Brain systems of error avoidance

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EXETER

Learning from mistakes

Learning from mistakes

Associative learning

- Event 1 predicts Event 2
- Thunder predicts lightning
- Bell predicts food
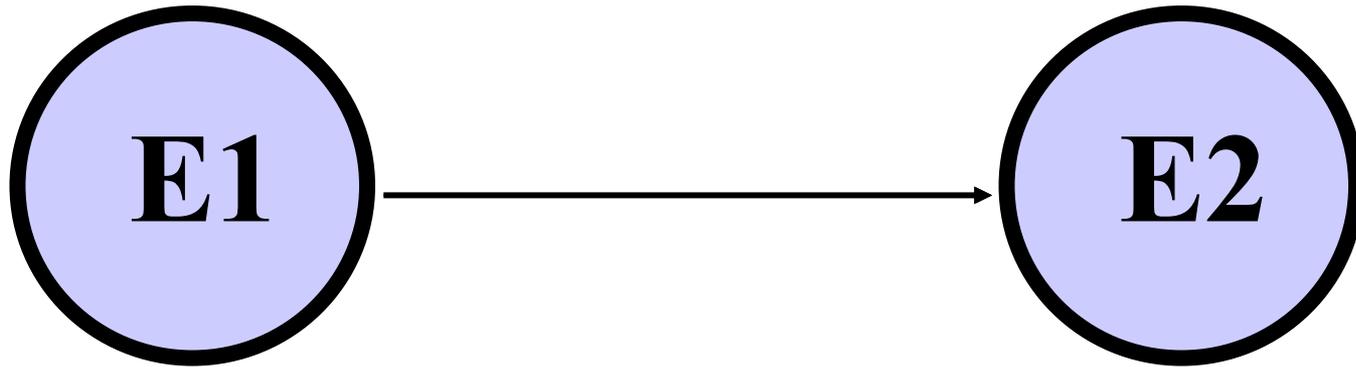

"... not the Pavlov's dog?"

