PRECOGNITIVE AVERSION

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ABSTRACT

At an earlier PA Convention, I reported on a phenomenon called "Precognitive Habituation" (PH) (Bem, 2003). The PH effect is a psi variation of a well-known psychological phenomenon, the habituation of arousal to an affectively arousing stimulus that occurs after repeated exposures to that stimulus. For example, in one habituation experiment, participants subliminally exposed to extremely positive and extremely negative words subsequently rated those words as less extreme than words to which they had not been exposed: Negative words were rated less negatively and positive words were rated less positively (Dijksterhuis & Smith, 2002). The PH procedure tests for precognition by, in effect, running a standard habituation procedure in reverse. Instead of exposing a participant to repeated exposures of a stimulus and then assessing his or her liking for it, the PH procedure reverses the sequence: On each trial the participant is first shown a pair of negatively arousing or positively arousing (erotic) photographs on a computer screen and asked to indicate which picture of the pair he or she prefers. The computer then randomly selects one of the two pictures to serve as the "habituation target" and displays it subliminally several times. If the participant prefers the picture subsequently designated as the target, the trial is defined as a "hit." Accordingly, the hit rate expected by chance is 50%. The PH hypothesis is that the repeated exposures of the target can reach back in time to diminish the arousal it would otherwise produce, rendering negatively arousing targets less negative and erotic targets less positive. (This latter effect on erotic targets can be conceptualized as precognitive boredom.) Operationally, participants are predicted to prefer the target-to-be on negative trials and the non-target-to-be on erotic trials. Across several studies, these predictions were confirmed: The hit rate was significantly above 50% on negative trials (52.6%, $t(259) = 3.17$, $p = .0008$) and significantly below 50% on erotic trials (48.0%, $t(149) = -1.88$, $p = .031$). Unexpectedly, when the number of target exposures exceeded 8, a precognitive boredom effect also occurred on low-arousal, "control" pictures. The current experiment was designed to explore this effect further across a range of low-arousal pictures, both positive and negative (where it is probably more accurate to conceptualize it as precognitive *aversion*). Two hundred participants, 140 women and 60 men, participated in a 24-trial session that presented 10 supraliminal exposures (750 ms) of the target picture after each preference judgment. Overall, the hit rate did not differ from chance, but participants low in arousability or boredom tolerance achieved an overall hit rate of 47.3% ($p = .006$). Consistent with the reasoning behind the protocol, participants who were low in Arousability displayed significant precognitive aversion on trials with negative targets (46.9%, $p = .036$) and participants low in Boredom Tolerance displayed precognitive boredom on trials with positive targets (44.4%, $p = .005$).

INTRODUCTION

At the 2003 PA convention, I reported on a phenomenon called "Precognitive Habituation" (PH; Bem, 2003). The effect is a psi variation of a well-known psychological phenomenon, the habituation of arousal to an affectively arousing stimulus that occurs after repeated exposures to that stimulus. For example, in a recent habituation experiment, participants subliminally exposed to extremely positive and extremely negative words subsequently rated those words as less extreme than words to which they had not been exposed: Negative words were rated less negatively and positive words were rated less positively (Dijksterhuis & Smith, 2002).

The PH procedure tests for precognition by, in effect, running a standard habituation procedure in reverse. Instead of exposing a participant to repeated exposures of a stimulus and then assessing his or her liking for it, the PH procedure reverses the sequence: On each trial of the PH procedure, the participant is first shown a pair of negatively arousing or positively arousing (erotic) photographs on a computer screen

and asked to indicate which picture of the pair he or she prefers. The computer then randomly selects one of the two pictures to serve as the "habituation target" and displays it subliminally several times. If the participant prefers the picture subsequently designated as the target, the trial is defined as a "hit." Accordingly, the hit rate expected by chance is 50%.

The PH hypothesis is that the repeated exposures of the target can reach back in time to habituate the participant's arousal to it, that is, to diminish the arousal it would otherwise produce, thereby rendering negatively arousing targets less negative and erotic targets less positive. This latter effect on erotic targets can be conceptualized as precognitive boredom. Because the two pictures in each pair are matched for valence and arousal, participants are predicted to prefer the target-to-be on trials with negatively arousing pictures and the non-target-to-be on trials with erotic pictures. Preferences on trials with low-arousal control pictures were not expected to differ from chance.

In my own laboratory, more than 300 men and women participated in several variations of the PH protocol. Collectively these studies provided strong support for the two predicted effects. Across the six basic studies, the hit rate was significantly above 50% on negative trials (52.6%, $t(259) = 3.17$, $p = .0008$) and significantly below 50% on erotic trials (48.0%, $t(149) = -1.88$, $p = .031$).

