

PERSPECTIVE/OPINION

# Conditioning is More Than Association Formation: On the Different Ways in Which Conditioning Research is Valuable for Clinical Psychology

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Cognitively-oriented clinical psychologists sometimes think of conditioning as the formation of associations in memory. From this perspective, conditioning research is important because it reveals the conditions under which potentially pathogenic associations are formed and can be changed. In this paper, I point out that it is also possible and useful to think of conditioning in ways that do not refer to associations. First, based on the idea that conditioning effects are due to the formation of propositional beliefs, it is possible to appreciate that conditioning research informs us about one way of forming or revising beliefs: via the experience of events. Second, conditioning research reveals the environmental causes of behavior and behavior change and thus has merit regardless of ideas about the cognitive processes and representations that mediate conditioning. By discussing these different perspectives on conditioning as well as the way in which they are related, I hope to provide the reader with a wider appreciation of the merits of conditioning research for clinical psychology.

**Keywords:** conditioning; clinical psychology; psychotherapy; levels of explanation; learning

Conditioning research has been and still is a major source of inspiration for clinical psychology (e.g., Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014; Watson & Rayner, 1920; Wolpe, 1958). The aim of this paper is not to question this claim but rather to qualify it. Many cognitively-oriented clinical psychologists continue to think of conditioning primarily in terms of the formation of associations in memory (e.g., Craske, Hermans, & Vansteenwegen, 2006; Craske et al., 2014). They see conditioning research as informing them about ways in which pathogenic associations in memory are formed and how their impact can be counteracted.<sup>1</sup> Although this point of view certainly has merits, there are other perspectives on conditioning that highlight other virtues of conditioning research. In this paper, I aim to describe several of these perspectives as well as the relation between them, thus clarifying different ways in which conditioning research can provide inspiration for clinical research and practice. The focus will be on conceptual issues rather than on concrete implications for clinical research and practice. Nevertheless, I hope that this paper will be of interest to all who wish to understand the relevance of conditioning research for clinical psychology, be it to further their academic research or their clinical practice.

The perspectives that I focus on cut across two fundamentally different approaches in psychology, being the cognitive and functional approach. Whereas functional psychologists are interested primarily in (abstract descriptions of) the relation between environment and behavior, cognitive researchers aim to uncover the mental mechanisms via which environmental events influence behavior. In contrast to the idea that both approaches are mutually exclusive competitors, my colleagues and I put forward a functional-cognitive framework that allows for mutually beneficial interactions between the two approaches (De Houwer, 2011; Hughes, De Houwer, & Perugini, 2016). As long as researchers are clear about whether they adopt the aims of functional or cognitive psychology, they can exploit work within the other approach to further the aims of their own approach. The current paper also fits within this framework. It describes both cognitive ideas about the role of conditioning in clinical psychology, as well as functional ideas on this topic. The aim of the paper is not to determine which approach to conditioning is superior but to describe the different perspectives and shed some light on why at least some people see merit in a particular perspective, as well as on how the different perspectives relate.

After sketching the associative perspective on conditioning and how it has enriched clinical research, I put forward two other ways of thinking about the role of conditioning in clinical psychology (see **Table 1** for an overview). First, propositional models of

**Table 1:** Overview of the Merits of Conditioning Research from the Perspective of Different Approaches and Theories in Psychology.

| <b>Approach/Theory</b>          | <b>Merits of Conditioning Research</b>                                                                                           |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Cognitive/Association Formation | Study the impact of the spatio-temporal pairing of events on the formation of and changes in potentially pathogenic associations |
| Cognitive/Propositional         | Study the impact of the spatio-temporal pairing of events on the formation of and changes in beliefs                             |
| Functional/Pre-RFT              | Study the spatio-temporal pairing of events as a cause of behavior (without making assumptions about mental processes)           |
| Functional/RFT                  | Study the spatio-temporal pairing of events as a cue for relating events (without making assumptions about mental processes)     |

