Emotion Prediction and the Role of Ambiguity

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Background

- The ability to use **prior information** to predict currently unfolding and future events is essential for **optimal and adaptive behaviour**, especially during **social interaction** [1].

- Studies show **more accurate emotion categorisation** when the **likelihood of the emotion** appearing **can be predicted** in advance versus when likelihood is unknown [2, 3].

- Previous research has used faces with easily discriminable expressions, but in reality expressions can be subtle and fleeting.
  - **Predictive information** may be **relied** on more when information is **ambiguous** to resolve uncertainty [4].

Research Questions

- How does emotion categorisation performance compare between **prediction-matching** and **-mismatching** expressions?

- Is **predictive information** utilised to **a greater extent** when **facial expressions are ambiguous**?

Method

- 87 participants (M_{age} = 26.1, SD_{age} = 6.0)

Ambiguous Clear / Happy / Angry

Stimuli
- 28 faces from the IASLab Face Set[1]
- Emotional (Clear; 100% intensity) and neutral faces used to morph Ambiguous (50% intensity) faces

Design & Procedure
- Prior expectations induced with **a predictive cue** at the start of the predictive sequence
- Sequences consist of Ambiguous or Clear faces
- **Emotion categorisation task:** Happy or Angry?

Baseline (preceding predictive sequences)

No predictive cue; 50% happy / 50% angry trials

Predictive sequences

75% prediction-matching / 25% prediction-mismatching emotion trials

5s — **Angry more likely** / 500ms / 500ms 3s to respond / 8 or 12 faces / 500ms 3s to respond
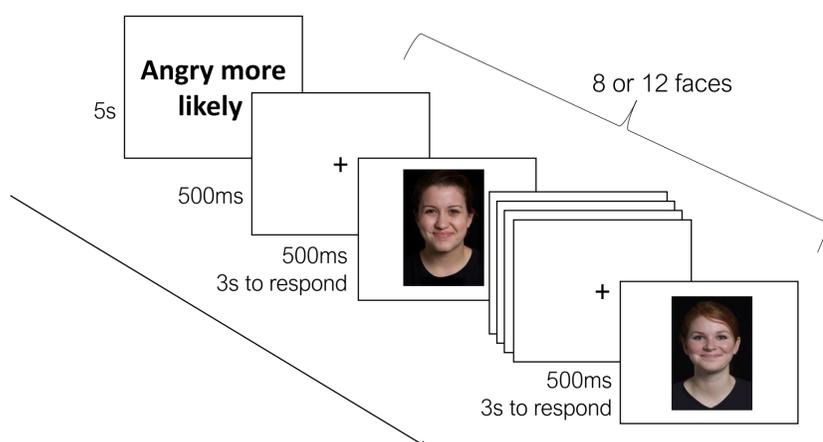
References

[1] Brown, E. C., & Brüne, M. (2012). The role of prediction in social neuroscience. *Frontiers in Human Neuroscience*, 6, 1–19.
[2] Ran, G., & Chen, X. (2017). The Impact of Top-Down Prediction on Emotional Face Processing in Social Anxiety. *Frontiers in Psychology*, 8, 1–12.
[3] Ran, G., Li, R., & Zhang, Q. (2020). Emotional face prediction in rejection sensitive individuals: Evidence from event-related potentials. *Consciousness and Cognition*, 78, 102880.
[4] Stangor, C., & McMillan, D. (1992). Memory for expectancy-congruent and expectancy-incongruent information: A review of the social and social developmental literatures. *Psychological Bulletin*, 111(1), 42–61.

[1]Development of the Interdisciplinary Affective Science Laboratory (IASLab) Face Set was supported by the National Institutes of Health Director's Pioneer Award (DP1OD003312) to Lisa Feldman Barrett. More information is available online at www.affective-science.org.

