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Social and monetary incentives counteract fear-driven avoidance: Evidence from approach-avoidance decisions

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ABSTRACT

Background and Objectives: The reduction of avoidance behavior is a central target in the treatment of anxiety disorders, but it has rarely been studied how approach of fear-relevant stimuli may be initiated. In two studies, the impact of hypothetical monetary and symbolic social incentives on approach-avoidance behavior was examined.

Methods: In Study 1, individuals high or low on fear of spiders (N = 84) could choose to approach a fear-relevant versus a neutral stimulus, which were equally rewarded. In a subsequent micro-intervention, approaching the fear-relevant stimulus was differentially rewarded either by monetary or social incentives. In Study 2 (N = 76), initial incentives for approach were discontinued to investigate the stability of approach.

Results: Hypothetical monetary and symbolic social incentives reduced or eliminated initial avoidance, even in highly fearful individuals. Approach resulted in a decrease of self-reported aversiveness towards the fear-relevant stimulus. However, even after successful approach, fearful individuals showed significant avoidance behavior when incentives for approach were discontinued.

Limitations: Future research should investigate the long-term effects of prolonged approach incentives on multiple levels of fear (e.g., self-report, behavioral, physiological). It should also be tested if such an intervention actually improves compliance with exposure based interventions.

Conclusions: The present findings highlight that incentives are useful to initiate initial approach towards a feared stimulus. Although incentive-based approach may neither fully eliminate avoidance nor negative feelings towards the feared stimulus, such operant interventions may set the stage for more extensive extinction training.

1. Introduction

Avoidance is the most prominent behavioral symptom across all anxiety disorders and its reduction is a central target of behavioral treatments (Alpers, 2010; Craske et al., 2009; Dymond & Roche, 2009). To this end, exposure therapy requires the individual to approach a fear-relevant stimulus or situation. Subsequently, approach sets the stage for extinction learning and fear reduction (Foa & Kozak, 1986; Vervliet, Craske, & Hermans, 2013). The effectiveness of such exposure-based interventions has been well documented (e.g., Bakker, van Balkom, Spinhoven, & Blaauw, 1998; Hofmann & Smits, 2008; Tolin, 2010). However, not all patients benefit equally. Sustained avoidance or a lack of willingness to initiate exposure exercises is indicated by substantial rates of refusal and drop-outs before exposure (Arch & Craske, 2009; Gloster et al., 2014). Diminished compliance with exposure is related to poor outcome (see Cammin-Nowak et al., 2013). Hence, strategies that may increase the individual willingness to engage in exposure may help to further optimize exposure-based interventions.

Exposure exercises crucially depend on an individual's decision to initiate appropriate actions to change pathological behaviors. In prominent models, highlighting benefits and incentives for behavior change have been proposed as an effective strategy to initiate such actions (Prochaska, DiClemente, & Norcross, 1992). Importantly, clear incentives have been well documented to alter behavior in the realm of operant treatment protocols for diverse conditions (Dutra et al., 2008; Ellgring & Alpers, 2009). Moreover, research on instrumental conditioning clearly indicates that incentives are essential to translate learning into behavioral performance (Bouton, 2007; Tolman & Honzik, 1930). In the case of anxiety disorders, the decision to approach a fear-relevant stimulus commands all of the individual's courage, as goal-directed approach is in direct opposition with avoidance tendencies. Incentives for approach may thus help to facilitate initial approach during exposure. Despite their relevance, incentives for approach and the actual decision conflict between approach and avoidance have

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rarely received attention in experimental psychopathology research.

Behavioral avoidance of single fear-relevant stimuli has been well-documented in instrumental learning tasks. For example, individuals quickly learn to perform avoidance responses to prevent the re-occurrence of aversive stimuli (e.g., by pressing a button; Cameron, Roche, Schlund, & Dymond, 2016; Dymond, Schlund, Roche, & Whelan, 2014; Lovibond, Mitchell, Minard, Brady, & Menzies, 2009; Lovibond, Saunders, Weidemann, & Mitchell, 2008; Ly & Roelofs, 2009). Such avoidance represents an adaptive response to naturally threatening stimuli. Moreover, fearful individuals also show similar avoidance responses towards fear-relevant stimuli in laboratory tasks (e.g., Lau & Viding, 2007; Tolin, Lohr, Lee, & Sawchuk, 1999; Wieser, Pauli, Weyers, Alpers, & Mühlberger, 2009), virtual reality (e.g., Rinck et al., 2010, 2016), or behavioral approach tests (e.g., Richter et al., 2012; Rinck & Becker, 2007; Zoellner, Echiverri, & Craske, 2000). Whereas these findings highlight the intensity and persistence of avoidance in fearful individuals, they do not account for the costs or impairments caused by pathological avoidance.

Recent studies thus focused on avoidance measures in which avoidance responses inflict costs. For example, spider-fearful individuals had to maximize monetary gains in a gambling task, in which high-reward options were paired with presentations of spider pictures and low-reward options with neutral stimuli. Despite missing higher monetary rewards, fearful individuals continuously chose to avoid (Pittig, Brand, Pawlikowski, & Alpers, 2014). Similar findings have been documented in both socially anxious individuals and patients with social anxiety disorder (Pittig, Alpers, Niles, & Craske, 2015; Pittig, Pawlikowski, Craske, & Alpers, 2014) as well as healthy individuals in response to newly acquired fear stimuli (Bublatzky, Alpers, & Pittig, 2017; Pittig, Schulz, Craske, & Alpers, 2014; van Meurs, Wiggert, Wicker, & Lissek, 2014). Such costly avoidance was not only found when avoidance is in conflict with hypothetical monetary rewards, but also when in conflict with shorter waiting periods within the experimental task (Rattel, Miedl, Blechert, & Wilhelm, 2016).