The Role of Arousal

In the first experimental series, PH effects were shown only by women participants; hit rates for the men were at chance levels for both the negative and erotic trials. Because the psi literature does not reveal any systematic sex differences in psi ability, it seemed likely that this occurred because the men were less aroused by both the negative and erotic pictures than the women.

Most of the pictures used in the PH studies were selected from the International Affective Picture System (IAPS; Lang & Greenwald, 1993), a set of 820 digitized photographs that have been rated on 9-point scales for valence and arousal by both male and female raters. Male raters rate every one of the negative pictures in the set as less negative and less arousing than do female raters. An fMRI study using IAPS pictures found that men had significantly fewer brain regions than women where activation correlated with concurrent ratings of their emotional experience, and men later recalled which pictures they had seen less accurately than did women (Canli, Desmond, Zhao, & Gabrieli, 2002).

The clinching argument for the arousal interpretation, however, came from a 5-point Arousability scale administered to participants prior to their experimental session ("In general, how intense are your emotional reactions to movies, videos, or photographs that are violent, scary, or gruesome?"). For both men and women, those who rated themselves above the midpoint on this scale showed a significant PH effect on the negative trials. All others scored at chance level. Correspondingly, those who rated themselves above the midpoint on a parallel Erotic Reactivity scale showed a significant PH effect on the erotic trials.

Precognitive Aversion on Low-Arousal Pictures: A Serendipitous Finding

The earliest studies of the PH effect used only 4 subliminal exposures on each trial. In an attempt to strengthen the effect, I kept increasing the number of exposures, moving from 4 to 6, 8, 10, and 12 across the successive experiments. The hit rate on the low-arousal control trials remained essentially at chance until the number of exposures reached 10, at which point the hit rate on these trials dropped to 46.8% ($t(39) = -2.12$, $p = .04$, two-tailed). In other words, with very frequent exposures, the low-arousal pictures behaved like the erotic pictures, showing a precognitive boredom effect. Like a too frequent TV commercial, the many repeated exposures (precognitively) rendered the target picture boring, or even aversive, and hence less attractive than its matched non-target.

This serendipitous finding suggested that it might be possible to design a protocol deliberately constructed to produce precognitive aversion as the central phenomenon. This would be desirable for two reasons. First, there are large sex, cultural, and individual differences in arousal to the gruesome and the erotic pictures used in the PH protocol, making successful replication across different populations more

difficult. Moreover, the proportion of men scoring high on the Arousability scale in the university populations studied so far is quite low. This means that successful replication requires either extensive pre-screening or running many more male participants to get an adequate sample. In contrast, it seemed likely that precognitive aversion would be most likely to occur among participants who are low in Arousability and/or Boredom Tolerance. If true, a potentially larger pool of successful male participants would be available in a university population.

Second, several psi investigators (or their Institutional Review Boards) have been hesitant to conduct a study using gruesome and erotic pictures. A precognitive aversion experiment would not need such pictures, however, because, just as the precognitive aversion effect is expected to be shown by participants low in arousal, it is expected to be shown with stimuli low in arousal value.

METHOD

Participants

Two hundred Cornell undergraduates, 140 women and 60 men, were recruited through the Psychology Department's automated on-line sign-up system to serve as participants in a "15-20 minute study of Precognitive Imagery." They either received one point of experimental credit in a psychology course offering that option or were paid $5 for their participation.

Stimulus Pictures

As noted above, the pictures used in the studies were selected from the International Affective Picture System (IAPS; Lang & Greenwald, 1993), a set of 820 digitized photographs that have been rated on 9-point scales for valence and arousal by both male and female raters. For purposes of this research, I have constructed an index of picture affect that combines both the valence and the arousal ratings: The 1-to-9 valence scale is shifted downward so that it ranges from -4 to +4, with 0 as the neutral point. Each valence rating is then multiplied by the corresponding 1-to-9 arousal rating, yielding an affect rating scale that ranges from -36 to +36, with scores below 0 characterizing negatively valenced pictures and scores above 0 characterizing positively valenced pictures.

Using this index, the 820 pictures in the IAPS set range from -22 and -29 for men and women, respectively (for a picture of a bloody mutilated face) to +20 for both men and women (for a picture of a skier on a snowy mountain).

The negative pictures used in the PH studies have a mean affect rating of approximately -12 and -18 for men and women, respectively. The negative pictures used in the present study have a much milder affect rating of approximately -7 and -12 for men and women, respectively.

Experimental Procedure

Upon entering the laboratory, the participant was told:

> In this experiment, we are interested in measuring your reactions to a wide variety of visual images in a procedure that tests for ESP (Extrasensory Perception). The experiment is run completely by a computer and takes about 15-20 minutes.

