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***Hypnotizability and belief in psi as predictors of precognition.***

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### Abstract

This study examined whether hypnotizability or belief in psi predicts precognition. The test measured if practice enhances memory recall with the precognitive feature being that the practice occurs after the recall test. Participants low ( $n = 15$ ) and high ( $n = 15$ ) in hypnotizability completed the precognition task and a psychometric measure of belief in psi. Age ranged from 19 to 65 years (16 males and 14 females). Highly hypnotizable individuals were expected to perform better than low hypnotizable on the test. We also predicted that individuals who believed more in psi phenomena would perform better on the test. We found no effect of hypnotizability or belief in psi on task performance.

## Contents

1. Introduction.....	4
1.1 Precognition.....	4
1.2 Presentiment.....	6
1.3 Theory.....	7
1.4 Psi and hypnotizability.....	9
1.5 Belief in psi .....	11
1.6 Experimenter effects.....	12
1.7 The present study.....	13
1.8 Predictions.....	14
2. Method.....	14
2.1 Participants .....	14
2.2 Experimenters.....	14
2.3 Materials .....	15
2.4 Procedure .....	16
2.5 Statistical analyses.....	17
3. Results.....	17
4. Discussion.....	19

### *Precognition*

Precognition is a purported phenomenon in which information is perceived about future events, when the information could not be inferred by ordinary means. It is one of the more frequently studied psi phenomena. Bem and Honorton (1994) defined psi as “anomalous processes of information or energy transfer ... that are currently unexplained in terms of known physical or biological mechanisms” (p. 4). Psi is a generic term that encompasses both extrasensory perception (ESP, e.g., telepathy) and psychokinesis (the influence of mind on matter). Although most of these phenomena do not necessarily contradict the dominating materialistic point of view (Collins & Pinch, 1982), precognition is more controversial than purported clairvoyance or telepathy.

Thus, precognition has not only gained attention in the field of psychology, but philosophy as well (Broad, 1937). The main issue of precognition is the question of how an event that we regard as yet having no existence can be cognized. Beloff (1990) and Roberts (1993) discuss this issue as well as the intervention paradox, in which the perceiver decides not to follow the path as laid out in his or her precognition. If so, the event does not take place and the experience cannot be precognitive.

Precognition is also a problem for physics as we need to explain how the information reaches us across space and time. The laws of classical physics (e.g., law of causality and locality) could easily dismiss the possibility of this phenomenon existing. However, research in quantum physics (e.g., the Bell experiments) challenges the traditional notions of locality and causality (Zeilinger, 1999). Thus, it is potentially consistent with the phenomenon of precognition.

A significant amount of spontaneous precognitive experiences have been reported to occur in people's everyday lives. Osborn (1962) captured this in his collection of precognitions of seemingly trivial and significant events. Rhine (1954) studied the distribution of different types of precognitions and identified four categories; intuitive, hallucinatory, realistic and symbolic dreams. She noticed that a majority of those precognitions were realistic dreams (approximately 60%). Steinkamp (2000) found a similar pattern. However, Stevenson (1970) did not find the same pattern in a survey with participants from India. He argued that this may be due to the psychological resistance to precognition in the West. It might be that

precognitive dreams are more readily acknowledged in the West as they easily can be excused as irrational fantasies rather than belief in the phenomenon.

Historically, precognitive research has involved forced choice designs with ESP card decks (Honorton & Ferrari, 1989). Among the first of such studies to be published was that of Rhine (1938). The participants were to predict in which order the cards appeared and subsequently the experimenter shuffled the deck after those predictions. Rhine did obtain significant results which could have been a demonstration of a psi phenomenon. However, the study did not eliminate the possibility of other forms of ESP or psychokinesis. The experimenter could use real-time psi (i.e., telepathy or clairvoyance) to recognize the participants' guesses and then shuffle the deck in an advantageous manner. Rhine, Smith, and Woodruff (1938) found that the shuffler could indeed match the guesses more than was expected by chance.

A summary of precognitive experiments published between 1935 and 1987 was done by Honorton and Ferrari (1989). In this meta-analysis they reviewed studies that used the Mangan method of target selection. This method involves a complex process of calculating the target in a way that makes use of real-time psi rather implausible. The results showed that studies using a Mangan method did not fare significantly worse than others using simpler methods. This indicated that the significant findings may demonstrate precognition rather than real-time psi.

