

Effect of Belief on Psi Performance in a Card Guessing Task

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Abstract—Subjects were asked to carry out a clairvoyance task as a study of the effect of belief and its modulation on psi performance. The task was to guess hidden symbols on Zener cards. Subjects stated whether they believed in the existence of psi, after which the belief was either supported or contradicted by written and verbal arguments. After this, the subjects carried out the clairvoyance task. A total of 12 subjects were each asked to guess the content of 100 hidden Zener cards. The p-value for believers given pro-psi arguments was 0.028 (two-tailed), which is substantially different ($p = 0.039$) and better than the values for the nonbelievers and believers who were given anti-psi arguments. This supports the concept that successful psi performance results from belief in psi, and not the reverse.

Keywords: psi — ESP — belief — clairvoyance — Zenercards — parapsychology

Introduction

It has been observed commonly that people who believe that they can carry out psi tasks appear to have more success than those who do not. Psi phenomena include the sending or receiving of information by extrasensory perception (ESP) and psychokinesis. The question arises as to whether believers are more successful because of their belief, or whether their belief arises from successful experiences with psi resulting from an innate ability. In the current experiment we attempt to answer this question.

Many psi experiments ask subjects to provide information about something in the environment that they do not have access to via the normal senses. These subjects bring with them deep beliefs regarding the existence and function of psi. Previous research has indicated that these beliefs are a factor in the performance of subjects in psi-related tasks (Lawrence, 1993; Schmeidler & McConnell, 1958). It can help explain why many experiments have not shown repeatable results, where differences between subjects rather than experimental conditions influence the results. If subject belief is required for significant psi-task success, then it could explain why certain people are such deeply rooted believers or

nonbelievers: those who do not believe in psi will not observe it and those who do believe in psi will.

In our experiment, beliefs are strengthened or challenged using "fact sheets" that contain general and scientific data. We compare the effect of pre-existing beliefs about psi to induced beliefs on the success rate of subjects in carrying out a particular psi-task. In this way we assess whether innate ability is the primary factor in psi performance, with belief resulting from it, or whether the belief itself is an independent factor in the performance.

Schmeidler performed the original testing of the effect of belief on psi performance in 1945 at Harvard University (Schmeidler & McConnell, 1958). Her technique was to divide pupils into two groups: "sheep," who believed that ESP might occur in their experiment, and "goats," who did not believe in the existence of ESP. Schmeidler showed a highly significant difference between the sheep and the goats, with the sheep having an increased ability to predict ESP events and the goats having a decreased ability. Lawrence reported a meta-analysis of all the sheep-goat ESP studies that have been done since 1947 (Lawrence, 1993). In total, 73 forced-choice tests of this nature were reported in that time span. The meta-analysis supports the concept of belief-moderated performance on ESP tests, with a p-value of 10^{-16} .

Smith, Foster, and Stovin (1998) examined how randomly providing statements either in supporting or contradicting the existence of the paranormal (psi) affected the belief in psi performance of those that read them. They found that those who had read statements in support of psi had the highest belief score and those who had read statements against psi had the lowest belief score. Although no psi experiments were carried out, the researchers suggested that believers in a skeptical context and nonbelievers in a pro-psi context would show depressed performance on psi-tasks due to low motivation. From this study we infer that belief in psi may be altered in a research setting using fact sheets. Storm and Thalbourne (2005) carried out a study on the effects of attempting to change the attitude toward psi among skeptics carrying out a computerized Zener-card guessing task. They found a significant correlation between success at the psi task belief in psi after "conversion" of the skeptics.

The present study makes use of Zener cards to measure ESP ability in describing correctly the contents of the hidden face of a particular card. On each Zener card one of five symbols is displayed: a star, a square, a circle, a cross, or three wavy lines. The first tests with Zener cards were done in the 1940s and included over a million trials, showing highly significant results (Pratt et al., 1940). Later, in a meta-analysis by Bem, Ferrari, and Horton (1998) involving 309 different studies, Zener cards were again shown to produce tremendous results over time.

