hits	Correct no. of hits	Decreased no. of hits	
Sheep	8.50 ( <i>n</i> = 18)	8.94 ( <i>n</i> = 16)	8.95 ( <i>n</i> = 19)	8.79 ( <i>n</i> = 53)
Middle group	9.97 ( <i>n</i> = 29)	9.27 ( <i>n</i> = 26)	10.54 ( <i>n</i> = 39)	10.01 ( <i>n</i> = 94)
Goats	10.80 ( <i>n</i> = 26)	11.10 ( <i>n</i> = 29)	9.52 ( <i>n</i> = 27)	10.49 ( <i>n</i> = 82)
Total	9.90 ( <i>n</i> = 73)	9.94 ( <i>n</i> = 71)	9.86 ( <i>n</i> = 85)	9.8996 ( <i>N</i> = 229)

the fact that the sheep-goat variable once more proved to be significantly related to ESP performance, though this time it was in a reversed direction from what was expected.<sup>3</sup>

In two previous experiments at the University of Iceland involving large numbers of subjects, a significant sheep-goat relationship was found. Now, in this, the third experiment, the relationship is once more significant, although in a reversed direction. According to Palmer (1978) the only significant reversal of the sheep-goat effect was reported by Moss, Paulson, Chang, and Levitt (1970) with a small subject pool. However, because their participants were selected on grounds of positive results in former ESP tasks, it is doubtful whether their experiment is compatible with ours.

In our experiment each subject made 40 guesses, which we hoped could be used as an indicator of their ESP ability. The question comes up: What shall constitute a fair indicator of a subject's ESP abilities? Is a certain minimal number of trials needed, given  $p = .25$  per trial? The number of trials in ESP experiments have varied greatly, from only 1 trial per person to thousands. In her group experiments Schmeidler (Schmeidler & McConnell, 1958) used an

<sup>3</sup> It is of some interest that when we excluded from the analysis those 12 subjects whom we considered as having used a preset sequence of numbers in the guessing game (e.g., 1111111222222223333333, etc.), and who were thus apparently not making an effort to guess the numbers, the significance rose slightly.

average of about 217 ( $p = .20$ ) trials per person. In previous successful sheep-goat experiments at the University of Iceland (Haraldsson 1975, 1980) 100 trials per person were used. Can the 40 trials in the present experiment be considered a sufficiently high number? No consensus has been reached on the required number of trials, but it should be stated that in our case the number is much lower than in Schmeidler's original sheep-goat experiments. The exceedingly low reliability of ESP measures (Haraldsson, 1983) is related to this problem but has rarely been addressed or tested, although some degree of reliability of ESP measures would seem a prerequisite to any meaningful search for correlates to ESP performance.<sup>4</sup>

The reversal of the sheep-goat effect is not easily explained, though a few post hoc explanations might be listed. If this finding is not a fluke of chance, what could be the reason? We made a separate analysis of the sheep-goat effect for each feedback treatment, but no clear overall pattern was apparent. It therefore seems unlikely that the feedback conditions had anything to do with this reversal.

It also seems unlikely that the effect was due to experimenter influence since the experimenters had a rather positive attitude toward the experiment as well as toward the subjects. What we failed to assess was whether perhaps the subjects who claimed to believe in psychic phenomena thought that clairvoyance could *not* take place in this particular experiment. It might also have been revealing to know whether in fact the distorted feedback had an effect on the expectancy or attitudes of the subjects toward the experiment. If it did, an interesting possibility might be that many of the subjects who got distorted feedback fell for the "gambler's fallacy," such that when they did surprisingly well in the beginning of the test they were led to believe that they would do worse later in the test, and vice versa. It is hard to tell, without experimentation, how such an effect might vary between sheep and goats, and between increased and decreased feedback.

A further guess at what might have led to these results is the surroundings in which the experiment took place: a somewhat noisy working area where a few subjects knew the experimenters and a few subjects had onlookers.

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<sup>4</sup> In an earlier study (Haraldsson, 1983) with 98 subjects, the one-to-three-year retest reliability of the Icelandic Sheep-Goat Scale was found to be .78, whereas the retest reliability was only .13 for 80 ( $p = .25$ ) ESP trials, 40 of which consisted of a paper-and-pencil precognition test ( $r = .04$ ) and 40 were trials on a computer game ( $r = .08$ ) similar to the one used in the present experiment.

As a last guess, could the deception of subjects by the experimenters regarding the distortion of the feedback have reversed the sheep-goat effect?

We cannot conclude with any certainty that any of the above stated variables contributed to the obtained negative results of this experiment. A replication is needed.

APPENDIX A

QUESTIONNAIRE ON BELIEF AND PERSONAL EXPERIENCE

Personal identification number (xxxx-xxxx):

Sex (M or F):

1. Do you think that some people are, as a rule, luckier in games than others?
  1. Yes
  2. No
  
2. Do you believe that the ability to know the future or have dreams about it is:
  1. Certain
  2. Likely
  3. Unlikely
  4. Unthinkable
  
3. Do you have a lucky number?
  1. Yes
  2. No
  
4. Do you think that flying saucers are a real phenomenon?
  1. Almost certain
  2. Probably
  3. Unlikely
  4. Not at All
  
5. Have you ever been aware of hauntings?
  1. Yes
  2. No
  
6. Do you read astrological prophecies?
  1. Often
  2. Sometimes
  3. Seldom
  4. Never
  
7. Do you believe that the existence of telepathy or clairvoyance is:
  1. Certain
  2. Likely
  3. Unlikely

4. Unthinkable
8. Do you think it will bring you a misfortune to walk under ladders?
1. Yes
  2. No
9. Have you ever dreamt anything that happened at the same time or later, and you could not have known by any known means?
1. Yes
  2. No
10. Do you read books about psychic matters?
1. Often
  2. Sometimes
  3. Seldom
  4. Never
11. Do you think you have experienced telepathy of some sort?
1. Yes
  2. No
12. Do you see films about psychic phenomena (e.g., "The Entity," "The Shining," "The Exorcist," "Poltergeist," "Omen", etc.)?
1. Often
  2. Sometimes
  3. Seldom
  4. Never

## APPENDIX B

### RANDOM NUMBER GENERATION

The random numbers we used were generated by the RAN function in FORTRAN. In VAX/11 FORTRAN this function is implemented in the following way:

$$x(n + 1) = \text{int}(K * x(n)) \text{ mod } 2 ** 32$$

where  $K$  is a large constant. This number is then scaled down to produce a number in the range 0.000000 to 0.999999. It is then multiplied by 4 and the integer part taken, giving one of the numbers 0, 1, 2, or 3 with equal probabilities. This is repeated 40 times for each subject. The resulting sequence determines the target numbers.

As an initial "seed" we used the number of milliseconds the subjects spent answering the questions.

The random number generator was also used to distort the feedback given to the subjects. In the reduced hits group, every *correct guess* had a probability of 1:5 to be displayed as a hit, giving a theoretical mean chance expectancy of 4 hits for each subject. In the increased hits group, every

wrong guess had a probability of 2:5 to be displayed as a hit, giving a theoretical mean chance expectancy of 16 hits per subject.

The random number generator was tested with a chi-square test of 10,000 numbers before and after producing each target number sequence. According to the chi-square test there was no valid reason to doubt the random number sequences.

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