conditioning provide an alternative for associative models at the cognitive level of explanation by postulating that conditioning is due to the formation of propositional beliefs (De Houwer, 2009, 2018a; Mitchell, De Houwer, & Lovibond, 2009). From this perspective, conditioning research can inform us about how the co-occurrence of events results in propositional beliefs that underlie psychological suffering, as well as ways in which these beliefs can be altered or their impact reduced (Lovibond, 2011). The second alternative is situated at the functional level of explanation (Skinner, 1953). At the functional level, conditioning research reveals the way in which environmental events induce and reduce psychological suffering, regardless of one's ideas about the cognitive processes and representations that are involved conditioning. When viewed from the perspective of Relational Frame Theory (Hayes, Barnes-Holmes, & Roche, 2001; Hughes & Barnes-Holmes, 2016; Törneke, 2010), conditioning research even sheds light on complex relational behavior. In sum, conditioning research is relevant for clinical psychology in more ways than one might think.

### **An Illustration of How Association Formation Models of Conditioning and (Exposure) Treatment Inform Clinical Research and Practice**

Consider the following example. A cognitively-oriented psychotherapist sees a patient who is terrified of flying. Based on what she knows about (classical) conditioning research and its relation to fear and anxiety in clinical practice (e.g., Craske et al., 2006; Grillon, 2008), the therapist formulates the hypothesis that the patient experiences fear of flying because he has formed an association in memory between flying and death. This association might have been formed as the result of a traumatic event during which the patient had a panic attack mid-flight, just like the pairing of a triangle and an electric shock in fear conditioning studies would result in an association between the triangle and shock, resulting

in fear of the shock. Hence, the therapist infers that she needs to get rid of the association if she wants to get rid of the patient's fear.

Until recently, it was thought that exposure treatments are an effective way of getting rid of associations in memory and hence of treating the fear caused by those associations (Wolpe, 1958). Therapists were therefore inclined to treat the patient by exposing him to (flights with) airplanes. To continue our example, imagine that the therapist is also aware of the recent literature on so-called inhibitory learning, that is, the idea that exposure treatment does not result in the elimination of old excitatory associations but the formation of novel inhibitory associations (see Craske et al., 2014, and Craske, Hermans, & Vervliet, 2018, for more details). For instance, when the patient is exposed to airplanes during therapy and experiences that he is not dying, the original association between flying and death would be left intact but supplemented with an inhibitory association between flying and death. Provided that the inhibitory association is strong and active, it cancels out the effect of the other (excitatory) association, thus eliminating fear.

Our scientist-practitioner has also learned that according to the inhibitory learning model (Craske et al., 2014, 2018), inhibitory associations might sometimes be weak and active only in the contexts in which they were formed (e.g., the context of being in an airplane together with the therapist). Hence, steps need to be taken to strengthen the inhibitory associations and to broaden the range of contexts in which the inhibitory associations are active. For instance, some association formation models predict that the extent to which association strength changes is a function of the extent to which events are unexpected (Rescorla & Wagner, 1972). Therefore, exposure experiences that are surprising (e.g., the fact that nothing bad happens to the patient when an airplane actually takes off and lands) should result in stronger inhibitory associations than less surprising events (e.g., the fact that nothing bad happens to the patient when he looks at an airplane from the outside). Likewise, providing exposure experiences in multiple contexts (e.g., with and without the presence of the therapist) would result in inhibitory associations that are active in multiple contexts and would thus broaden the impact of the exposure treatment on fear. Inspired by these ideas, empirical evidence has been collected showing that the effectiveness of exposure treatment can indeed be improved by using variants of exposure therapy that, according the inhibitory learning model, strengthen and broaden the impact of inhibitory associations (Craske et al., 2014, 2018).

### **Propositional Models of Conditioning and Their Relevance for Clinical Psychology**

#### ***On the Nature of Propositions***

The example provided in the previous section was meant to illustrate how association formation models of conditioning have continued to evolve and to inspire clinical psychologists. Models like the inhibitory learning model should indeed be celebrated for generating predictions that have been supported not only in the lab

but also in clinical practice. But these successes do not imply that association formation models of conditioning are correct, or that they provide the most useful way to think about the role of conditioning in clinical psychology. Based on the idea that the earth is flat, one can also make predictions that hold (e.g., the fact that the sun rises each morning and sets each evening) but few would argue that the flat earth theory is correct or that it is the most useful model to successfully navigate the globe. More generally, lay people as well as scientists often fall prey to the fallacy of affirming the consequent: if A then B; B is true; hence A is true. There is a simple reason why this argument is fallacious: the same conclusion (e.g., prediction) often follows from multiple premises (e.g., theories).

