What can we learn from absent cues?

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SPACE EXPLORER

Error Driven Learning (EDL)

- Minimizing uncertainty
- Cues (incoming sensory information)
- Outcomes (upcoming events)

Rescola-Wagner Model (1972)

- Delta Rule (Widrow and Hoff)
- Simple neural network

- $\Delta V_{ij}^{t} = \begin{cases} 0 & cue\ i\ is\ absent \\ \eta\left(1 - act_j^t\right) & cue\ i\ and\ outcome\ j\ are\ present \\ \eta\left(0 - act_j^t\right) & cue\ i\ is\ present\ and\ outcome\ j\ absent \end{cases}$

Van Hamme and Wasserman (1994)

- $\Delta V_{ij}^{t} = \begin{cases} \eta_1\left(1 - act_j^t\right) & cue\ i\ absent, outcome\ j\ present \\ \eta_1\left(0 - act_j^t\right) & cue\ i\ and\ outcome\ j\ are\ absent \\ \eta_2\left(1 - act_j^t\right) & cue\ i\ and\ outcome\ j\ are\ present \\ \eta_2\left(0 - act_j^t\right) & cue\ i\ is\ present, outcome\ j\ absent \end{cases}$

- Experiment

Van Hamme and Wasserman (1994)

- Evidence in the direction of their hypothesis
- Food
- Rating system

- Will we find learning in the absence of cues?
- Modelling

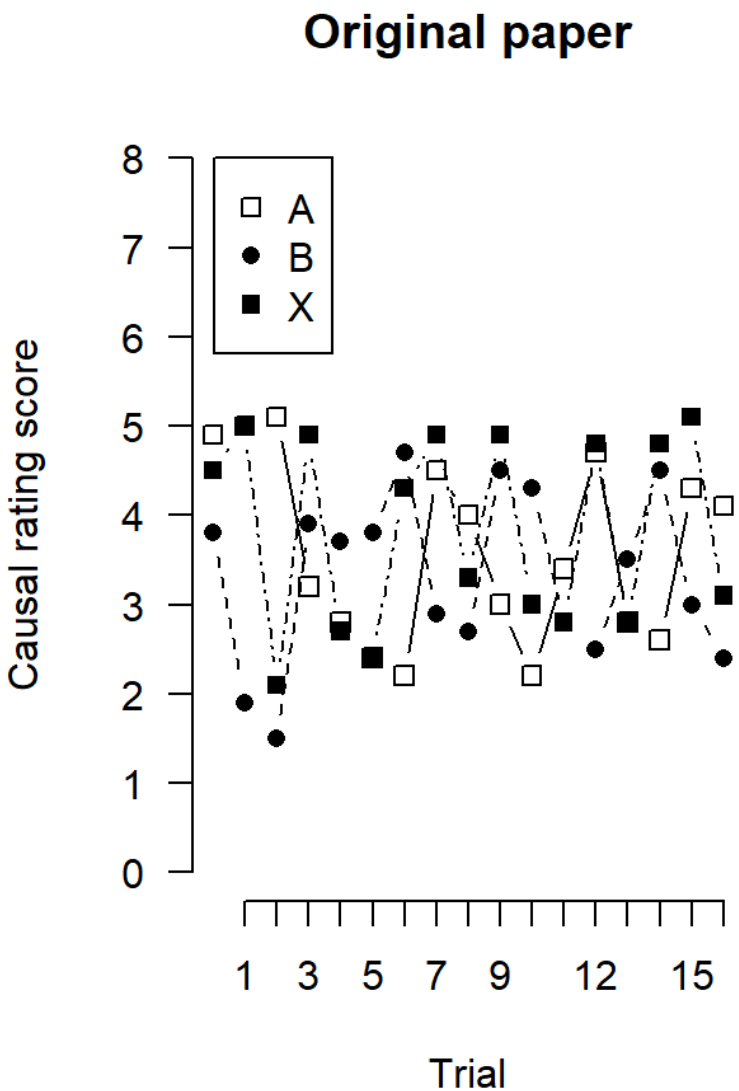
Modelling, the experiment

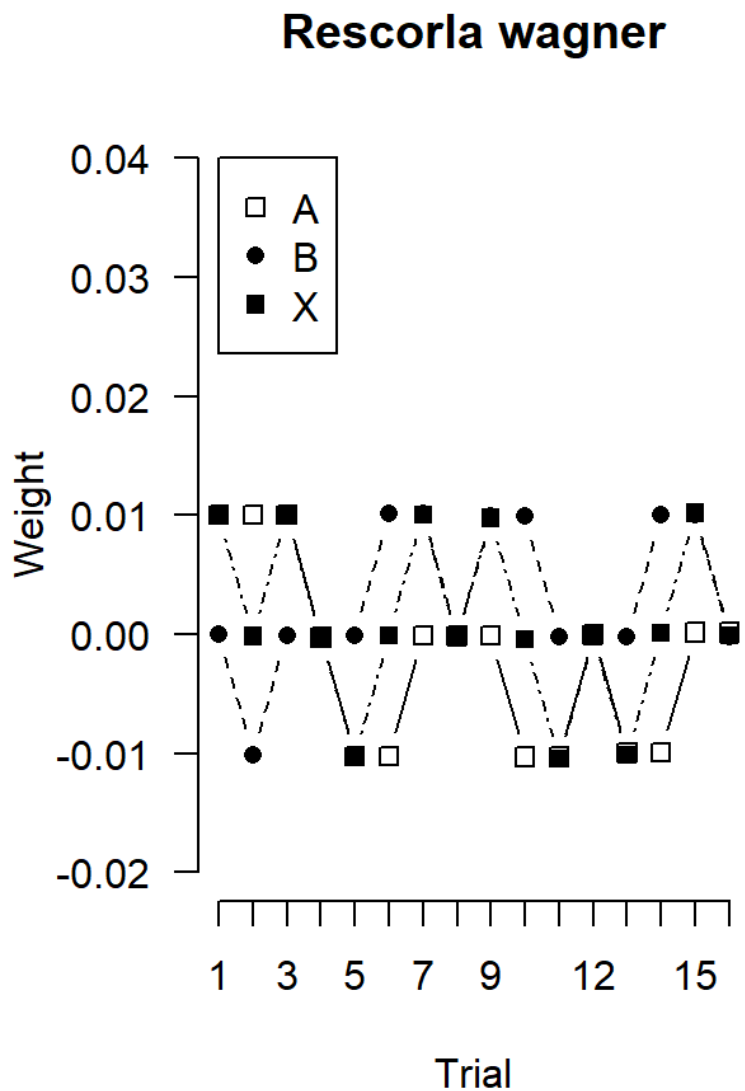
- Allergist
- AX or BX
- How likely do you think it is that this food causes an allergic reaction?
  - 0-8
- 16 trials, 3 blocks
  - What food
  - Outcome condition
    - 0.00, 0.50, 1.00

