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Can prepared fear conditioning result from verbal instructions?

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ABSTRACT

Evolutionary fear-relevant stimuli such as snakes or spiders are thought to be prepared to elicit fear reactions. This implies that the acquisition of conditioned fear responses is facilitated when these stimuli serve as conditioned stimuli (CSs). Moreover, extinction of conditioned fear responses is delayed when CSs are prepared stimuli. The research presented in this article addresses the question whether such selective learning effects can be obtained even when participants do not experience pairings of CSs and US but receive only instructions about those pairings. Two experiments were conducted in which participants were verbally informed about the relationship between fear-relevant and fear-irrelevant CSs and the presence of an electrical stimulus (US). However, CSs were never actually paired with the US. US expectancy ratings and skin conductance responses were recorded during multiple CS only trials. In the first experiment, we observed acquisition, extinction and reinstatement of fear on the basis of instructions, but these effects were not modulated by the fear-relevance of the CSs. In the second experiment, we manipulated whether participants actually experienced the CS–US contingencies or were merely instructed. We obtained facilitated acquisition for the merely instructed fear-relevant CS+. We discuss these results in relation to the evolutionary fear learning model of Öhman and Mineka (2001) and the expectancy bias model of Davey (1992).

1. Introduction

Fear conditioning in the lab is commonly established by repeatedly pairing an initial neutral stimulus (the Conditioned Stimulus or CS) with an aversive stimulus (the Unconditioned Stimulus or US), resulting in fearful reactions (or Conditioned Responses, CRs) to the initial neutral CS. However, direct pairings of the CS and US are not necessary to establish fearful CRs. Fearful reactions can also be established by providing participants with verbal information about the contingency between the CS and US, in the absence of any actual CS–US pairings (Field, 2006; Rachman, 1977). Previous research has demonstrated that verbal instructions can be a very powerful tool for inducing fear reactions (e.g., Cameron, Roche, Schlund, & Dymond, 2016; King, Eleonora, & Ollendick, 1998; Merckelbach, de Jong, Muris, & van den Hout, 1996; Muris & Field, 2010). Despite its potency, however, fear conditioning through verbal instructions is still poorly understood (e.g., Olsson & Phelps, 2007).

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According to Olsson and Phelps (2007), fear conditioning through verbal instructions can be partly dissociated from learning via direct experience and learning via social observation (see also: Olsson & Phelps, 2004). That is, verbal instructions primarily result in cognitive contingency learning, while learning via direct experience and via social observation result in both contingency learning and affective learning. Affective learning is the acquisition of defensive responses to potentially threatening stimuli. This type of learning is proposed to take place in an automatic way and is assumed to be independent of cognitive contingency learning (Hamm & Weike, 2005; Mineka & Öhman, 2002). Cognitive contingency learning, on the other hand, refers to the purely cognitive learning of contingencies between events.

Alternatively, according to single-process models of associative learning (De Houwer, 2009; Mitchell, De Houwer, & Lovibond, 2009), learning is the result of the non-automatic formation of propositions. According to this view, there should not be any qualitative differences between pathways of learning because learning via all the different pathways is mediated by the same underlying processes. Thus, verbal instructions should be able to result in learning on measures that are believed to capture affective components of learning as well. This is supported by a number of studies that show that verbal instructions can result in the acquisition of defensive responses (Cameron et al., 2016; Costa, Bradley, & Lang, 2015; Grillon, Ameli, Woods, Merikangas, & Davis, 1991) and subjective feelings of fear and distress (Raes, De Houwer, De Schryver, Brass, & Kalisch, 2014; Soeter & Kindt, 2012), which are considered to be affective measures of fear (Hamm & Weike, 2005; Soeter & Kindt, 2012). Such results call into question whether distinctions should be made between the processes underlying learning via verbal instructions and other types of learning.

