Accepted Manuscript

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PII: S0005-7967(17)30063-3

DOI: 10.1016/j.brat.2017.03.013

Reference: BRT 3115

To appear in: *Behaviour Research and Therapy*

Received Date: 23 June 2016

Revised Date: 21 March 2017

Accepted Date: 27 March 2017

Please cite this article as: Dethier, V., Philippot, P., Attentional focus during exposure in spider phobia: The effect of valence and schematicity of a partial distractor, *Behaviour Research and Therapy* (2017), doi: 10.1016/j.brat.2017.03.013.

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Attentional focus during exposure in spider phobia: The effect of valence and schematicity of a partial distractor

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The manuscript is 30 pages long and includes 2 tables, 4 figures and supplementary online data.

Abbreviations: BAT = Behavioural Avoidance Task; CS = conditioned stimulus; FSQ = Fear of Spiders Questionnaire; HR = heart rate; nSch– = non-schematic negative condition; nSch+ = non-schematic positive condition; Sch– = schematic negative condition; SC = skin conductance; SCRs = skin conductance responses; SES = Self-Efficacy Scale; STAI-T = State-Trait Anxiety Inventory; SUD = subjective units of distress; US = unconditioned stimulus; VVIQ = Visual Vividness Imagery Questionnaire.

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Abstract

This study examines the impact of partial distractor valence and schematicity (i.e., their relation to fear representation) on exposure efficacy. One hundred forty-one spider phobics were exposed to spider pictures and asked, in a between-subjects experimental design, to form mental images of words that were fear related (to spiders) and negative (schematic negative), fear unrelated and negative (non-schematic negative) or fear unrelated and positive (non-schematic positive). Multilevel measures of anxiety were performed at pre-exposure, post-exposure and 6 days' follow-up. Results show that both of the negative condition groups displayed similar results on all outcome variables and systematically differed from the positive condition group. While the latter group displayed a stronger decline in distress during exposure itself, the other groups showed greater exposure benefits: a stronger decline in emotional and avoidance responses and skin conductance responses from pre- to post-exposure and more approach behaviours when confronted with a real spider. The critical feature of distraction thus seems not to be the fact of being distracted from the phobic stimulus, but rather the fact of performing emotional avoidance by distracting oneself from negative affect. The results highlight that the acceptance of aversive emotional states is a critical active process in successful exposure.

Keywords: Distraction; Attentional Focus; Exposure Therapy; Spider Phobia; Schematicity; Valence

Introduction

Exposure therapy consists of repeated confrontation with a feared stimulus. Despite the well-recognized and demonstrated efficacy of this therapy in the treatment of anxiety disorders (Barlow, 2002; Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008), uncertainty still abounds regarding the optimization of its clinical implementation. More particularly, the role of attentional focus during exposure remains unsettled, the beneficial effect of partial distraction being under debate (Podină, Koster, Philippot, Dethier, & David, 2013). Indeed, previous studies investigating this question have yielded contradictory results: Some favour partial distraction (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999), some are against distraction (Grayson, Foa, & Steketee, 1982; Haw & Dickerson, 1998; Kamphuis & Telch, 2000; Mohlman & Zinbarg, 2000; Raes, De Raedt, Verschuere, & De Houwer, 2009) and others show no evidence of any significant impact of distraction (Antony, McCabe, Leeuw, Sano, & Swinson, 2001; Rose & Dudley McGlynn, 1997; Telch et al., 2004). These inconsistent results might be related to the current lack of precise conceptualization of distraction during exposure and of its underlying processes. It is thus crucial to examine which dimensions of distraction are posed as determinant by theoretical models and what their predictions are regarding exposure efficacy.

According to the emotional processing theory (Foa & Kozak, 1986), emotional processing, considered as a central mechanism for exposure efficacy, requires attention to be focused on threat elements during exposure. More particularly, it requires the activation of the fear schema, i.e., a memory network that includes information about (a) stimuli defining a feared situation, (b) responses in that situation and (c) the meaning of these stimuli. The fear schema is aroused by the activation of some of its elements, this activation then spreading towards other elements of the schema. In regard to distraction, emotional processing theory states that paying attention to elements that are not part of the fear schema regardless of their

valence impedes emotional processing and, consequently, reduces exposure efficacy. Attention should be focused only on information related to the fear schema. The emotional processing theory is thus clearly against distraction during exposure. In the same vein, the inhibitory learning approach (Craske et al., 2008; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014) considers distraction to be detrimental to exposure. This approach states that successful exposure is not the result of the removal of the original association between the conditioned stimulus (CS) and the unconditioned stimulus (US). Rather, it is best explained by inhibitory learning (Bouton, 1993), that is, the creation of a secondary association that competes with the original association (the CS no longer predicts the US). By reducing the awareness of the relationship between the CS and the absence of US, distraction may hinder expectancy violation and therefore inhibitory learning.

An alternative account of exposure is based on the concept of self-efficacy (Bandura, 1988) or perceived control (Mineka & Thomas, 1999). The aim of exposure is to enhance the belief of phobics in their ability to overcome aversive situations. Learning an effective coping response would thus enhance exposure efficacy. From this perspective, distress during exposure should be maintained at a sustainable level—an aim that partial distraction helps to reach. Distraction during exposure, with neutral or positive material, would reduce distress, allowing participants to sustain the phobogenic situation and consequently to restore their sense of self-efficacy (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999). McNally (2007) suggested that the effect of distraction may vary as a function of the current level of fear. Distraction would be more beneficial if fear is above an optimal level, that is, by reducing fear to an intensity that the individual can tolerate and/or regulate. Those views are congruent with another claim that presenting the feared object simultaneously with positive stimuli may yield an affective valence change for the feared object (De Jong, Vorage, & Van Den Hout, 2000).

At least two important dimensions of potential distractors emerge from these models: schematicity and valence. Schematicity refers to the extent to which a stimulus is related to the fear schema. For example, for a spider phobic, the word “bite” is strongly related to the fear schema (“schematic element”), whereas the word “bill” is relatively unrelated to the fear schema (“non-schematic element”). Regarding valence, in the emotion appraisal theory (Scherer (2001), valence appraisal refers to the evaluation of whether a stimulus is likely to result in pleasure or pain. This evaluation leads to distinct emotions and action tendencies: approach when the stimuli is judged as positive and avoidance when the stimulus is judged as repulsive.

The importance of schematicity is supported by preliminary evidence. Dethier, Bruneau, and Philippot (2015) directly manipulated the schematicity of the concepts activated during exposure. Spider phobics were exposed to pictures of spiders and concurrently asked to form mental images of concepts associated or not with the fear schema (schematic and non-schematic elements, respectively). The results demonstrated that the activation of non-schematic concepts during exposure leads to a return of distress at follow-up, whereas the activation of schematic concepts during exposure leads to a decrease of emotional and avoidance responses at follow-up.

One limit of this study and of the other studies on distraction, however, is that valence was not controlled for. In Dethier et al.’s (2015) study, the words used in both sets (schematic vs. non-schematic) might have differed in terms of pleasantness. Schematic words such as “bite”, “fear” or “spider” lead to a more negative judgment than do non-schematic words such as “candle”, “pen” or “interest” and therefore induce different emotions and subsequent action tendencies (approach vs. avoidance) during exposure. In previous studies, distraction has been operationalized with considerable variations in regard to valence. In some studies, distraction was positive, i.e., playing games with the therapist (Grayson et al., 1982; Schmid-Leuz,

Elsesser, Lohrmann, Jöhren, & Sartory, 2007) or listening to audio excerpts chosen for their intrinsic interest value (Craske, Street, Jayaraman, & Barlow, 1991). In a study by Rodriguez and Craske (1995), distraction involved both positive and negative slides projected on the wall in the high distraction condition and neutral slides in the low distraction condition. Telch et al. (2004) used neutral words and images. In other studies, the valence was not determined: the presentation of a printed word next to the picture (Haw & Dickerson, 1998) and listening to an audiotape about leadership and goal setting (Rose & Dudley McGlynn, 1997). Finally, in some studies, distraction was considered neutral but could potentially be positive: conversations about future plans, studies and leisure activities (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999). Therefore, we cannot exclude the possibility that mood induction was part of the effects attributed to distraction. To our knowledge, no study has directly manipulated the valence of the distractor by comparing negative and positive distraction during exposure.

Beyond the schematicity and valence of the distractors, an important caveat is the control of participants' attentional focus during exposure. Indeed, most studies used partial distraction (i.e., divided attention between the phobic object and the distractor), but none controlled attention allocation towards the phobic object, assuming that it would automatically capture attention. This consideration is particularly important because the affective priming effect depends upon the explicit evaluation required by a task (Spruyt, De Houwer, & Hermans, 2009). In conclusion, studies investigating partial distraction during exposure should check whether explicitly identifying the phobic stimulus matters or not.

