

DO SOME OF US HABITUATE TO FUTURE EMOTIONAL EVENTS?

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ABSTRACT: From an evolutionary perspective, it may be advantageous not only to unconsciously react to emotionally threatening stimuli but also to habituate to these if they should prove harmless. A major purpose of the study was to test for the occurrence of this precognitive affective habituation at a subliminal level using emotionally loaded pictures. The design chosen here enabled us to evaluate whether or not participants habituated to emotionally loaded pictures and to see if they reacted selectively to just those target pictures that would later be repeatedly exposed, thus becoming potentially less threatening. It was further hypothesized that both the subliminal and the precognitive effects would relate to individual measures of emotional reactivity and transliminality. Fifty participants took part in the two successive computer steered procedures in order to respectively evaluate these aspects. A significant habituation effect was found for the negatively loaded targets. The overall findings failed to show a significant discrimination between those pictures than would be re-presented and those that were not. However, by selecting out the 34 individuals who showed affective habituation, a post hoc significant effect of precognitive habituation was found.

Keywords: precognition, psi, subliminal, affective habituation, emotional reactivity

The last decades of research with the introduction of the concepts of the emotional unconscious and the cognitive unconscious (Kihlstrom, 1987; Kihlstrom, Mulvaney, Tobias, & Tobis, 2000) have raised important questions concerning the limits of unconscious processes.

The evidence that emotional reactions to threat can occur without conscious recognition has been favourably reviewed by Arne Öhman (1999). Intuitive hunches and gut feelings have been shown to have a decisive role in reacting to threat (Katkin, Wiens, & Öhman, 2001; Öhman, 2000). The priority given to rapidly executed unconscious processes over those of conscious analytical ones is crucial for survival. As Öhman (1999, p. 338) vividly expressed it, "Predators strike hard and fast, and therefore time has always been a primary consideration for the fear system." It makes, then, evolutionary sense that exposure effects have been found to be stronger when the stimuli are exposed *subliminally*, that is, too quickly for conscious recognition, than when the participants are aware that they are being exposed to the stimuli (Dijksterhuis & Smith, 2002; Zajonc, 2001).

Turning now to studies relating more to the psychosocial context of emotion, two well-established psychological phenomena are *the mere exposure effect* and *affective habituation*. The mere exposure effect concerns how individuals come to be positively inclined toward stimuli they are frequently exposed to (Bornstein, 1989). Affective habituation refers to

the decreasing arousal with repeated exposure to an emotionally loaded stimulus (Dijksterhuis & Smith, 2002). These two effects are not so contradictory as they seem because the mere exposure effect requires the original stimulus to be of *neutral* value, whereas affective habituation occurs with *relatively strong* (negative or positive) value. The value or “valency” then gradually diminishes in strength with increased frequency of exposure. Despite the above theory, there is an almost complete absence of subliminal habituation studies carried out using *strongly* affective stimuli (Bem, 2003). Accordingly, a major aim of the present study was to rectify this shortcoming by testing whether or not affective habituation occurs when emotionally loaded pictures are subliminally presented.

The second issue concerns the temporal limits of this unconscious processing. The series of studies known as presensing or simply *presentiment* studies found that participants showed an unconscious physiological reaction immediately prior to the actual exposure of emotionally loaded pictures, and that this reaction was not shown with neutral ones (Bierman, 2000; Bierman & Radin, 1997; Bierman & Scholte, 2002). Although these results have been reviewed and discussed in relation to possible computational biases (Dalkvist, Westerlund, & Bierman, 2002), the findings have been further replicated with audio stimuli (Spottiswoode & May, 2003), and it would seem that there is as yet no simple conventional explanation for the presentiment effect.

Using these reports and findings as a starting point, Bem (2003) designed a computer-based procedure for testing an effect that is conceptually similar to presentiment, which he called *precognitive habituation*. Because an important feature of the work reported here concerns emotional targets, we use the term *precognitive affective habituation*. Like presentiment, *precognitive affective habituation* refers to the time-reversed influence of the stimuli before they are exposed, and, like presentiment, the effect has been found to be linked more specifically to negative than to positive stimuli. Nevertheless, the situation becomes a little more complicated because all forms of affective habituation are limited by the fact that individuals will seek to maintain an optimal level of arousal by virtue of their sensitivity to the negative stimuli.

