Audio and Visual cue-congruency comparisons with EEG/ERP.

Examples within a task-switching study.

Challenges

- Verbal strategies with EEG is not possible.

- Demonstration: Place your hands aside and above your ears, now clench your teeth.

- Alternative method is to use audio recordings of verbal task-cues.

  - Highly similar RTs and costs between audio presentations and verbal statements (Kirkham, Breeze, & Marí-Beffa, 2012).

- Can be argued that each are processed in different forms, but no means of obtaining clean verbal data.

Cautions

- Using audio cues requires speakers - can induce interference because of magnets.

- Different impacts on different systems.

    - Regardless, aim to keep all sources of noise far from the participant, and if possible shield all cables and devices.

- Particularly important if you use a passive system - any interference is likely to be amplified with the signal being recorded.

- Active systems have a reduced likelihood of this happening, but remains a consideration.

Study background

- Facilitation of performance in task-switching paradigms.

- Compared measures with visual and verbal/audio cues.

- Participants respond to bivalent stimuli, directed by task cues to either the colour or shape.

- Measuring mixing costs to determine maintenance of sequences.

[fix]

[cue]

[1000ms]

[stimulus]

[Until response]

Basic bivalent stimuli
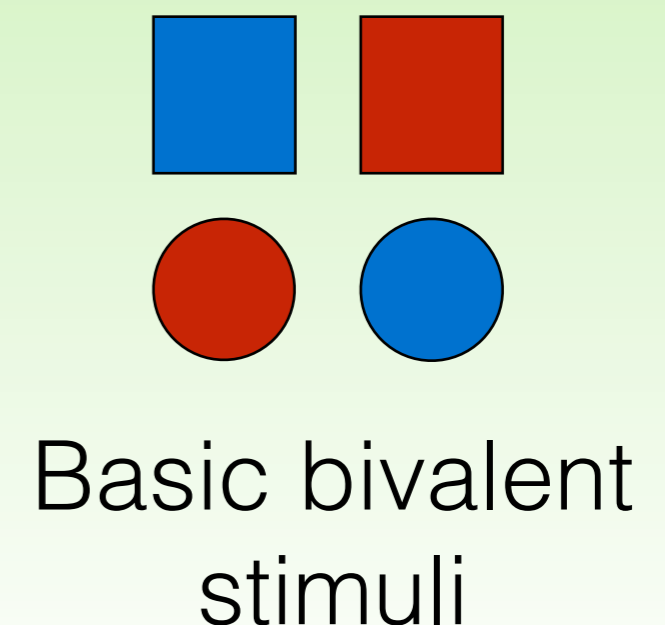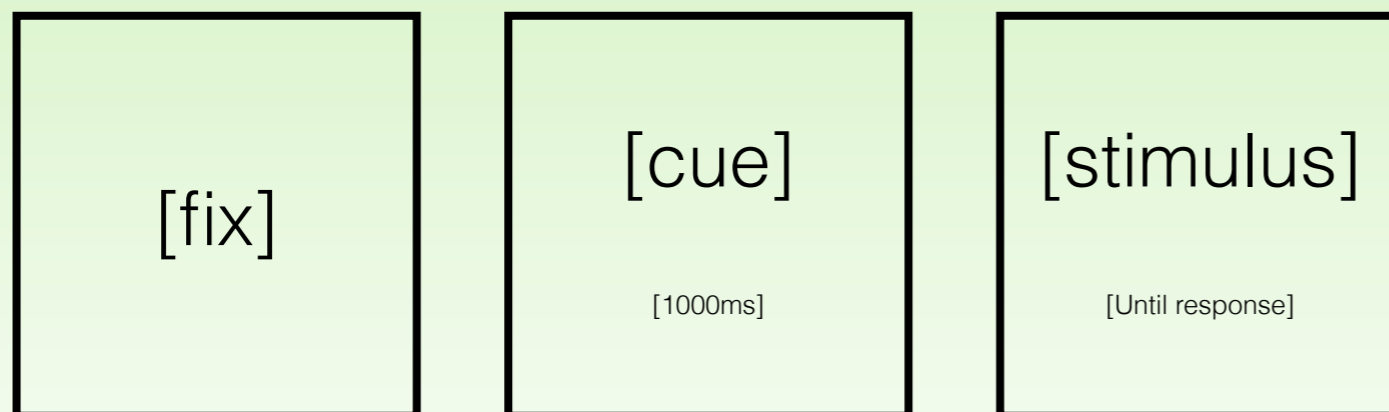
Measurements

- Perform list paradigm first - all responses to colour, then to shape.