In view of these unexplored issues, in the present study, we examined the respective impact of partial distractor valence and schematicity on exposure efficacy while controlling for explicit processing of the phobic stimuli. Two sessions of exposure were given to spider phobics 6 days apart. During exposure, the nature of the partial distractor was manipulated in

terms of schematicity and valence. There were three conditions: schematic negative (Sch−), non-schematic negative (nSch−) and non-schematic positive (nSch+). In order to check whether it matters that phobic stimuli are processed explicitly, we also manipulated the explicit versus implicit nature of the processing: Some participants performed the task while explicitly identifying the phobic stimuli (i.e., pressing a key only when a spider picture is presented) and others without explicitly identifying the phobic stimuli (i.e., pressing a key at each stimulus presentation). No differences between these types of processing in their effect on exposure were expected if phobic stimuli are automatically processed. Multimodal measures of exposure were recorded at pre- and post-exposure. We hypothesized that, if schematicity is the determining factor, the Sch− group would differ from both the nSch− and the nSch+ group in terms of efficacy. Conversely, if valence is the most relevant factor, both the Sch− and the nSch− group would differ from the nSch+ group in terms of efficacy.

Method

Participants

Participants were recruited through announcements on posters, in electronic mail, in a popular magazine and on social networks. The volunteers who scored over 4 (out of 7) on the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) were invited to participate in the study. Three participants who expressed subjective distress (see the Measures section) lower than 20 (out of 100) when looking at pictures of spiders were excluded from the study. All participants (n = 141) complied with the A, B, C, D, F and G specific phobia criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000), as ascertained by the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (First, Spitzer, Gibbon, & Williams, 2002). The diagnosis was performed by trained master students in clinical

psychology who were supervised by a licensed psychotherapist. The sample consisted of 129 women and 12 men, their age ranging between 18 and 62 years (M = 25.28, SD = 9.34). None of the participants were medicated with psychotropic drugs. All participants gave their informed written consent before starting the survey. A transportation cost compensation of 20 euros was offered to participants who had to travel to the laboratory. The study protocol was approved by the ethical committee of the Psychology Department of the Université catholique de Louvain.

Measures

Control measures

The trait version of the State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; French adaptation: Bruchon-Schweitzer & Paulhan, 1993) is a 20-item self-reported measure of anxiety proneness. Cronbach's alpha (α) in the current sample was .90.

The Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973; French validation: D'Argembeau & Van der Linden, 2006) is a 16-item scale that comprises situations (e.g., a relative's face, a common place) that the participant is asked to visualize and to rate for vividness (α = .82).

Outcome measures

Subjective units of distress (SUD)

The Subjective Units of Distress Scale (Wolpe, 1968) measures the peak level of distress. This measure was taken both during exposure and when participants viewed spider pictures from the assessment set and neutral pictures (see the Materials section) on a scale from 0 (no distress) to 100 (extreme distress).

Physiological measures

Physiological measures were recorded in response to the assessment set of spider pictures and neutral pictures (see Materials section). Skin conductance (SC) and heart rate (HR) were measured via the Active Two System (Biosemi, Amsterdam, Netherlands) and digitized by the software ActiView at a rate of 1024 Hz. For SC, two passive 8-mm Ag/AgCl electrodes were attached to the forefinger and middle finger of the non-dominant hand with double-sided adhesive disks (13 × 5mm) and an electrolyte paste specifically formulated with 0.5% saline in a neutral base (TD-246, MedCat supplies, Netherlands). HR was measured by a digital photoplethysmograph sensor (MLT1020, ADI Instruments) placed on the thumb of the non-dominant hand. In order to reduce noise, we explicitly asked participants not to move during measurement.

Self-reported measures

The FSQ (French validation: Delroisse & Philippot, 2007) comprises 18 items (7-point Likert-type scale) and measures the severity of spider phobia symptoms on two factors: emotional and avoidance responses (α = .86, e.g., “If I saw a spider right now, I would feel very panicky”), and anxious anticipation of spiders (α = .72, e.g., “Currently, I am sometimes on the lookout for spiders). The “emotional and avoidance responses” factor has been shown to be sensitive to change within a single exposure session, in contrast with the “anxious anticipation of spiders” factor (Dethier et al., 2015).

A Self-Efficacy Scale (SES) was created following the recommendations of Bandura (2006). It consists of items depicting steps of the Behavioural Avoidance Task (BAT), for which participants report their confidence in their capacity to perform it on a scale from 0 (cannot do at all) to 100 (highly certain can do) (α = .95).

Behavioural measure

The BAT measured the number of steps that participants could achieve when confronted with a live spider. It consisted of a 22-step hierarchic exposure adapted from Merluzzi, Taylor, Boltwood, and Gotestam (1991), from looking and touching a picture of a spider to standing 3 m from a spider enclosed in a container to letting the spider walk on one's forearm. The participants were asked to perform each of the steps and could stop whenever they decided. No verbal encouragement was given during the BAT in order to avoid any interaction effect with the experimenter.

Materials

Pictures were selected from the Geneva Affective Picture Database (Dan-Glauser & Scherer, 2011). Sixty pictures inducing high arousal were used for exposure (exposure set). Twelve neutral pictures of common objects (e.g., bike, computer, chair, lamp, pen) were also included in the exposure set. Six neutral pictures were used to assess the SUD and physiological variables in a resting state. Four sets of six spider pictures with similar mean arousal scores, $F(3,20) = .034$, $p = .991$, were used to assess the SUD and the physiological variables (assessment sets). A live spider was used for the BAT. This spider was 4 cm long (Agelenidae).

Three sets of 24 words were used during exposure: schematic negative words (e.g., spider, cobweb, fear), non-schematic negative words (e.g., error, bill, pollution) and non-schematic positive words (e.g., interest, sympathetic, cute). Schematic words were taken from words associated with fear of spiders generated by psychotherapists experienced in arachnophobia (Dethier et al., 2015). The three sets of words were evaluated in pre-tests, with spider phobic participants scoring higher than 4 on the FSQ. Schematicity was operationalized as the degree to which a word evokes thoughts or images about spiders or the fear of spiders

and was evaluated on a 7-point scale by a sample of 23 spider phobic participants not included in the main sample. Schematic negative words were significantly more schematic than both non-schematic negative words, $t(46) = 27.191$, $p < .001$, and non-schematic positive words, $t(46) = 25.857$, $p < .001$. No difference was shown between non-schematic negative and non-schematic positive words, $t(46) = .943$, $p = .351$. Imageability was measured with the same procedure as used by Desrochers and Thompson (2009) in the same sample. The three sets of words were similar in terms of imageability, $F(2,69) = .131$, $p = .878$. Valence was evaluated on a scale from -4 to +4 by another sample of 35 spider phobic participants who scored higher than 4 on the FSQ. Non-schematic positive words were significantly more positive than both schematic negative words, $t(46) = 9.934$, $p < .001$, and non-schematic negative words, $t(46) = 10.031$, $p < .001$. No difference in terms of valence was shown between schematic negative words and non-schematic negative words, $t(46) = 1.367$, $p = .178$. The three sets of words were similar in frequency on the basis of the lexical database of New, Pallier, Brysbaert, and Ferrand (2004), $F(2,69) = 1.271$, $p = .320$.

General Procedure

The study included two sessions. In the first session, participants performed measures during, before and after five trials of exposure with spider pictures from the exposure set. The second session tested a potential distress return as well as the efficacy of the treatment at post-reexposure. Two new trials of exposure were provided and measures were performed again. An overview of the procedure is provided in Figure 1. This study has a 2 (stimuli identification (between subjects)) × 3 (word set (between subjects)) × 4 (assessment time (within subjects)) design.

---Insert Figure 1 about here ---

At the first session, participants completed the FSQ, the SES, the VVIQ and the STAI-T. SC, HR, and SUD were measured first in response to a set of six neutral pictures and then in response to a set of six spider pictures, each presented for 7 s and separated by a 4-s blank screen (after a resting period of 20 s). These measures were aimed at providing an assessment of subjective and physiological reactivity both at rest and when confronted with spider pictures. Participants then performed five 5-min exposure trials consisting of an exposure to pictures of spiders from the exposure set. The participants performed a dual task during exposure. One task consisted of focusing on pictures that were displayed on the screen at positions varying randomly every 1 to 5 s. The concurrent task was to form a mental image of a word presented every 12.5 s via headphones and to verbally report the intensity of imagery on a scale from 0 (no clear image) to 10 (very clear image). Each spider and neutral picture of the measurement set and each of the 24 words (described in the Materials section) was presented once during each exposure trial. The duration of each picture presentation was pseudo-random, with the constraint that the exposure trial had to last 5 min overall and that three pictures had to be presented for the presentation of one word. No time was left between trials, except the time necessary for the participant to report the SUDs. After that, the next trial was run as soon as the participant was ready.