Steinkamp (2003) also examined the possibility that what we consider to be precognition is more accurately a form of real-time psi. She investigated precognition in a series of six experiments, which included two postal, two laboratory and two internet studies. To ensure precognition, she used a combination of stock-market figures and random number tables in the process of target selection. As the stock market figures depend on many human decisions, it is unlikely that the participants would know how many stocks these people would buy on a given day. It is also unlikely that the participants would have more incentives to use psychokinesis than those with real investments. The participants were asked to guess the target from a set of four pictures. Not one of the six studies produced significant results. This suggests that precognition may not exist (also, see Morris, 1982). But Steinkamp argued that the limitation may also be due to the length of time before feedback. The data from Honorton and Ferrari (1989) does indeed indicate a decline in ability the longer the precognitive interval. Thus, let us examine precognition in shorter intervals.

### *Presentiment*

Recent studies have focused rather on physiological response to future stimuli. This means that a person may react to a sensorially inaccessible event without any conscious thoughts about that event. This form of precognition has been privileged with its own name, presentiment (Radin, 1997).

Radin (1997) conducted an experiment that measured electrodermal activity (EDA; i.e., changes in electrical activity within the skin) during display of randomly selected photos that were either calm or emotional. The participants appeared to react differently to emotional and calm pictures even before the pictures were shown. The difference in activity pattern was observed approximately three seconds prior to the target selection. The results were significant. This experiment and three replications of it appear to demonstrate a form of precognition in the human autonomic nervous system (ANS; Radin, 2004).

The promising results from Radin did warrant further research in the topic. Bierman and Scholte (2002) followed a similar procedure but used functional magnetic resonance imaging instead in order to see what role the brain could have in precognition and where in the brain this effect would appear. One particular area displayed an interesting difference between males and females. This was located near the amygdala. For females the results showed a significant presentiment effect (i.e., difference in anticipation pattern) for erotic as well as for violent stimuli relative to neutral stimuli. For males, however, only erotic stimuli yielded a significant result relative to neutral stimuli. No such pattern was found for violent images. Still, Bierman and Scholte argued that their study needs to be seen as exploratory, primarily because of issues of randomization and multiple analyses. The presentiment effect has also been replicated by Hinterberger, Studer, Jäger, Haverty-Stacke, and Walach (2007) who examined presentiment by measuring event related potentials before stimulus onset.

An additional experiment in the same vein was conducted to investigate whether the heart has anything to contribute to the topic of precognition. McCraty, Atkinson & Bradley (2004) found in their research that the heart is involved in the processing and decoding of intuitive information. The procedure was similar to that of Radin's (1997) study, but the experiment consisted of two conditions; a baseline condition and a physiologically coherent condition

(i.e., 15 minutes of meditation). The difference in heart rate variability for the first condition was significant and started off approximately four seconds prior to the stimulus. But they did not replicate the skin conductance results. Spottiswoode and May (2003) used audio startle stimuli against a silent control in their experiment. They measured skin conductance and found a significant effect three seconds prior to presentation of stimuli. However, Broughton (2004) as well as Savva and French (2003) found no significant presentiment effect in two studies where they measured skin conductance and skin resistance, respectively. Thus, there is still reason to be cautious about the replicability of the presentiment effect.

Nevertheless, on the whole, this research appears to demonstrate an anomalous ANS response to future arousing experiences. But even if we assume that this anomalous response is real, it still remains a question as to how far we can look into the future. Is there even a limit? Needless to say, if this phenomenon exists, it definitely stresses the incompleteness of our understanding of time.

### *Theory*

As previously mentioned, the topic of precognition and time has received contribution from a wealth of different sources. Philosophers such as Broad (1937) as well as physicists such as Einstein, Podolsky, and Rosen (1935) have all had their say on the subject. But let us first consider two general theories for ESP, Roll's memory trace theory and Honorton's noise reduction model, that are of particular importance for the present study.

Roll's (1966) memory trace theory implies that external ESP stimuli arouse certain memory traces in the organism. In other words, ESP responses are claimed to consist of revived memory traces. This mechanism is assumed to work much in the same way as normal cognitive functions. Thus, Roll expected the ESP process to share the main characteristics of memory (e.g., the laws of association, recency, frequency and vividness). ESP stimuli should therefore be more likely to activate memory traces that are already prepared to fire. However, the correlational data on memory and ESP is inconsistent (Palmer, 2006). Irwin (1979) argued that this inconsistency can be explained with the distinction of primary memory (now generally referred to as working memory) and secondary memory (long-term memory). Retrieval from secondary memory is argued to be more complex than it is in the case with primary. The information in secondary memory is retrieved from relatively deep levels of the

subconscious mind, while the primary memories are on the threshold of consciousness. Irwin's interpretation of the memory trace theory is therefore that it only concerns secondary memory. It is only then that the theory predicts a significant positive outcome. This is supposed to be the case when an interference task (e.g., listening to a 3 minute explanation of the next phase of the experiment) is occurs between learning and recall.

