Right brain damage failures of perceptual updating in ambiguous figures

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Search for a general updating deficit

- Mental model = hypothesis about the world based on experience
- When predictions of mental model ≠ incoming data:
  1. detect mismatch
  2. revise model
- Updating in the right hemisphere: Danckert et al (2012): RBD impairment to exploit a changing bias in a rock, paper, scissors game.
  1. Impairment of model building or updating?
  2. Learned helplessness due to a too long task?
  3. Poor statistical reasoning or reward processing?
- If Right Hemisphere responsible for updating: Updating impairment in a different task that
  1. does not require learning a model in the first place
  2. is easy & less dependent on detecting statistic regularities in the world & does not require reward processing

Updating models based on gradual change

Instruction:
“I will show you series of pictures that begin with the picture of a commonly known object. It will then change gradually over the pictures to finally show a completely different object by the end of the series. Tell me for each picture what you see”.

Dependent Variable:
# first object reports

Logic: The longer participants stick with the first object, the less efficiently they update.

Ambiguous figures: quick & easy updating

First Image

Ambiguous Image

Second Image

- Four picture sets based on ambiguous figures (picture # 8)
- Pictures changed gradually to the two extremes
- 17 pictures per picture set (15 pictures + 2 catch trials)
- 8 different sequences – counterbalanced between participants

RBDs significantly impaired in updating

Executive impairment:
Moca & # first object reports:
HCO: \( t = -6.8^*, p < .01 \)
RBD: \( t = -1.9, p > .40 \)

Perseveration?
- all participants 100% correct on catch trials
- RBDs see differences, BUT they interpret those differences in favor of the first object

Seeing change but not updating

1. Lady looking in the mirror
2. Lady looking in the mirror
3. Lady looking in the mirror
4. Lady looking in the mirror
5. Lady looking in the mirror
6. Something is going around her waist
7. She looks in a different direction
8. Mirror looks towards us
9. Woman holding a baby
10. Woman holding a baby; mouth of baby open
11. Woman holding a baby
12. Baby looking at the mother; maybe choking
13. Guy
14. Guy, sleeping
15. Guy, ear

Right Brain Damaged (RBD) vs Healthy Controls (HCO)

<table>
<thead>
<tr>
<th></th>
<th>RBD</th>
<th>HCO</th>
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<tbody>
<tr>
<td>Moca*</td>
<td>23.17 (± 4.57)</td>
<td>26.6 (± 2.0)</td>
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<tr>
<td>Age*</td>
<td>65.00 (± 8.10) years</td>
<td>72.25 (± 5.22) years</td>
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Specific impairments

Lesions predicting the worst performance

- Insula & Rolandic operculum

Insula may be the key

Danckert et al (2012): Worst performance in the rock, paper, scissors game

Updating and Theory of Mind (ToM)

- Griffin et al (2006): lesions in the right BA 44 & 45 and the right insula predicts ToM impairment in RBD patients
- Rafteseder et al (in prep.): Correlation ToM & updating in 5 year olds

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