Nevertheless, what emerges as a common denominator among presentiment, *precognitive affective habituation*, and subliminal affective habituation is that all of these processes may reflect a sensitivity or preference for reacting to *negatively loaded stimuli*. In the case of presentiment, the sensitivity is directed towards negatively loaded stimuli in the immediately impending future event, whereas in the case of *precognitive habituation* the sensitivity is toward negatively loaded stimuli, which the individual soon becomes repeatedly exposed to. It is this latter paradigm that was tested in Bem’s studies.

The procedure that Bem used is an elegantly simple one: Participants were exposed to two pictures differing in content but with

similar negative or positive emotional valency, and the task was to click on the preferred member of the pair. Directly afterward, one of the pictures, designated as the “target,” was randomly selected and then repeatedly flashed on the screen. The participant was next presented with two new pictures and the procedure repeated in a series of trials. The question was: Would the earlier preference for a picture be influenced backward in time by these subsequent exposures? If the participant selected the picture that was subsequently flashed, this counted as a “hit.” For all trials, both in terms of the individual and the group, a simple hit rate could then be calculated (with the chance hit rate as 50%).

As was previously mentioned, it was thought necessary to take into account the need for maintaining an optimum level of arousal. Accordingly, it was predicted that the participants would prefer the subsequent target more often in trials in which *negative pictures* were presented (and less often in trials with positive pictures). These results have a high consistency of confirmation¹ at laboratories in several countries (Bem, 2004; Savva, Child, & Smith, 2004).

THE PRESENT STUDY

In designing the present study, attention was given to the fact that while the repeated (mere) exposure and affective habituation effects can be considered as well established, subliminal effects using the affective habituation procedure appear not to have been researched—at least not with naturalistic material. Hence we identify the effect studied here as *subliminal affective inhibition*.

An area of practical concern was whether to include positive (so-called erotic) pictures as naturalistic material in the design. In the previous studies by Bem (2003), the results were predicted to be less successful with positively loaded pictures than with negative pictures. There were also practical and ethical concerns about exposing participants to strongly loaded or valenced material in the form of explicit erotic pictures, as it could not be taken for granted that such pictures would be consistently perceived as positive by the participants. Because of this consideration and the fact that a previous replication had succeeded without the use of erotic pictures (Savva et al., 2004), we decided to use only negative and neutral pictures.

A further consideration in designing the study is related to the potential effect of individual differences on the results. To assess the participant’s sensitivity to negatively arousing visual material, Bem (2003) constructed a simple, two-item personality measure that he called the *Emotional Reactivity Scale*.

As predicted by the precognitive affective inhibition hypothesis, scores on this scale correlated positively and significantly with the hit rate

¹ Overall, the target was selected in 52.6% of all negative trials ($p < .01$) and 48.0% of all positive trials ($p = .03$; Bem, 2003)

on negative pictures (but not on neutral pictures). Rather strikingly, the analysis showed that it was only the emotionally reactive participants who scored above chance on the precognitive habituation trials. Nevertheless, as *emotional reactivity* is not an established personality measure, there seemed to be some grounds for using a more general and theoretically grounded personality factor that might predict success in the precognitive affective habituation trials. The *Transliminality Scale* (Lange, Thalbourne, Houran, & Storm, 2000) was chosen because the concept of transliminality relates to the hypothesized tendency for psychological material to cross thresholds into or out of consciousness. Scores on the Transliminality Scale have been found to correlate with measures of creativity, magical ideation, absorption, fantasy proneness, and mystical experience (Lange et al., 2000). There is also some evidence that belief in psi is a reliable predictor of actual psi performance (see Parker & Brusewitz, 2004), and for this reason two items relating to belief were added to the transliminality scale.