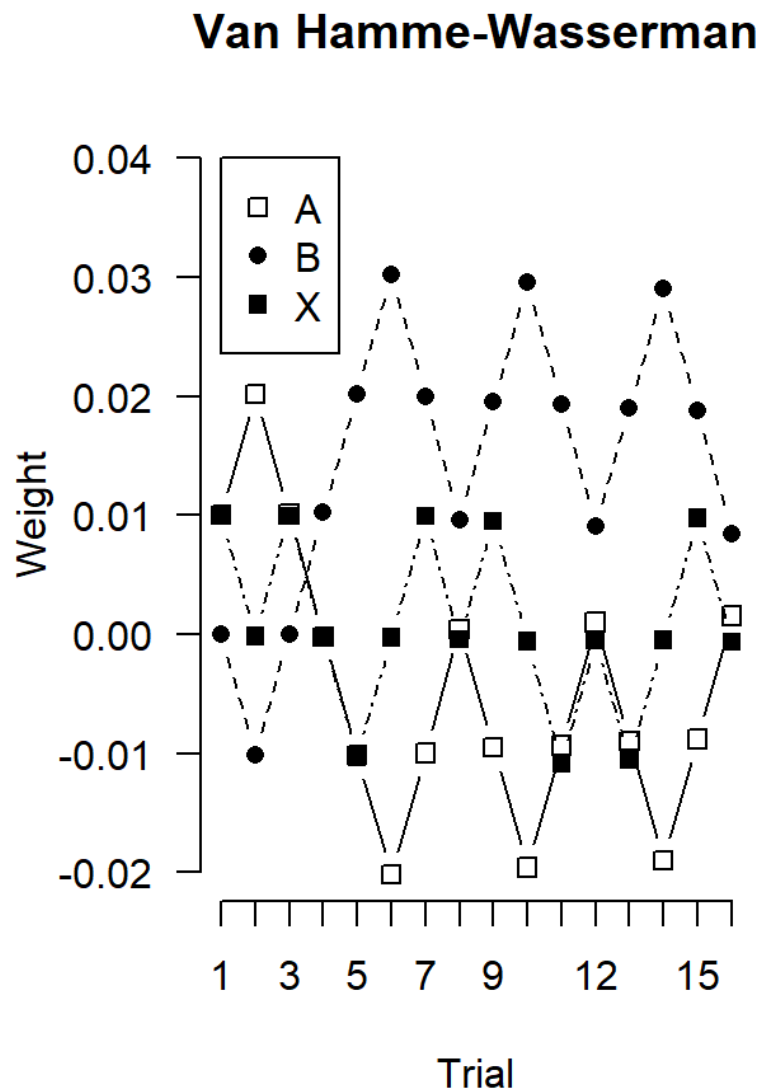
Modelling

- EDL and NDLvisualisations
- Background cue (Rescorla 1972)
- Memory
- No outcome