## Results

2 x 2 ANOVAs (Clarity of Expression x Prediction)
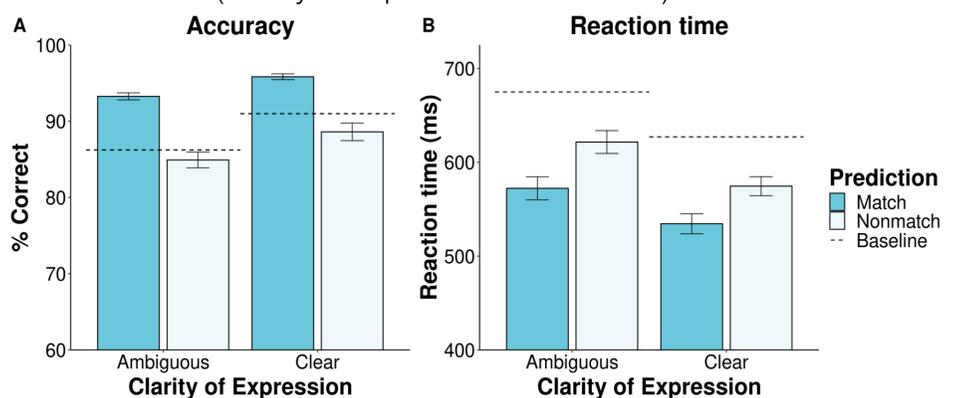
- Better performance in Clear versus Ambiguous trials (ps < .001)
- Better performance in Match versus Nonmatch trials (ps < .001)
  - Accuracy: Performance was facilitated in Match (p < .001), but impaired in Nonmatch trials in comparison to Baseline (p = .041)
  - RT: Baseline was slower than Match and Nonmatch trials (ps < .001)
- Clarity of Expression did not significantly modulate the effect of Prediction (ps > .066)

Control Experiment: Contribution of Frequency Effects
- Do frequency effects (i.e. 75% probability of a match occurring) drive the match benefit ?
- Additional control experiment (N = 71) **without the predictive cue**
- While there was a frequency benefit for accuracy (p = .005), it was a fraction of the magnitude of the main predictive task.

Difference Scores (Positive values indicate a match/frequency benefit)
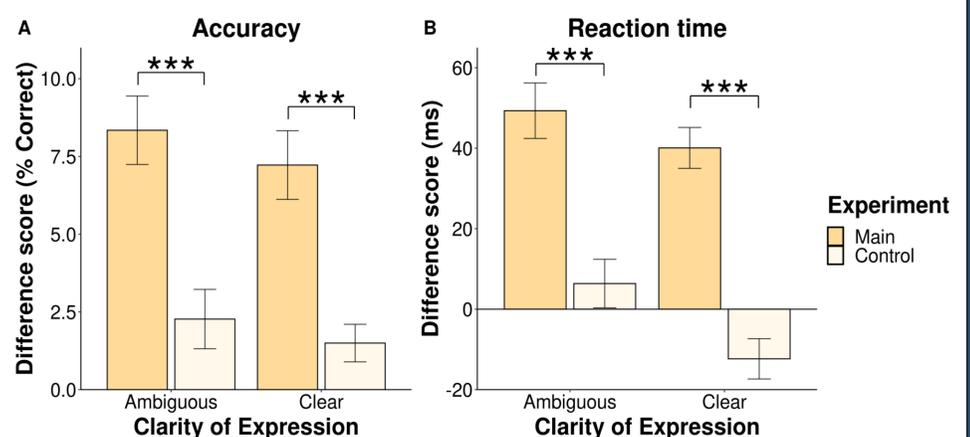
Note. Accuracy difference score: Match – Nonmatch % Correct **or** Frequent – Infrequent % Correct
RT difference score: Nonmatch – Match RT **or** Infrequent – Frequent RT

Discussion

- We found both an **accuracy and RT benefit for prediction-matching** versus –mismatching expressions.

- However, there was **no evidence that predictive information was utilised to a greater extent when facial expressions were ambiguous.**
  - Perhaps facial expressions were not ambiguous enough?

- Comparison with the control experiment shows the impact of explicit versus more implicit predictive information

- Future research
  - Use of more ambiguous (e.g. 20% versus 80% intensity) or less discriminable expressions (e.g. disgust versus anger) to examine the effects of predictiveness

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