Hypotheses

On the basis of the above considerations, three hypotheses were developed:

- (1) The repeated subliminal exposure to extremely negative pictures will lead to the subliminal affective habituation of the individual's conscious preferences for these pictures. This will be shown as the ratings of previously subliminally exposed pictures being significantly less extreme than those of new pictures of the same kind. The effect is predicted to be absent for neutral pictures.
- (2) Participants will differentially and significantly prefer the pictures that moments later are designated as targets. This precognitive affective habituation effect will occur significantly more often with negatively loaded pictures than with neutral, low-affect pictures.
- (3) The above hit rate is predicted to be significantly higher for participants scoring high than those scoring low on scales designed to measure transliminality and emotional reactivity.

METHOD

Design

To test the above hypotheses, two studies were carried out independently in the form of computer-presented tasks, although in practice this occurred with the same participants in the same experimental session. The

same-subjects design also enabled further analyses in terms of order effects to study how affective habituation might relate to precognitive habituation. Because there was a concern that the previous exposure of negative images might influence the precognitive affective habituation procedure, the actual order in which the two computer programs were run was not counterbalanced. In order to maintain the novelty and integrity of the procedure, the precognitive affective habituation condition was always run first.

Study 1. This experiment was a replication attempt of the original precognitive habituation study reported by Bem (2003). The independent variable was the valency (negative or neutral) of the pairs of pictures exposed, and the dependent variable was the marked preference for one of the two pictures, measured as a “hit rate” in relation to the target exposed.

Study 2. This experiment tested the affective habituation hypothesis using subliminally exposed pictures of the same type (negative or neutral) used in Study 1. The design was based on that of Dijksterhuis and Smith (2002), in which study the independent variables were designated as *the valency of the picture* (negative or neutral) and *the type of exposure* (previously presented or newly presented). The dependent variable was the *picture preference* in terms of perceived valency of the pictures, as rated on an ordinal scale ranging from *extremely negative* to *extremely positive*.

Ethical Concerns

Research on subliminal perception can be ethically problematic because it involves some degree of manipulation that bypasses the participant’s volitional control. Due to the extreme negative valency of some pictures used in the study, strong negative—and to some degree unconsciously elicited—affective reactions were to be expected and needed for the purpose of evaluating the hypothesized effects. In order to meet the ethical recommendations prescribed by the American Psychological Association (2002), the participants were therefore explicitly warned, both in the recruiting announcement and verbally in the laboratory, of the potentially strong negative content of some stimuli in the study. Participants were also told that they could withdraw from the study at any time without penalty. Afterward, they were fully debriefed and informed how they could later obtain a copy of the final report.

Participants

The preset goal was to recruit a minimum of 50 participants. In effect, 51 participants were recruited from announcements on notice boards at the university, by an appeal for volunteers to a first-year psychology class, and via personal contacts. Most of the participants belonged to the student population. One participant withdrew from the experimental session prematurely due to the unpleasant content of some of the pictures

used. Data from this participant were not used in the analysis. Thus, the preset goal was exactly met and data were obtained from 50 participants (27 women and 23 men, aged 19–63 years).

Instruments

Questionnaires. The main questionnaire used was Thalbourne's *Transliminality Scale: Form B* (Houran, Thalbourne, & Lange, 2003). The Transliminality Scale has been presented in several forms and versions (see e.g., Houran et al., 2003; Lange et al., 2000; Thalbourne, 2004). The latest form, the *Revised Transliminality Scale* (RTS) was used, which consists of all 29 items rated "true" or "false." Only 17 items are actually scored, the rest being filler items. The RTS has a documented test-retest reliability of .82 (Houran et al., 2003). Examples of scored items are, "At the present time, I am very good at make-believe and imagining" and "I think I really know what some people mean when they talk about mystical experiences."

Two additional questions related to *emotional reactivity* were derived from Bem (2003). The two questions were: "In general, how intense are your emotional reactions to movies, videos, or photographs that are violent, scary, or gruesome?" and "In general, to what degree are you aware of, attuned to, or in touch with your emotional reactions to images that are violent, scary, or gruesome?"

Responses could range from 1 (*not at all intensely aware*) to 5 (*very intensely aware*). As instructed by Bem (2003), anybody who scored above the midpoint (i.e., 4 or 5) on both scales was defined as "emotionally reactive"; all others were defined as "emotionally nonreactive." Besides this dichotomous grouping, a mean score on the emotional reactivity items (i.e., 1–5) was used for the correlational analysis.

