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Delaying in vivo exposure to a tarantula with very brief exposure to phobic stimuli

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ABSTRACT

Background and objectives: Research has documented the *very brief exposure* (VBE) *effect*: the reduction of phobic fear by continuous presentation of masked phobic pictures. In prior studies, phobic participants approached a live tarantula immediately after the masked stimuli were presented. This study tested the hypothesis that VBE would reduce phobic avoidance of the tarantula 24 h later.
Method: 86 spider-phobic participants were identified with a fear questionnaire and Behavioral Avoidance Test (BAT) with a live tarantula indicative of a DSM-IV diagnosis of Specific Phobia. One week later, they were randomly assigned in double-blind fashion to presentation of a continuous series of 25 trials of masked images of either spiders or flowers (33-ms each), i.e., to VBE or control exposure. The participants gave subjective distress ratings just before and after these exposures. Then they engaged in the BAT again either immediately thereafter or 24 h later to measure changes in avoidance of the tarantula.
Results: Masked images of spiders reduced avoidance of the tarantula both immediately after exposure and 24 h later without causing subjective distress. The effect sizes at these two time points did not significantly differ from each other.
Limitations: We did not manipulate awareness of the spider images by presenting them unmasked to a third group. Conclusions about the effect of awareness of the stimuli cannot be drawn.
Conclusions: VBE induces a process of fear reduction before phobic individuals engage in in vivo exposure, which is more distressing. Thus, VBE may help phobic-resistant individuals start treatment more gradually.

1. Introduction

A great deal of evidence supports the efficacy of *exposure*, the direct confrontation of phobic stimuli under controlled conditions (Anton & Swinson, 2000; Emmelkanp, 2004). As a result, it has long been maintained that exposure and attending conscious processing is required to reduce fear of phobic stimuli (Beck & Clark, 1997; Foa & Kozak, 1986; Hofmann, 2008; Lovibond, 2004). Yet by psychiatric definition, a phobia involves a dissociation between conscious cognition and behavior (APA, 2000). On the one hand, a phobic person realizes that his fear of an object or situation is excessive and irrational. Nonetheless, physiological arousal, subjectively experienced fear, and concomitant changes in behavior (facial expressions, running away) occur automatically when s/he encounters the feared object or situation. Consistently, many studies have shown that autonomic and neurobiological responses can be activated by and conditioned to masked phobic and fear-relevant stimuli, respectively (Carlsson et al., 2004; Katkin, Wiens, & Öhman, 2001; Morris, Öhman, & Dolan, 1998; Öhman & Soares, 1993, 1994, 1998; Phelps, 2005; Whalen et al., 2004). However, other studies have called the automaticity of fear into question (Alpers et al., 2009). Eye-tracking studies have not convincingly shown that early saccades are quickly drawn to phobic stimuli (Gerdes & Alpers, 2007; Gerdes, Alpers, & Pauli, 2008; Rinck & Becker, 2006). A signal detection study showed that amygdala activation (often considered an index of fear automaticity) by fearful faces depended on target visibility and visual awareness (Pessoa, Japee, Sturman, & Ungerleider, 2006).

The theoretical controversy over the automaticity of fear may stem, in part, from the fact that all lines of related research cited above have focused entirely on maladaptive (i.e., phobic) – rather than adaptive – behaviors. If phobic behaviors can in fact be induced and acquired by masked stimuli (see prior cites), it raises the intriguing question of whether they can be similarly reduced – of adaptive rather than maladaptive unconscious processes in

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phobia. Such processes would have implications for the lingering question of the automaticity of fear. If phobic behavior can be not only elicited by and conditioned to but also reduced by masked stimuli, it would add to the growing body of research suggesting that fear processing occurs automatically.

In a series of experiments, Siegel and colleagues have shown that continuous exposure to masked phobic images, what they term *very brief exposure* (VBE), reduces avoidance of a live tarantula by spider-phobic participants (Siegel, Anderson, & Han, 2011; Siegel & Weinberger, 2012; Siegel & Warren, 2013a, 2013b; Weinberger, Siegel, Siefert, & Drawl, 2011). After they were presented with a continuous series of masked images of spiders (VBE), these subjects were asked to approach the live tarantula in a series of graded steps. Independent lines of evidence suggest that the effect of the masked stimuli on reducing avoidance of the tarantula occurs without conscious cognition: objective and subjective tests of awareness of the masked stimuli (Siegel & Weinberger, 2009, 2012; Siegel et al., 2011), and dissociations between the effects of VBE and clearly visible exposure (CVE) to the same, unmasked spider images. Whereas VBE does not immediately affect subjective fear ratings and subsequently reduces phobic avoidance, CVE causes subjective fear and does not affect avoidance (Siegel & Weinberger, 2012). The purpose of the current study was to test if VBE has not only immediate but delayed effects on reducing phobic avoidance of a live tarantula.