Contiguity-driven learning

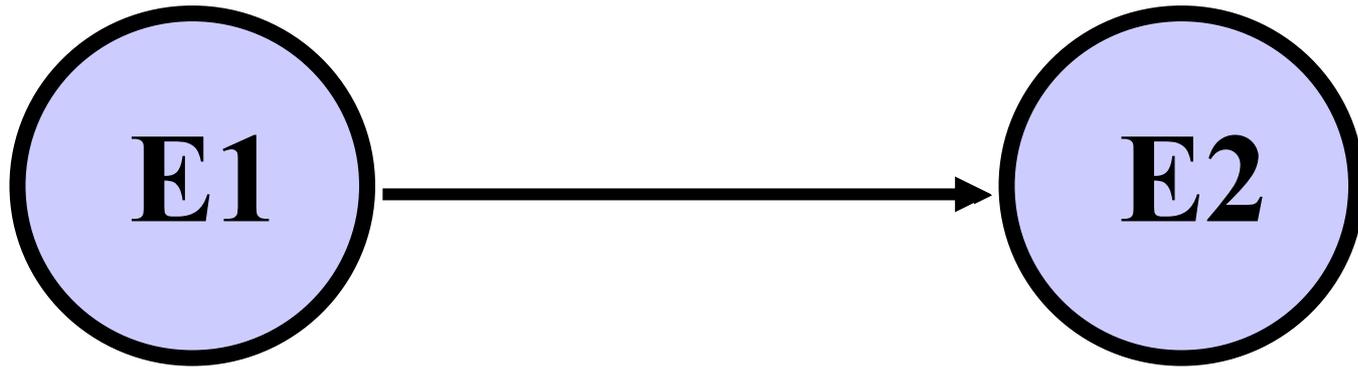# Contiguity-driven learning

Contiguity-driven learning

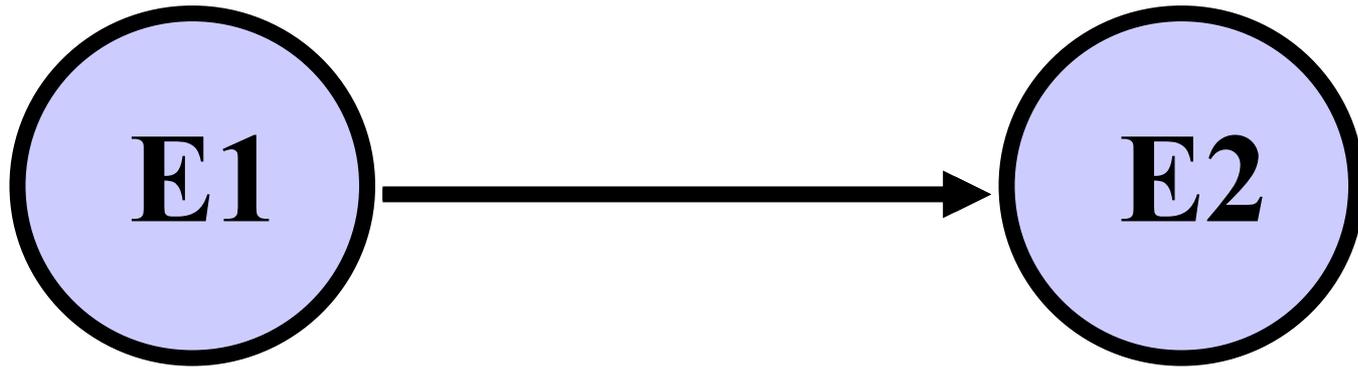# Contiguity-driven learning
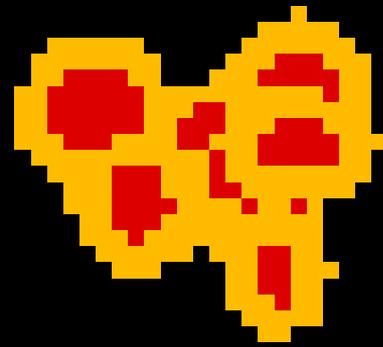
Learning is driven by errors of prediction
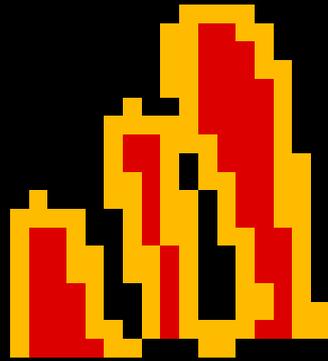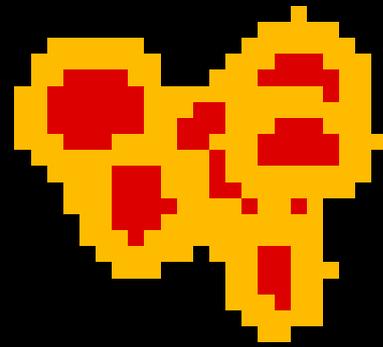
- An example…
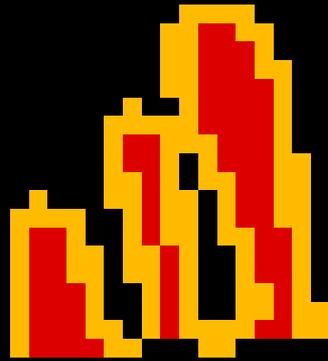
Jominy fever!

No fever.

Jominy fever!