A further two questions were added that related to ESP: "Do you believe that ESP exists?" and "Have you had any experiences that you believe were ESP?" These items were also measured on a five-point scale, ranging from *definitely no* to *definitely yes*. We label the scores on these questions as *apparent ESP-proneness*. The full questionnaire was translated into Swedish and the translation was checked by backward translation into English by a native speaker.

Pictures. Both the picture set provided with the original PH Program and the pictures used in Study 2 were selected from the International Affective Picture System (IAPS; Lang & Greenwald, 1993). The IAPS database contains 820 digitized photographs, rated for valency and arousal on scales from 1 (negative/low) to 9 (positive/high). Twenty-four pictures were selected for Study 2 after excluding the pictures already used in the PH condition. One set of 12 pictures constituted the extremely negative stimuli and consisted of those pictures from the IAPS with the lowest average valency scores ($M = 1.7$, $SD = 0.1$). These pictures typically depicted such material as explicit physical injuries and mutilated bodies. Another set

of 12 pictures made up the neutral stimuli and consisted of those pictures with valency scores closest to 5 (the mid-point of the scale; $M = 5.0$, $SD = 0.0$). These pictures typically depicted everyday objects such as a lampshade or a fan. To balance out possible differences in perceived valency among the selected pictures, the 12 neutral pictures and the 12 negative pictures were divided into two sets of six neutral and six negative pictures. One of the two picture sets was then randomly assigned to be subliminally exposed to every participant.

Computer equipment and software. Two equivalent desktop computer sets were used in the study. The systems met the technical specifications stated in the instruction manual for the original precognitive habituation studies by Bem (2003).

For both monitors, the screen refresh frequency was 60 Hz. This meant that visual stimuli could be theoretically exposed for, at a minimum, 16.7 ms (i.e., 1/60 s, or the exposure time of one screen refresh frame). The exposure time was minimized by using the techniques of forward and backward masking with plain visual stimuli (in this case colored patterns). These masking stimuli were displayed immediately before and after the exposure of a picture, ensuring that no image from the intended stimulus remained on the retina for longer than 16.7 ms. Although this exposure time enables most participants to occasionally identify the pictures, experience from previous studies has shown that participants are in fact most often wrong when asked what they have seen. Moreover, practical experience suggested that this exposure was sufficiently short to produce a subliminal effect (Bem, 2003; Robert Morris, personal communication, April 14, 2004).²

In *Study 1*, the affective precognitive inhibition study, the original precognitive inhibition program software was used. The program options were set on the experimenter's opening screen (which was not displayed to the participant), to exclude erotic pictures and to provide the "cool down period": an initial 5-min relaxation period during which the program displayed a starry sky on the screen and played the sound of ocean waves from an audio file.

In *Study 2*, the subliminal affective habituation study, the software used was Inquisit version 2.0 (a Windows-based program for producing rapid picture presentation on the computer screen). The accuracy of the exposure times using this software has been validated in independent studies using a photocell and the computer program FASTLOG to measure the actual exposure times Inquisit can produce.³ The experiment was programmed in the Inquisit command language by the second author and presented to the participants in Swedish.

² Other studies of subliminal perception, according to a recent Swedish dissertation on the subject, have used exposure times of up to 100 ms using this technique (Birgegård, 2004).

³ For the specific report, see <http://users.ugent.be/~adeclerc/inquisit/>. Further details and technical specifications about the software can be found on the manufacturer's web page, www.millisecond.com.

Procedure

The initial questionnaire was sent out by email, to be completed by the participants before the study, either at home or as soon as they arrived at the laboratory.

The experimental sessions with individual testing were carried out during a 2-week period at the Department of Psychology at Gothenburg University. Instructions were provided in English in the computer program designed by Bem. In addition, participants were briefly introduced to the program in Swedish and instructed to always follow their “gut feelings” when making any choices concerning the presented stimuli. Beyond these points, the experimenter (in all cases the second author) was present only to start the second computer program, and returned only after the participant had completed the precognitive affective inhibition program. All the other instructions were given via the computer.