> First you will be asked to answer some questions describing ways in which you react to different situations. Then, on each trial, you will be shown a pair of pictures and asked to click on the one you like better. You will then be asked to watch passively as one of the two pictures is flashed repeatedly on the screen. This will be repeated for 24 trials.

> At the end of the session, I will explain to you how this procedure tests for ESP.

The participant then signed a consent form and was seated in front of a computer housed in an open cubicle. The cubicle was dimly lit by a floor lamp positioned so that there were no reflections on the computer screen. Overhead fluorescent lights were turned off.

The PA procedure is similar to the one used in the PH studies: First, the program administers a set of screening items to which the participant responds on 5-point scales. Then, on each of 24 trials, the participant is shown two matched pictures and asked to click on the picture he or she prefers. Half the picture pairs have positive affect ratings and half have negative affect ratings. The program then randomly selects one of the two pictures to serve as the target and flashes it on the screen 10 times. Unlike most of the PH studies, however, the exposures are enlarged to fill the entire screen and are supraliminal in duration (750 ms followed by a blank screen for 250 ms). The shift to supraliminal exposures was designed to maximize the probability that participants would find the negative targets increasingly aversive and the positive targets increasingly boring.

In addition to the random selection of the target on each trial, the sequence of pairs across trials and the left/right placement of the two pictures in each pair are also randomized (as is, consequently, the left/right placement of the target). Randomizing is done by a pseudo random number generator (PRNG) using an algorithm by Marsaglia (1997) which passes his well known "Die-Hard Battery" of tests for randomization.

RESULTS AND DISCUSSION

It will be recalled that the PA effect is expected to be shown by participants low in Arousability and Boredom Tolerance. To identify participants who were low in Arousability, I used the same question used in the PH experiments to identify participants who were high in Arousability ("In general, how intense are your emotional reactions to movies, videos, or photographs that are violent, scary, or gruesome?"). Those who scored below 3 on the 5-point scale were defined as low in Arousability. To identify participants who were low in their tolerance for boredom, responses to two questions were averaged: "I get bored easily" [scored in the reverse direction] and "I often enjoy seeing movies that I've seen before." Those who scored below 3 on the combined scale were defined as low in Boredom Tolerance.

Operationally, the PA hypothesis is that participants low in Arousability and Boredom Tolerance will select the target picture on significantly fewer than 50% of the trials. Over all 200 experimental sessions, the hit rate did not differ from chance (49.1%); but, as predicted, participants low in Arousability and Boredom Tolerance obtained a hit rate significantly below chance (47.3%, $p = .006$). Consistent with the reasoning behind the protocol, participants who were low in Arousability displayed significant precognitive aversion on trials with negative targets (46.9%, $p = .036$) and participants low in Boredom Tolerance displayed precognitive boredom on trials with positive targets (44.4%, $p = .005$).

As noted in the Method section, the algorithm used for randomizing the several events in this study has passed rigorous tests of randomness. Nevertheless, there is always a concern (especially among critics of psi research) that a flawed PRNG might produce nonrandom patterns within a short run of trials. This could, for example, create patterns in the left/right placement of the target that might coincide with a participant's pre-existing biases (e.g., excessive left/right alternations). This problem is avoided in the present study because successive decisions of the same kind are not made by successive calls to the PRNG. For example, between successive selections of a target or left/right picture placement, the PRNG is called upon to select the picture pair for the trial. Because it does this by repeatedly generating random integers between 1 and 24 until an unused pair is located, the number of intervening calls to the PRNG varies from trial to trial, thereby destroying any systematic patterns that might be generated by the PRNG itself.

To guard even further against potential bias problems in the randomization, two Monte-Carlo-like analyses were performed. The first analysis matched each participant's sequence of left/right preference judgments against 1000 randomly generated left/right target sequences. These "virtual" sessions provide an empirical chance baseline for each participant against which his or her actual hit rate can be

compared—rather than comparing it to the theoretical chance baseline of 50%. Across all 200 participants, the mean Monte Carlo baseline was 49.966%, and the analyses yielded the same statistical conclusions as reported above.

The second analysis matched each participant's sequence of left/right preference judgments against each of the actual target sequences generated in the other 199 sessions of the experiment, thereby controlling for possible target-placement biases during the actual experiment. The mean empirical chance baseline hit rate was 50.010% and, again, the statistical conclusions were the same as reported above.

In sum, the PH studies previously reported demonstrated that participants high in Arousability show precognitive habituation on high-arousal pictures. The study reported here demonstrates that participants low in Arousability or Boredom Tolerance show precognitive aversion on low-arousal pictures. Perhaps everyone can display psi when the task matches his or her personality.

ACKNOWLEDGEMENTS

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