

## THE PRECOGNITIVE HABITUATION EFFECT: AN ADAPTATION USING SPIDER STIMULI

Louie Savva, Robert Child & Matthew D. Smith  
*Parapsychology Research Group, Department of Psychology  
Liverpool Hope University College*

### ABSTRACT

There has been a recent trend in precognition research to examine established conventional psychological paradigms for temporally reversed effects. The precognitive habituation (PH) effect is a newly emerging paradigm based upon a temporally reversed mere exposure (ME) study. Where in conventional psychology the ME effect involves exposing stimuli to participants and then measuring liking for it, the PH effect involves the opposite procedure. Participants are presented with a pair of photographs and are then asked to make a preference choice between the two. Previous research has argued that precognitive exposure to one target over another, results in diminished arousal and that negatively arousing targets are made less negative. The PH hypothesis is that negatively arousing targets will be preferred over the non-targets and that no effect (or a precognitive boredom effect) is expected on non-arousing (low-affect) trial. In this study, we sought to conceptually replicate and extend Bem's (2003) findings by using less ethically problematic images. In the Bem studies, many of the images were disturbing (graphic images of gun shot victims etc) and Bem reported that some participants did make attempts to avoid looking at the stimuli through closing of the eyes or averting the gaze. To help circumvent the problem of showing potentially disturbing stimuli to participants, the authors sought to replace the negatively arousing images used by Bem with pictures of spiders. This was based on the work of Savva and French (2001; 2002), where spider pictures had been used to replace more disturbing images in a number of paradigms, including the presentiment effect. Fifty participants contributed to the current study and provided a self-report measure of spider fear, where 25 were categorised as 'spider fearing' and 25 as 'no-spider fear'. The overall hit rates obtained by the different fear groups were not significant but the data did suggest that an analogous effect was to be found. A significant difference was found for the mean number of hits obtained on the spider stimuli versus the low-affect pictures and only for the spider fearing group. This effect may be interpreted as a precognitive habituation or a temporally reversed mere-exposure effect. The results are discussed and future direction of research suggested.

### INTRODUCTION

Within contemporary precognition research there seems to be an increasing interest to investigate what can best be termed "time-reversed effects" (TREs). That is, to take a conventional psychological paradigm and examine it for potential psi influences from the future. For example, Radin (1997) highlighted Klintman's (1983; 1984) work as an example of one of these TREs. Klintman was interested in a variation of the Stroop (1935) paradigm, where cognitive interference affects the processing of coloured names and words. In the standard Stroop paradigm, participants take longer to name the ink colour of a colour word if the ink colour and word meaning are incongruent (e.g. "red" written in blue ink) compared to when they are congruent (e.g. "red" in red ink). However due to unexpected variation in the data, Klintman reanalysed his results and found a stroop-like effect that was reversed in the temporal dimension; hence Klintman termed it time-reversed interference (TRI). Although there have been a number of studies investigating the TRI effect, the overall conclusions from the paradigm are mixed (e.g. Camfferman, 1987; Radin & May, 2000; Savva & French, 2002).

The presentiment effect is another example of a TRE, in that it is essentially temporally reversed arousal to emotional stimuli, not seen with low affect stimuli (Bierman & Radin 1998; 2000; Radin, 1996). In the early presentiment work, skin conductance provided a measure of arousal and anomalous anticipatory effects were claimed beyond normal expectancy effects. Bierman and Scholte (2002) chose to extend the

presentiment effect by making use of an fMRI (Functional Magnetic Resonance Imaging) brain scan to highlight the brain's activities and monitor the cells that are responsible for perceptions and emotions. The experiment involved the participant being scanned while they were shown images in a random order. The images were either emotionally stimulating (these were violent or negative pictures) or neutral. Results were similar to the earlier presentiment effect studies and the presentiment effect continues to be an important area of precognition research.

Furthermore, Bem (2003) has recently reported positive findings investigating another TRE. This involved a variation upon a technique called the mere exposure (ME) effect. Conventional ME theories state that the more humans (or animals) are exposed to a particular stimulus the more they will like it. The large amount of research on mere exposure has established this as a well recognised phenomenon (Bornstein, 1989).