Participants were randomly allocated to one of the conditions that differed in terms of word valence and schematicity: Sch– (e.g., spider, cobweb, fear), nSch– (e.g., error, bill, pollution) and nSch+ (e.g., interest, sympathetic, cute). Moreover, we manipulated whether participants explicitly processed spider stimuli. Participants were therefore allocated to one of the resulting six groups: (1) schematic negative with explicit stimuli identification (n = 23), (2) schematic negative without explicit stimuli identification (n = 25), (3) non-schematic negative with explicit stimuli identification (n = 25), (4) non-schematic negative without explicit stimuli identification (n = 21), (5) non-schematic negative with explicit stimuli

identification (n = 25), (6) non-schematic negative without explicit stimuli identification (n = 22).

A sixth of the pictures of the exposure set were neutral. Participants in the condition in which explicit identification of spider stimuli was required were asked to respond specifically (by pressing the space bar) at the presentation of a new spider picture, while participants in the condition in which no explicit identification of spider stimuli was required were instructed to press the space bar in response to any new spider or neutral picture. After each exposure trial, the participants were asked to report the peak level of distress (SUD) during exposure.

After the five exposure trials, subjective and physiological reactivity were measured in response to a novel set of six spider pictures. The use of different sets allowed us to test the generalizability of potential distress reduction in response to novel spider stimuli, as well as in the context in which the systematic use of the concurrent task was interrupted. Participants again completed the FSQ and the SES.

At the second session, participants completed all the measures before and after two exposure trials. Exposure trials were included at the second session in order to evaluate the differential effects of the conditions (trained during the first session) on the mediating processes during re-exposure. They also performed the BAT in the same room. The mean number of days between sessions was 6.35 (SD = .98). At the end of the experiment, the participants were fully debriefed about the objective of the study and oriented to a therapist for those who were willing to engage in therapy. Five experimenters conducted this study as a function of their availability, with 23 to 41 participants per experimenter.

Results

Data Preparation

Skin conductance

SC raw data was analysed with Ledalab (Benedek & Kaernbach, 2010) on MATLAB 8.0 (Mathworks, Natick, MA, USA). No filter or smoothing was applied. A continuous decomposition analysis was performed to distinguish phasic and tonic activity. A response window of 1 to 4 s after stimulus onset and a minimum amplitude criterion of .01 µS were used (Boucsein et al., 2012). Skin conductance responses (SCRs) in response to each of the presented pictures were range-corrected by dividing each response of an individual by his or her maximal response (Lykken & Venables, 1971). Range-corrected SCRs were then square root transformed for reducing skewness. Finally, the range-corrected square root transformed SCRs of each measurement set were averaged in order to provide an index of the electrodermal activity for each of the repeated confrontations with spider pictures (pre-exposure, post-exposure, follow-up and post-reexposure).

Heart rate

Pulse peaks were detected by using a peak detection algorithm (based on first derivative; FD1) from Friesen et al. (1990, p. 92) and applied in MATLAB. Signals that were not suitable for peak detection were excluded (3.94% of the data). Signals were visually inspected for false detection and the number of beats per minute was calculated for each measurement set.

Statistics

Statistical analyses were performed with SPSS 21 (IBM, Armonk, NY, USA). Preliminary analyses tested the equivalence between dropouts and finishers, a potential stimuli identification effect, group equivalence and a potential effect of the words used on imagery intensity. The equivalence between dropouts and finishers was tested with chi-squared tests and t-tests on independent samples. The stimuli identification effect was tested

with two-way repeated measures analyses of variance (ANOVAs). The differential effect of condition on imagery intensity was tested separately in each of the sessions with two-way repeated measures ANOVAs.

The main results will be presented along the following structure: (1) Within-session effects (changes that occurred during exposure), (2) Between-sessions effects (changes that occurred from post-exposure to follow-up) and (3) Efficacy at the end of treatment (at post-reexposure). In regard to the literature, the amplitude of within-session effects does not seem to predict overall improvement. Moreover, based on the notion that there is a discordance between fear expressions versus learning, it has been recommended to assess the outcome of exposure independently of the indices of emotional processing in order to avoid tautology (Craske et al., 2008). Within-session effects are therefore not considered in this study as critical indices of outcome but as relevant in order to disentangle the mechanisms implied in successful exposure, namely emotional processing and self-efficacy. The distress intensity changes in response to the regular stimuli used during exposure, to novel sets of pictures (generalizability) and in response to spiders more generally (self-reported questionnaire) are considered as various indices of the activation of the fear structure (cf emotional processing theory). Moreover, potential changes in self-efficacy offer the possibility to test an alternative explanation of the success of exposure therapy. Between session effects aim at testing a potential return of fear after a follow-up period. Efficacy is tested at the end of treatment because we consider this measurement time to be the most relevant index of a successful therapy more especially in terms of behavioural achievement. Within and between sessions effects were tested thanks to two-way repeated measures ANOVAs. In regard to the efficacy at the end of treatment, one-way ANOVAs were performed. The aim for including a nSch– group in the experimental was to test the influence of valence and schematicity. The extent to which the result pattern of this group is closer to one of the other groups should be indicative

of the most determining factor. We hypothesized that, if schematicity is the determining factor, the Sch− group would differ from both the nSch− and the nSch+ group in terms of efficacy. Conversely, if valence is the most relevant factor, both the Sch− and the nSch− group would differ from the nSch+ group in terms of efficacy. Therefore, when the analyses revealed an effect of the experimental conditions, and in order to disentangle the respective influence of valence and schematicity of the partial distractor used during exposure, specific contrasts were tested with the LMATRIX and MMATRIX subcommands in SPSS, as described in Howell and Lacroix (2012). The contrasts tested two models in which the predominance of schematicity and valence varied. The schematicity contrasts tested, on the one hand, whether the non-schematic conditions (positive and negative) displayed similar results and whether the results observed in the non-schematic conditions differed from those of the schematic condition (negative) (Sch– ≠ (nSch– = nSch+)). The valence contrasts tested, on the other hand, whether the negative conditions (schematic and non-schematic) displayed similar results and whether the results observed in the negative conditions differed from those of the positive condition (non-schematic) ((Sch– = nSch–) ≠ nSch+). In the following sections, the terms schematicity contrasts and valence contrasts are used to refer to these statistical tests. No adjustment was applied to the results of these contrasts. The means and standard deviations of each outcome variable are presented in Appendix A (see Supplementary Material).

Preliminary analyses

Dropouts

Ten participants (7.09%) did not complete the second session. There was no significant difference in dropout frequency between conditions, $\chi^2(2) = .218$, $p = .897$ (three in Sch–, three in nSch–, and four in nSch+). Dropouts were compared to finishers on

demographic and outcome variables. Dropouts reported more emotional and avoidance responses (FSQ) at post-exposure, $t(13) = 2.682$, $p = .019$, as well as lower SUD at pre-exposure, $t(139) = 2.257$, $p = .026$, and lower trait anxiety (STAI-T), $t(16) = 4.086$, $p < .001$. They also reported more self-efficacy at pre-exposure, $t(139) = 2.189$, $p = .030$, but not at post-exposure, $t(139) = -.191$, $p = .849$. A repeated measure ANOVA showed a significant Time × Finisher status interaction in regard to self-efficacy between pre- and post-exposure, $F(1,139) = 5.560$, $p = .02$. Finishers showed a significant increase in self-efficacy ($p < .001$), which was not found among dropouts. Dropouts seemed to have overestimated their capacity to confront spiders before exposure. They adjusted their evaluations after exposure. There were no significant differences for other variables.

Stimuli identification

We checked for the impact of adding explicit visual stimuli identification. No differences between these types of processing in their effect on exposure were expected. Similar analyses to those presented in the following section (efficacy analyses) have been performed. A two-way repeated measures ANOVA with Time (pre-exposure and post-exposure) as a within-subject factor and Stimuli identification and Condition as between-subjects factors was conducted. Another two-way repeated measures ANOVA with Time (post-exposure and follow-up) as a within-subject factor and Stimuli identification and Condition as between-subjects factors was also conducted. The results are presented in Appendix B (see Supplementary Material). This manipulation did not lead to any significant effect[1]. For clarity, we therefore present the results without this factor. The results imply that

[1] For three of the outcome variables (of 13), the triple Time × Stimuli identification × Condition (type of words used in imagery) interaction was at the edge of significance. Considering the fact that borderline effects imply second-order effects and because of their lack of stability across measures, these results should not be interpreted.

the main factor, i.e., the type of words used in imagery, were similar to (sometimes even more significant than) those presented in the next section.