The experimental session began with a 5-min relaxation period prior to Study 1, the affective precognitive habituation study. Following the relaxation period, the participant marked the preference for one of two pictures displayed next to each other on the screen by clicking on it with the mouse. The pairs of pictures depicted were either negatively valenced or else neutral in content, as previously described. Immediately following the participant's choice, one of the pictures was randomly selected by the program and then repeatedly exposed subliminally: in total 12 times. For each 16.7 ms exposure, the selected picture was displayed randomly on either the left side or the right side of the screen. After these repeated exposures, two new pictures were presented, with the procedure being repeated for a total of 48 trials. The program took 15–20 min to complete. (This included short pauses for eye resting periods made after 1/3 and 2/3 of the trials.)

Following the display of the closing message in Study 1, the experimenter started the second program and briefly introduced its task. At this point, participants were also asked if they had experienced any technical difficulties; no one reported any.

Study 2, the subliminal affective habituation study, followed directly from Study 1 and contained two phases. First, participants were given six repeated subliminal exposures to the 12 pictures from one of the two picture sets. This occurred while they consciously focused on carrying out a simple categorization task by pressing the “A” key if a dark grey square appeared on screen or the “L” key if a light yellow square appeared. The participant was thereby advised to keep a left-hand finger on the “A” key and a right-hand finger on the “L” key. The subliminal exposures occurred before every colored square was displayed by first flashing a masking stimulus for nine screen-refresh frames (0.15 s), then a picture (neutral or negative) from the selected set for one frame (16.7 ms), followed by another masking stimulus for one frame (16.7 ms). The colored square was thereafter displayed until the participant responded

by pressing either the “A” key or the “L” key. Every picture in the set was exposed six times in random order, for a total of 72 trials. Next, participants were required to judge the valency of the whole set of 24 pictures, presented one at a time in random order, by clicking with the mouse on a 21-point scale ranging from -10 (extremely negative) to +10 (extremely positive). These pictures consisted of the set of six neutral pictures and six negative pictures that had been previously exposed, as well as the other set of six neutral and six negative pictures that had not been exposed. The whole program took 5–6 min to complete.

After the completion of both programs, participants were debriefed about the hypotheses of the experiment. An awareness check was also administered by asking the participants if they had been able to identify the pictures that flashed by. Most participants said that occurred at least occasionally; however, they were not confident what had been displayed or why. The participants were subsequently thanked and dismissed, and they were asked not to share the information with other potential participants.

Statistical Analyses

To reduce any ambiguity and to keep to the replication requirements, the planned statistical analyses for the affective inhibition study used the same methods that Bem (2003) had used, namely one-sample *t* tests of obtained hit rates against the chance hit rate of 50% and independent samples *t* tests to compare the results between emotionally reactive and nonreactive participants. Additionally, standard Pearson correlations were computed between hit rates and the selected personality measures.

In Study 2, the data were analyzed by a repeated measures analysis of variance (ANOVA), where the calculated means for the valency judgments of the pictures (previously exposed and not previously exposed) constituted the within-participants variables, and the picture set selected (Set 1 vs. Set 2) constituted the between-participants factor. This was done with the judgments of negative pictures and neutral pictures, respectively, as the dependent variable.

A further analysis used a difference score, calculated for both types of pictures with regard to the difference in the valency judgment scores between the results with the previously exposed (used) set of subliminal pictures and the new set of pictures. These *difference scores* were also analyzed in relation to the selected personality measures.

RESULTS

We present the results in the actual order in which the studies were carried out (rather than the hypothesis order). The alpha level was preset to 95% ($p = .05$) and all tests were two-tailed.

Study 1

The overall hit rate on negative pictures was 51.0%, $t(49) = 0.51$, $p = .61$, and on neutral pictures, 50.3%, $t(49) = 0.17$, $p = 0.87$. These are very slight differences from the chance hit rate of 50% and failed to provide support for the affective precognitive habituation hypothesis.