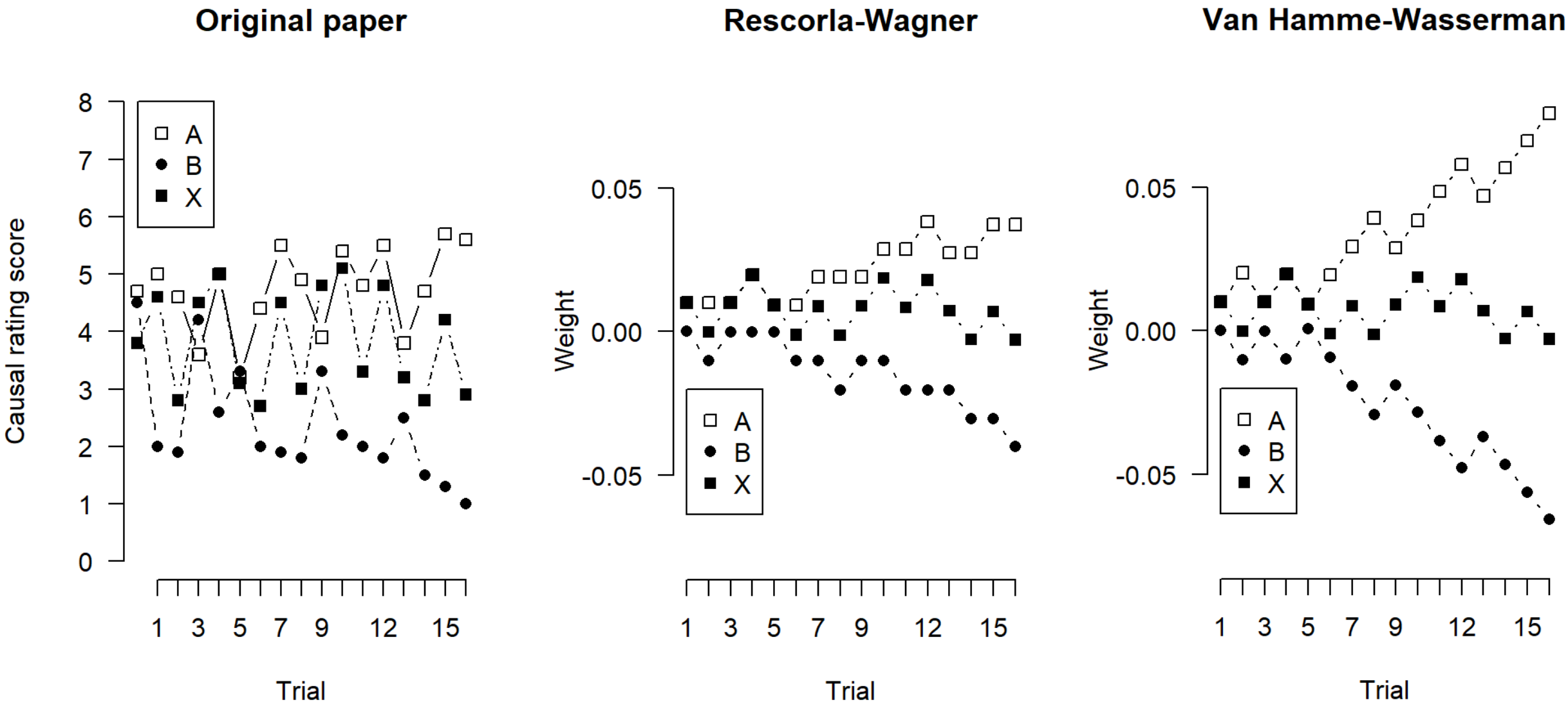
Modelling, the results



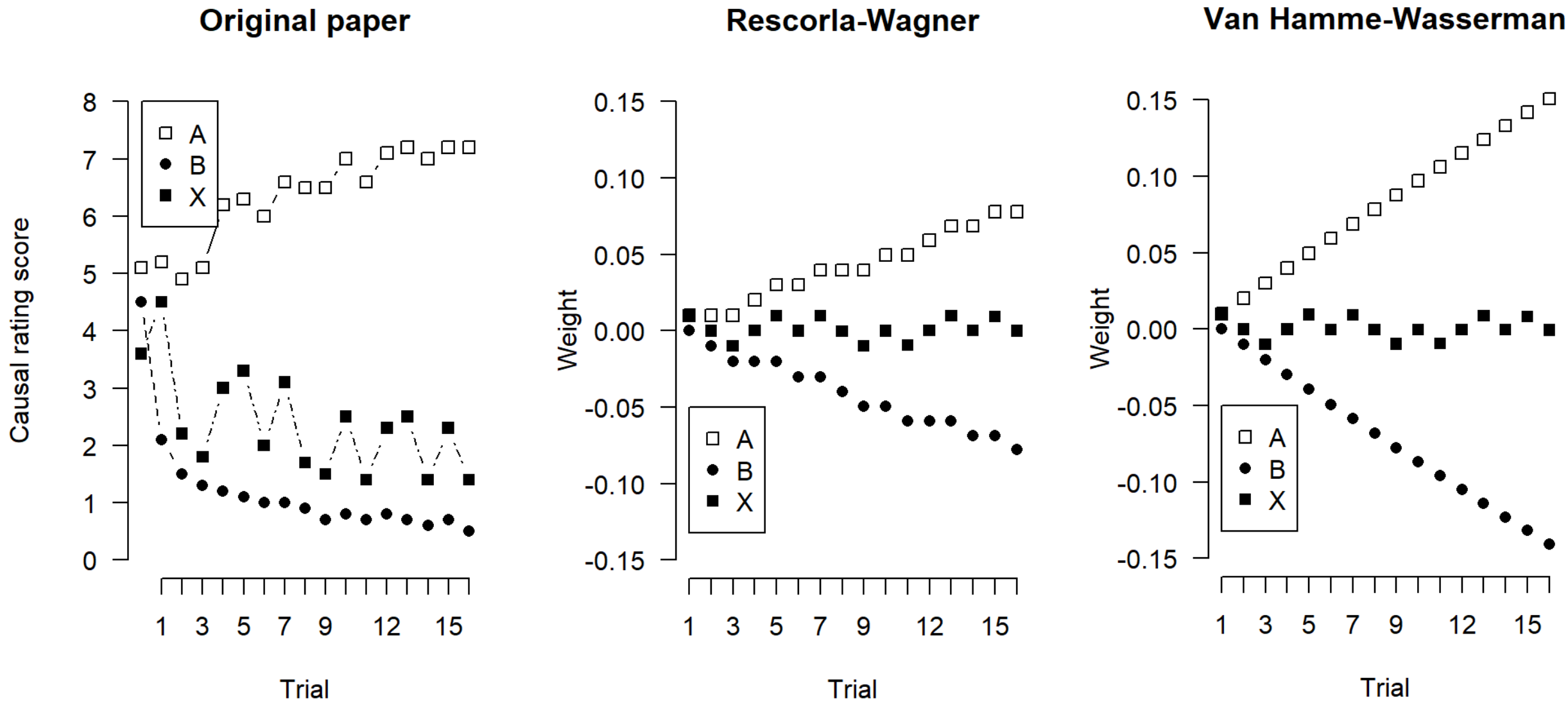


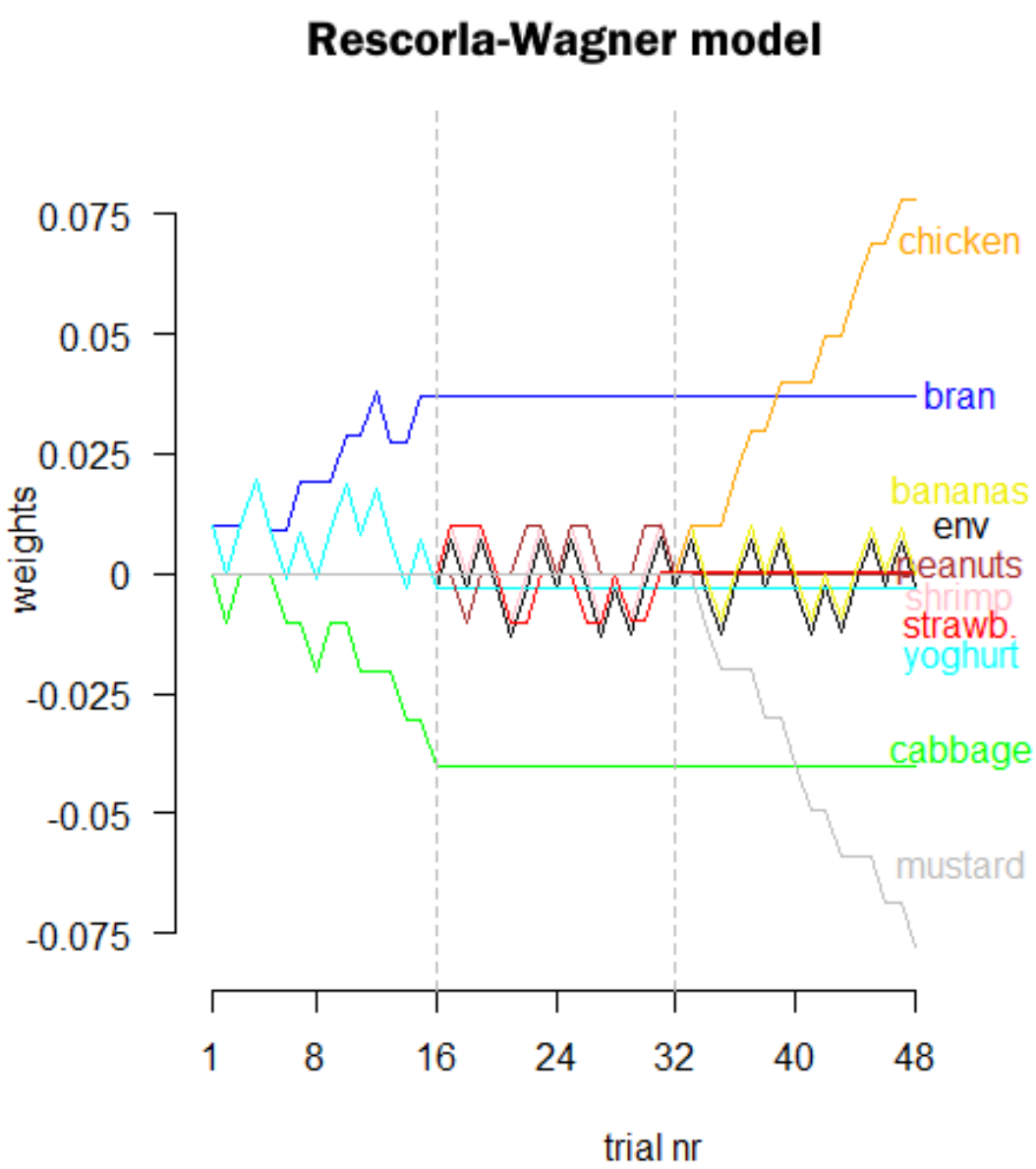


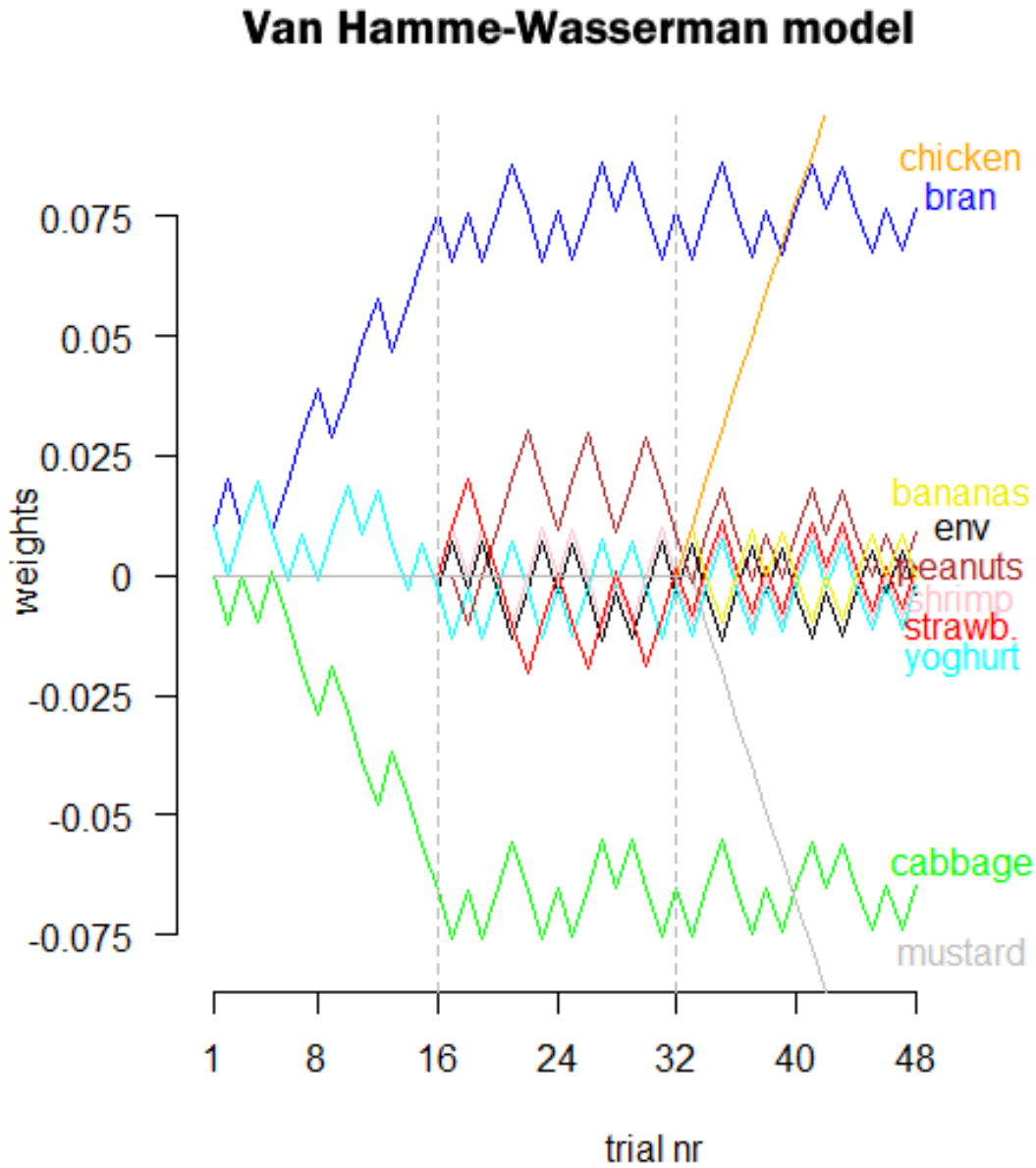
Modelling, the results

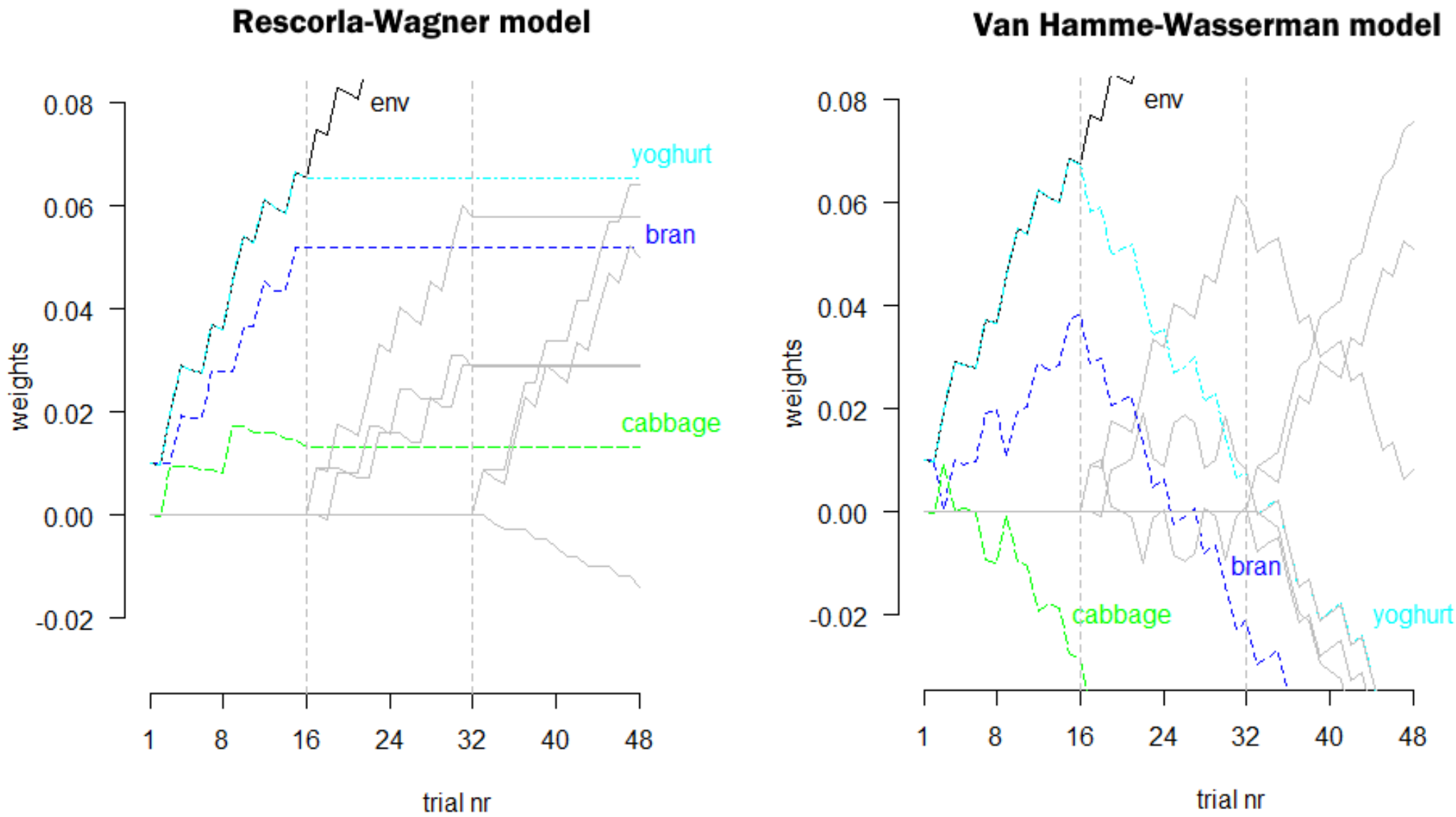