Experimental Methods and Results

The subjects comprised 12 University of Colorado students of college age. At the outset of each run, the subject was given a definition of psi-phenomena. S/he

then indicated to the experimenter (K.W.) whether s/he believed in the existence of psi based on the definition provided. At this time the subject was chosen randomly, by a simple coin flip, to receive pro-psi or anti-psi arguments. Those receiving the pro-psi arguments, regardless of their previous belief in psi, received a fact sheet that strongly supported the existence of psi. Those receiving the anti-psi arguments, regardless of previous belief, received a different fact sheet, which was harshly critical of belief in the existence of psi. Both fact sheets (shown in Appendices A and B) included valid but selected general and scientific evidence that supported one position and rejected the opposing position. Additionally, the experimenter indicated that his personal belief coincided with whichever position to which the subject had been randomly assigned, and he told the subject that the purpose of the experiment was to prove that position.

Afterwards, the subject began his or her trial. The guessing task was a classic psi test in which the experimenter had a stack of 100 Zener cards. There were 20 of each symbol in the stack of 100. The stack was well shuffled and then divided into 4 stacks of 25 from the top down. This way, neither the experimenter nor the participant knew how many of each symbol was in each set of 25, which prevented participants from card counting.

The experimenter and subject were seated facing each other, separated by an approximately 1.2-m-wide table with an open laptop computer adjacent to and facing the experimenter, and just under 1 m of table space between the back of the computer and the subject. A stack of shuffled face-down cards sat in front of the experimenter, blocked from the subject's view by the vertical computer display. The experimenter raised one face-down card at a time approximately 8 cm from the center of the computer screen, with any view of the card still completely blocked from the subject by the computer display. He held it raised until the subject guessed its contents, approximately 3 to 5 seconds, and then placed it face down on an adjacent pile of cards, which was also blocked from the subject's view by the computer display. There were no reflective surfaces behind the experimenter and no one else was in the room at the time of the experiment. The experimenter did not look at the faces of the cards during the experiment, but went back at the end, with the cards in order, and compared the order of the cards with the order of guesses.

One hundred cards were tested per person, with 12 people, 3 in each of the 4 conditions: (i) believer|pro-psi arguments, (ii) believer|anti-psi arguments, (iii) nonbeliever|pro-psi arguments, and (iv) nonbeliever|anti-psi arguments. Once 6 believers were used as subjects, additional subjects who declared themselves to be believers were asked not to participate, so that the number of believers and nonbelievers would be balanced. The pro-psi and anti-psi arguments were chosen randomly, and by chance the same number of each was given to believers and nonbelievers.

The results are summarized in Table 1, and the individual subject scores are given in Appendix C. The p-values were determined using a Student's t-test based on the data shown in Appendix C. Because a closed deck is used, the

TABLE 1
 Statistical Results Against Chance for 4 Groups Composed of Believers and Nonbelievers
 Provided With Pro-Psi and Anti-Psi Arguments.

Group no.	Prior belief	Arguments provided	Score (%)	Standard deviation	t-Score	p-value	Effect size
i	Believer	Pro-psi	27.0	3.61	3.36	0.028	0.175
ii	Believer	Anti-psi	23.3	3.06	1.89	0.132	0.083
iii	Nonbeliever	Pro-psi	21.7	1.53	1.89	0.132	0.042
iv	Nonbeliever	Ant-psi	21.0	4.58	0.38	0.725	0.025

Note: Scores are an average for 3 subjects per condition for 100 trials per subject. Chance is 0.20. Also shown are the two-tailed p-values for the scores against chance, standard deviations, t-scores, and effect size, as defined in the text.

variance is slightly increased over the case of a truly independent random selection in an open-deck procedure. The result is only trivially different (Burdick & Kelly, 1977) and we do not take this difference into account. In addition, we have not corrected the p-values for multiple testing (see, for example, Aickin [2004] for a discussion of this issue).