Within the context of the present paper, these philosophical considerations are merely meant to highlight the fact that clinical psychologists are free to consider the possibility that conditioning effects are due to mechanisms other than association formation and to explore whether those new ideas are useful for them. Highlighting this option is far from trivial given the fact that association formation models of conditioning are so dominant that many (clinical) psychologists even define conditioning as the (automatic) formation of associations (e.g., Evans, Jamal, & Foxall, 2006) and thus are unable to consider the possibility that conditioning effects might be due to other types of cognitive processes (see De Houwer, 2018b, for a brief historic overview). Some conditioning researchers, however, do take serious the idea that conditioning effects are due to cognitive processes other than association formation, more specifically the formation of propositions (De Houwer, 2009, 2018a; Mitchell et al., 2009). In the following paragraphs, I briefly describe what propositional models of conditioning entail and how they could provide an alternative explanation for the phenomena that were predicted by the inhibitory learning model. At the end of this section, I argue that propositional models even have benefits for cognitively-oriented clinical psychologists that go beyond those of associative models of conditioning.

Whereas associations in memory are merely links between representations via which activation can spread, propositions are beliefs in a cognitive sense, that is, mental representations of statements about events in the world (see Lagnado et al., 2007, for an excellent discussion of the difference between associations and propositions). Statements are inherently relational, that is, they always relate one thing to another thing (e.g., “A is B”, “A co-occurs with B”, “A causes B”). As a result, they can capture differences in the way that things are related. For instance, some patients might believe that being in an airplane is likely to cause their death (e.g., because of a crash or a lack of oxygen in the airplane). Other patients might believe that flying makes their death more likely rather than actually causing it, for instance, by not being able to get to a hospital in time when they would have a heart attack mid-flight. From the perspective of current association formation models, both types of patients would have in memory an association between flying and death. But only propositions can differentiate between

the fact that the first group of patients sees the airplane as a direct cause of their death whereas the second group sees the airplane merely as a context in which other causes of death are more threatening. In addition to being inherently relational, propositions also have a truth value in a philosophical sense: that which is stated can, at least in principle, be true or false. Associations, on the other hand, do not have a truth value because they do not state anything; they just are. This has the important implication that inferences require propositional representations. Inferences involve the transfer or transformation of the truth of premises (If A is present then B is present; A is present) to the truth of conclusions (B is present). Hence, they require propositional representations because only those representations have a truth value. Given the central nature of inferences in human cognition (De Houwer, 2019; Halford, Wilson, & Phillips, 2010), it is safe to conclude that propositions are also vital for human cognition. In sum, compared to simple associations, propositions are much more rich in terms of the information that they can capture and the information processing that they allow for. It is for this reason that I maintain the position that propositional representations are the bedrock of the mental world (De Houwer, 2009, 2018b, 2019).

#### ***On the Relevance of Propositional Models for Clinical Psychology***

Do propositional theories also provide a viable alternative for association formation theories in clinical psychology, for instance, when we look at our patient who is terrified of flying an airplane? First, they indeed provide a potential cognitive explanation for the role of conditioning in psychological suffering. For instance, in line with cognitive theories of fear and panic (e.g., Clark, 1986), fear of flying might well result from propositional beliefs about flying (e.g., that being in an airplane causes suffocation or increases the probability that a heart attack will be fatal). Importantly, these beliefs could have resulted from a traumatic experience such as having a panic attack mid-flight, just like the pairing of a triangle and shock could result in the belief that the triangle predicts the shock.

