Does learning occur in the absence of cues?

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Error Driven Learning, or EDL, is a theory where the main goal is to minimise uncertainty when learning. One of the most known formalisations of this theory is the Rescorla-Wagner model (1972). If a certain cue is present and an outcome is as well, then the connection between the two is strengthened, while if the cue is present but the outcome is not, the connection is weakened. Because the informativeness of a cue is important, Rescorla and Wagner decided that if a cue is not present, it is not informative and therefore there should be no change to the connections.

However, we want to know if learning does occur in the absence of cues. One of the main theories that argues this is that of Van Hamme an Wasserman (1994). They agree on what happens when cues are present, but suggest an addition when they are not. A non-present cue should be encoded negatively, which leads to a non-present cue and present outcome resulting in a weakened connection and a non-present cue and non-present outcome leading to a stronger connection.

Is this addition to the original Rescorla-Wagner model needed? We have created models of both the Rescorla-Wagner and the Van Hamme-Wasserman model and looked how they performed when taking the experiment from Van Hamme and Wasserman's 1994 paper. In this experiments participants had to indicate how likely it was that an allergic reaction occurs based on foods eaten. There were three types of food, of which two were shown in one trial together with an outcome (an allergic reaction or not). The participants then had to rate on a scale from 0 to 8 for *all three foods* how likely they could cause an allergic reaction (0-very unlikely, 8-very likely). As can be seen in Figure 1 and 2. In the first figure the ratings scores for each condition can be seen, and in the second the models performance can be seen (weights to not allergic subtracted from those to allergic). While the scale between the two models is different, the overall pattern is the same.

We propose however that EDL is an implicit process, that can be hindered by explicit inference. In the original experiment ratings were explicitly asked, therefore the ratings might not reflect EDL, which could explain why the general order of the food groups is the same between the original experiment and the model, but the details are not. Thus the results of Van Hamme and Wasserman might be due to explicit inference, not EDL.

To test this we will adjust the original experiment in three ways. The first is to change the stimuli, as food could give people certain preconceived notions about what will lead to an allergic reaction. The second way will be to alter both the stimuli (which will be the same as in the first change) and the speed at which participants have to react. We expect that by manipulating this speed, we will find a difference in what participants learn in the slower condition (room for explicit inference) and the faster condition (forced implicit learning).

SORT OF CONCLUDE SOMETHING HERE!!

References

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Wagner, A., & Rescorla, R. (1972). A theory of pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. *Classical conditioning ii*, *64*, 99.

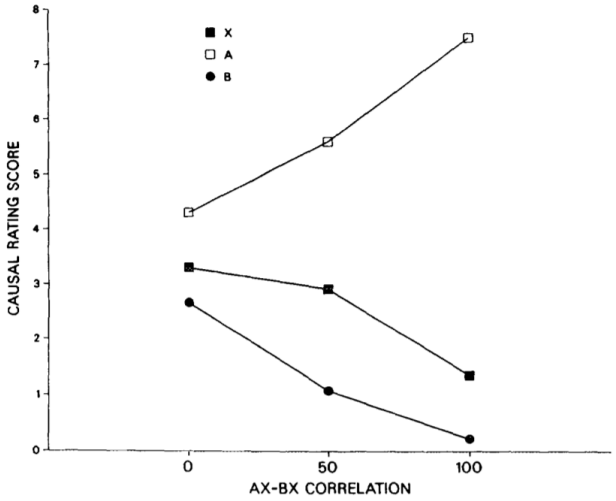

FIG. 2. Final (Day 16) mean causal rating scores of subjects in all groups combined to Elements A, B, and X of AX and BX compounds as a function of the difference in the predictiveness of those compounds (AX–BX) for the occurrence of an allergic reaction.

Figure 1: Rating scores per condition from paper Van Hamme and Wasserman 1994. X, A and B are different groups of foods

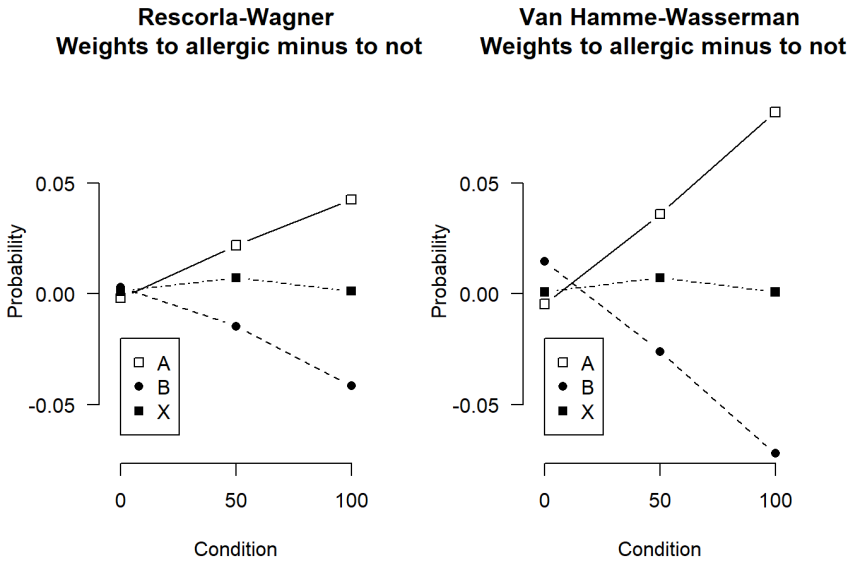

Figure 2: Weights to *Allergic* minus *not Allergic*, Rescorla-Wagner left, Van Hamme-Wasserman right