No fever.
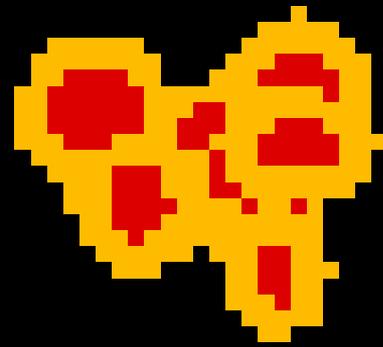
No fever.
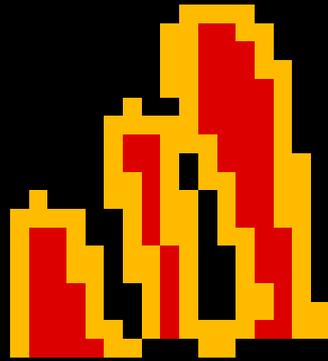
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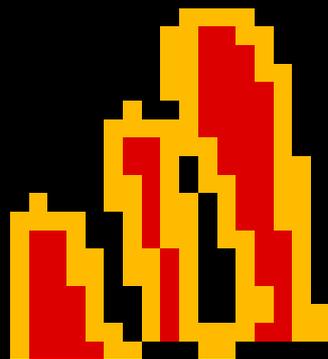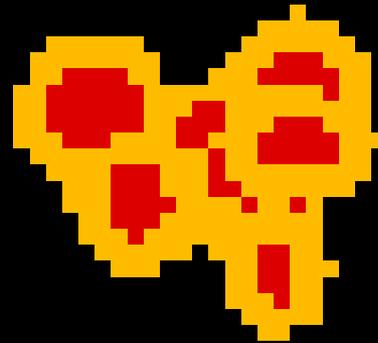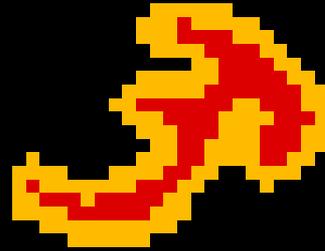
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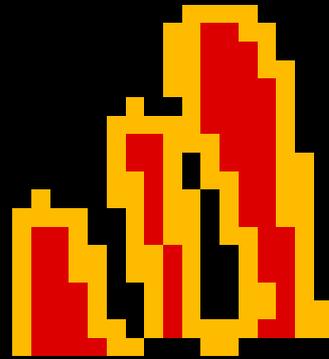
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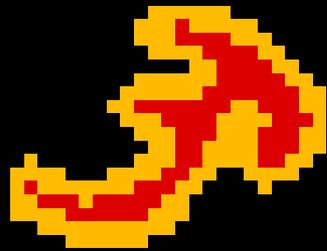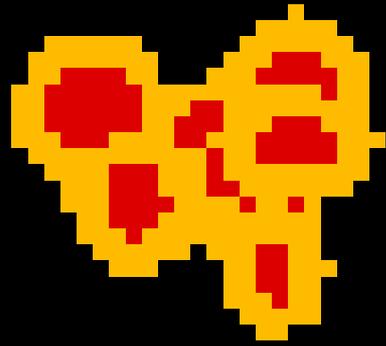
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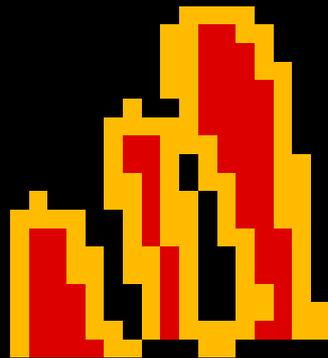
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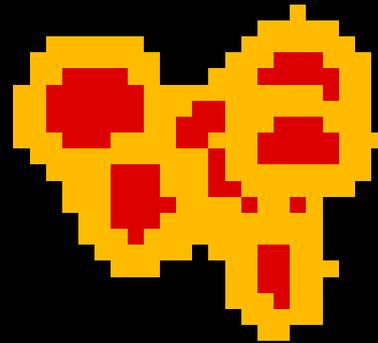
Jominy fever!
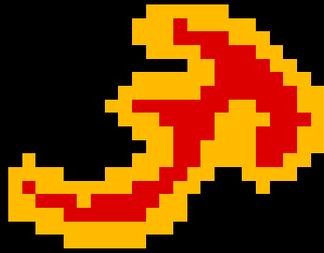
Jominy fever!