Imagery intensity

Whereas forming mental images that are not related to the task at hand (non-schematic) may be more difficult than forming mental images related to the task (schematic), we expected the non-schematic words to yield less intense images than the schematic words, at least for the first trials. In order to check this hypothesis, a two-way repeated measure ANOVA with Time (Trial 1, Trial 2, Trial 3, Trial 4, Trial 5) as a within-subject factor and Condition as a between-subjects factor was computed on the mean intensity of imagery reported during each of the exposure trials of the first session. The results revealed a significant main effect of Time, $F(4,552) = 35.687$, $p < .001$, $\eta^2 = .205$, modulated by a significant Time × Condition interaction, $F(8,552) = 11.309$, $p < .001$, $\eta^2 = .141$. Paired comparisons demonstrated that at Trial 1, participants in the schematic negative condition reported higher imagery intensity scores ($M = 7.256$, $SD = .247$) than did participants in the non-schematic negative condition ($M = 5.758$, $SD = .252$, $p < .001$) and in the non-schematic positive condition ($M = 5.822$, $SD = .250$, $p < .001$), with no significant difference between the latter conditions ($p = .728$). From the first to the fifth trial, the imagery intensity scores linearly increased in both the non-schematic negative condition ($p < .001$) and the non-schematic positive condition ($p < .001$), in contrast with the schematic negative condition in which the scores remained stable ($p = .929$). At the fifth trial, no significant difference was observed between conditions. The schematic negative condition scores ($M = 7.240$, $SD = .275$) did not differ significantly from both the non-schematic negative condition ($M = 7.006$, $SD = .281$, $p = .553$) and the non-schematic positive condition scores ($M = 7.100$, $SD = .258$, $p = .929$), with no significant difference between the latter conditions ($p = .812$). A similar two-way repeated measure ANOVA with Time (Trial 1, Trial 2) as a within-subject factor and

Condition as a between-subjects factor was computed on the mean intensity of imagery reported during the exposure trials of the second session. The results showed a significant main effect of Time, $F(1,128) = 8.942$, $p < .003$, $\eta^2 = .065$, with an increase from the first ($M = 7.036$, $SD = 1.769$) to the second trial ($M = 7.206$, $SD = 1.791$), but no significant Time × Condition interaction, $F(2,128) = 1.961$, $p = .145$, $\eta^2 = .030$ These analyses revealed that there was more difficulty in forming mental images of words that were not related to the task. This increased difficulty seemed to be compensated for across trials by a learning effect.

Group equivalence

The number of participants per condition ranged from 46 to 48. Preliminary analyses indicated no differences across conditions on the outcome variable measured at pre-exposure, i.e., on emotional and avoidance responses, $F(2,138) = .218$, $p = .804$; anxious anticipation of spiders, $F(2,138) = .1.382$, $p = .255$; self-efficacy, $F(2,138) = .772$, $p = .464$; and reactivity to spider pictures, i.e., SUD, $F(2,138) = .040$, $p = .961$, SCRs, $F(2,137) = .680$, $p = .508$, and HR, $F(2,132) = .093$, $p = .911$; as well as on reactivity to neutral images, i.e., SUD, $F(2,138) = .493$, $p = .612$, SCRs, $F(2,136) = .512$, $p = .600$, and HR, $F(2,131) = .143$, $p = .867$. All groups were similar in terms of age, $F(2,138) = 1.152$, $p = .289$; gender ratio, $\chi^2(2) = .509$, $p = .775$; number of days between sessions, $F(2,128) = 1.217$, $p = .299$; and trait-anxiety, $F(2,138) = .185$, $p = .831$. A significant difference between groups emerged on the VVIQ, $F(2,135) = 3.111$, $p = .048$, but no post hoc differences were shown after Bonferroni correction[2].

Main analyses

[2] However, in order to exclude any potential role of this variable on the observed effects of the treatment, we computed Pearson's correlations between the VVIQ and the scores of differences between pre-exposure and post-exposure. None of the correlations were significant.

Within-session effects[3]

Subjective distress habituation during exposure. We hypothesized that forming mental images of negative schematic words may induce a weaker short-term decline in anxiety than would forming mental images of positive non-schematic words. This hypothesis is based on the emotional processing theory that states that the activation of distress during exposure is dependent upon the degree to which the content of the evocative information is related to the fear structure (Foa & Kozak, 1986). A two-way repeated measure ANOVA with Time (first and last trial of exposure) as a within-subject factor and Condition as a between-subjects factor was computed on the SUD reported after each trial of exposure in order to evaluate a potential differential within-session habituation effect between conditions. The results are presented in Table 1.

---Insert Table 1 about here ---

A significant main effect of Time was modulated by a significant Time × Condition interaction. Schematicity and valence contrasts were performed on the SUD changes observed from the first to the last trial. The results (presented in Figure 2) supported the valence model but not the schematicity model. Participants in the negative conditions (schematic and non-schematic) did not differ in the habituation of subjective distress from the first to the last trial, $F(1,92) = .002$, $p = .965$, $\eta^2 < .001$. In contrast, participants in the positive condition (non-schematic) showed a significantly greater habituation than in the negative conditions, $F(1,138) = 6.172$, $p = .014$, $\eta^2 = .043$. Conversely, participants in the non-schematic conditions (positive and negative) displayed dissimilar decreases of subjective distress from

[3] Those analyses tested the changes observed during the first session of exposure. Similar analyses realized for the second session are reported in Appendix C (see Supplementary Material). Overall, the effect tested in the first session in regard to subjective distress during exposure tended to maintain in the second session. However, the observed effect for SCRs and emotional and avoidance responses did not maintain.

the first to the last trial, $F(1,91) = 6.184$, $p = .015$, $\eta^2 = .064$, which questions the schematicity model.

---Insert Figure 2 about here ---

Generalizability. In contrast to expectations for habituation, no potential benefit of non-schematic positive imagery over schematic negative imagery was expected for the generalizability of potential differential distress habituation to novel phobic stimuli in a context in which there was no concurrent task (both for the SUD and physiological measures). This hypothesis is based on the fact that the habituation to specific stimuli during a session of exposure does not necessarily generalize to other set of stimuli (Craske et al., 2008). By extension, we hypothesize that a potential benefit of a distraction (vs focusing) during exposure will not likely be generalized and helpful in response to other stimuli. Two-way repeated measure ANOVAs with Time (pre-exposure and post-exposure) as a within-subject factor and Condition as a between-subjects factor were computed on SUD, SCRs and HR measured in response to novel sets of pictures. The results are presented in Table 1.

In regard to the SUD, we found a significant main effect of Time with a decrease from pre- to post-exposure in all conditions, but no Time × Condition interaction effect. The observed increased habituation in the positive condition (non-schematic) when compared to the negative conditions (non-schematic and schematic) did not generalize. In regard to SCRs, a significant main effect of Time was modulated by a weak tendency for a Time × Condition interaction ($p = .104$) between pre- and post-exposure. Schematicity and valence contrasts performed on the change in SCRs observed from pre-exposure to post-exposure indicated that valence was the most relevant model. The results are presented in Figure 3. Participants in the negative conditions (schematic and non-schematic) did not differ in their decrease in SCRs, $F(1,90) = .179$, $p = .673$, $\eta^2 = .002$. In contrast, participants in the positive condition (non-

schematic) displayed a significantly weaker decrease in SCRs than did those in the negative conditions (schematic and non-schematic), $F(1,136) = 4.424$, $p = .037$, $\eta^2 = .032$. The schematicity model was not valid because participants in the non-schematic conditions (positive and negative) displayed dissimilar decreases in SCRs from pre-exposure to post-exposure, $F(1,91) = 4.055$, $p = .047$, $\eta^2 = .043$. For HR, a significant effect of Time but no Time × Condition interaction was shown. HR decreased in all conditions.

---Insert Figure 3 about here ---

Reported severity of symptoms. We hypothesized no impact of the manipulation on the observed change in the self-reported severity of symptoms from pre-exposure to post-exposure. Similarly as to the previous hypothesis, we did not expect distraction to be helpful in regard to the reported severity of symptoms expressed in response to spiders more generally. Two-way repeated measure ANOVAs with Time (pre-exposure and post-exposure) as a within-subject factor and Condition as a between-subjects factor were computed on the dimensions of the FSQ questionnaire. The results are presented in Table 1.

