The N170 is driven by the presence of horizontal facial structure

Ali Hashemi, Matthew V. Pachai, Patrick J. Bennett, Allison B. Sekuler

Department of Psychology, Neuroscience & Behaviour, McMaster University, Hamilton, Canada

hashea@mcmaster.ca

**Introduction**
- Horizontal structure contains most diagnostic information\(^{a,c,d}\)
- Observers are tuned to use horizontal structure\(^d\)
- Horizontal structure underlies behavioural\(^a\) and N170\(^b\) face inversion effects
- How does orientation structure affect the N170?

**Methods**
- 11 Caucasian observers
- 3 male, mean 22 ± 3.7 years old
- Task (64 trials per condition)
  - 1 s pre-stimulus fixation
  - 1 s post-stimulus blank screen
  - 6 alternative forced choice
  - 0.25 s delay before next trial
- Stimulus filtered with a Bandwidth of 0.25 s delay before next trial
- Response using full faces

**Behavioural Results**
\(2 \times 5\) repeated-measures ANOVA
- Baseline, \(F_{(1,10)} = 180, p < 0.0001\)
- Band, \(F_{(4,40)} = 189, p < 0.0001\)
- Base x Band, \(F_{(4,40)} = 37, p < 0.0001\)

**EEG Methods**
- 256-channel EGI geodesic net (500 Hz sampling rate)
- Referenced to electrode Cz
- 30 Hz lowpass filter
- Mean amplitude measured as average voltage in 40 ms time-window centred on N170 peak
- Latency measured as time of local peak between 150-210ms

**N170 Amplitude Results**
\(2 \times 5 \times 2\) repeated-measures ANOVA
- Base, \(F_{(1,10)} = 10.1, p = 0.0098\)
- Band, \(F_{(4,40)} = 6.1, p = 0.0006\)
- Base x Band, \(F_{(4,40)} = 8.8, p < 0.0001\)
- Hemisphere, \(F_{(1,10)} = 1.8, p = 0.2117\)
- Base x Hemis, \(F_{(1,10)} = 0.04, p = 0.839\)
- Band x Hemis, \(F_{(4,40)} = 3.04, p = 0.0281\)

**N170 Latency Results**
\(2 \times 5 \times 2\) repeated-measures ANOVA
- Base, \(F_{(1,10)} = 1.1, p = 0.3252\)
- Band, \(F_{(4,40)} = 25.9, p < 0.0001\)
- Base x Band, \(F_{(4,40)} = 9.7, p < 0.0001\)
- Hemisphere, \(F_{(1,10)} = 1.1, p = 0.3194\)
- Base x Hemis, \(F_{(1,10)} = 4.5, p = 0.0597\)
- Band x Hemis, \(F_{(4,40)} = 3.0, p = 0.0285\)

**Conclusions**
- Behaviourally, horizontal structure drives face identification
- N170 is more full-face-like with increasing horizontal structure
- Next: What orientation content is required to observe an N170? What is the role of facial context?

**References**
- a. Dakin et al., (2009), J. Vis: 9