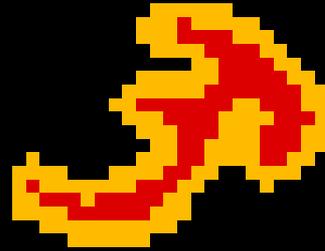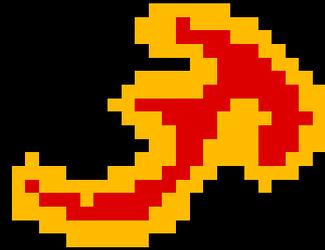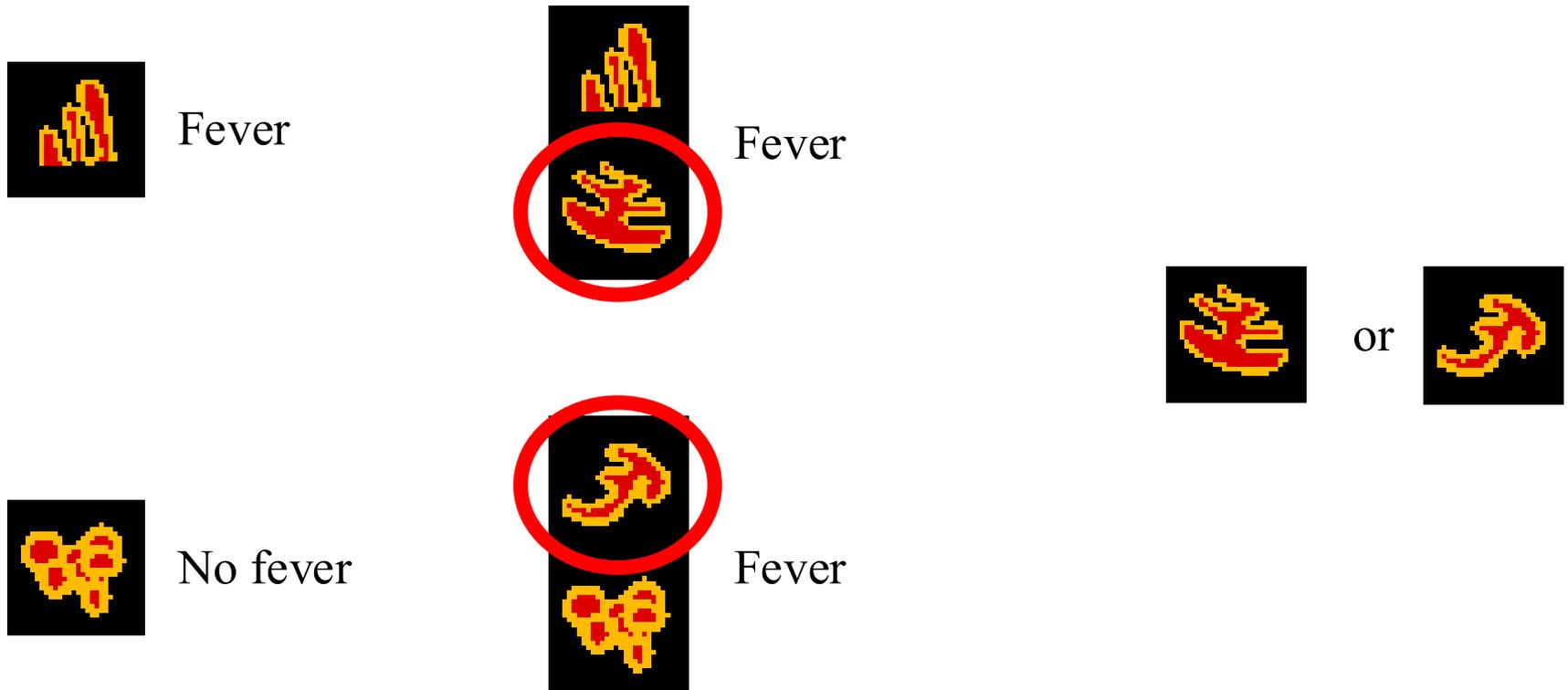**Which is more likely to produce Jominy fever?**

I reckon you'll say this one.

Learning driven by prediction error

Fever

Fever

Fever

No fever

Fever

or

- Equally frequent, but …

Learning driven by prediction error

Fever

Fever

Few prediction errors

or

No fever

Fever

Many prediction errors

- …one is involved in errors of prediction more than the other.

How does this happen?

