Postconditioning Event Manipulations on Processing of the Target Conditioned Stimulus in Conditioned Taste Aversion

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For the month of April, we are highlighting Chapter 8 of Reilly and Schachtman's "Conditioned Taste Aversion: Behavioral and Neural Processes." This chapter, by Schachtman, Ramsey and Pineño, is entitled “Postconditioning Event Manipulations on Processing of the Target Conditioned Stimulus in Conditioned Taste Aversion”.

The authors begin their chapter by noting that while traditionally little attention has been paid to issues of postconditioning manipulations on conditioned performance more current work has shown that “Treatments occurring between training and testing have been very valuable in isolating the various processes presumably involved in the learning that occurred as well as the associative content of memory.” With that stated, they note that their chapter will address such phenomena using taste aversion learning.

In this context, they describe a number of such manipulations, beginning with historical antecedents in the literature on traditional forms of conditioning and learning. The first of the manipulations discussed was “reminder effects” in which animals conditioned and then made amnesic by electroconvulsive shock display evidence of the conditioning if given a reminder treatment prior to the test. Other postconditioning phenomena, e.g., reinstatement, spontaneous recovery and US modification, were then described and explained in the context of the event memory model in which during conditioning representations are formed of the CS, US and the CS-US paring. Within this model, they describe reinstatement of an extinguished CR with presentations of the US alone, spontaneous recovery of the extinguished CR with time post extinction and change in the CR with post-conditioning changes to the US. All illustrate effective postconditioning manipulations that apparently impact retrieval processes.

The authors follow this introduction of the effectiveness of postconditioning manipulations in general with an overview of some similar phenomena in taste aversion learning. For example, reinstatement of extinguished taste aversions has been reported with postconditioning exposure to the US alone (that is dependent upon the degree of extinction). Also, extended retention intervals (between extinction of an aversion and reacquisition of an aversion to the same CS) reverse the retardation that such extinction generally has on learning. Changing the context between extinction and testing also impacts the display of taste aversions, i.e., animals whose aversions have been extinguished in an environment different from training recover the aversion when tested in the original training environment, i.e., the renewal effect. All sets of data suggest that associations are intact and are differentially retrieved dependent upon the postconditioning manipulations.

Latent inhibition is yet another phenomenon shown to be affected by postconditioning
manipulations. Specifically, latent inhibition weakens with time between conditioning and testing, indicating an intact CS-US association not evident when no delay is imposed. Interestingly, presentation of a surprising event following extinction of a CTA did not impact the subsequent reacquisition of an aversion to that CS, suggesting that changes in attention do not affect learning in these conditions.

The authors then turn their attention to stimulus interaction effects and postconditioning manipulations. In this section, they focus on negative interactions, e.g., blocking and overshadowing, and positive interactions, e.g., second-order conditioning and sensory preconditioning. In the context of negative interactions, they note that unlike more traditional classical conditioning preparations, postconditioning extinction of one element in a compound (the overshadowing stimulus) has no effect on the overshadowed CS. On the other hand, extinction of one element in a compound (the blocking stimulus) attenuates its ability to serve as a blocking stimulus. Interestingly, this attenuating effect is not evident if extinction occurs 3 weeks before compound conditioning or if the animals are given a US exposure (reinstatement) immediately following extinction, again suggesting that excitatory control is still evident under appropriate retrieval conditions. Both overshadowing and blocking can be reduced with greater numbers of conditioning trials, facilitating retrieval of the overshadowed or blocked stimulus. A final issue in negative interactions is latent inhibition. Preexposure to a taste stimulus reduces its ability to serve as a CS. If following preexposure that taste is now paired with a US prior to it serving in a blocking study (when it is given in compound with another CS), blocking is attenuated. This blocking is only evident if the training to test interval is brief. If long, blocking again is evident, despite the fact that LI had been evident earlier. It is clear that associations are intact; simply not evident under specific retrieval conditions.

Such effects are also demonstrated in positive interactions. After a brief overview of explanations for sensory preconditioning and second order conditioning, the authors describe several studies showing that extinction of the direct association (CS-US) has no effect on second order conditioning, whereas such extinction weakens sensory preconditioning, suggesting that the two forms of learning are based on different processes, i.e., stimulus-response (S-R) and within compound associations, respectively. In addition to assessments with extinction, the authors describe work on associative devaluation in which devaluing the primary CS-US association (by pairing the US with a toxic manipulation) has no effect on the second order stimulus, aging showing that SOC is S-R in nature and not dependent upon within compound associations. Similar support for S-R learning in SOC is demonstrated by testing animals in different motivational states (that reduce responding to the first order, but not second order, CS).

The authors close their analysis by examining the extinction of taste aversions in the presence of a second CS. They note that such extinction is protected by a Pavlovian conditioned inhibitor (or a neutral CS; overshadowing of extinction). They then describe the fact that an extinguished CS may retard acquisition of conditioning and block
extinction to an already established CS (i.e., extinguished cues can serve as a conditioned inhibitor in taste aversion learning). Finally, they note that pairing two tastes which each had previously been paired with a US does not result in more rapid extinction (in fact extinction is retarded), suggesting that second order conditioning may impact extinction under such conditions.

As the authors conclude, “The findings reviewed in this chapter illustrate how the processes of retrieval and interference among associations have a large impact on the CR.” It is clear from this work that a complete understanding of associative control in taste aversion conditioning (and other associative learning) necessitates an awareness of such retrieval processes.

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