Modelling, the results




Rescorla-Wagner model
weights
0.075
0.05
0.025
0
-0.025
-0.05
-0.075
chicken
bran
bananas
env
peanuts
shrimp
strawb.
yoghurt
cabbage
mustard
1
8
16
24
32
40
48
trial nr


Van Hamme-Wasserman model
weights
0.075
0.05
0.025
0
-0.025
-0.05
-0.075
chicken
bran
bananas
env
peanuts
shrimp
strawb.
yoghurt
cabbage
mustard
1
8
16
24
32
40
48
trial nr


Rescorla-Wagner model
0.08
0.06
0.04
0.02
0.00
-0.02
weights
env
yoghurt
bran
cabbage
1
8
16
24
32
40
48
trial nr
Van Hamme-Wasserman model
0.08
0.06
0.04
0.02
0.00
-0.02
weights
env
bran
cabbage
yoghurt
1
8
16
24
32
40
48
trial nr

Replicating the experiment

- Nature related
- Diamond/no diamond
- Test phase

Next experiment

- Same stimuli and outcome
- No more rating

Discussion?

Conclusion

- Van Hamme and Wasserman's experiment does not seem to test what they set out to test
- The models show almost no difference in prediction between the Rescorla-Wagner model and the Van Hamme-Wasserman model.
  - Expect when looking at activation over all blocks

Modelling, the results