- Follow by alternating-runs paradigm of C<u>C</u>S<u>S</u>C<u>C</u>S<u>S</u>...

- Mean RT in list blocks = pure RT.

- Mean RT of repeat trial in a-r block = repeat RT.

- Mixing cost = repeat RT - pure RT.

  - Demands associated with maintaining sequences.

Task - Conflicting cues.

- Core interest was always the benefits obtained through auditory inputs, and how these facilitate performance.

- But how does audio differ & provide a facilitation over standard silent performance?

  - Even though inner-speech is feasible and often used.

- Presented both audio/visual cues at the same time, but each promoted direction towards a different stimulus response (e.g. Audio towards colour, and Visual towards shape).

Task results
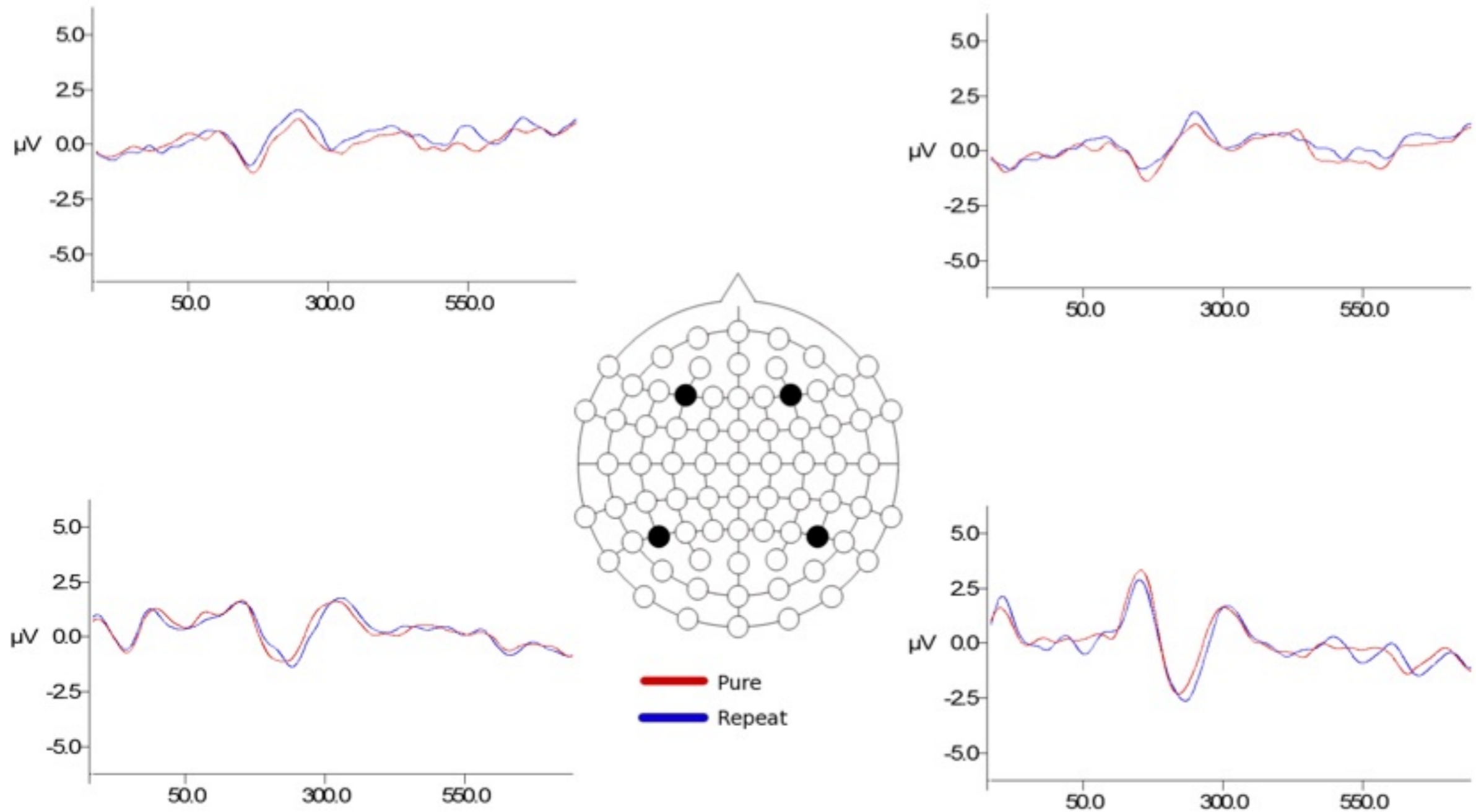
Audio relevant (Visual irrelevant)
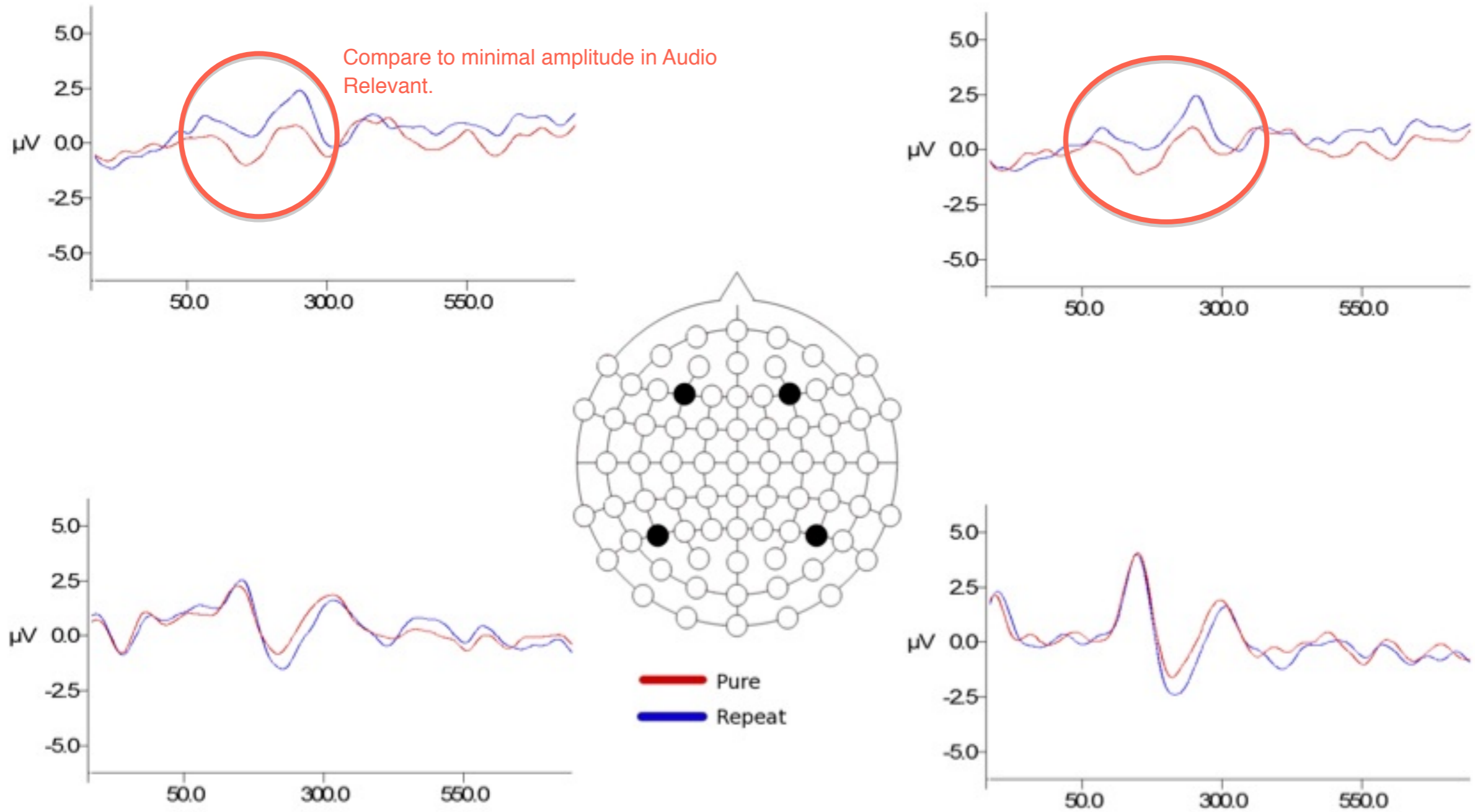
Task results