Bem (2003) hypothesised that the stimuli that would be most effective in a ME study would be negative and highly arousing, and highlighted the lack of ME research using such stimuli. It is also clear that ME takes effect mostly when the stimuli are shown subliminally, suggesting that the effect is taking place at an unconscious level. Using paradigms like the presentiment as an influence, Bem (2003) decided to test for a temporally reversed ME effect, which he referred to as precognitive habituation (PH). He devised a protocol to test for precognition, by conducting a ME study backwards. A trial in a PH experiment involves the participant being shown a pair of pictures and being asked to choose which picture they prefer. Following this the computer uses a pseudo-random procedure to select one of the two displayed pictures as the target and is then presented to the participant. The PH hypothesis is that the repeated flashing of the target image will weaken the arousal that it would have produced. Bem argues that will lead the negative pictures to be less negative and the positive pictures to be less positive. It is important to note that the two displayed images are matched for their arousal type (positive or negative). He found that the highly negatively arousing pictures produced a significant psi effect with participants preferring the randomly selected target picture more than would be expected by chance. A similar, although reversed, effect was found with highly positively arousing pictures. No such significance was found for low-affect stimuli.

Since Bem's precognitive habituation effect had reportedly produced a significant hit rate comparable to other popular parapsychological paradigms, the authors felt that it was worthwhile attempting a replication. Bem had taken stimuli from the International Affective Picture Set (IAPS, Lang and Greenwald, 1993) and supplemented these with images taken from the Internet. These pictures fell into three categories; the first was low-affect (e.g., coastlines), the second were negative images (e.g., pictures of corpses) and the third were erotic images. On viewing the highly negative and highly positive images used by Bem, however, it was deemed that these may prove to be ethically problematic in terms of attempting a replication of the PH effect. Indeed Bem reported that in one PH study, female participants were recorded shutting their eyes, or averting their glance, thus reducing the PH effect. It was therefore concluded that alternative stimuli be sought.

One of the authors (LS) had already conducted presentiment research where conventional stimuli (such as that found in the Bem study) had been replaced with spider related stimuli. Savva and French (2001) argued that pictures of spiders would potentially induce in those afraid of spiders a similar reaction as the violent images would in 'normal' participants. By replacing the negative pictures with spider stimuli, and by omitting the erotic pictures, any ethical concerns we had with conducting a PH study would be resolved.

Savva and French have also replaced conventional stimuli with spider stimuli in a number of other paradigms, including the time-reversed interference effect, with varying degrees of success (Savva & French, 2002). The fear of spiders is one of the most common phobias in Western society (Cornelius & Averill, 1983; Kirkpatrick, 1984). It has been argued that the phobia stems from evolutionary selection due to some spiders being venomous (Seligman, 1971; Öhman, 1986). Davey (1994) highlights the fact that many studies (e.g. McNally, 1987) have carried out a research that linked pictures of spiders with a mild electric shock and have found that the fear which becomes conditioned to spiders is significantly more resistant to extinction than the fear of low-affect (or 'fear-irrelevant') images. In his own paper, Bem also suggests that a

precognitive ability to detect the emotionally arousing images may be related to an evolutionary adaptation for psi.

Thus, based on the findings reported by Bem (2003), it was hypothesised that those participants who had a fear of spiders would be more likely to select the target picture when the pictures were of spiders than when the pictures were low-affect images. No such difference was expected for non-spider fearing participants.

## METHODS

### *Design*

The study was a 2x2 between-subjects design with two independent variables: emotionality of stimuli (spider versus calm) and fear group (spider-fearing versus no fear group).<sup>1</sup>

### *Participants*

There were 50 participants (23 male, 27 female) representing an opportunity sample recruited mainly from the undergraduate population at Liverpool Hope University College. Equal numbers of spider-fearing and no fear participants were recruited. Age ranged from 18 to 36 (with a mean of 22.4 years and a standard deviation of 3.08). Participants were not made aware of the exact aims of the study, but were given enough information to make an informed choice on whether to participate in the study or not.

### *Materials*

The participants were categorised with a fear of spiders questionnaire devised by Szymanski and O'Donohue (1993). This test is comprised of six yes-no type questions; with an answer of yes to any categorising the participant as spider-fearing, and those answering no to all as non-spider fearing.

The experimental program was run on a laptop computer (working under Windows XP at screen resolution 1024x768) using a program compiled by Daryl Bem. The images used by Bem (2003) were removed and replaced. All previous negative images were replaced with images of spiders, while many low-affect pictures were also added to replace some of the more arousing neutral pictures. Although we did not match pictures on any specific rating scales, pictures were wherever possible, matched on closeness of appearance. The full collection of pictures used in the study can be obtained from the researchers. A 'normal' (non-touchpad) mouse was also attached to the laptop, so the participants could choose how to respond to the stimuli.