In regard to emotional and avoidance responses, a significant main effect of Time was modulated by a significant Time × Condition interaction effect between pre- and post-exposure. Schematicity and valence contrasts performed on the change in emotional and avoidance responses observed from pre-exposure to post-exposure indicated that both models were valid. The results are presented in Figure 3. Participants in the negative conditions (schematic and non-schematic) did not differ in their decrease of emotional and avoidance responses, $F(1,92) = 1.192$, $p = .278$, $\eta^2 = .013$. In contrast, participants in the positive condition (non-schematic) displayed a significantly weaker decrease in emotional and avoidance responses than did those in the negative conditions (schematic and non-schematic), $F(1,138) = 4.935$, $p = .028$, $\eta^2 = .035$. Reciprocally, participants in the non-schematic

conditions (positive and negative) did not differ in their decrease in emotional and avoidance responses, $F(1,91) = 2.393$, $p = .125$, $\eta^2 = .026$. Participants in the schematic condition (negative) displayed a significantly larger decrease in emotional and avoidance responses than did those in the non-schematic conditions (positive and negative), $F(1,138) = 4.685$, $p = .032$, $\eta^2 = .033$. For anxious anticipation of spiders, no significant effect of Time or Time × Condition interaction was observed.

Self-efficacy. Those analyses allowed to test an alternative hypothesis stated by the proponents of distraction who argued that the use of distraction is beneficial for increasing individuals' confidence in their ability to confront a spider. If this hypothesis is true, then we should observe a larger increase in self-efficacy in the non-schematic conditions as compared with the schematic condition. In order to test this hypothesis, we conducted a two-way repeated measure ANOVA with Time (pre-exposure and post-exposure) as a within-subject factor and Condition as a between-subjects factor on self-efficacy. The results are presented in Table 1. A significant effect of Time but no Time × Condition interaction was shown. Self-efficacy increased regardless of conditions during the first session.

Between-sessions effects

We hypothesized that participants who formed mental images of non-schematic positive words would show a stronger return of distress between sessions than would participants who formed mental images of schematic negative words. This hypothesis is based on the results observed in Dethier et al. (2015). Such a stronger rebound effect was also expected on the self-reported severity of symptoms. We also wondered whether physiological data would be consistent with such effects: The participants who formed mental images of non-schematic positive words would show a stronger return of fear responses between sessions than would participants who formed mental images of schematic negative words. No

specific hypothesis was formulated in regard to self-efficacy. Two-way repeated measure ANOVAs with Time (post-exposure and follow-up) as a within-subject factor and Condition as a between-subjects factor were computed on the outcome variables. These analyses allowed us to test a potential return of distress at follow-up. The results are presented in Table 2.

---Insert Table 2 about here ---

The analyses of the variables measured in response to novel sets of pictures, namely SUD, SCRs and HR, showed significant Time effects but no significant Time × Condition interactions or Condition effects. Each of these variables increased from post-exposure to follow-up regardless of conditions, indicating some return of distress.

In regard to emotional and avoidance responses, no significant effect of Time or Time × Condition interaction was shown, but there was a marginal effect of Condition. Schematicity and valence contrasts performed on emotional and avoidance responses measured both at post-exposure and follow-up indicated that both schematicity and valence models were valid. Participants in the negative conditions (schematic and non-schematic) did not differ in emotional and avoidance responses, $F(1,86) = 1.326$, $p = .253$, $\eta^2 = .015$. In contrast, participants in the positive condition (non-schematic) displayed significantly higher emotional and avoidance responses than did those in the negative conditions (schematic and non-schematic), $F(1,128) = 4.171$, $p = .043$, $\eta^2 = .032$. Reciprocally, participants in the non-schematic conditions (positive and negative) did not differ in emotional and avoidance responses, $F(1,84) = 1.594$, $p = .210$, $\eta^2 = .019$. Participants in the schematic condition (negative) displayed significantly weaker emotional and avoidance responses than did those in the non-schematic conditions (positive and negative), $F(1,128) = 4.551$, $p = .035$, $\eta^2 = .034$. A significant effect of Time on anxious anticipation was observed, with a decrease from post-

exposure to follow-up. No Time × Condition interaction or Condition effect was shown. No significant effect was observed for self-efficacy.

Efficacy at the end of treatment

We hypothesized that participants who formed mental images of positive non-schematic words would show more avoidance when confronted with a real spider when compared with participants who formed mental images of schematic words. Moreover, we hypothesized that participants who formed mental images of positive non-schematic words would experience more subjective distress when confronted to a novel set of pictures of spiders and more emotional and avoidance responses. This hypothesis is based on emotional processing theory that states that the use of distraction will likely result in less emotional processing and therefore lesser resulting outcomes. We had no specific hypothesis in regard to physiological variables and self-efficacy.

In order to test these hypothesis, one-way ANOVAs were computed on the outcome variables measured at post-reexposure. In regard to the BAT, a significant effect of Condition was observed, $F(2,128) = 6.209$, $p = .003$, $\eta^2 = .088$. Schematicity and valence contrasts performed on the BAT indicated that valence was the most relevant model. The results are presented in Figure 4. Participants in the negative conditions (schematic and non-schematic) did not differ in terms of avoidance behaviour, $F(1,86) = .348$, $p = .557$, $\eta^2 = . 004$. Moreover, participants in the positive condition displayed more avoidance than did those in the negative conditions (schematic and non-schematic), $F(1,128) = 12.003$, $p = .001$, $\eta^2 = .086$. The schematicity model was not supported, as participants in the non-schematic conditions (positive and negative) displayed dissimilar avoidance behaviours, $F(1,84) = 7.725$, $p = .007$, $\eta^2 = .084$.

---Insert Figure 4 about here ---

No effect of Condition was evidenced for the SUD in response to a novel set of spider pictures, $F(2,128) = 1.563$, $p = .214$, $\eta^2 = .024$, emotional and avoidance responses, $F(2,128) = 1.031$, $p = .360$, $\eta^2 = .016$, anxious anticipation of spiders, $F(2,128) = .394$ $p = .675$, $\eta^2 = .006$, SCRs, $F(2,127) = .520$, $p = .596$, $\eta^2 = .008$, HR, $F(2,124) = .116$, $p = .891$, $\eta^2 = .002$, and self-efficacy, $F(2,128) = .644$, $p = .527$, $\eta^2 = .010$.

Discussion

This study aimed to examine the respective impact of valence and schematicity of a partial distractor during exposure. Results demonstrate that the participants who were required to form mental images of schematic negative words during exposure displayed results that were similar to those of participants who were required to form images of non-schematic negative words on all variables (i.e., habituation of SUD during exposure, decrease in SCRs, decrease in self-reported emotional and avoidance responses between pre- and post-exposure, avoidance behaviours when confronted with a real spider). In contrast, when compared to participants in the former conditions, participants who were required to form non-schematic positive mental images showed a stronger habituation of subjective distress during exposure and this effect tended to maintain in the second session. However, this immediate distress relief did not index a therapeutic improvement in the longer run. Indeed, when confronted with novel sets of pictures but without forming mental images of non-schematic positive concepts, these participants showed the same decline in distress as those in the other two conditions, suggesting that the apparent benefit experienced during exposure with positive distractors did not generalize. Moreover, these participants showed poorer declines on other variables than did those in the other two conditions: a weaker decline in emotional and avoidance responses from pre- to post-exposure (this difference persisting marginally at follow-up but not at post-reexposure) together with a weak tendency (p=.104) for weaker

decline in SCRs from pre-exposure to follow-up. Finally, they manifested more avoidance when confronted with a real spider at post-reexposure.

A potential interpretation of these converging indices of therapeutic efficacy is that participants in the non-schematic positive condition engaged in more avoidance from emotional aversive states than did those in the other groups. Although the findings for self-reported emotional and avoidance responses did not allow us to differentiate the valence against schematicity models, the contrasts performed on subjective distress during exposure, on behavioural avoidance and, to a lesser extent, on SCRs did favour the valence model. Moreover, no differences between the two negative conditions were observed. These elements suggest that successful emotional processing during exposure does not rely much on schematicity, but rather on the focus on negative affect and the capacity to tolerate it. Additionally, adding explicit visual stimuli identification did not lead to any significant and stable effect, suggesting that spiders automatically captured attention of phobic participants.

These data have clear implications in regard to the postulated mechanisms implied in exposure therapy. In contrast with the principles of emotional processing theory, maximal matching of the elements that are in the scope of attention with fear structure elements does not seem to be a key factor for successful exposure. Rather, the results are congruent with the notion that emotional aversive state toleration is a central factor in exposure efficacy. The maximal efficacy of exposure may rely on two conditions: activation of the fear of spiders and maintenance of the confrontation with an aversive emotional state. These conditions suggest that the critical matter for successful exposure rests more in the process that is being engaged, namely emotional acceptance or tolerance of aversive affect, rather than the specific content of the emotional information being attended to.