Nevertheless, it may be that there are certain instances of affective learning that cannot be obtained through verbal instructions, thus requiring a multi-process account for the different pathways of fear acquisition. The most prototypical example of affective learning is perhaps prepared learning (Öhman & Mineka, 2001). Selective or prepared learning refers to the finding that the pairing of a fear-relevant CS (e.g., pictures of snakes or spiders) with an aversive US (e.g., an electric shock) produces a stronger CR that is more easily established or more resistant to extinction than CRs to fear-irrelevant CSs (e.g., a picture of a flower or a bird). The idea for a varying capacity of stimuli to become associated with an aversive event was introduced by Seligman (1971) in his preparedness theory. According to this theory, stimuli that were potentially threatening for survival in our ancestral history are more easily learned to be feared. This auxiliary assumption to learning theory could explain why certain types of phobias, such as these for heights and spiders, are more prevalent than others (Rachman, 1977). A large set of experiments have provided evidence for this preparedness theory in the lab using fear conditioning (for a review see: Öhman & Mineka, 2001).

It has been argued that prepared learning is due to the operation of a specific fear learning module (Mineka & Öhman, 2002; Öhman & Mineka, 2001). Features of this proposed module include selective activation in the presence of aversive events, automatic activation with a minimal amount of stimulus processing, and encapsulation from higher cognitive influences. Because of the selective and automatic nature of this learning module, we would not expect that prepared learning is a property of fear conditioning via verbal instructions because it seems unlikely that verbal instructions provide the conditions to recruit this module in the learning process (Olsson & Phelps, 2004, 2007).

However, several previous experiments have provided evidence that prepared learning can be obtained via verbal instructions. Öhman, Eriksson, Fredriksson, Hugdahl, and Olofsson (1974) and Davey (1992) both reported that threatening participants that a shock will follow the CSs during the experiment, without actually pairing the CSs with the US, potentiated fear reactions more in the group that saw fear-relevant CSs than in the group that saw fear-irrelevant CSs. However, because no non-threatened CSs had been included in these experiments, it is impossible to determine whether threat instructions generated specific potentiation of fearful reactions to the threatened fear-relevant CS + s, or generated a general potentiation of fearful reactions to all fear-relevant stimuli. While the former would be an instance of selective learning, the latter is not. In two other studies by Hugdahl and Öhman (1977) and Hugdahl (1978), participants were given instructions that one CS would be followed by a shock but the other CS would not. These instructions led to stronger acquisition effects (Hugdahl & Öhman, 1977) and to more resistance to instructed extinction (i.e., the combination of verbal CS-no US instructions and removal of the shock electrodes; Hugdahl, 1978) in the group receiving these instructions about fear-relevant CSs compared to the group receiving these instructions about fear-irrelevant CSs, even though participants had never actually experienced the instructed contingencies. These studies clearly show that prepared learning can be obtained when conditioning is established through verbal instructions, and thus further show that learning via verbal instructions and learning through direct experience of contingencies may be very similar. However, the fact that instructed extinction was less strong with fear-relevant than with fear-irrelevant CSs does demonstrates that there are limits to what can be learned through verbal instructions (Hugdahl, 1978), and seems to contradict a single-process account of fear learning (De Houwer, 2009; Mitchell et al., 2009).

Nevertheless, there are several caveats that potentially limit the interpretability of these experiments. First, the resistance to instructed extinction effect (Hugdahl & Öhman, 1977; Hugdahl, 1978; Öhman, Erixon, & Lofberg, 1975) has been difficult to replicate. In subsequent studies, the combination of an extinction phase with explicit instructions that USs would no longer be presented, resulted in a complete reduction of the CR for both fear-relevant and fear-irrelevant CSs (Lovibond, 2004; McNally, 1987). Second, there is a methodological issue that might complicate the interpretation of the results from Hugdahl and Öhman (1977) and Hugdahl (1978). In both experiments, a between-subjects design was used in which one group was verbally conditioned with fear-relevant CSs and the other group was verbally conditioned with fear-irrelevant CSs. Such a design is not optimal because differences between groups, such as elevated state-anxiety due to repeated exposure to fear eliciting stimuli (pictures of snakes and spiders), are not controlled for. Such uncontrolled differences in state-anxiety