Of the 4 groups, the only one that achieved standard statistical significance against chance during testing was group (i), the believers who were provided with pro-psi arguments ($p = 0.028$, two-tailed, or if one takes the direction of the effect as a given, $p = 0.014$, one-tailed). Using analysis of variance (ANOVA) to analyze the significance of differences among the 4 groups resulted in an insignificant p-value of 0.21. Comparing group (i) to the other 3 groups with ANOVA resulted in a much more significant p-value of 0.039, and so group (i) clearly stands out from the rest. Comparing all believers with all nonbelievers resulted in a p-value of 0.076, and comparing all subjects given pro-psi arguments to those given anti-psi arguments gave a p-value of 0.34.

If the p-value is calculated simply from the average score, assuming a binomial distribution, then it attains a more significant value of 0.0038, two-tailed. Because of the score variations among subjects, however, the results of the Student's t-test, given above, are statistically more rigorous than those from the binomial test, which assumes a binomial distribution. The effect sizes in Table 1, defined as z/\sqrt{N} , are based upon the binomial distribution z-scores and $N = 300$. Tying the effect size to the Student's t-test t-score and the associated $N = 3$ would make no sense in assessing the size of the clairvoyance effect.

Discussion and Conclusions

The results support the hypothesis that believers whose beliefs are supported by fact sheets and verbal reinforcement perform better than both nonbelievers and those whose beliefs are challenged by fact sheets and verbal reinforcement.

The group of subjects that had pre-existing belief in psi that was reinforced was able to demonstrate an ability to predict random symbols at a statistically significant level (p -value of 0.028).

Of the following two explanations for the distribution of psi ability among experimental subjects, only one is consistent with our results.

1. Person-to-person differences in psi performance are due solely to differences in innate ability, and it is this innate ability that determines whether one believes in the existence of psi. This is inconsistent with the poorer performance of group (ii), psi believers who were provided with anti-psi arguments, as compared to group (i), believers who were provided with pro-psi arguments. If the psi ability of group (ii) were independent of its belief, the anti-psi arguments would not affect its success.
2. Belief and motivation produce success in psi tasks. In our experiment, belief and motivation are expected to be highest in the group having previous belief that is supported by arguments presented before the testing. The claim that belief and motivation precede success in a psi task is fully consistent with the results: initial doubts about the existence of psi and receiving anti-arguments are expected to diminish belief and enthusiasm.

For these reasons it appears that innate psi ability alone cannot explain why some subjects perform better. Belief in psi is required. This leads to the question of whether there are differences in innate ability, or whether belief in psi is the sole determining factor. To answer that question we would have to measure innate ability independent from belief. Given that different members of group (i) perform differently, one might conclude that belief alone is insufficient. However, we assess only whether a particular subject was a believer or not, and not the degree of belief in psi, which might be a factor in the differences in the scores. If the psi score were independent of degree of prior belief when pro-psi arguments were presented, one could conclude that in addition to belief, differences in innate ability determine psi success. On the other hand, if we saw a strong correlation between degree of prior belief and psi score when pro-psi arguments were presented and lack of such a correlation when anti-psi arguments were presented, that would lend credibility to the hypothesis that belief alone was the determining factor.

In any case, belief is clearly an important factor in psi performance. This is consistent with the finding by Storm and Thalbourne (2005) that skeptics can be induced to perform better at a psi task by shifting their mind-set. Since belief in psi improves performance, it is likely that there is reinforcement, i.e., positive feedback, in which belief breeds greater belief. Because the difference in performance between believers and nonbelievers was greater ($p = 0.076$) than the difference between those given pro-psi and those given anti-psi arguments ($p = 0.34$), it appears that initial belief has a stronger effect than belief induced

by argument. However, because neither of these results is statistically significant, this must be considered to be only a suggestion at this point.

It is natural to question whether belief in psi giving rise to success, i.e., self-fulfilling prophesy, works here via psychological or psychic mechanisms. Prior psychology research has demonstrated self-fulfilling prophesy in educational settings. In a famous study, Rosenthal and Jacobson (1966) posed as psychologists who could identify which children would show dramatic intellectual growth. In fact, they had chosen the children at random. Several months later, the "psychologists" returned to the classroom and measured IQ scores. The children who were chosen earlier exhibited significantly better IQ scores than the children who were not chosen. This experiment is taken as evidence of the self-fulfilling prophecy effect. The teachers expected that those children would do better and that expectation moderated certain behaviors that caused the children to actually do better. We cannot distinguish whether the effect we see is psychological or psychic in nature.