Second, propositional theories can also shed light on the cognitive processes that mediate the effects of clinical interventions. For instance, from the perspective of propositional models of conditioning, exposure treatment can have an effect by creating new beliefs. For instance, during exposure therapy, our patient might learn that being in an airplane sometimes does not cause death by suffocation. Based on what we know about belief formation, it also makes sense to assume that novel beliefs are more likely to be formed or to be seen as more convincing when they result from surprising, unexpected events than when they result for unsurprising events. Likewise, novel beliefs can be very context dependent (e.g., the belief that being in an airplane does not cause suffocation when the therapist is present), something that can be overcome by providing exposure treatments in multiple contexts.

In sum, conditioning effects in the lab and in clinical practice might well be mediated by propositional beliefs rather than associations. It could even be that recent advances

in exposure therapy such as creating unexpected events or providing exposure experiences in multiple contexts is effective not because it strengthens and broadens the impact of inhibitory associations but because it strengthens and broadens the impact of novel propositional beliefs that are formed during exposure therapy.

Not only can propositional models match some of the benefits of associative models for clinical psychology (e.g., their implications for exposure therapy), they also have important additional benefits, at least for cognitively-oriented clinical psychologists (see Lovibond, 2011, for an excellent and more extensive discussion of the merits of propositional models of conditioning for clinical psychology). First, propositional models fit well with the core assumption of cognitive therapies that beliefs are central in psychological suffering (e.g., Beck et al., 1990; Clark, 1986; Young, Klosko, & Weishaar, 2003). As I noted earlier, whereas simple associations cannot fully capture the informational complexity of the kind of beliefs that clinical psychologists often encounter in patients (e.g., the distinction between airplanes causing death or facilitating other causes of death), propositions can.<sup>2</sup>

Second, propositional models highlight that stimulus pairings are just one possible source of beliefs and thus psychological suffering. Actually experiencing a traumatic event in which an initially neutral event (e.g., being in an airplane) co-occurs with an aversive event (e.g., having a panic attack) could indeed give rise to negative beliefs about flying (e.g., “I am likely to die when I take the airplane”). But similar negative beliefs about flying can also result from or be maintained by verbal information (e.g., reading about a recent plane crash on the news), observation (e.g., seeing images of a plane crash or seeing other people being terrified of airplanes), or inferences (e.g., the conclusion that heart attacks on airplanes are likely to be fatal based on the knowledge that heart attacks are likely to be fatal when one does not get to the hospital in time and the knowledge that it is impossible to get to the hospital when you are stuck in an airplane mid-flight). Also for treatment, there are likely to be interactions between the different sources of belief revision such as experiencing events (the effects of which are typically studied in conditioning research; e.g., Bouton, 2016; Catania, 2013), verbal messages (the effects of which are typically studied in persuasion research; e.g., Cialdini, 1984), and the observation of others (the effects of which are studied in social learning research; e.g., Rendell et al., 2011). Hence, for cognitive therapists who are seeking to reduce psychological suffering by changing pathogenic beliefs, it makes perfect sense to adopt a propositional perspective on conditioning because it allows them to fully integrate conditioning-based treatment techniques such as exposure with other techniques that are based on persuasion and social learning. All these sources can jointly be directed at achieving belief-revision (also see Lovibond, 2011, for a discussion and Lovibond, Mitchell, Minard, Brady, & Menzies, 2009, for a concrete example of how beliefs and behavior interact).

More recently, so-called “third-wave” therapies such as Acceptance and Commitment Therapy (ACT) have been put

forward that focus not so much on changing the content of beliefs but individuals’ relationship with their beliefs (as well as the relationship with other forms of private behavior such as emotions; e.g., Flaxman, Blackledge, & Bond, 2011; Hayes, 2004). For instance, rather than trying to convince our patient with fear of flying that flying is safe, some “third-wave” therapists would learn the patient to distance oneself from the fear evoked while flying. Unlike association formation models of conditioning, propositional models of conditioning also fit well with these therapies. Most importantly, third wave therapies are built on the idea that patients suffer because of the way they deal with certain beliefs (e.g., because they avoid disturbing thoughts). As I noted above, the full complexities of those beliefs can be captured at the cognitive level more naturally by assuming the existence of propositional representations in memory than by assuming associations.<sup>3</sup> From a propositional perspective, conditioning research can inform us about the way in which people approach their beliefs and how this influences behavior. For instance, using conditioning procedures (e.g., the pairing of a shock and triangle) as a way to install fear-related beliefs (e.g., that the triangle will be followed by a shock) allows one to study which acceptance interventions are effective in reducing conditioned fear or avoidance.