This latter conclusion calls for reconsideration of distraction during exposure. The critical feature of distraction is not the fact of being distracted from the phobic stimulus, but rather the fact of performing emotional avoidance. In other words, partial distraction does not seem to be harmful, as long as it will not entail avoidance of the negative affect induced by exposure to the phobic stimulus. This interpretation is consistent with the claim that emotional avoidance is deleterious and results in the maintenance of the avoided emotion (Barlow & Allen, 2007). More particularly, it is also congruent with studies showing the deleterious effect of avoidance and the contrasted effects of acceptance of an aversive state versus its suppression (for a comprehensive review, see Salters-Pedneault, Tull, & Roemer, 2004, and Helbig-Lang & Petermann, 2010). For example, Levitt, Brown, Orsillo, and Barlow (2004) exposed patients with panic disorder to inhalation of 5.5% carbon dioxide. Prior to exposure, participants received instructions about emotion regulation strategies (acceptance or suppression) or heard a neutral narrative (control group). The acceptance group was significantly less anxious and less avoidant than were the suppression or control groups.

The present results also bring to light the importance of distinguishing the observations made during exposure and the resulting therapeutic efficacy. Indeed, the stronger habituation of distress in the non-schematic positive condition could have been interpreted as indexing therapeutic efficacy. However, re-confrontation with novel sets of pictures demonstrated that the benefit of distraction did not generalize and even that non-schematic positive participants displayed poorer efficacy on several other outcome variables.

These results are consistent with those of Dethier et al. (2015), who reported greater benefits of schematic imagery (negative) over non-schematic imagery (neutral and positive). However, because valence was not controlled for, the effect of schematicity has been overrated. The results of the present study lead us to reconsider the interpretation of the former observations. Rather than the intensity of the association with the fear structure, the

fact of being confronted or not with a sustained emotional aversive state seems to be the mechanism that best accounts for the observed effects. This interpretation is also consistent with the observations of Tabibnia, Lieberman, and Craske (2008), who confronted spider phobics with images of spiders on a screen, followed by the presentation of a cross (exposure only group), or negative words unrelated to spiders (negative label group), or of neutral or slightly positive words (neutral label group). They reported a benefit during exposure to the subsequent presentation of an unrelated negative word, with greater attenuation of SCRs. Similar results were shown with healthy controls presented with threatening pictures. Maintaining the confrontation with the emotional aversive state rather than escaping it therefore seems to be an important active ingredient of exposure.

A similar manipulation was performed in a clinical context (Kircanski, Lieberman, & Craske, 2012). Eighty-eight spider-fearful individuals were repeatedly exposed to a live spider while uttering a sentence that included either negative words to describe the spider and their emotional response to it (affect-labelling group), neutral words to describe the spider and a way of thinking about it in order to feel less negative about it (reappraisal group), or words to describe objects that could be found in their home and the location of these objects (distraction group). An additional group received no verbalization instructions (exposure alone). At the 1-week post-test, the affect-labelling group demonstrated reduced SCRs in comparison with the other groups, as well as marginally greater approach behaviour than the distraction group. No differences were shown in self-reported fear. Moreover, the percentage of anxiety and fear words used during exposure was correlated with a greater reduction in SCRs.

These results may seem to conflict with those of studies that showed a positive effect of valence combined with exposure. For example, Dour, Brown, and Craske (2016) found a beneficial effect of the combined presence of exposure and positive valence training that

aimed to change the valence of spiders towards a more positive evaluation. Nonetheless, the valence was manipulated after exposure in that study, whereas the valence was manipulated during exposure in the present study. This difference between studies suggests that the time at which the valence is manipulated is critical and may induce detrimental effects when performed during exposure and beneficial effects when performed afterwards. Further studies should investigate this issue more carefully.

The proponents of the importance of self-efficacy (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999) and of sense of control would predict that the simultaneous presentation of non-schematic positive words might help to improve self-efficacy and therefore produce better therapeutic effects. In the same vein, the proponents of counterconditioning may argue that simultaneously presenting the feared stimuli and the positive valence stimuli may change its affective valence. In contrast with these predictions, our results showed that, on the one hand, the presentation of non-schematic positive concepts does not improve self-efficacy to a larger extent than does the presentation of schematic and non-schematic negative words. On the other hand, the presentation of non-schematic positive concepts was associated with poorer behavioural approaches and more emotional and avoidance responses. It cannot be excluded that self-efficacy plays a role in the behavioural effects of exposure as stated by Bandura (1988). Indeed, all groups improved in self-efficacy and it is reasonable to assume that they all improved in terms of behavioral approach. Unfortunately, as we measured behavioural approach only at the end of the treatment, this cannot be ascertained in the present data. However, our data indicate that the differential impact of our manipulations is not accounted for by changes in self-efficacy. Indeed, the participants that formed images of negative words do not report more confidence in their ability to cope before being confronted to a real spider relative to the non-schematic positive group but exhibited more approach at post-reexposure.

Despite convincing elements regarding the interpretation of the results in terms of a detrimental effect of emotional avoidance shown in the non-schematic positive group, some non-significant results may limit our conclusions. We failed to show a significant effect of the experimental manipulations on the physiological variables and on the self-reported anxious anticipation of spiders in the first session. Surprisingly, no significant between-session effects of the manipulation indicating a detrimental effect of the use of non-schematic positive imagery during exposure were demonstrated from post-exposure to follow-up, and a stronger return of distress could have been expected in the positive non-schematic condition. Moreover, the effect of the condition on emotional and avoidance responses was only marginal at follow-up and did not persist at post-reexposure and the effect of condition at post-reexposure was only significant in regard to behavioural achievement but not in regard to the other variables (SUD and emotional and avoidance responses). Finally, although results are interpreted in terms of emotional avoidance versus acceptance, the experimental procedure did not directly measure or manipulate these strategies. This study is the first to directly manipulate schematicity and valence, offering a clearer view of the mechanisms implied in exposure. Moreover, the repeated measurement of several indicators allowed us to test the many facets of anxiety and the maintenance of the effects at follow-up. However, this study has several limitations. We did not perform a manipulation check that may have ensured that participants adhered to their respective experimental instructions. In addition, the experimental procedure did not include an exposure-alone condition, which prevents us from directly comparing our partial distraction conditions, especially the schematic negative condition to exposure alone. A prior study, however, showed that exposure alone did not stand out from the schematic negative condition (Dethier et al., 2015). Moreover, the present study did not assess positive mood, which may be relevant for determining whether the various conditions induced differential positive moods. Furthermore, the study did not

comprise an inter-rater reliability assessment of the diagnostic assessment. In addition, the observed results in terms of heart rate did not allow to distinguish our experimental conditions. Future studies should measure the cardiac activity with electrodes placed on the chest in order to allow the computation of heart rate variability, which is a more subtle index of sympathovagal activity. Finally, we recommend the adaptation of the Fear of Spiders Questionnaire in order to provide a more contextualized measure of self-reported symptoms. Indeed, the present formulation of this questionnaires might be too general to capture specific changes in a short time frame. Despite these limitations, this study demonstrates that the processes in which a participant is involved during exposure are more important than the concurrent content that is attended to during exposure. The acceptance of aversive emotional states is a critical active process implied in successful exposure. Future studies should clearly distinguish what happens during exposure from the longer term benefits and on the various facets of anxiety. Moreover, distraction studies should strive to specify and distinguish the dimensions underlying distraction, such as valence or schematicity, as well as interactivity, i.e., the extent to which distraction implies interaction with another person.

Funding

This work has been entirely supported by the Université catholique de Louvain (Belgium), which did not exert any editorial direction or censorship on any part of this article.

Conflict of interest

There is no conflict of interest associated with this publication.

Acknowledgment

We would like to thank Mélissa Orobello, Gwendoline Isenborghts, Laura Demarthe, Chloé Servais and Maureen Martinot for their help in the collection of data. We also thank the members of the Laboratory for Experimental Psychology and more especially Pierre Maurage, Joel Billieux, and Anne-Charlotte Franckx for their comments on a preliminary draft of this article.

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Figure captions

Fig. 1. Procedure and measurements. BAT = Behavioral Avoidance Task; FSQ = Fear of Spiders Questionnaire; HR = heart rate; SCRs = skin conductance response; SES = Self-Efficacy Scale; STAI-T = State Trait Anxiety Inventory (trait version); SUD = subjective units of distress; VVIQ = Visual Vividness Imagery Questionnaire.