One influence that was not taken into account in this study is the experimenter effect, which has frequently been observed in psi studies. As a result of the experimenter effect the intentions of the experimenter to achieve results in a certain direction either intentionally or unintentionally influences the experimental outcome (Smith, 2003). In the current study, however, the experimenter was expecting to achieve chance results throughout, but may still have exerted a confounding unconscious influence.

There are several ways in which this type of study may be improved upon. One problem with the experiment was in maintaining the attention of participants during each presentation of the 100 Zener cards. Over time, participants gradually became unfocused. A shorter run of cards may mitigate this. Additionally, to reduce the potential influence of the experimenter, a fully double-blind design is recommended for further research. Finally, participants were forced to choose between stating belief or disbelief in psi, which did not allow for the gradations of prior belief. An improvement would be to allow for such gradations and to take them into account, as discussed earlier.

In summary, previous research has shown that believers tend to out-perform nonbelievers on psi-tasks. In the present experiment we attempted to manipulate such beliefs using written and verbal arguments so as to influence subjects' success rate in a psi task. Believers who received positive reinforcement performed significantly better than chance, and better than groups who were doubters or who received anti-psi arguments. This supports the idea that belief gives rise to successful psi performance, as opposed to innate psi ability giving rise to belief.

This study was carried out as a student project for a course entitled "Edges of Science" at the University of Colorado in Boulder. As such, its scope and the number of trials were limited. Although formal statistical significance ($p \leq 0.05$) was achieved, the conclusions should be treated as preliminary. Additional studies supporting the results will be required before firm conclusions can be drawn.

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APPENDIX A

Fact Sheet Against Psi

Non-Science in a Scientific Age

Psi may be defined as the unexplained mechanism responsible for sending or receiving information in such processes as telekinesis, telepathy, clairvoyance, remote viewing, and ESP. Since industrialization and the turn of the scientific age, believers of psi have tried to develop it into an accepted science by applying new scientific principles. Believers thought that this new methodology would yield results that would confirm psi's existence once and for all. As a result, the mysterious nature of psi has been studied extensively in the past century using modern advances in experimental design, instrumentation, and statistics. Subsequently, all that has been confirmed is that psi is physically and conceptually elusive. Studies from believers have been continually snared by problems that have made them ripe for criticism and notoriously unreliable. Psi would have been better off staying off the modern world's radar screen, but after trying to assert its place among the accepted disciples, it has become a parody of science.

Unlike accepted scientific experiments that have very tight controls, many psi-related experiments are very broad and do not prove to be replicable by other scientists. Repeatability is crucial in all other areas of study in that it can be used to corroborate results among experimenters and provide a basis for further exploration. In addition, successful psi-experiments tend to rely on "gifted

subjects": individuals who have unique abilities allowing them to perform well in psi-related tasks. These gifted subjects have frequently been shown to "lose their abilities" during tests by other experimenters. When psi-experiments have yielded statistically significant results, believers are unable to postulate a theory that aligns with known medical, psychological, or biological principles, instead turning to the soft-ground of philosophy on which to build its reasoning. In the end, modern advances in methodology have had the effect of making psi seem even more dubious than before.

This combination of factors leads psi-related research to be far from convincing, instead arousing suspicion in the scientific community. Consequently, further review of believers' experiments have led nearly every major psi-related experiment from the past century to be plagued with accusations of design problems, lack of scientific merit, incomplete statistical analysis, and fraud. In certain instances, believers have caved-in under the pressure of critics and admitted to a range of problems in their studies, including deception. Believers claim that critics have been too harsh when analyzing results. They explain that since critics refuse to believe in the existence of this invisible, unexplainable phenomenon, false claims are raised against the psi-research. Critics refute that claim, they say believers have tarnished their reputations with unrepeatable experiments, faulty data, and fraud; a critical approach to psi must be maintained for the good of science.