Fever

Fever

Few prediction errors

or

No fever

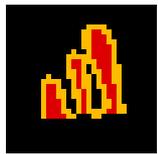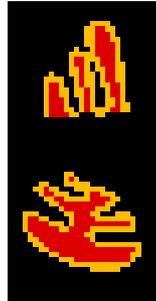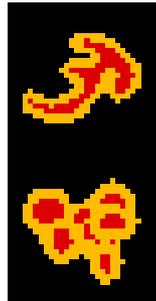Fever

Many prediction errors

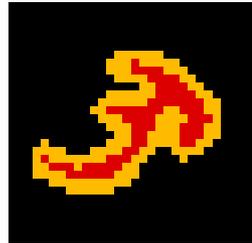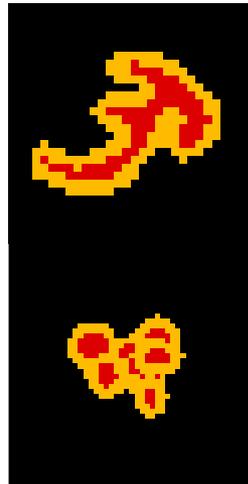- …one is involved in errors of prediction more than the other.

How does this happen?

Fever

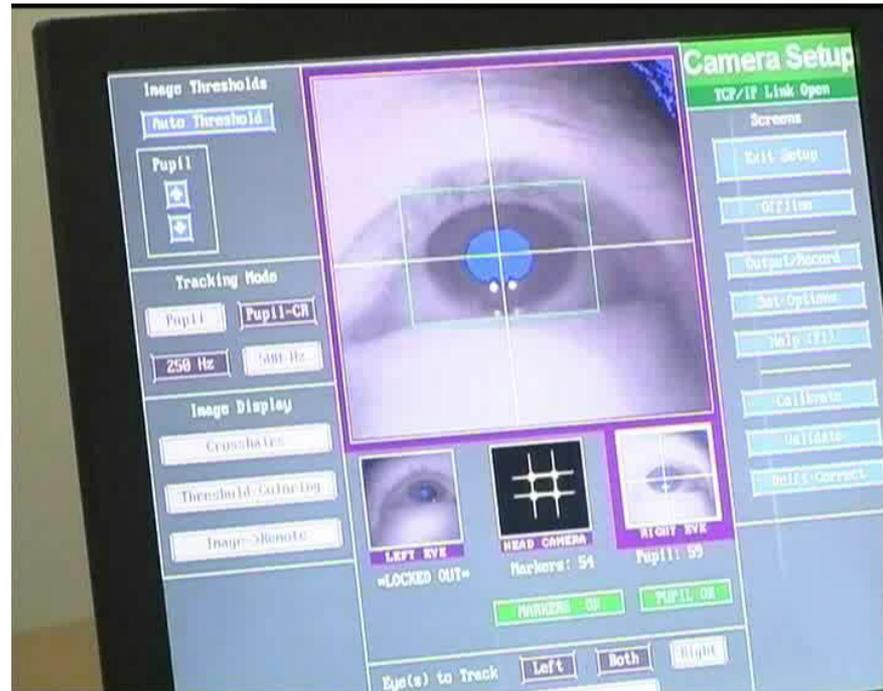Fever
Few prediction errors

or

No fever

Fever
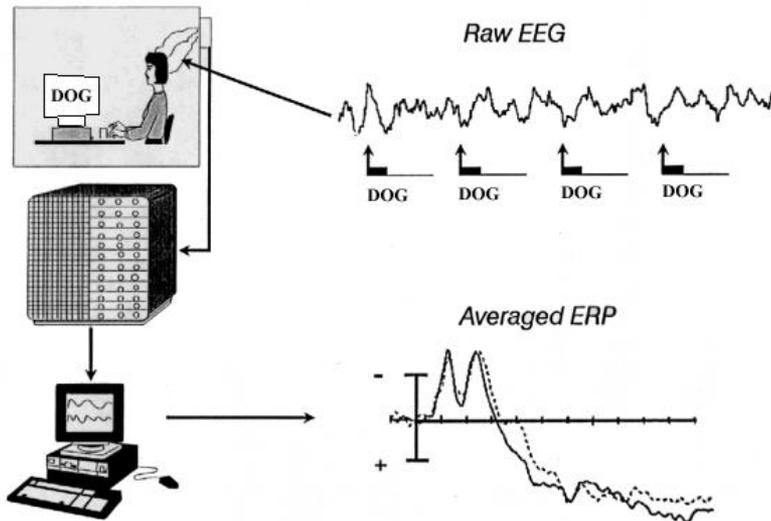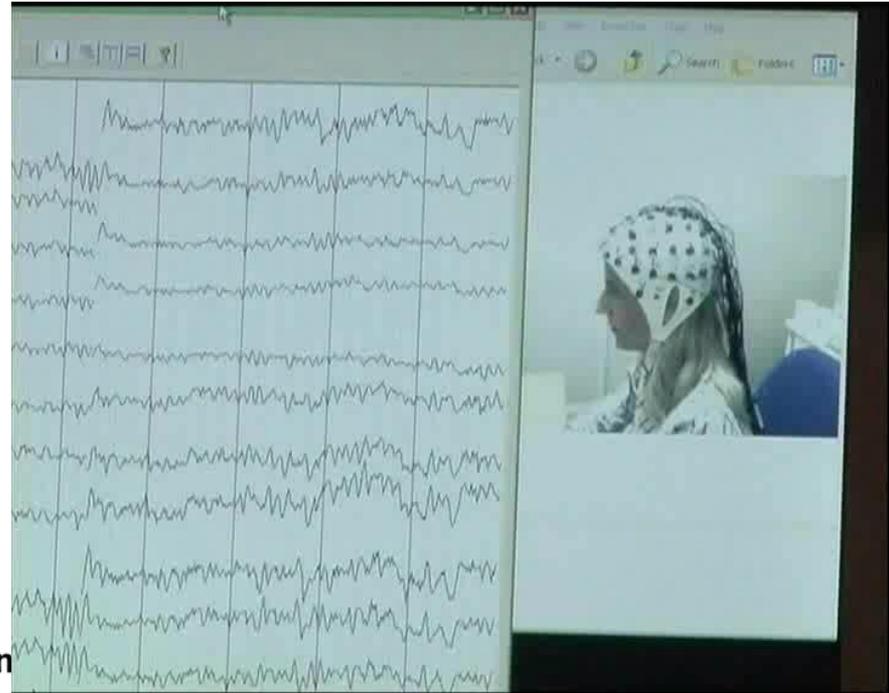
Many prediction errors