Emotionally reactive participants ($n = 20$) achieved a slightly higher hit rate on negative pictures, 52.9%, compared to 49.7% for emotionally unreactive participants ($n = 30$), but the difference is not significant, $t(48) = -0.80$, $p = .43$. Moreover, emotionally reactive participants alone did not score significantly better than chance, $t(19) = 1.16$, $p = .26$. For the neutral picture trials, this difference became slightly less: Emotionally reactive participants obtained 50.8% neutral hits, compared to 50.0% for emotionally unreactive participants. The ESP prone participants ($n = 14$) obtained a hit rate on negative picture trials of 53.0%, compared to 50.2% for ESP nonprone participants ($n = 36$). On neutral picture trials, the hit rates for ESP prone and ESP nonprone participants were 50.6% and 50.2%, respectively.

There was an absence of a significant correlation between the transliminality scores and the hit rates on negative trials, $r = .03$, $df 49$, $p = .87$.

Study 2

There was a significant main effect of the previous exposure on the scores on negative pictures as the dependent variable, $F(1, 48) = 8.20$, $p < .01$. This effect was in the predicted direction, in that the previously exposed pictures were judged as less negative ($M = -7.08$, $SD = 1.63$) than pictures that had not been previously exposed ($M = -7.68$, $SD = 1.67$).

Using the scores on neutral pictures as the dependent variable, the effect was nonsignificant. Although neutral pictures that were not previously exposed were judged as slightly more positive ($M = 1.80$, $SD = 1.77$) than pictures that were previously exposed ($M = 1.62$, $SD = 1.85$), the difference was not significant. The results are summarized in Table 1.

TABLE 1
EVALUATION OF MEANS (STANDARD DEVIATIONS) FOR NEUTRAL AND EXTREME
NEGATIVE PICTURES AS A FUNCTION OF PREVIOUS SUBLIMINAL EXPOSURE

	Exposed	Not exposed
Neutral pictures	1.62 (1.85)	1.80 (1.77)
Negative pictures	-7.08 (1.63)	-7.68 (1.67)

Note. -10 = extremely negative, 10 = extremely positive.

The Relation of the Psi Scores to Emotional Reactivity

For trials with negatively loaded pictures, the correlation between mean scores on emotional reactivity and difference scores between the exposed and unexposed negative pictures just reached significance, $r(49) = .28$, $p = .05$. For trials with neutral pictures, the correlation between transliminality and the difference scores between exposed and unexposed pictures was nonsignificant.

The Relation of Psi Scores to Transliminality

For trials with negatively loaded pictures, there was a nearly significant positive correlation between transliminality and the difference between pictures previously exposed and not previously exposed, $r(49) = .27$, $p = .06$. For trials with neutral pictures, the correlations between transliminality and the difference scores between exposed and nonexposed pictures, were both nonsignificant. There was also a small but significant correlation between transliminality and emotional reactivity, $r(49) = .31$, $p = .03$.

Post Hoc Analyses

In reviewing the preliminary findings, a colleague, Dick Bierman, commented that it would have been preferable for the two studies to have been carried out in the reverse order. This design would then have enabled us to select out the individuals who showed a sensitivity to affective habituation for the study of precognitive affective habituation. If precognitive habituation is a special case of subliminal affective habituation, then it would be most easily detected in specially selected individuals. Such selected individuals would then be expected to obtain higher scores on the subliminally exposed negatively loaded pictures, which they were previously exposed to, than on the previously unexposed ones. Accordingly, we selected out the 34 individuals who showed the affective habituation effect and compared their hit-rate scores on the precognitive habituation target pictures with the remaining 16 individuals who did fulfil the selection criterion. The average hit rate for the 34 affectively habituated individuals was 54.2%, whereas for the 16 nonhabituated individuals it was 44.3%. A t test of this difference was significant, $t(48) = -2.50$, $p = .016$, two-tailed.

In order to examine our third hypothesis, that concerning the influence of emotional reactivity and transliminality on scoring, a multiple regression was performed on the full data using transliminality, habituation, and emotionality as predictor variables for the dependent variable of the scores on negatively loaded targets. In practice, the usefulness of this analysis was limited by the fact that subliminal affective habituation is a dichotomous variable (either it occurred for participants in Study 2 or it

did not), and emotionality scores were based on just two questions. The model that emerged reached marginal significance, $F(3, 46) = 2.44$, $p = .077$. Only one variable, habituation, gave a significant positive loading for its beta coefficient $t(49) = 2.38$, $p = .021$.