### *Procedure*

Participants were recruited individually and took part in the experiment in a location where they felt comfortable, often the participant's home, although other locations were sometimes used. All of these areas were dimly lit and had no other stimuli that could distract the participant during the experiment. No other people were present in the room with the participant when they were viewing the images. All participants were asked to switch off their mobile phones to stop any disturbances during the experiment.

Before beginning the experiment all participants were given instructions regarding what to expect during the task and asked to fill out a consent form and a copy of the participant response form (which contained the spider questionnaire). Upon consulting the answers to the questionnaire participants were either allowed to continue or advised that the group into which they were categorised (spider-fear or no fear)

---

<sup>1</sup> Although one anonymous referee pointed out that we are specifically interested in just the difference of the spider-fear group on the spider stimuli versus the low-affect stimuli and that the no fear group are ex hypothesi, the authors agreed that all collected data should be presented. This comment may however influence any future designs.

already contained enough participants. On the occasions in which the latter occurred, the participant was given the option to continue with the study in the knowledge that their results would not be used.

The precognitive habituation software first presents a screening test, which comprises of a 20-item questionnaire. Although the data was collected during the current research, it was not used in any subsequent analysis. The software then provides a “cool-down” period, where participants are provided with 5 minutes of relaxing sounds and images.

On each trial, participants were shown two pictures side by side and asked to indicate which one they like better by clicking on it with the mouse. They were then asked to watch the screen, as one of the pictures was flashed rapidly on the screen (12 subliminal exposures in all). There were 12 spider trials and a further 36 low-affect trials. At the end of these trials the experimenter debriefed the participants as to the aims of the study. The entire procedure lasted approximately 20-25 minutes.

The PH program supplied by Daryl Bem included a database program that collated the data and exported the required data to SPSS for further analysis.

## RESULTS

Plotting the results in a bar chart (see figure 1) reveals that those who reported a fear of spiders did score better than those who reported no-fear. There also seems to be a difference between spider stimuli and the low-affect stimuli for the spider-fearful participants, not seen in the no-fear group.

The hit rate for the overall study is 51.3% for the spider pictures and is not significantly above chance ( $t(49) = .739$ ,  $p = ns$ ) and 48.1% for the low-affect stimuli ( $t(49) = -1.58$ ,  $p = ns$ ). This splits across the fear groups where the spider fear group obtained a hit rate of 54% on the spider stimuli ( $t(24) = 1.70$ ,  $p = .051$ , one tailed) and a 48% hit rate on the low-affect pictures ( $t(24) = -1.07$ ,  $p = ns$ ). The no fear group obtained a hit rate of 49% on the spider pictures ( $t(24) = -.35$ ,  $p = ns$ ) and 48% on the low-affect pictures ( $t(24) = -1.14$ ,  $p = ns$ ). As such the hit rate is in the predicted direction but is not significantly different from mean chance expectation.

A 2x2 repeated measures ANOVA was conducted on the data. No within subjects main effect of type of stimuli (spider versus low-affect) was found ( $F(1,48) = 2.23$ ,  $p = ns$ ). No between subjects main effect of fear group was found ( $F(1,48) = .017$ ,  $p = ns$ ). A slightly suggestive interaction was found ( $F(1,48) = 2.97$ ,  $p = .091$ ). Two t-tests were carried out to explore this suggestive interaction further (Bonferroni corrected to .025 to reduce spurious claims of significance). A non-significant difference was found for the spider stimuli and low-affect stimuli hit rates for the no-fear group ( $t(24) = -1.51$ ,  $p = ns$ ). However a significant difference was found for the spider stimuli and low-affect stimuli hit rates for the spider-fear group ( $t(24) = 2.48$ ,  $p = 0.021$ ). This suggests that for the spider-fear group performance on the PH task seems to be significantly different when the stimuli are spider related than when the stimuli are low-affect.