In favour of that interpretation, Palmer (2006) found that those studies that have utilized interference tasks have all been significant in the positive direction (i.e., a positive correlation between ESP and memory). However, it is not certain that the participants in the rest of the studies have engaged in type I rehearsal (which implies activation of primary memory) rather than type II rehearsal (which implies activation of secondary memory).

Palmer (2006) found several interesting findings that related memory to ESP. Participants scored significantly above chance on ESP items linked to paired associates they correctly remembered, and significantly below chance on ESP items linked to associates they did not remember correctly. In addition, incorrect guesses tended to be similar in meaning to the correct targets. In all studies reviewed, the data support the theory. However, Palmer argued that the tests have been quite indirect. The findings would be more convincing if they incisively demonstrated that ESP responses are memories rather than direct representations of ESP stimuli.

It is also theorized that ESP may be a weak signal, and, in that sense, ordinary sensory input is considered to be noise. ESP should therefore be enhanced by sensory noise reduction. Honorton (1977) argued that procedures like meditation, hypnosis, induced relaxation, and ganzfeld stimulation will increase this signal-to-noise ratio. The states induced by these procedures are referred to as internal attention states. He refers to Bergson's filter theory which claims that the brain and nervous system function primarily as filters. They protect us from being overwhelmed by shutting out useless and irrelevant information and keeping the information that is likely to be of practical use. In his review of more than 80 studies, Honorton found a combined significance for each of the four procedures. He concluded that psi functioning is improved when the receiver is in a state of sensory relaxation and is minimally influenced by ordinary perception. In sum, ESP performance is supposed to be enhanced when both internal and external noise is reduced.

The ESP process can be divided into two stages (Palmer, 2006). The first stage concerns how the information gets to the receiver. The second stage concerns how this information is processed by the mind. As mentioned earlier, the first stage belongs primarily in the domain of physics and is therefore outside the focus of this paper. Though, when striving to create an adequate theory of psi, parapsychology is dependent on progress in the area of physics. Several psi theories (e.g., observational theories) are based on quantum physics, primarily because of Bell's theorem (Bell, 1964).

Saltmarsh (1938) emphasized the aspect of perception in precognition. People experience duration: we observe things moving, and movement must occupy some duration. If this duration period were extended, it would include more events. Now, suppose that one observer experiences two events,  $E_1$  and  $E_2$ . These are perceived simultaneously in the "present moment" of this observer. If the spotlight of another person's consciousness embraced more events,  $E_1$ ,  $E_2$  and  $E_3$ , then,  $E_3$  would seem to be a precognitive experience for the first observer. Osborn (1962) argued that this theory does not explain the nature of the events themselves, or what their status is at the moment they are precognized.

Dunne (1927) postulated other dimensions of time in his attempt to solve the issue of precognition. If time flows, it must flow at some particular rate. To rate this flow, you need a second kind of time,  $T_2$ . But to rate  $T_2$ , you need  $T_3$ , and so on to infinity. Dunne also argued that this infinite series of time would involve an infinite series of observers. He proposed that the world of Observer 1 has three dimensions of space and one of time,  $T_1$ . For Observer 2,  $T_1$  gets transformed to a spatial dimension, so he has four dimensions of space and one of time,  $T_2$ . For each observer, the number of spatial dimension increases by one, but the number of time dimensions remains the same. What is contained in space is there all the time. Consequently, for Observer 2 the events are no longer successive. Dunne stated that these observers are not different persons, but different levels of the mind. Saltmarsh (1938) argued that time does not flow. Events or changes occur in succession and it is this which constitutes time.

Even though these theories seem interesting for the authors, not one of them is to be considered adequate at the moment, since they do not give account for how the information is transferred to the experient. We hope that future research in both physics and parapsychology will refine and extend these theories. Next, let us look at potential predictors of psi

performance.

### *Psi and hypnotizability*

Hypnotizability is a cognitive trait that indicates suggestibility following hypnotic induction. It includes various abilities such as imagery (Kogon et al., 1998), fantasy-proneness (Lynn & Ruhe, 1986) and absorption (Tellegen & Atkinson, 1974). Pekala and Kumar (2001) reviewed studies that correlated hypnotizability with psi experiences and beliefs. Across five studies they found 11 correlations between hypnotizability and belief in psi for which 9 were significant (median  $r = .20$ ). They found stronger results for hypnotizability and psi experiences; 23 correlations, of which 20 were significant, were reported across 11 studies (median  $r = .31$ ). These are quite small effects, but the results are highly significant.