Fig. 2. (a) Subjective units of distress (SUD) as a function of time and treatment condition. The figure represents both the habituation of SUD during the exposure trials and the generalizability in response to novel sets of pictures at pre- and post-exposure. (b) SUD decrease across exposure trials (from trial 1 to trial 5) as a function of treatment condition. Asterisks represent the significance of the tests of contrast. Error bars represent standard errors. nSch = non-schematic condition; Sch = schematic condition; + = positive condition; – = negative condition; ns = >.10; * $p < .05$.

Fig. 3. (a) Skin conductance responses (SCRs) decrease from pre- to post-exposure as a function of treatment condition. (b) Emotional and avoidance responses (Fear of Spiders Questionnaire) decrease from pre- to post-exposure as a function of treatment condition. Error bars represent standard errors. Asterisks represent the significance of the tests of contrast. nSch = non-schematic condition; Sch = schematic condition; sqrt = squared root transformation; + = positive condition; – = negative condition; ns = >.10; * $p < .05$.

Fig. 4. Behavioral Avoidance Task as a function of treatment condition. A lower score expresses more avoidance. Error bars represent standard errors. Asterisks represent the significance of the tests of contrast. nSch = non-schematic condition; Sch = schematic condition; + = positive condition; – = negative condition; ns = >.10; ** $p < .01$; *** $p < .001$.

Table 1. Two-way repeated measures analyses of variance with Time as a within-subject factor and Condition as a between-subjects factor

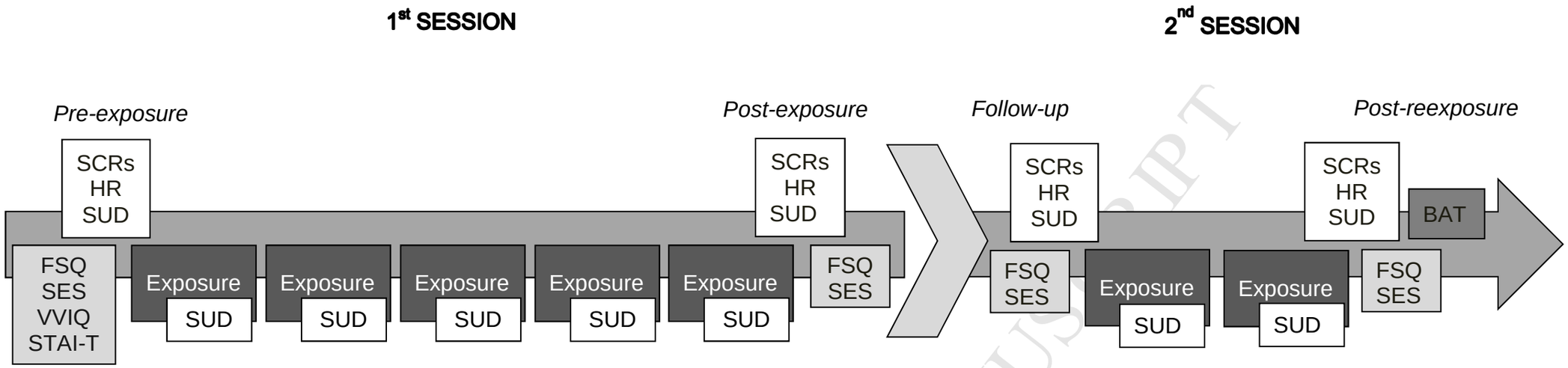
Variable	Time effect					Time × Condition effect				
	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2
Habituation during exposure trials (SUD; first and last trial)	1	138	166.593	<.001	.447	2	138	3.086	.049	.043
Generalizability (pre-exposure and post-exposure)										
SUD	1	138	100.314	<.001	.421	2	138	.446	.641	.006
SCRs	1	136	153.908	<.001	.531	2	136	2.301	.104	.033
HR	1	131	265.463	<.001	.670	2	131	.234	.792	.004
Reported symptoms (pre-exposure and post-exposure)										
Emotional and avoidance responses	1	138	71.259	<.001	.341	2	138	3.225	.043	.045
Anxious anticipation of spiders	1	138	1.829	.179		2	138	1.141	.322	.016
Self-efficacy (pre-exposure and post-exposure)	1	138	36.788	<.001	.210	2	138	1.840	.163	.026

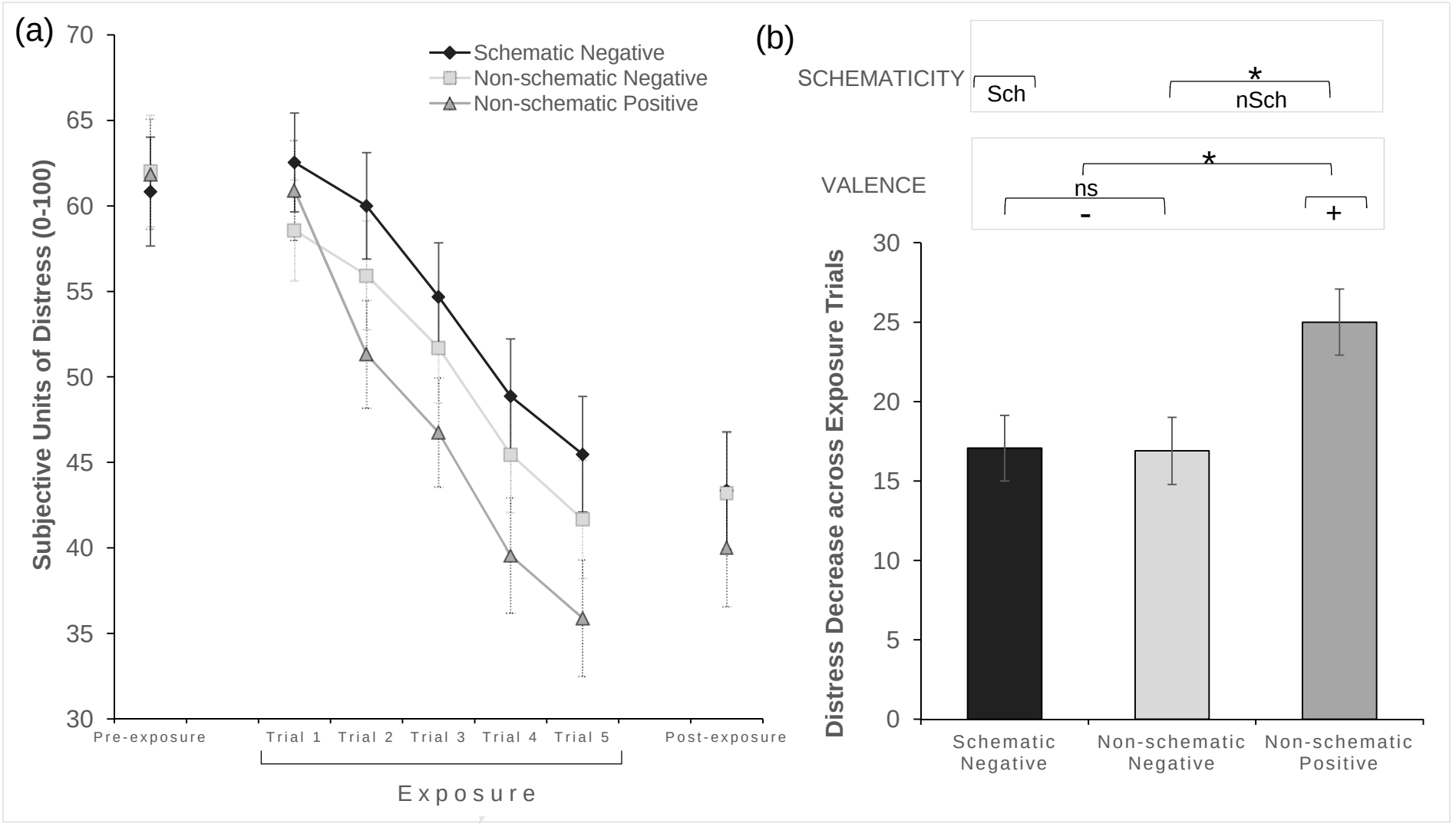
Note. SUD = subjective units of distress; SCRs = skin conductance responses (square root transformed); HR = heart rate.