Next to the strengths of propositional models as a cognitive framework for thinking about the relation between conditioning and psychological suffering, propositional models also have their limitations. Most importantly, they have little to say about when and how beliefs influence behavior. For instance, propositional models as such do not specify why certain beliefs influence behavior in a particular way, nor do they explain why beliefs sometimes have no behavioral effects (Mitchell et al., 2009). As pointed out by an anonymous reviewer, certain behaviors can be seen as a rather direct consequence of having a belief (e.g., when someone with social anxiety starts to blush based on the expectancy that she will be evaluated negatively). However, also in these cases, it is difficult to say on the basis of the underlying belief why certain reactions occur and not others (e.g., blushing rather than becoming pale). Note, however, that also association formation models of conditioning do not always provide a good account of behavior change (e.g., see Bouton, 2016, pp.187-193, for a discussion). Hence, better understanding the nature of behavior change poses a challenge for conditioning research at large.

## **Exploiting Conditioning Research Without Committing to a Cognitive Theory of Conditioning**

### ***On the Nature and Merits of the Functional Level of Explanation***

Until now I have argued that (a) conditioning does not have to be thought of in terms of association formation and that (b) there is merit in considering the idea that conditioning is due to propositional processes. It is important to realize, however, that both associative and propositional models of conditioning are situated at the cognitive level of explanation: they specify assumptions about the mental

processes and representations via which the pairing of stimuli leads to changes in behavior. For cognitively-oriented (clinical) psychologists, these cognitive models of conditioning have merit because they (1) provide possible answers to questions about how conditioning comes about and (2) generate novel predictions about the conditions under which conditioning effects strengthen and weaken. For instance, the inhibitory learning model is one of those cognitive theories that led to interesting predictions about how to optimize exposure treatment (e.g., Craske et al., 2014). For cognitively-oriented clinical psychologists it is important to distinguish between associative and propositional models of conditioning because these models provide different answers and generate different predictions concerning the role of conditioning in psychological suffering.

Despite these merits of cognitive theories, it is also possible and useful to think of conditioning independent of cognitive processes. This can be achieved by defining conditioning as an effect, that is, as the impact of regularities in the environment (e.g., the pairing of a triangle and shock) on behavior (e.g., fear of the triangle; De Houwer, Barnes-Holmes, & Moors, 2013; De Houwer & Hughes, 2020). Such a definition qualifies as a functional definition of conditioning in that behavior (fear of the triangle) is said to be a *function of* elements of the environment (pairing of triangle and shock). Earlier, I noted that defining conditioning as an effect has benefits for cognitive researchers in that it allows one to consider multiple cognitive theories of conditioning. Functional definitions have the additional advantage that they reveal a functional level of explanation that is separate from the cognitive level of explanation. By highlighting the environmental events that influence behavior, functional definitions provide a potential explanation of that behavior. For instance, the claim that a certain change in behavior (e.g., fear of flying) is an instance of conditioning entails that the change in behavior is due to the pairing of events in the environment (e.g., a traumatic event in which flying co-occurred with a panic attack) rather than some other environmental cause (e.g., the mere fact of being in an airplane) or genetic cause (e.g., some gene that triggers fear of flying). It does not identify the cognitive processes via which the pairing of those events leads to fear of flying (this is the aim and domain of cognitive explanations) but it does provide a potential explanation of how the fear of flying came about. Importantly, by doing so, functional explanations allow one to predict-and-influence behavior: if behavior A (e.g., fear of flying) is a function of event B (e.g., having a panic attack mid-flight), then the presence of elements of event B (e.g., being in an airplane) allows one to predict behavior A (e.g., fear) and the manipulation of event B (e.g., decreasing the strength of the relation between flying and panic attack via exposure) allows one to influence behavior A (e.g., less panic attacks).