Pekala and Kumar (2001) also reviewed research on the relationship between psi experiences and the aforementioned correlates of hypnotizability. Unfortunately only a few studies exist in this area. First, for the relation between imagery and psi experiences, they found three significant correlations across two studies ( $r = .33$ ,  $r = .28$ ,  $r = .16$ ). Second, for the relation between absorption (assessed with Tellegen Absorption Scale, TAS) and psi experiences they found nine correlations across three studies. Here, as well, they found nothing but significant correlations (median  $r = .52$ ). These findings were not surprising to Pekala and Kumar as some of the items in TAS directly relates to psi experiences (e.g., “I can often sense the presence of another person before I actually see him or her”). A more interesting investigation should exclude those items. Finally, for the relationship between fantasy-proneness and psi experiences they found 19 significant correlations in one study (median  $r = .24$ ). A similar artifact as for absorption was possible here (fantasy proneness was assessed with Inventory of Childhood Memories and Imaginings: Children’s Form).

As for the relationship between these abilities and psi belief, even fewer studies have been published. The only studies that Pekala and Kumar (2001) found were those between psi belief and fantasy proneness. All three correlations in as many studies were significant ( $r = .15$ ,  $r = .16$ ,  $r = .19$ ).

All in all, this research suggests that participants with high hypnotizability tend to believe more in the paranormal and also tend to report a greater number of paranormal experiences

than those with low hypnotizability. There is therefore an incentive to investigate whether hypnotizability can predict psi performance in a laboratory experiment. Unfortunately, little research has been done in this topic, especially in the last decades (see Honorton and Krippner, 1969 for a review of earlier research). Nevertheless, let us take a look at what research has been conducted.

Stanford (1992) reviewed the literature on the topic of hypnosis and psi performance. The main question was whether psi performance is better following a hypnotic induction than during a control condition. The answer was yes, but no conclusions about the cause of the effect could be drawn. It was not clear whether the induction per se or the difference in abilities caused the contrasts in performance. Thus there is a need to examine hypnotizability as a predictor of psi performance. May, Bányai, Vassy, and Faith (2000) examined the relationship between hypnotisability and precognition in a remote viewing study. However, no significant results were found.

Honorton (1997) examined whether four predictors facilitated successful performance in three ganzfeld studies. Amongst those predictors was “practice of a mental discipline” (i.e., meditation, biofeedback, hypnosis, or relaxation exercises). The difference between practitioners of a mental discipline and non-practitioners was not significant. However, the predictor was not specified to hypnosis as mentioned above. This may confound the actual influence of hypnosis. Some of Honorton’s findings were replicated by Roe and Flint (2007) in a pilot remote viewing study where the participants underwent a ganzfeld induction.

The authors of this paper think that more research needs to be done to investigate the relationship between hypnotizability and psi performance. As we have seen, highly hypnotizable individuals tend to believe more in psi. We will now look at whether those who believe in psi tend to perform better in psi experiments than non-believers do.

### *Belief in psi*

One way towards better results in psi experiments is identifying which individuals perform better. Schmeidler (1952) divided her participants in two groups, sheep and goats, on the basis of their belief in psi. Sheep are those who believe in the possibility of psi, goats are those who do not. The sheep-goat effect refers to the difference in performance on a psi task between the

two groups. Sheep are believed to perform better, and the empirical evidence supports this. In fact, the sheep–goat effect is one of the most consistent effects in the history of parapsychology (Lawrence, 1993).

Lawrence (1993) reviewed 73 forced choice ESP studies with 37 principal investigators. He found a small, but highly significant sheep–goat effect. In addition, 24% of the studies got significant results, in contrast to the expected 5% by chance. However, as with all meta-analyses there is a risk for a possible file-drawer effect (i.e., non-significant studies remaining unpublished). The effect size did not covary with the study quality. Furthermore, Lawrence reported that there is unfortunately not yet a superior way to separate sheep from goats. All measures used to date give approximately the same answer. On the other hand, this, along with the high significance mentioned above, indicates a robust effect.

Thus, despite the negative results from May et al. (2000) there is reason to believe that highly hypnotizable individuals perform better in psi tasks than those low in hypnotizability because they tend to believe more in psi (Pekala & Kumar, 2001). In addition, the research done by Lawrence (1993) showed that those who believe in psi tend to perform better in psi tasks than non-believers.