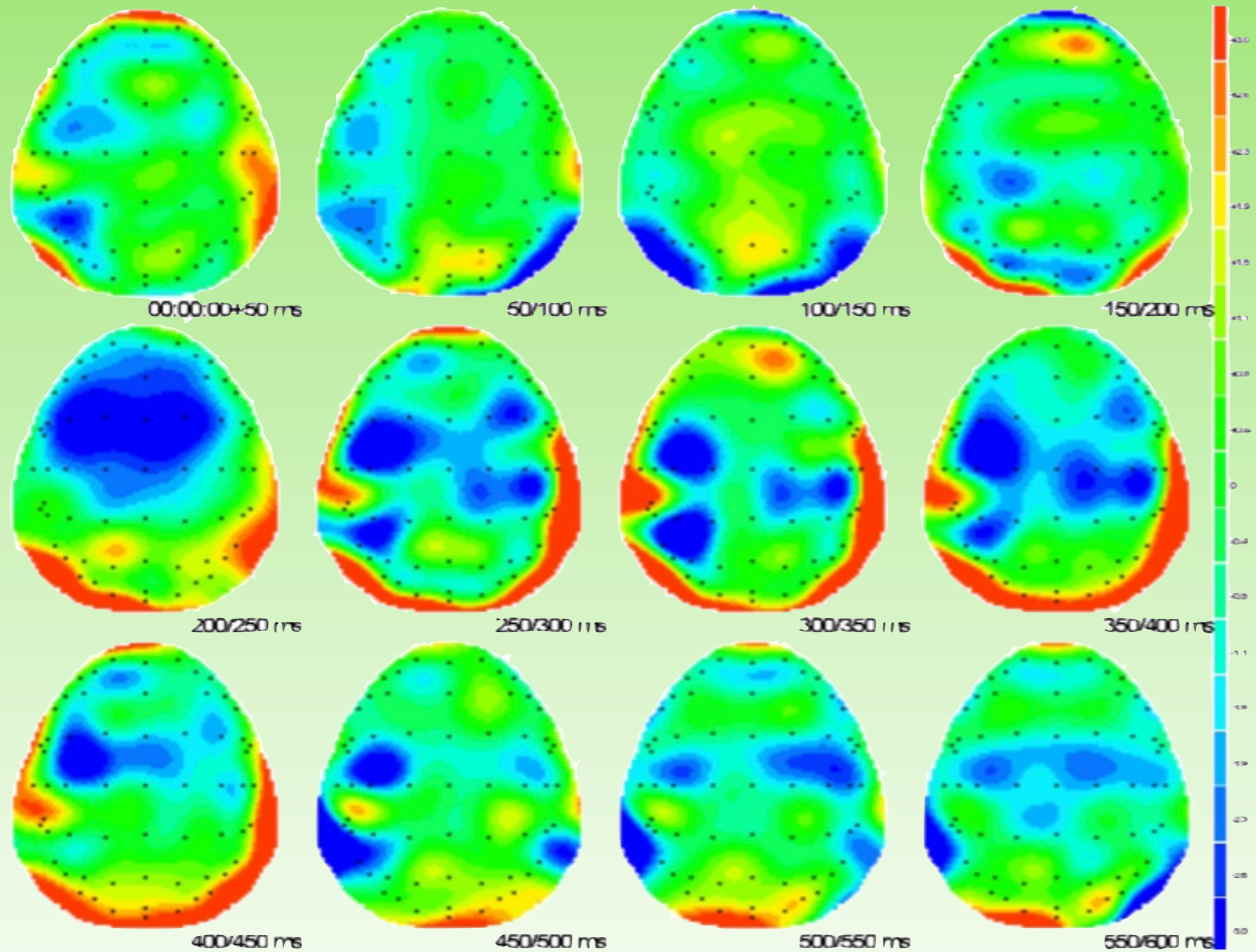Compare to minimal amplitude in Audio Relevant.

Visual Relevant

(Audio irrelevant)

Task results

Topographic maps of mixing cost
(audio - visual)

What is being shown?

- When two modalities of task cue are placed in conflict it seems that audio is prominent.

- Visual language-based cues are almost always affected by inner-speech, but overriding the audio signal is cognitively demanding.

- Or, that audio signals are processed with greater finesse and result in primary activation.

What are the benefits?

- When taking std behavioural measures, no evidence for differences in audio/visual costs.

- Clearly the processing for each is vastly different.

- Whilst cost differences are seen, the increased cognitive demands for visual cues are evident.

- Cue-conflict resolution is more challenging with visual cues than audio cues.

- Evidenced by increased waveforms and topographic mappings.