When viewed from a strictly functional perspective, conditioning research informs us about the conditions under which the experience of co-occurring events influences behavior, as well as the nature of the events that are necessary to counteract those effects. Importantly,

conditioning research provides these insights regardless of whether we know the cognitive processes and representations via which co-occurring events influence behavior (also see Eelen, 2018). For instance, the fact that repeated exposure to a stimulus can reduce conditioned fear responses to that stimulus holds independently of whether these reductions are due to changes in associations or changes in propositional beliefs. Especially for applied psychologists such as clinical practitioners, what matters is *whether* a procedure is effective in changing behavior and not so much *why* it is effective (see De Houwer, 2011, and Hughes, De Houwer, & Perugini, 2016, for a more detailed discussion of the relation between the functional and cognitive levels of explanation and De Houwer, Hughes, & Barnes-Holmes, 2017, for an extensive discussion of why the functional level of explanation is primary in applied psychology). Although clinical practitioners often resort to the cognitive level of explanation in order to understand the cognitive mechanisms of psychological suffering and therapy, it is important to realize that they could in principle operate solely at the functional level of explanation.

### Relational Frame Theory: A Functional Account of Language, Thinking, and Conditioning

An important reason why cognitively-oriented clinical psychologists might often turn to the cognitive level of explanation is that they believe that a strict functional analysis of psychological suffering in terms of conditioning does not allow them to capture the full complexity of what they encountered in their clinical practice (Hayes, 2004). More recently, however, a new functional conceptualization of conditioning has been put forward that can enrich strict functional analyses. More specifically, proponents of Relational Frame Theory (RFT) have argued that conditioning is not simply a matter of co-occurring events causing a change in behavior. Rather a relation between the presence of events could function as a contextual relational cue, that is, something that signals the way in which events are related (also see Hughes, Ye, & De Houwer, 2019; De Houwer & Hughes, 2020).

Again consider a prototypical fear conditioning experiment in which a triangle is repeatedly paired with an aversive shock. From the perspective of RFT, the pairing of the triangle and shock is not a direct cause of fear for the triangle but a cue that signals similarity between the triangle and shock, much like the sentence “the triangle goes together with the shock” signals similarity between both stimuli (Leader, Barnes, & Smeets, 1996). We know from basic learning research that language-capable humans can respond *as-if* stimuli are related in a certain way (e.g., that the word “glass” has things in common with the object glass; that “hate” is opposite to “love”) even when there is no physical basis for assuming such a relation. In technical terms, this pattern of behavior (e.g., acting *as-if* stimuli are equivalent, opposite, ...) is called arbitrarily applicable relational responding (see Törneke, 2010, and Hughes & Barnes-Holmes, 2016, for an accessible introduction to RFT). In less technical terms, one could say that conditioned behavior is symbolic behavior: behavior changes because the co-occurrence of events

functions as a symbol for the way in which the events are related (De Houwer & Hughes, 2016). Importantly, arbitrarily applicable relational responding is a behavioral phenomenon or effect, just like fear conditioning is a behavioral phenomenon or effect. Hence, it can be part of a strictly functional analysis. For instance, having a panic attack mid-flight can result in fear of flying not because the co-occurrence of the panic attack and being in an airplane is a direct cause of fear of flying but because it signals causal relation between the panic attack and flying. As a result of that event, the patient starts behaving as-if flying is equivalent to other things that evoke panic (e.g., suffocation), including an avoidance of flying. Because RFT views conditioning as a symbolic event, functional analyses that refer to conditioning can capture also the symbolic aspects of psychological suffering, something that is more difficult on the basis of pre-RFT conceptualizations of conditioning. Hence, an RFT perspective on conditioning greatly increases the power and scope of strictly functional analyses of psychological suffering (also see Hughes, De Houwer, & Barnes-Holmes, 2016). Note that RFT is one of the cornerstones of ACT (see Törneke, 2010, for a discussion). Although ACT in some ways goes beyond the functional level of explanation (see De Houwer, Barnes-Holmes, & Barnes-Holmes, 2016, for more details), the role of RFT in the development of ACT attests to its relevance for clinical psychology.