DISCUSSION

The major finding that subliminal affective inhibition occurs, and that it occurs with emotionally loaded pictures having a negative valency (rather than neutral content), confirms what many hunters know: You approach an animal slowly and in successive stages so that even if it does not appear outwardly to see you, you give it time to get used to the impending threat. In humans, we may feel a bodily uneasiness due to the continued presence of threat, but if no attack ensues, we can eventually become used to it without reflecting further on it.

Although the post hoc findings can be seen as supporting Bem's work, it is of course unfortunate that the order of the study confounded the clarity of the conclusion here. Had we not been concerned with the importance of maintaining the novelty of the pictures for the affective habituation study, this study would have been run afterward, thereby allowing us to select the participants with an emotional responsiveness to subliminal affective habituation. Indeed Bem's overall significant results indicate that it was only the emotionally reactive individuals who achieved a psi effect on the negatively loaded targets. Bem (2003) writes, "These results also imply researchers seeking to replicate the precognitive habituation effect can save time and effort by screening out nonreactive individuals ahead of time" (p. 11).

Although the effect of emotional reactivity failed itself to reach significance, it did correlate significantly with the scores predicting thereby whether the individual showed affective habituation or not. It should be mentioned that in one sense, the results here and in Bem's work are counterintuitive; it might easily be expected that emotionally sensitive individuals would be less likely to habituate, but it may instead be the case that it is an overreactivity that habituates.

Emotional reactivity to the target pictures was a rather crude measure based on a self-reported response to two questions: one concerning the intensity of the emotional reactions and one concerning how much attention is given to these reactions. Emotional reactivity may be closely related to the broader concept of *affect intensity*, on which there has been considerable work (see Larsen, 2009, for a review). Affect intensity concerns the degree to which the individual shows general and personal reactions to emotional stimuli and seems to be a variable with good reliability and construct validity. Daily moods, measured by experiential sampling methods, correlate well with the results from a questionnaire, the *Affect Intensity Measure*, and it is possible that such scores would provide a more

precise way of selecting participants. Ethical considerations would naturally demand a careful selection of pictures to eliminate the more gruesome pictures in the IAPS.

The present results indicate that we need to pay closer attention to individual differences in studying unconscious reactions to stimuli. The use of measures of emotional reactions and affect intensity show promise in this respect. In view of this fact, we consider our results to justify some attention to these variables and encourage further work in this regard.

How do these findings relate to the bigger picture? We began with a discussion of the limits of cognitive-emotive consciousness. There is a body of evidence (reviewed in Parker, 2003) suggesting that paranormal experiences relate to unconscious processes that generally gain their expression as a form of intuition, or in the content of spontaneous altered states of consciousness. Various attempts have been made to relate these experiences to subliminal perception, fantasy proneness, and dissociation (see, e.g., Irwin, 1990, 1994) and the development of the Transliminality Scale is an attempt to find a common ground. Interestingly, the variable ESP-proneness did appear in our post hoc analysis to interact with affective habituation as a predictor of a precognitive effect.

More than a hundred years has passed since William James wrote, "The subliminal region being thus established as an actuality, the next question is as to its farther limits, where it exists. My subliminal, for instance, has my ordinary consciousness for one of its environments, but has it additional environments on the remote side?" (James, 1903, p. 24). It has taken a century, but we now have the means, methods, and perhaps the motivation to answer James's question.

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ABSTRACTS IN OTHER LANGUAGES

French

EST-CE QUE CERTAINS D'ENTRE NOUS S'HABITUENT
A DE FUTURS EVENEMENTS EMOTIONNELS ?