### *Experimenter effects*

A major challenge for parapsychology is the replicability of psi. It is therefore of special interest to investigate the experimenter effect. This effect refers to the fact that some experimenters are consistently more successful than others in obtaining evidence for psi (Smith, 2003b). Smith argued that both psychological (e.g., how the experimenter interacts with the participant) and parapsychological (i.e., the experimenter uses his or her own psi) factors may underlie the differences in the data. Smith (2003a) found significant correlations between psi-conduciveness and belief in the possibility of ESP, in one's own ESP ability, in one's own psychokinesis ability, and in that ESP can be demonstrated in an experiment.

The experimenter effect is not restricted to parapsychology. In general there is a significant relationship between the experimenter's own performance on the task and the participants' performance (Rosenthal, 1966). Rosenthal discussed observer errors, interpretation errors and fraud that may all be potential artifacts in research. Silverman, Shulman, and Wiesenthal

(1972) found that different experimenters obtained different responses from participants on a self-rating inventory. Silverman (1974) conducted a survey to investigate the numbers of experimenters in research. The sample consisted of articles published in three A.P.A. journals between October 1968 and September 1969. Only 60 out of 300 studies included more than one experimenter. In 20 cases it was just a matter of convenience with no attention towards counterbalance. Despite the concerns for the experimenter effect in theory, this shows that, in practice, not much attention is given to this source of variance in experimental research.

Wiseman and Schlitz (1997) examined the experimenter effect by doing a joint study in which they acted as separate experimenters for two sets of trials. Wiseman considered himself to be a skeptic regarding the claims of parapsychology, while Schlitz viewed herself as a psi proponent. Schlitz has frequently obtained positive findings in contrast to Wiseman. In this experiment they measured EDA to observe whether the participants could detect remote staring. Participants that were run by Schlitz were significantly more activated in stare than non-stare trials compared to participants that were run by Wiseman. The findings were replicated in a second study, but a third experiment yielded no significance (Wiseman & Schlitz, 1999; Schlitz, Wiseman, Radin, & Watt, 2006). We hope to see more collaborations of a skeptic–proponent design in parapsychological research.

### *The Present Study*

The purpose of this study is to examine if hypnotizability and belief in the paranormal predicts precognition. No hypnotic induction is conducted. Therefore, any differences between low and high hypnotizable individuals should be the effects of some cognitive characteristics in these individuals.

In this study we use a computer program developed by Bem (2008) which purports to measure precognitive memory. The participants are first exposed to a set of English words, one word at a time. When all the words have been shown the participants are subjected to a test where they are asked to recall the previously shown words. After the recall test, the computer randomly selects half of the words that were shown as practice words, with the other half serving as control words. This means that the participants will undergo an exercise where they will be asked to memorize the practice words. If practice makes a difference they

will remember more practice words than control words in the original recall test. Accordingly, the first variable that we measure is the practice–control difference.

The second variable in this study is the level of hypnotizability. The participants were assessed as being either high or low in hypnotizability. In addition to this we also include a third variable which is belief in psi. The reason for including belief in psi as a predictor is to examine whether any precognition effect is due to hypnotizability or belief in psi – or both.

The two authors of this paper ran separate sets of trials. A fourth variable will therefore be the experimenter that runs the sessions. Because of the experimenter effect, it may be that the two experimenters will obtain different results.

### *Predictions*

The first prediction is that the individuals will remember more practice words than control words, even though the practice takes place after the memory test. This might indicate precognition.

The second prediction is that hypnotizability will predict performance in the precognitive memory test. More specifically, high hypnotizables will perform better on the test than low hypnotizables.

The third prediction is that scores on the Australian Sheep-Goat Scale (ASGS) will predict performance in the precognitive memory test. We propose that the belief in psi will positively correlate with the performance on the test.

## Method

### *Participants*

Participants in this experiment were recruited from a list of people that previously took part in a hypnosis study. The list was provided by our supervisors. It consisted of two independent groups: those high and low in hypnotizability. The participants from each group were spread out on different days for balancing purposes. The experimenters were blind to group identity

until the completion of data collection. The number of participants was pre-specified ( $N = 30$ ). No trials were omitted. In the end, there were 15 individuals (7 males, 8 females) from the group with high hypnotizability and 15 (9 males, 6 females) from the group with low. Age ranged from 19 to 65 years ( $M = 24.3$ ). The participants were mainly Lund university undergraduates. All of the participants were of Swedish ethnicity. All participants gave informed consent to participate and all were compensated with a cinema ticket.