Most importantly, some of these studies provide preliminary support that competing incentives may counteract avoidance in non-fearful individuals. For example, healthy individuals avoided aversive stimuli when competing rewards were too small, but approached the very same stimuli for higher rewards (Aupperle, Sullivan, Melrose, Paulus, & Stein, 2011; Sierra-Mercado et al., 2015). In addition, short-term avoidance of a newly introduced threat stimulus was quickly overcome in favor of maximizing rewards (Bublatzky et al., 2017). These findings indicate that incentives can counteract avoidance in non-fearful individuals, but corresponding effects were rarely tested in fearful individuals. In addition, most studies used (hypothetical) monetary rewards as incentives.

Beyond monetary incentives, the role of social incentives and reinforcement has long been highlighted as an important factor for successful treatment (e.g., Krasner, 1962), and it has been formally integrated in treatment protocols for children with anxiety disorders (e.g., Beidas, Benjamin, Puleo, Edmunds, & Kendall, 2010). In basic research, happy faces have been found to guide decision making in ambiguous situations (Averbeck & Duchaine, 2009; Pittig et al., 2015; Pittig, Pawlikowski, et al., 2014). However, experimental investigation rarely tested whether symbolic social incentives suffice to counteract avoidance of fear-relevant stimuli in fearful individuals.

2. Study 1 – reduction of initial avoidance

The first study investigated whether hypothetical monetary and symbolic social incentives initiate self-chosen approach to fear-relevant stimuli in fearful individuals. Participants completed an approach-avoidance task, in which choosing one option was followed by a fear-relevant stimulus (picture of a spider) and another option was followed by a neutral stimulus (picture of a butterfly). In two different versions of the task, either hypothetical monetary (monetary incentives version) or symbolic social outcomes (social incentives version) were contingent with these options. Both versions of the task included two different contingency phases. During *Equal Contingency*, both options were followed by the same monetary or social reward stimulus to probe baseline differences in approach-avoidance. Here, fear-driven avoidance is indicated by less frequent choices of the fear-relevant option. To verify avoidance behavior during equal contingencies, approach-avoidance decisions of fearful participants was compared to non-fearful control participants. During *Approach Contingency*, choosing the fear-relevant option was linked to high monetary or social reward stimuli. For both types of rewards, Study 1 thus investigated whether initial avoidance behavior under equal contingencies is reduced by incentives for approach. In addition to behavioral approach-avoidance decisions, we expected a decrease in self-reported aversiveness following task completion. Before and after completion of the task, all participants therefore rated their levels of unpleasantness, fearfulness, and arousal when presented with the spider picture used in the task (i.e., the task-spider) as well as additional pictures, which were only presented during ratings (to control for repeated measures effect).

2.1. Materials and methods

2.1.1. Participants

In total, 84 participants were recruited from the community and from students enrolled at the University of Mannheim.[1] Participants were pre-selected as either high or low spider fearful using the Spider Fear Screening (Rinck et al., 2002). This screening questionnaire uses four items to assess the four diagnostic criteria for spider phobia: fear of spiders, physiological arousal, avoidance, and self-reported impairment (0 = *not at all* to 6 = *absolutely*). Following Rinck et al. (2002), participants with scores between 0 and 3 were recruited as non-fearful and participants with a score of 18 or higher as spider fearful. Exclusion criteria included any neurological or other severe medical condition, traumatic brain damage, current or history of psychiatric hospitalization, and current use of psychoactive medication. 20 fearful and 20 non-fearful participants completed the monetary incentives version (N = 40) and 22 fearful and 22 non-fearful participants completed the social incentives version (N = 44). Groups were pseudo-randomized with regard to balanced group sizes between fearful and non-fearful participants and sex ratio.

Questionnaire and demographic data are shown in Table 1. Fearful participants had significantly higher scores on the Fear of Spiders Questionnaire (FSQ; German version: Rinck et al., 2002). The average fear in the present sample was comparable to the level of FSQ scores of clinically diagnosed individuals with spider phobia (e.g., Gerdes & Alpers, 2014; Rinck & Becker, 2006). Fearful participants in the social incentives compared to money incentives version were significantly more fearful of spiders.

2.1.2. Questionnaires and procedure

Participants provided written informed consent to procedures approved by the institutional ethics committee before completing a questionnaire battery. Fear of spiders was assessed with the FSQ (Rinck et al., 2002), a widely used self-report questionnaire with 18 items (0 = *not at all* to 6 = *absolutely*). Previous studies provided clear evidence for significant differences in FSQ scores in spider fearful compared to non-fearful individuals (e.g., Alpers et al., 2009; Gerdes, Alpers, & Pauli, 2008; Pittig, Brand, et al., 2014), with non-overlapping

[1] Effect size was estimated based on two recent studies pitting reward stimuli against unpleasant stimuli (Aupperle et al., 2011; Talmi, Dayan, Kiebel, Frith, & Dolan, 2009). Relevant effect sizes for the impact on rewards on approach-avoidance were transformed into Cohen's *f* and ranged from *f* = 0.34 to 0.62. For Cohen's f = 0.34, power analyses conducted with GPower (Faul, Erdfelder, Lang, & Buchner, 2007) yielded an overall sample size of 68 participants (for between, within and interaction effects of the critical repeated measures ANOVA with power = .80, α error = 0.05).