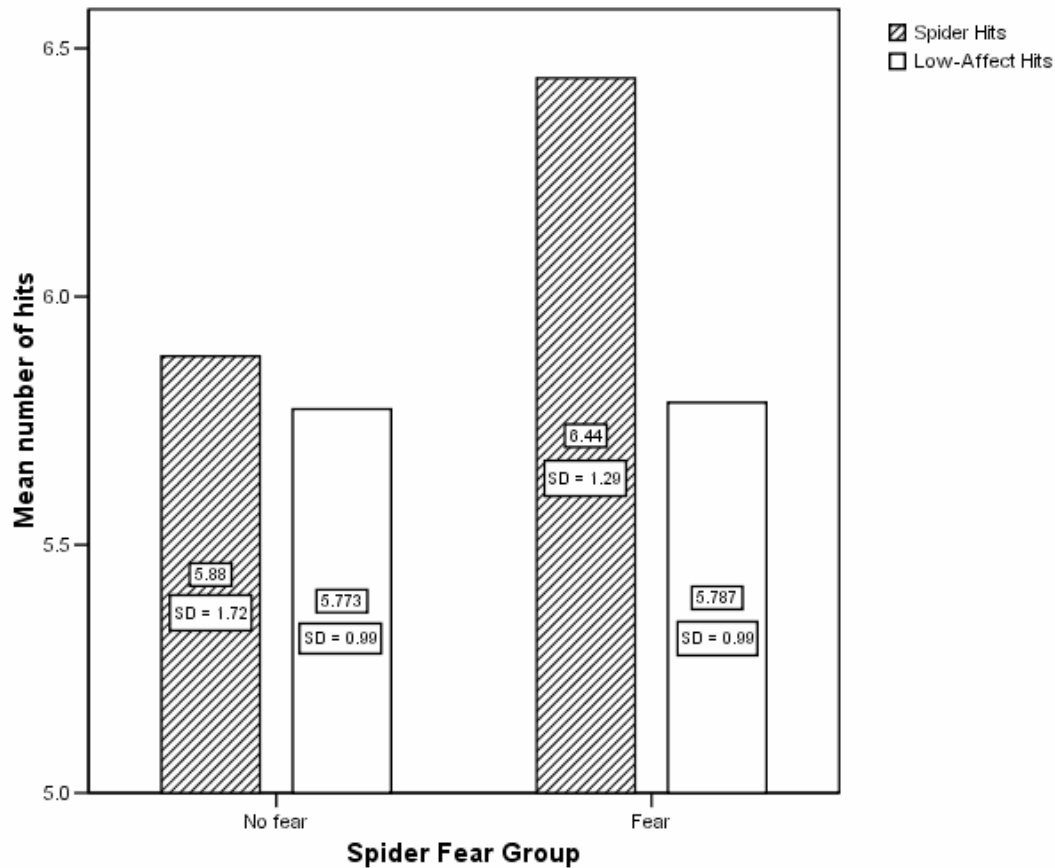


Fig. 1 Mean hits for both spider pictures and low-affect stimuli across the spider fear groups.

## DISCUSSION

The results of this study are very encouraging. After replacing the stimuli found in earlier PH studies with spider-stimuli, it was found that participants who rated themselves as being afraid of spiders seemed to precognitively habituate to spider-stimuli and seemed to exhibit a precognitive boredom effect for low-affect stimuli. No psi effect was found in the no-fear group.

These results seem to suggest that participants who are afraid of spiders show preference to one picture over another matched picture, if they are then shown that picture in the future. This appears to be a temporally reversed ME effect. These participants also show a precognitive boredom effect for the low-affect stimuli, showing a tendency to select the picture that they will not be shown in the future. Although neither effect is very striking, the difference between the two effects is significant and not found in the no-fear group.

This adapted PH methodology therefore provides parapsychologists with an ethically less problematic tool than that developed by Bem. Whilst it is unlikely that the ethics committee at Liverpool Hope University College would have passed the PH experiment in its original form, it was more than happy to accept the version reported here. As such it provides a means of making use of what claims to be a replicable and simple methodology without subjecting participants to extremely unpleasant stimuli. Although some may argue that spider stimuli can be just as disturbing as Bem's original stimuli it was felt that, since participants would be informed that they would be presented with spider pictures, such stimuli, however unpleasant, were not as surprising as some of the images in Bem's stimuli set.

### Future studies

Perhaps the PH effect's greatest strength is the ease with which it can be adapted and manipulated. Currently a straight replication is planned to follow up this initial study. If this is successful there are a number of adaptations that would be worthy of further investigation. Perhaps of interest to conventional psychologists and those believing the precognitive effect to be some kind of TRE is to conduct a normal mere-exposure effect study, combined with a PH study. If a similar level of mere-exposure is found for those rating themselves as spider-fearful to that found in the PH part of the study, it would certainly provide strength to the argument that it is a TRE and that it makes little difference what the temporal direction of the experiment is.