### *Experimenters*

The two experimenters (D.C. and J.W.) divided the number of trials between themselves, with D.C. conducting 16 (8 high, 8 low) and J.W. conducting 14 (7 high, 7 low) trials. The experimenters had slightly different views on parapsychology with D.C. being more positive to the research in general. J.W. had a more skeptical view but did not want to rule out the possibility of paranormal phenomena existing. D.C. scored 14 out of 32 on the ASGS and J.W. scored 8, suggesting greater belief in psi than the latter.

### *Materials*

*Precognitive Memory Task.* Precognitive memory was measured with a computer program created by Bem (2008). The program included Filemaker database engine. The engine enables handmade corrections for obvious spelling mistakes (e.g., “gorila” instead of “gorilla”); it also preserves the original data in a folder called “Session Records”. The task was run on a pc computer in a partially sound-attenuated room.

First, the program asked for demographic information and subsequently it let the participants experience a 3-minute relaxation period in which they were shown images of space accompanied by relaxing music. After the relaxation period the participants were asked to visualize the referent to 48 English nouns, shown in succession. Stimuli were presented for 3000 ms with inter-stimulus intervals of 1000 ms. Following this, the program administered a surprise recall test for which participants were asked to write down as many of the words as they could remember. They had a five minute time limit to do this. Half of the words from the original list were then randomly selected by the program and made into a list. These were the practice words. The remaining half served as control words. The participants were then

informed that all the words are collected from four categories (foods, animals, occupations, and clothes). Subsequently they received the task to recall six words from a category. This task was repeated until all the four categories were completed. The important thing to notice is that this practice occurred after the recall test was finished. The random selection of practice words also occurred after the recall test. Thus, the participant could not know which words were practice words at the time of the first recall test.

*Australian Sheep-Goat Scale.* The ASGS (Thalbourne & Delin, 1993) is a Rasch-scaled questionnaire with sixteen items relating to belief in psi phenomena. In this version two items relating to belief in afterlife are excluded. Items consist of two bipolar statements; a representative item is as follows: “I am completely convinced that ESP does not exist” in contrast to “I am completely convinced that ESP exists”. The ASGS is a visual analog scale; participants make a mark on a line above the two statements. Items are scored from one to two points, reflecting each view. The participants got zero points if they put the cross less than 3.18 cm from the left end of the line; they got two points if they put the cross more than 9.84 cm from the left end, and one point in between. Thus, total score ranges from 0 to 32. Thalbourne and Delin reported a significant test-retest reliability coefficient ( $r = .66$ ,  $N = 29$ ) for the 18-item version of ASGS. The ASGS had very good internal consistency ( $\alpha = .94$ ) in this study.

*Waterloo-Stanford Group Scale of Hypnotic Susceptibility (WSGC).* The WSGC (Bowers, 1993, 1998) is a group-adaptation of the individually-administered Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962) and has strong psychometric properties (Bowers, 1993, 1998). The scale consists of the administration of twelve dichotomously-scored suggestions including ideomotor (arm heaviness), challenge (arm immobilization), and cognitive-perceptual (auditory hallucination) suggestions. Scores range from 0 to 12 with scores of 0 to 4 and 8 to 12 reflecting low and high hypnotizability, respectively.

### *Procedure*

The WSGC was administered to participants in groups of 4 to 30 by one of two experimenters with extensive hypnosis research experience. In all cases, there was a clinically-trained observer present in case of negative responses to hypnosis.

Participants of low and high hypnotizability were recruited and were tested individually in laboratory sessions that lasted 15-25 minutes. Prior to letting the participant start the program exercise, the height of the desk chair and the tilt of the computer screen were adjusted to suit the participant being tested. Lights in the room were turned down making the experimental space semi-darkened. At the end of the task a feedback display with percentages depicting how many words each participant was able to recall was shown from the practice and control categories. They were not informed of the purpose of the task. This was to prevent an artificial correlation between the performance and the ASGS. After the computer test, the ASGS was administered to the participants by one of the experimenters.

### *Statistical analyses*

We used parametric tests for all analyses as all required assumptions were met. To examine whether hypnotizability contributes to precognition a 2 x 2 mixed ANCOVA was conducted with experimental condition (practice vs. control) as a within-groups independent variable, hypnotizability (low vs. high) as a between-groups independent variable, number of recalled words as the dependent variable, and belief in psi (ASGS scores) as a covariate. We also performed an exploratory analysis of trends with a 2 x 3 mixed ANOVA with experimental condition (practice vs. control) as a within-groups independent variable, sequence order (divided in three intervals; 1-10, 11-20, and 21-30) as a between-groups independent variable, and number of recalled words as the dependent variable, to look for a potential decline effect over the course of the experimental sessions. The experimenter effect was examined with a 2 x 2 mixed ANOVA with experimental condition (practice vs. control) as within-groups independent variable, experimenter as between-groups independent variable (D. C. vs. J. W.), and number of recalled words as the dependent variable. All analyses were done in SPSS (16.0). An alpha level of .05 was used for all statistical tests.