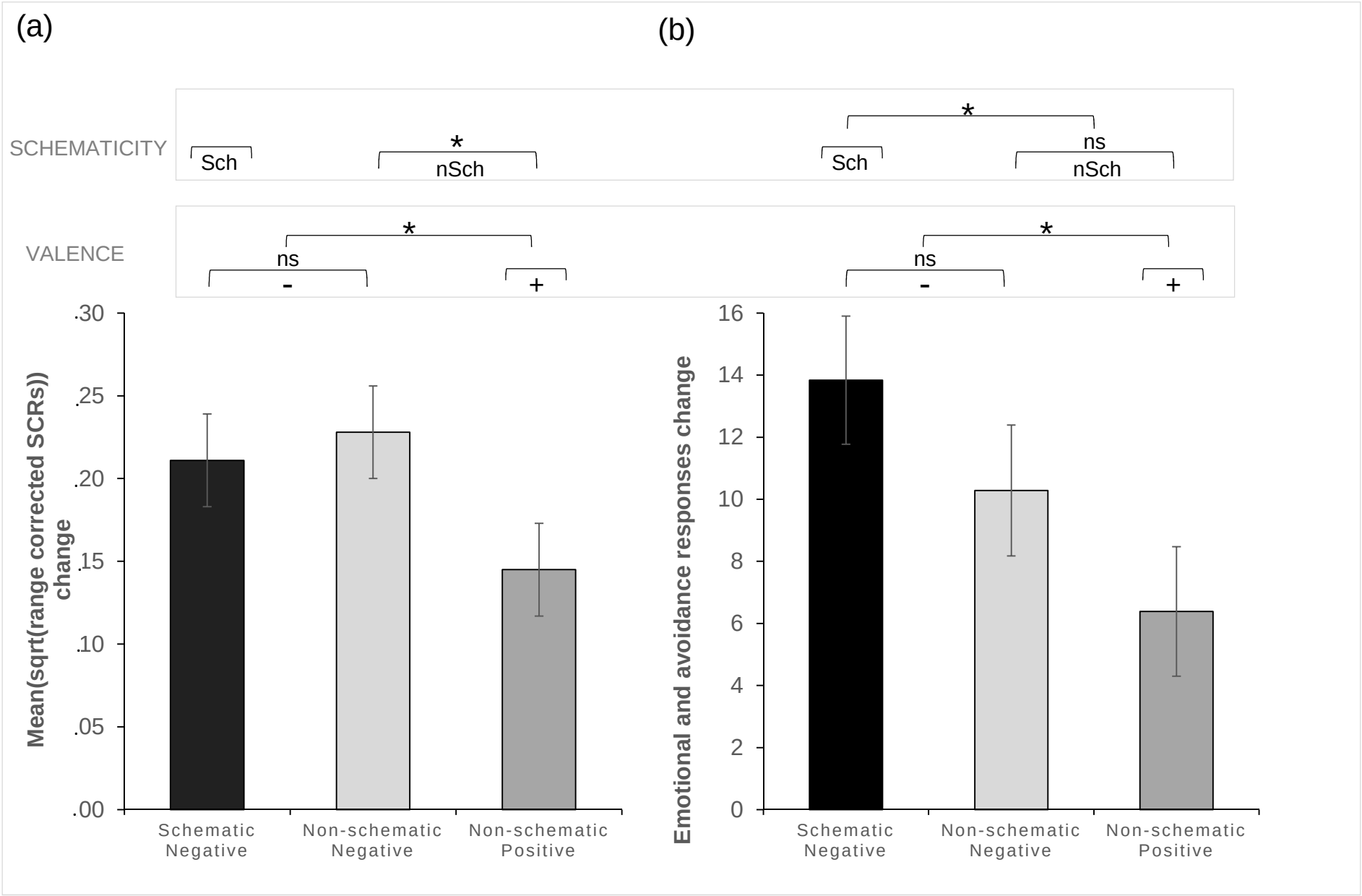
Table 2. Two-way repeated measures analyses of variance with Time (post-exposure and follow-up) as a within-subject factor and Condition as a between-subjects factor

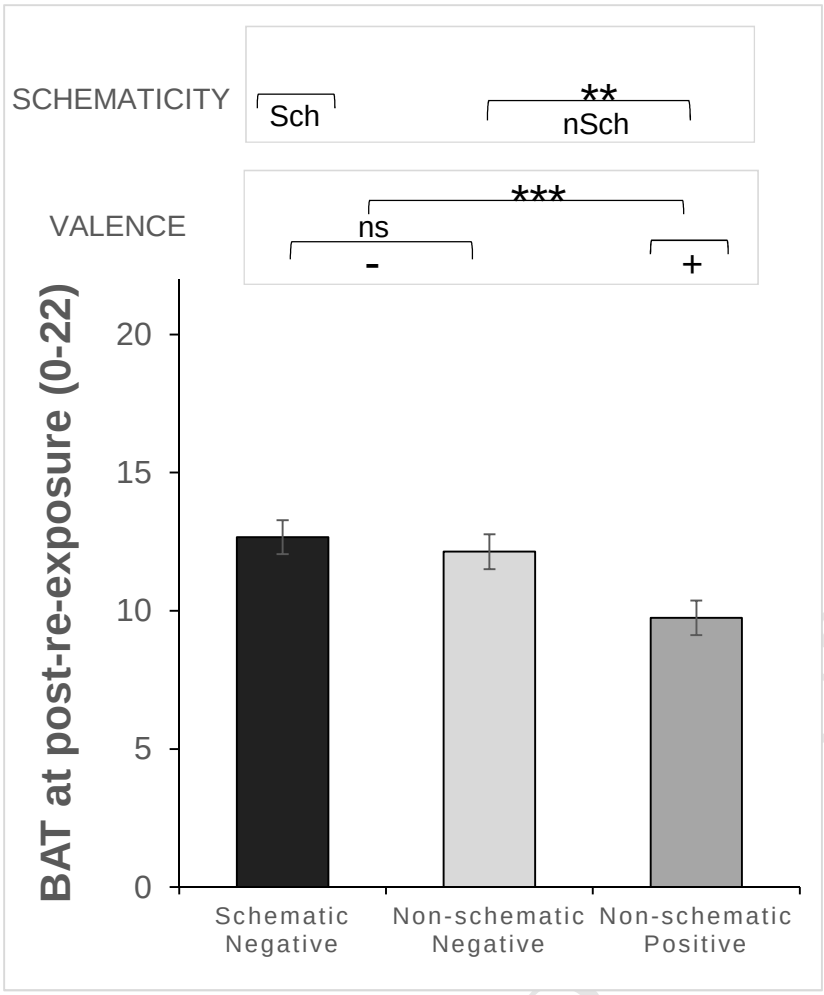
Variable	Time effect					Time × Condition effect					Condition effect				
	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2	df_n	df_d	F	p	η^2
Reactivity measures															
SUD	1	128	22.711	<.001	.151	2	128	.476	.622	.007	2	128	.384	.682	.006
SCRs	1	125	18.658	<.001	.130	2	125	1.051	.353	.017	2	125	.376	.688	.006
HR	1	120	31.109	<.001	.206	2	120	.218	.805	.004	2	120	.191	.827	.003
Reported symptoms															
Emotional and avoidance responses	1	128	.173	.679	.001	2	128	1.123	.328	.017	2	128	2.921	.057	.044
Anxious anticipation of spiders	1	128	9.753	.002	.071	2	128	.139	.871	.002	2	128	.727	.485	.011
Self-efficacy	1	128	.792	.375	.006	2	128	.419	659	.006	2	128	.451	.638	.007

Note. SUD = subjective units of distress; SCRs = skin conductance responses (square root transformed); HR = heart rate.




(a)
Schematic Negative
Non-schematic Negative
Non-schematic Positive
Subjective Units of Distress (0-100)
70
65
60
55
50
45
40
35
30
Pre-exposure
Trial 1
Trial 2
Trial 3
Trial 4
Trial 5
Post-exposure
Exposure
(b)
SCHEMATICITY
Sch
*
nSch
VALENCE
ns
*
-
+
Distress Decrease across Exposure Trials
30
25
20
15
10
5
0
Schematic Negative
Non-schematic Negative
Non-schematic Positive


(a)
SCHEMATICITY
Sch
*
nSch
VALENCE
ns
-
*
+
Mean(sqrt(range corrected SCRs)) change
.30
.25
.20
.15
.10
.05
.00
Schematic Negative
Non-schematic Negative
Non-schematic Positive
(b)
Sch
*
ns
nSch
ns
-
*
+
Emotional and avoidance responses change
16
14
12
10
8
6
4
2
0
Schematic Negative
Non-schematic Negative
Non-schematic Positive



Highlights

- Forming negative (vs. positive) images during exposure led to less distress reduction.
- It also led to a stronger decline in emotional and avoidance responses.
- It also led to more approach behaviours at later exposure.
- The use of emotional avoidance may be an important feature of distraction.
- Acceptance of aversive emotional states seems to be critical in exposure.