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Retrospective Revaluation in Human Associative Learning: New Data and Implications for Models of Learning

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New experiments examined two forms of retrospective revaluation in human associative learning. Retrospective revaluation occurs when a cue is initially associated with some outcome, but subsequent learning about other cues causes the prior association to be changed. Retrospective revaluation is an especially challenging phenomenon for many contemporary models of associative learning because the associative strength of the cue is changed when the cue is not itself present in the stimulus. Many models, to the contrary, predict no change in strength for absent cues. It is important, therefore, to establish the extent of the phenomenon itself when trying to explain it. (Examples of recent work include Dickinson & Burke, 1996; Van Hamme & Wasserman, 1994)

Our experiments used simulated medical diagnosis, wherein people learned to classify lists of symptoms as particular fictitious diseases. This paradigm, which has multiple possible outcomes (diseases), allows within-subject designs and greater flexibility of associative relations than many experiments previously reported in the literature, which used ratings of a single outcome, such as presence or absence of allergic reaction

Our first experiment investigated forward and backward blocking (i.e., preventing or diminishing) of associative learning, in a within-subjects design. People learned in one phase of the experiment that the pair of symptoms A+B indicated disease 1, which we denote AB-1. If they learned in a prior phase that symptom A alone indicated disease 1 (A-1), then learning about symptom B was blocked in the subsequent AB-1 phase. This is called forward blocking. If people learned A-1 after they learned AB-1, then the significance of B could be (and was) retrospectively diminished. This is called backward blocking. Unlike previous studies, we found that the magnitude of backward blocking was as robust as forward blocking. Thus, the challenge for models of human associative learning is indeed a strong one.

Our second experiment investigated what we call forward and backward conditioned inhibition, again in a within-subjects design. As in the first experiment, people learned AB-1 in one phase of the experiment. In the other phase of learning, however, the single symptom A was associated with a different, second disease 2 (A-2). If the A-2 training is provided before AB-1 training, many models of associative learning predict that symptom B should be learned as an especially strong indicator of disease 1, perhaps even inhibiting selection of disease 2. This we call forward conditioned inhibition. If the A-2 training instead comes after AB-1 training, then this result would be called backward conditioned inhibition. As with backward blocking, many models predict forward conditioned inhibition but do not predict backward conditioned inhibition. Our results showed neither forward nor backward conditioned inhibition, contrary to the models.

Our third experiment explored the cause of the lack of conditioned inhibition found in the previous experiment. We discovered that the apparent lack was a consequence of the type of control condition used as a comparison for assessing conditioned inhibition. Our control condition was directly analogous to controls used previously by other researchers. The control condition simply has another pair of symptoms associated with another disease, denoted CD-3, learned concurrently with AB-1. The test for conditioned inhibition consists of measuring responses to the pair of conflicting symptoms, BD. Because symptom B should be an especially strong predictor of disease 1, and D is only part of the two symptoms that predict disease 3, responses to BD should favor disease 1. But, as stated above, people showed no preference for disease 1 in this case. In our third experiment, we expanded the design so that people would be forced to learn CD-3 as a conjunctive pair, i.e., C AND D indicates 3, rather than as a disjunctive pair, i.e., C OR D indicate 3. With this new control condition, we found both forward and backward conditioned inhibition.

These new results present a complex situation for models of associative learning to address. Not only should the models produce retrospective revaluation in blocking and conditioned inhibition, the models should also be sensitive to the difference between conjunctive and disjunctive encoding of cues.

References

Dickinson, A., & Burke, J. (1996). Within-compound associations mediate the retrospective revaluation of causality judgements. *The Quarterly Journal of Experimental Psychology, 49B*, 60–80.

Van Hamme, L. J., & Wasserman, E. A. (1994). Cue competition in causality judgments: The role of nonpresentation of compound stimulus elements. *Learning and Motivation, 25*, 127–151.