## Results

Descriptive statistics for low and highly hypnotizable individuals are given in Table 1.

Table 1

*Means and Standard Deviations for Numbers of Recalled Words*

Level of hypnotizability	Practice			Control		
	M	SD	N	M	SD	N
Low	9.93	2.37	15	9.33	2.23	15
High	9.53	3.31	15	9.87	3.58	15
Total	9.72	3.84	30	9.60	3.94	30

On average, the subjects recalled 0.13 more practice words than control words, but the ANCOVA showed no significant precognitive effect ( $F [1, 27] = 0.00, p = .98, \eta^2 = 0.00$ ). The main effect of hypnotizability was not significant ( $F [1, 27] = 0.00, p = .95, \eta^2 = 0.00$ ), neither was belief in psi ( $F [1, 27] = 0.04, p = .85, \eta^2 = 0.00$ ). As we can see in table 1, low hypnotizable actually performed slightly better than high in terms of practice-control differences.

The trend analysis was conducted with an ANOVA dividing the participants in three sequences. Descriptive statistics for all sequences are given in table 2. The practice-control difference was slightly positive in the first two sequences, in accord with a possible precognitive effect, but slightly negative in the third. We found no significant differences between the sequences ( $F [2, 27] = 0.87, p = .43, \eta^2 = 0.06$ ).

Table 2

*Means and Standard Deviations for Numbers of Recalled Words by Sequence*

Sequence	Practice			Control		
	M	SD	N	M	SD	N
1	10.4	2.76	10	9.0	2.26	10
2	10.0	2.40	10	9.1	2.41	10
3	8.8	2.84	10	9.1	3.87	10

Furthermore, as we can see in figure 1, there was a small difference between the experimenters in both practice and control. The ANOVA for investigating experimenter effect, however, was non-significant ( $F [1, 28] = 0.04, p = .84, \eta^2 = 0.04$ ).

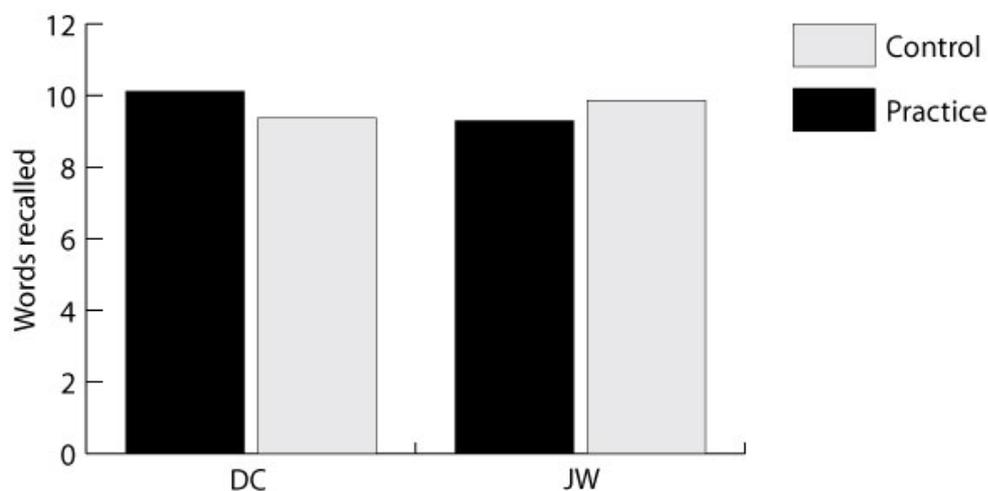


Figure 1. Means of numbers of words recalled for the participants run by each experimenter; D. C. ( $n = 16$ ; 8 high, 8 low) and J. W. ( $n = 14$ ; 7 high, 7 low).

## Discussion

It seems to us that no precognition was documented in this experiment. Contrary to what we expected, neither hypnotizability nor belief in psi predicted performance on the precognitive memory test. This could be because there was no precognition to predict, or because they failed as predictors. However, if we assume that precognition exists under some circumstances, then that brings us to why it did not occur in this experiment. In what follows we consider different explanations for the non-significant results.