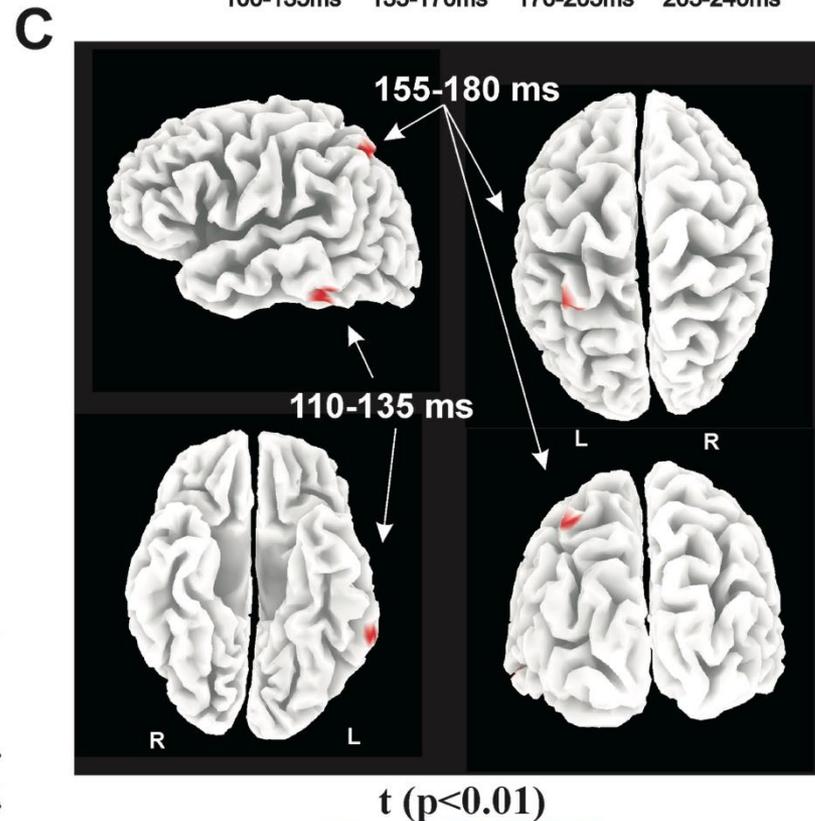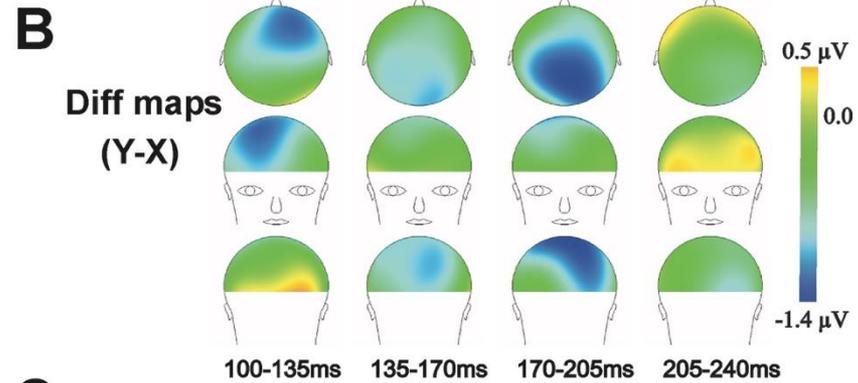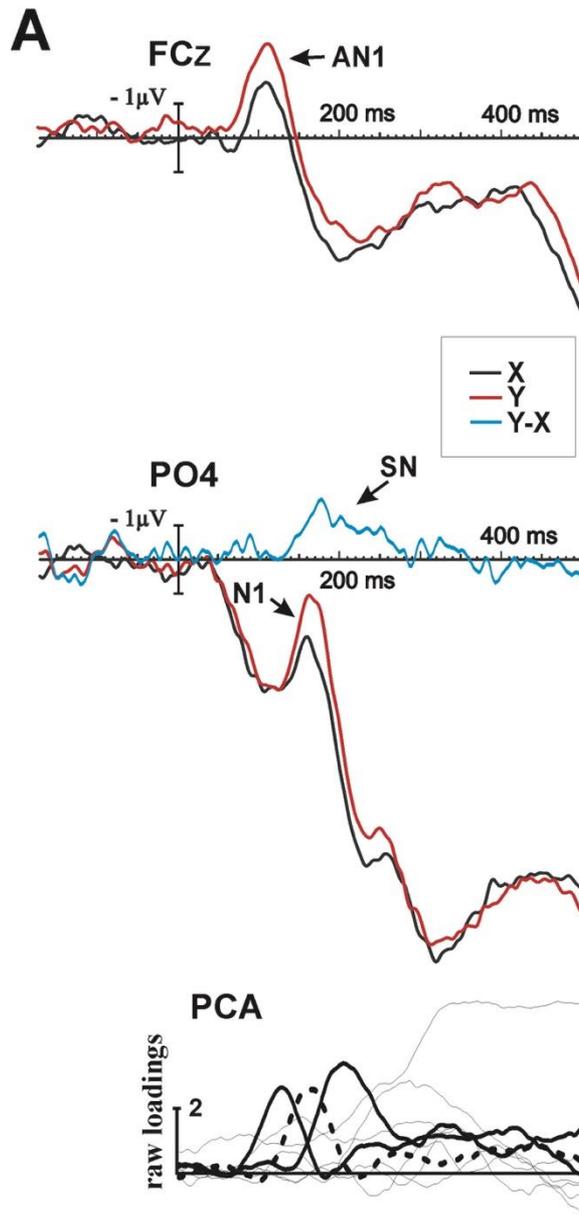- …one is involved in errors of prediction more than the other.

Eye tracking

EEG recording

Very rapid consequences of prediction error

Summary

- Learning is often driven by errors of prediction
- Objects previously involved in errors of prediction tend to receive enhanced attention.
- This attentional process is extremely fast (~100ms)
  - » …presumably in the absence of much conscious deliberation.
  - » … provides a quick-and-dirty 'heads up' which often helps learning
  - » … but, it seems likely to be a fairly 'dumb' process, driven by our previous mistakes.
  - » In some cases, this could lead to incorrect, even illogical, learning (work on this continues…)