When clearly separating the functional and cognitive levels of explanation, it becomes possible to appreciate the fact that RFT-based analyses (which are located at the functional level of analysis) are highly compatible with propositional models of conditioning (which are located at the cognitive level of explanation). RFT highlights the relational nature of behavior: people act *as-if* events are related in a certain manner (e.g., are similar or opposite). From a cognitive perspective, the ability to respond relationally (a behavioral phenomenon) requires cognitive representations that can encode information about specific types of relations. As noted above, unlike simple associations, propositional representations can encode this information. In sum, although RFT and propositional models of conditioning are situated at different levels of explanation and are therefore fundamentally different, they are highly compatible (see De Houwer, Hughes, & Barnes-Holmes, 2016, for a more detailed discussion of the relation between RFT and propositional models).

### Conclusion

There are different ways in which one can think about the role of conditioning research in clinical psychology. Unlike to what many cognitively-oriented clinical psychologists seem to believe, the role of conditioning research is not limited to revealing ways in which pathogenic associations in memory are formed and can be changed. Conditioning research can also be seen as informing clinical psychologists about the way in which the spatio-temporal co-occurrence of events leads to the formation of propositional beliefs and how those beliefs can be revised. Hence, both associative and propositional models

of conditioning can help clinical psychologists (a) to think about the mechanisms underlying psychological suffering and treatment and (b) to design new ways of reducing psychological suffering. Finally, the merits of conditioning research do not hinge upon the validity of current theories about the mental processes and representations that mediate conditioning effects. Instead, conditioning research contributes to a functional level of explanation by revealing the environmental causes of behavior and psychological suffering. From the perspective of RFT, conditioning research can even inform us about complex relational behavior akin to verbal symbolic behavior, which again sets the stage for new ways of tackling psychological suffering (e.g., ACT). From all of these points of view, conditioning research has the potential to continue to inspire clinical psychology for many years to come.

### Notes

- <sup>1</sup> In this paper, I focus on classical conditioning rather than operant conditioning because within cognitively-oriented clinical research, the former has had more impact than the latter (e.g., Craske et al., 2006). However, a similar argument can be developed for operant conditioning.
- <sup>2</sup> An anonymous reviewer correctly pointed out that the role of beliefs in conditioning has been highlighted also in expectancy theories and that these theories also had an impact in clinical psychology (e.g., Davey, 1992; Kirsch, 2004; Reiss, 1980). Expectancy theories postulate that (a) the presence of event A leads to the expectancy of event B when A and B have been paired in the past and that (b) conditioned changes in behavior (e.g., fear of flying) are the direct consequence of these expectancy beliefs. Although expectancy theories can be seen as a precursor of propositional theories of conditioning (e.g., Lovibond, 2011), there are two important differences. First, expectancy theories focus on just one type propositional belief: the proposition that one event will follow another event. Second, expectancy theories are often (implicitly) grounded in association formation models. In fact, in its simplest form, an expectancy theory is an associative model in which the associative activation of a representation (e.g., activation of the representation of a panic attack as the result of being in an airplane) results in the conscious expectancy that the represented event will actually occur (e.g., that a panic attack is bound to take place; De Houwer, 2018b). As elegantly argued by Jozefowicz (2018), this idea is problematic, if only because representations can also be activated without generating the expectancy that the represented event will actually take place in the near future (e.g., thinking about a holiday in Greece without expecting to be in Greece; also see Baeyens, Eelen, Crombez, & Van den Bergh, 1992). However, expectancy theories that acknowledge the role of propositional beliefs other than expectancies and that reject the formation of simple associations as the mechanism of belief formation can be regarded as propositional models (De Houwer, 2018a).

<sup>3</sup> The term “belief” can be used at the functional level to refer to a behavioral phenomenon (e.g., a pattern of relational behavior) and at the mental level to refer to a mental representation. Although it is important to recognize the fundamental difference between those two conceptualizations, it seems safe to conclude that, from a cognitive perspective, beliefs as behavioral phenomena are necessarily mediated by propositional beliefs as mental representations.

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