*The precognitive memory test.* One thing to take into account is that the program was completely in English. This included the words which the participants were asked to visualize. In general, the words were not very complicated but a few of them might have been hard for the participants to understand (e.g., mortician, jockstrap and parka). If the participants failed to understand the words, then they would not be able to visualize them. Hence, the way the participants processed the words may have differed. Some may have

activated primary rather than secondary memory. According to Irwin's interpretation of Roll's memory trace theory (1979), that might have influenced how well the participants performed on the test. It would therefore be optimal if further studies using this method were conducted in the participant's mother tongue. A similar critique can be leveled at the practice task. The participants were told to memorize six words and then type those words on the next screen. This recall could be done with both type I and type II rehearsal.

It may also be that the circumstances of this experiment do not permit precognition. Perhaps the interval between the recall and the practice was too long. The presentiment studies imply a precognitive interval of just a few seconds (e.g., Radin, 1997). Conversely, instances of spontaneous precognition with intervals over several days or even years have been reported (Osborn, 1962). Another angle is emotionality; the presentiment studies suggest that it is an important factor (e.g., Hinterberger et al., 2007). That could also, to some degree, be said about the spontaneous precognitions (Broughton, 2006). There was no emotional component in our task. It may therefore be a good idea to expose the participants to stimuli of emotional importance in further experiments of this kind. It should be mentioned that once the experiment had started, Bem communicated to the first supervisor that he had made a revision to the program and preferred that that revision be used. However, considering that data collection was on the way, the experimenters continued using the same test, although now aware that there might be a problem. This may be a pertinent consideration when considering a possible decline effect in the results.

*Experimenters.* In parapsychology the role of the experimenter has been emphasized (Smith, 2003b). Particularly the experimenter-participant interaction has been brought into focus. Therefore our inexperience as experimenters and the way we interacted with the participants may have affected the outcome of the study. Furthermore, both researchers had a moderate score on the ASGS. This suggests that we might not be psi-conducive, which could have influenced the outcome as well. It is hard to pinpoint exactly what experimental factors could have made an impact on the outcome, as little is known about the importance of personal characteristics in experimenters (Watt & Wiseman, 2002). On the other hand, the program was developed to minimize experimenter effect with the test being run mainly on computer.

*Noise.* According to Honorton's noise reduction model (1977) ESP functioning is enhanced when noise is reduced. One might question if the relaxation video prior to the memory test

served its purpose or if it was more of a distraction. It is possible that far from everyone gets relaxed by the type of stimuli that the relaxation video includes. For some individuals it might even have the opposite effect. In addition to this, there was a constant humming sound coming from another computer in the room. Although the sound was fairly low, it might have served as another distraction.

As for our second hypothesis, hypnotizability did not predict performance in the precognitive memory test. This runs against our hypothesis, but in line with the results from May et al. (2000). This could be due to the lack of actual induction of hypnosis during the test itself (Stanford, 1992). Perhaps the altered state of awareness is crucial to get high hypnotizables to perform well as in Honorton's model (1977). It may also be that there are different ways to score high on hypnotizability. Researchers should take these issues into account in future studies as it may have implications for psi performance.

The ASGS did not predict performance in the precognitive memory test. This seems likely to be due to the test rather than the ASGS as the latter is a recognized and well used scale in parapsychology. However, it could also be argued that language may have been a barrier, as the whole questionnaire was in English. It could also be that the sheep-goat effect only applies when the individuals know it is a psi test they are doing. The effect may not work for implicit psi tasks. Accordingly, the participants in our study were not told that this was a psi test. Therefore, factors that might be responsible for the sheep-goat effect (e.g., differences in motivation between sheep and goats) were not there to produce the effect. A sheep-goat effect in the opposite direction was identified in a study conducted by Palmer (2006). The participants were doing computer guessing task measuring implicit sequence learning. The significant results showed that goats anticipated correctly more often than sheep. Palmer speculatively attributed the results to the two experimenters being goats themselves. The participants might have been more comfortable with experimenters sharing their view. In our study, it might have been that the experimenters' moderate score on the ASGS or the implicit nature of psi task affected the ASGS as a predictor of precognition. It also bears mentioning that, although not significant, there seemed to be a decline of the practice/control difference between the first two thirds and the last third data collection points.

In conclusion, we did not find any evidence that precognition exists. However, a future study conducted with the aforementioned improvements along with a larger sample size might more

reliably determine the authenticity of precognition. Hence, it is difficult to draw conclusions from this study about the predictors. Further studies should investigate hypnotizability in relation to other psi phenomena to generalize the findings.

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