RESUME : Selon une perspective évolutionniste, il pourrait être avantageux non seulement de réagir inconsciemment à des stimuli menaçants émotionnels mais aussi de s'habituer à eux s'ils se révèlent être inoffensifs. Un des principaux buts de l'étude suivante est de tester l'occurrence de l'habituation affective précognitive à un niveau subliminal en utilisant des images émotionnellement chargées. Le dispositif choisi ici nous a permis d'évaluer si les participants s'habituèrent aux images émotionnellement chargées et de voir s'ils réagissaient sélectivement seulement à ces images cibles dont la présentation serait répétée plus tard, ce qui les rendrait potentiellement moins menaçante. Il fut ensuite fait l'hypothèse que tant les effets subliminaux et précognitifs seraient reliés aux mesures individuelles de la réactivité émotionnelle et de la transliminalité. Cinquante participants prirent part à deux procédures informatisées successives afin d'évaluer respectivement ces deux aspects. Un effet significatif d'habituation fut trouvé pour les cibles chargées négativement. L'ensemble des résultats ne parvint pas à montrer une discrimination significative entre les images qui seraient re-présentées et celles qui ne le seraient pas. Toutefois, en sélectionnant en post hoc 34 des individus qui montraient une habituation affective, un effet significatif d'habituation précognitive fut découvert.

Spanish

¿ALGUNOS DE NOSOTROS NOS HABITUAMOS
A EVENTOS EMOCIONALES FUTUROS?

RESUMEN: Desde una perspectiva evolucionista, podría ser ventajoso reaccionar, no solo inconscientemente a estímulos emocionales amenazantes, si no que también, habituarse a estos estímulos, si ellos prueban que son no dañinos. Un propósito mayor del estudio fue poner a prueba la habituación afectiva precognitiva, a un nivel subliminal, usando fotos cargadas de contenido emocional. El diseño elegido nos permitió evaluar si los participantes se habituaron o no a las fotos con carga emocional e identificar si ellos reaccionaron selectivamente solo con aquellas fotos

objetivo, que posteriormente iban a ser repetidamente expuestas, lo que las haría potencialmente menos amenazantes. Fue posteriormente hipotetizado que los efectos subliminales y precognitivos se relacionarían con mediciones individuales de reactividad emocional y transliminaridad. Cincuenta participantes tomaron parte en dos procedimientos desarrollados computacionalmente, en orden de evaluar respectivamente estos aspectos. Un efecto de habituación significativa fue encontrado para las fotos objetivo cargadas emocionalmente con contenidos negativos. Una mirada general de los hallazgos falla en mostrar una capacidad de discriminación significativa, entre aquellas fotos que podrían ser re-presentadas y aquellas que no. Sin embargo, al seleccionar dentro del grupo de los 34 individuos que mostraron habituación afectiva, un efecto post hoc significativo de habituación precognitiva fue encontrado.

German

GEWÖHNEN SICH MANCHE VON UNS AN ZUKÜNFTIGE EMOTIONALE EREIGNISSE?

ZUSAMMENFASSUNG: Aus evolutionärer Perspektive könnte es von Vorteil sein, nicht nur unbewußt auf emotional bedrohliche Reize zu reagieren, sondern sich auch daran zu gewöhnen, sollten sie sich als harmlos herausstellen. Ein Hauptziel der Studie bestand darin, das Vorliegen einer solchen präkognitiven affektiven Habituation auf subliminaler Ebene unter Verwendung emotional aufgeladener Reize zu überprüfen. Die dafür gewählte Versuchsplanung hat zum Ziel, herauszufinden, ob sich die Versuchsteilnehmer an emotionale Bilder gewöhnen (oder auch nicht), und um festzustellen, ob sie selektiv gerade auf solche Zielbilder reagierten, die ihnen später mehrfach gezeigt und dadurch möglicherweise weniger bedrohlich wirken würden. Es wurde weiterhin angenommen, dass sich sowohl die subliminalen wie die präkognitiven Effekte auf individuell unterschiedliche Maße von emotionaler Reaktivität und Transliminalität beziehen würden. Fünfzig Teilnehmer nahmen an zwei aufeinanderfolgenden computergesteuerten Versuchen teil, um diese Aspekte in dieser Abfolge zu überprüfen. Ein signifikanter Habituationseffekt zeigte sich bei den negativ geladenen Zielbildern. Bei der Gesamtauswertung ergab sich kein signifikanter Unterschied zwischen denjenigen Bildern, die wiederholt präsentiert wurden, und solchen, bei denen dies nicht der Fall war. Bei getrennter Auswertung derjenigen 34 Personen, die die affektive Habituation zeigten, konnte post hoc ein signifikanter Effekt der präkognitiven Habituation nachgewiesen werden.