It would also be interesting to compare other fear groups, such as those afraid of snakes, and even to investigate clinical populations (i.e., patients who are diagnosed as extremely phobic of spiders). The spider-fear measure used in the study above is not very selective and even people who merely dislike spiders are rated as being afraid of spiders. By making the difference between spider-phobics and non-spider phobics more extreme it could be argued that a greater difference would be predicted.

Finally, the stimuli presentation method could be adapted to include some more life-like stimuli. Virtual reality is regularly used in the clinical treatment of phobias to provide extremely life-like (and therefore emotionally more realistic) exposure to negative stimuli. A virtual-reality based PH effect methodology could be developed which would produce a more naturalistic testing environment, whilst maintaining the best elements of laboratory testing.

### ACKNOWLEDGEMENTS

This paper is based on a study conducted by Robert Child for his undergraduate dissertation, under the supervision of Matthew Smith and Louie Savva. We would like to thank Professor Daryl Bem of Cornell University for his kind help in developing this experiment.

### REFERENCES

- Bem, D. J. (2003). Precognitive habituation: Replicable evidence for a process of anomalous cognition. *Proceedings of Presented Papers: The Parapsychological Association 46th Annual Convention*, 6-20.
- Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin*, 106, 265-289.
- Bierman, D. J., & Radin, D.I. (1997). Anomalous anticipatory response on randomized future conditions. *Perceptual and Motor Skills*, 84, 689-690.
- Bierman, D. J., & Scholte, H. S. (2002). Anomalous anticipatory brain activation preceding exposure of emotional and neutral pictures. *The Parapsychological Association 45th Annual Convention, Proceedings of the Presented Papers*, 25-36.
- Camfferman, G. (1987). Time reversed interference: A replication study. *European Journal of Parapsychology*, 7, 13-31.
- Cornelius, R. R. & Averill J. R. (1983). Sex differences in fear of spiders. *Journal of Personality & Social Psychology*, 45, 377-383.
- Davey, G. C. L. (1994). The disgusting spider: The role of disease and illness in the perpetuation of fear of spiders. *Society and Animals*, 3, 17-24.
- Dijksterhuis, A., & Smith, P. K. (2002). Affective habituation: Subliminal exposure to extreme stimuli decreases their extremity. *Emotion*, 2, 203-214
- Klintman, H. (1983). Is there a paranormal (precognitive) influence in certain types of perceptual sequences? I. *European Journal of Parapsychology*, 5, 19-49.

- Klintman, H. (1984). Is there a paranormal (precognitive) influence in certain types of perceptual sequences? II. *European Journal of Parapsychology*, 5, 125-140.
- Kirkpatrick, D. R. (1984). Age, gender and patterns of common intense fears among adults. *Behaviour Research & Therapy*, 22, 141-150.
- Lang, P. J., & Greenwald, M. K. (1993). International Affective Picture System Standardization Procedure and Results for Affective Judgments: Technical Reports 1A-1C: University of Florida Center for Research in Psychophysiology, Gainesville, FL.
- McNally, R. J. (1987). Preparedness and phobias: A review. *Psychological Bulletin*, 101, 283-303.
- Öhman, A. (1986). Face the beast and fear the face: Animal and social fears as prototypes for evolutionary analyses of emotion. *Psychophysiology*, 23, 123-145.
- Radin, D. (1997). *The Conscious Universe: The Scientific Truth of Psychic Phenomena*. San Francisco, Harper.
- Radin, D. & May, E. (2000). Evidence of a retrocausal effect in the human nervous system [World Wide Web]. Retrieved from <http://www.boundaryinstitute.org/articles/tri2.pdf>.
- Savva, L., & French, C. C. (2001). *Investigating the presentiment effect as an adapted behaviour. Evolution and psi*. 25th International Conference of the Society for Psychical Research. Clare College, Cambridge, 14-16 September 2001.
- Savva, L., & French, C. C. (2002). Is there time-reversed interference in Stroop-based tasks. *The Parapsychological Association 45th Annual Convention, Proceedings of the Presented Papers*, 194-205.
- Seligman, M.E.P. (1971). Phobias and preparedness. *Behavior Therapy*, 2, 307-320.
- Szymanski, J., O'Donohue, W. (1995) Fear of spiders questionnaire. *Journal of Behavior Therapy and Experimental Psychiatry*, 26, 1, 31-34

*Address for correspondence:* Matthew D. Smith,  
Parapsychology Research Group, Department of  
Psychology, Liverpool Hope University College,  
Hope Park, Liverpool, L16 9JD, UK.  
E-mail: [smithm3@hope.ac.uk](mailto:smithm3@hope.ac.uk)