The educated elite have certainly not embraced psi-phenomenon. In fact, the psychological handbook for disorders (DSM-IV) lists the belief in psi as a behavioral criterion that could qualify someone as having schizotypal personality disorder. British psychologist Chris Roe alleged that people who believe in psi are weak-minded or lack critical thinking abilities. The educated public isn't buying it either. A study from the National Science Foundation found that of the people who do believe in psi, nearly half of them had less *than* a high-school level education.

It's time that people accept psi for what it is: a social invention that people use to explain the coincidental occurrences in their lives.

APPENDIX B

Fact Sheet Supporting Psi

The Arrival of Psi into Modern Science

Psi may be defined as the unexplained mechanism responsible for sending or receiving information in such processes as telekinesis, telepathy, clairvoyance, remote viewing, and ESP. Since industrialization and the turn of the scientific age, scientists have developed psi into an accepted phenomenon by applying new scientific principles. Believers understood that this new methodology would yield results that would confirm psi's existence. As a result, the mysterious nature of psi has been studied extensively in the past century using modern

advances in experimental design, instrumentation, and statistics. Subsequently, through a slow process of transforming critics, psi is asserting its place among the accepted disciples.

Thousands of experiments conducted under unusually rigorous conditions have produced extensive evidence in favor of the existence of psi. One of the earliest of these experiments involved now renowned telepath, Van Dam. He correctly predicted the target square on a checkerboard extremely accurately, with odds associated against chance of 121 trillion to 1. Using galvanic skin response measurements, it was determined that Van Dam could physiologically select the target based on skin conductance. Even the most critical observers could not overturn the statistical results, which have been independently verified.

Functional magnetic resonance imaging (fMRI) scanners provide additional psi-evidence. While one person is being scanned, another person in a distant room watches a flickering light and mentally sends images to the scanner. Experimenters produced an fMRI image showing brain activity specifically isolated in the visual cortex of the scanner that was synchronized with the image sender. The odds against chance of this experiment were 14,000 to 1. Three independent replications of this experiment have occurred since 2004, all showing the same results. In addition, the United States Department of Defense has been operating a remote viewing outfit since 1985. The U.S. military classifies remote viewing as a learnable skill that is actually used in times of war.

The existence of psi is often rejected because it is yet to have an established theoretical basis, but this objection is not always valid. When scientists come across anomalies in experiments, they tend to ignore them, even though they may be an indication of something else occurring. Gradually, these anomalies may become more apparent, and thus more powerful, eventually indicating the existence of a new phenomenon. For instance, even though Newton's laws were well accepted in physics, Einstein noticed certain areas in which anomalies would occur. Einstein studied these anomalies and eventually formulated his own theories, which are now also accepted in physics as laws of relativity. In fact, Einstein was a member of the American Society for Psychical Research that explored anomalous conscious phenomenon (psi). This society contained some of the most important, highly educated, and respected scientific investigators of the past century.

Apart from the now antiquated psi-believers of the past century, who believes in psi today? A study by the National Science Foundation found that of adult Americans with higher than High-School education and who regularly read a daily newspaper, over 60% strongly believe in the existence of psi. The belief is not confined to the uneducated or culturally inept members of society, as certain critics have assumed, but quite the opposite, being prevalent among the elite. As psi becomes more of an accepted science, the focus of research will shift from proving to understanding its existence.

APPENDIX C

Individual Correct-Guess Scores out of 100 Trials for Each of 12 Participants

Group no.	Prior belief	Argument presented	Score
i	Believer	Pro-psi	30
i	Believer	Pro-psi	23
i	Believer	Pro-psi	28
			Average = 27.00
ii	Believer	Anti-psi	26
ii	Believer	Anti-psi	20
ii	Believer	Anti-psi	24
			Average = 23.33
iii	Nonbeliever	Pro-psi	22
iii	Nonbeliever	Pro-psi	23
iii	Nonbeliever	Pro-psi	20
			Average = 21.67
iv	Nonbeliever	Anti-psi	16
iv	Nonbeliever	Anti-psi	22
iv	Nonbeliever	Anti-psi	25
			Average = 21.00

Note: Chance expectation is 20 in each case.