The hypothesis that exposure without conscious cognition can reduce phobic behavior is a direct extension of contemporary research and theory. Neuroanatomical studies of mammal species suggest a dual neural architecture of fear (Bechara et al., 1995; Fendt & Fanselow, 1999; LaBar, LeDoux, Spencer, & Phelps, 1995; Lang, Davis, & Öhman, 2001; LeDoux, 2000). A variety of neuroimaging studies have demonstrated the activation of the human amygdala by masked phobic and fear-relevant stimuli, implicating neural systems that are dissociable in terms of conscious cognition (Carlsson et al., 2004; Etkin et al., 2004; Lipka, Miltner, & Straube, 2011; Morris et al., 1998; Straube, Mentzel, & Miltner, 2006; Whalen et al., 2004). Such research established a biological basis for Öhman and Mineka's (2001) theory of the *fear module*: a neural system for automatically processing stimuli that posed threats in the evolutionary history of mammals. Öhman and colleagues have repeatedly shown that autonomic responses are activated by and conditioned to masked, fear-relevant stimuli (Katkin et al., 2001; Öhman & Soares, 1994, 1998; Wiens, Katkin, & Öhman, 2003). Thus, the fear module is characterized by automatic processes that cannot be controlled by conscious cognition.

If fear responses can be activated and acquired without conscious processing, it may be that they can be similarly diminished. Tyrer, Horn, and Lee (1978) found that both subliminal and supraliminal exposure to a brief film of agoraphobic stimuli (e.g., crowded markets; public transportation) reduced self-reported phobic symptoms and physiological responses in treatment-resistant agoraphobics. Interestingly, subliminal exposure reduced physiological responses more then supraliminal exposure. However, this study did not assess effects on the raison d'etre of exposure: avoidance of the feared object.

Siegel and Weinberger (2009) developed very brief exposure (VBE) for this purpose. If priming with masked phobic stimuli activates unconscious fear responses (see prior cites), it stands to reason that continuous exposure to such stimuli will eventually result in reduction of those responses. That is the rationale behind VBE. As noted at the outset, phobic participants are administered a continuous series of masked images of spiders, each for a very brief duration (~25–33 ms) in order to limit conscious processing of them. Such masked exposure has been shown to reduce phobic avoidance of a live tarantula (Siegel & Weinberger, 2009, 2012; Siegel et al., 2011; Weinberger et al., 2011). However, in all prior VBE studies, spider-phobic participants approached the tarantula immediately after the masked stimuli were presented. A preponderance of research attests to the efficacy of in vivo exposure to the feared object on reducing avoidance of it. Thus, the VBE effect may rely entirely on immediate, subsequent exposure to the actual feared object – without it, the masked stimuli may not reduce phobic fear. That is, if the VBE effect depends on immediate, in vivo exposure, it would suggest that the masked stimuli are having an ephemeral priming effect on such exposure. As described just below, that would make the effect less theoretically and potentially clinically significant.

The current study was designed to test how VBE might be used in treatment, if phobic-resistant individuals were to delay direct confrontation of the feared object with masked exposure to corresponding phobic stimuli. VBE was delivered to spider phobic participants either 24 h or just before in vivo exposure to the live tarantula in order to compare the immediate and delayed effects of VBE on avoidance of the feared object. If the VBE effect does not depend on immediate, in vivo exposure to the feared object - if the masked stimuli still reduce avoidance of the tarantula after a delay – it will suggest that relatively enduring, adaptive learning (i.e., the reduction of phobic fear) is occurring during masked exposure.

Replicating prior findings, VBE was expected to reduce avoidance of the tarantula immediately after exposure without affecting experienced fear. The main hypothesis was that VBE would still reduce avoidance of the tarantula when spider-phobic participants confronted it in vivo 24 h later. We tested these hypotheses by randomly assigning the participants to either VBE (masked images of spiders) or presentation of masked control stimuli, flowers. Most of the flower images were "spider flowers", so-called because of their resemblance to spiders. A series of measures were taken to ensure that both the subjects and experimenters who delivered these masked conditions were blind to their identity.

In addition to its theoretical implications, a delayed effect of masked exposure on reducing phobic avoidance would have obvious clinical implications. Exposure is an unpleasant experience. Phobic-resistant individuals suffer from fear-related disorders, but do not seek treatment because they are unwilling to confront the feared situation (Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996). If in vivo exposure was delayed in treatment by preceding it with a type of exposure that limited awareness of the feared stimulus, phobic-resistant individuals could start treatment more gradually and without experiencing distress, which would likely lower their resistance to treatment. Thus, if VBE reduces phobic behavior after a delay, it is more likely to be useful as a preliminary adjunctive treatment. That is, phobic-resistant individuals wouldn't start treatment by engaging in direct confrontation of the feared object or situation. Instead, they would first be administered VBE on a computer screen in the therapist's office. This could be done in the same sessions preceding in vivo exposure, in which they learn the cognitive and behavioral skills that are necessary to engage in it. If VBE reduces avoidance of the corresponding feared object or situation after a suitable delay, it could make it easier for phobic-resistant individuals to start treatment by initially reducing their fear just enough to engage them in the more distressing prospect of in vivo exposure.

2. Method

2.1. Participants

The Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) was administered to 750 undergraduates in natural science courses at a public northeastern college in the