Neural signatures of conscious face perception: The N170 is absent during inattentional blindness

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Neural correlates of conscious visual perception
  Idea: compare brain activity in response to perceived stimuli to the same stimuli when they are not consciously perceived

Inattentional blindness
  The failure to detect an unexpected, but otherwise salient stimulus because one’s attention is engaged elsewhere.

Face perception
  N170 – the earliest face-sensitive ERP component
Research Question

- What are the neural correlates of conscious perception of faces?
  - What is the role of the N170 in visual awareness?
  - How might the correlates of awareness for faces compare to proposed correlates of general visual awareness?
Methods

- Distractor task:
Methods

- Video example of stimuli:
  http://www.youtube.com/watch?v=aWsfo2FNlp0
Methods

Example background patterns:

- Scrambled pattern
- Face
- Face, missing piece
Methods

- Stimulus sequence:

  - Scrambled pattern 600-800ms
  - Face (30%)
  - Face, missing piece (20%)
  - Scrambled Pattern (50%)
  - 300ms
  - Scrambled pattern 600-800ms
Methods

- Experiment sequence:

  Phase I:
  Task: Attend to green discs, detect bright disc targets.

  Phase II:
  Task: Attend to green discs, detect bright disc targets.

  Phase III:
  Task: Attend to faces, detect ones missing a feature.

  Awareness Assessment

  Awareness Assessment
Methods

- Awareness assessment foils
Results

Inattentionally Blind

Phase I (unaware)

Phase II (aware)

Phase III (aware + task relevant)

Noticers

Phase I (aware)

Phase II (aware)

Phase III (aware + task relevant)

Key:
- Blue: Face
- Red: Scrambled
Results

Inattentionally Blind

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Noticers

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Key:
- **Face**
- **Scrambled**
Results (N170)

Phase I
180-220 ms
-3 µV  0 µV  3 µV

Inattentionally Blind

Phase II
180-220 ms
-3 µV  0 µV  3 µV

Noticers

Phase III
180-220 ms
-6 µV  0 µV  6 µV
Results (N170)

N170 Amplitude

Inattentionally Blind

Noticers

Phase I
Phase II
Phase III
Results

Inattentionally Blind

Phase I (unaware)

Phase II (aware)

Phase III (aware + task relevant)

Noticers

Phase I (aware)

Phase II (aware)

Phase III (aware + task relevant)

Key:
- **Face**
- **Scrambled**
Results (Nd2)

Inattentionally Blind

**Phase I**
280-320 ms
-3 μV - 0 μV - 3 μV

**Phase II**
280-320 ms
-3 μV - 0 μV - 3 μV

**Phase III**
250-290 ms
-6 μV - 0 μV - 6 μV

Noticers
Results (Nd2)

Nd2 Amplitude

Inattentionally Blind

Noticers

Phase I
Phase II
Phase III
Results

Difference waves

Inattentionally blind

Noticers

Key:
- Blue: Phase I
- Red: Phase II
- Green: Phase III
Conclusions

- The N170 & Nd2 were present for all subjects, but only during awareness:
  - Subjects who spontaneously noticed faces
  - Subjects who had previously been unaware.

- Task-related attention significantly enhanced N170 and Nd2 amplitude.

- Possible Interpretations:
  - N170 & Nd2 both correlates of awareness
  - N170 correlated with attention; Nd2 correlated with awareness
  - N170 & Nd2 both correlates of attention