ABR WAVE V DIPOLE ORIENTATIONS FOR LOW INTENSITY CLICK AND FREQUENCY SPECIFIC STIMULI

Oscar Leung

Supervised by Professor William Hal Martin

INTRODUCTION

- The ABR is the gold standard for estimating behavioural thresholds in patients who cannot or will not respond to hearing tests
- The reliability of the ABR is dependent on the signal-to-noise ratio
- **Response amplitude is dependent upon the orientation of the electrical field (dipole orientation) relative to the recording electrode location**
- The standard clinical electrode montage used for threshold testing was based on recording ABRs in response to high intensity click stimuli in 1970s and may be inappropriate for use with other stimulus types

ASSUMPTIONS

- The 3-Channel Lissajous' Trajectory (3-CLT) method provides a valid estimate of equivalent dipole orientation for the ABR wave V (Grandori, 1986)

- The orientation of the 3-CLT apex vector is equivalent to the orientation of the dipole for ABR wave V (Pratt et al., 1984)

HYPOTHESES

1. Dipole orientation for ABR wave V evoked by high intensity click stimuli is different from that evoked by low intensity clicks and tonebursts

2. The Fpz to ipsilateral ear ABR recording montage does not align with the Wave V dipole orientation for low intensity click and 500, 1000, 2000, 4000 Hz toneburst stimuli

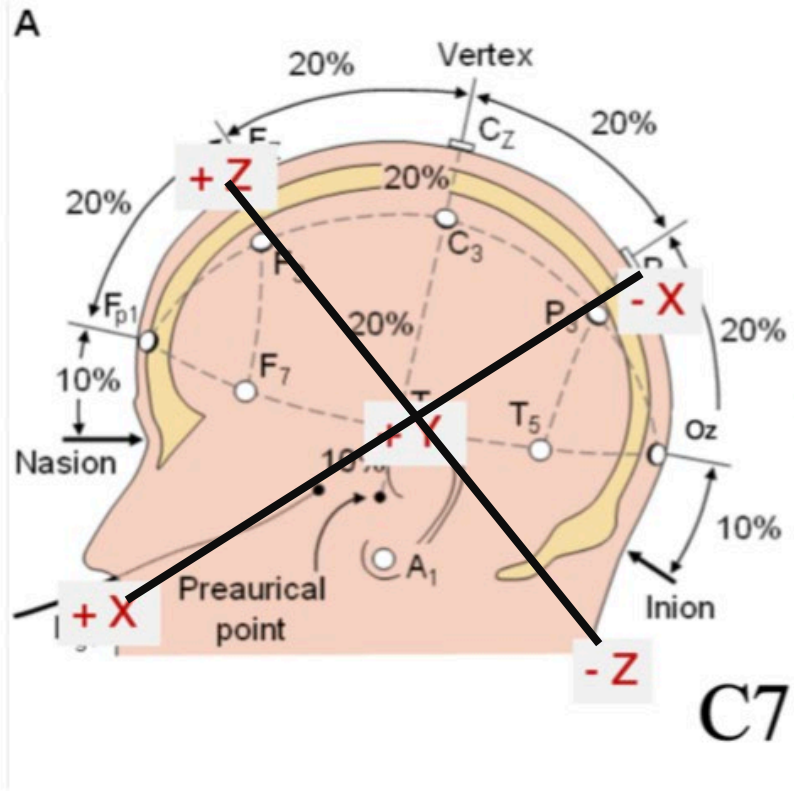
- **Tonotopic organisation results in different nerve tracts being activated**

METHODS

- Subjects: 7 adults with normal hearing – sleeping/resting quietly
- Stimuli:
  - 80 dBnHL clicks
  - 25 dBSL clicks
  - 25 dBSL tonebursts at 500, 1000, 2000, 4000 Hz
- Rate: 15.7/s to the right ear
- 2 x 2000 sweeps per average

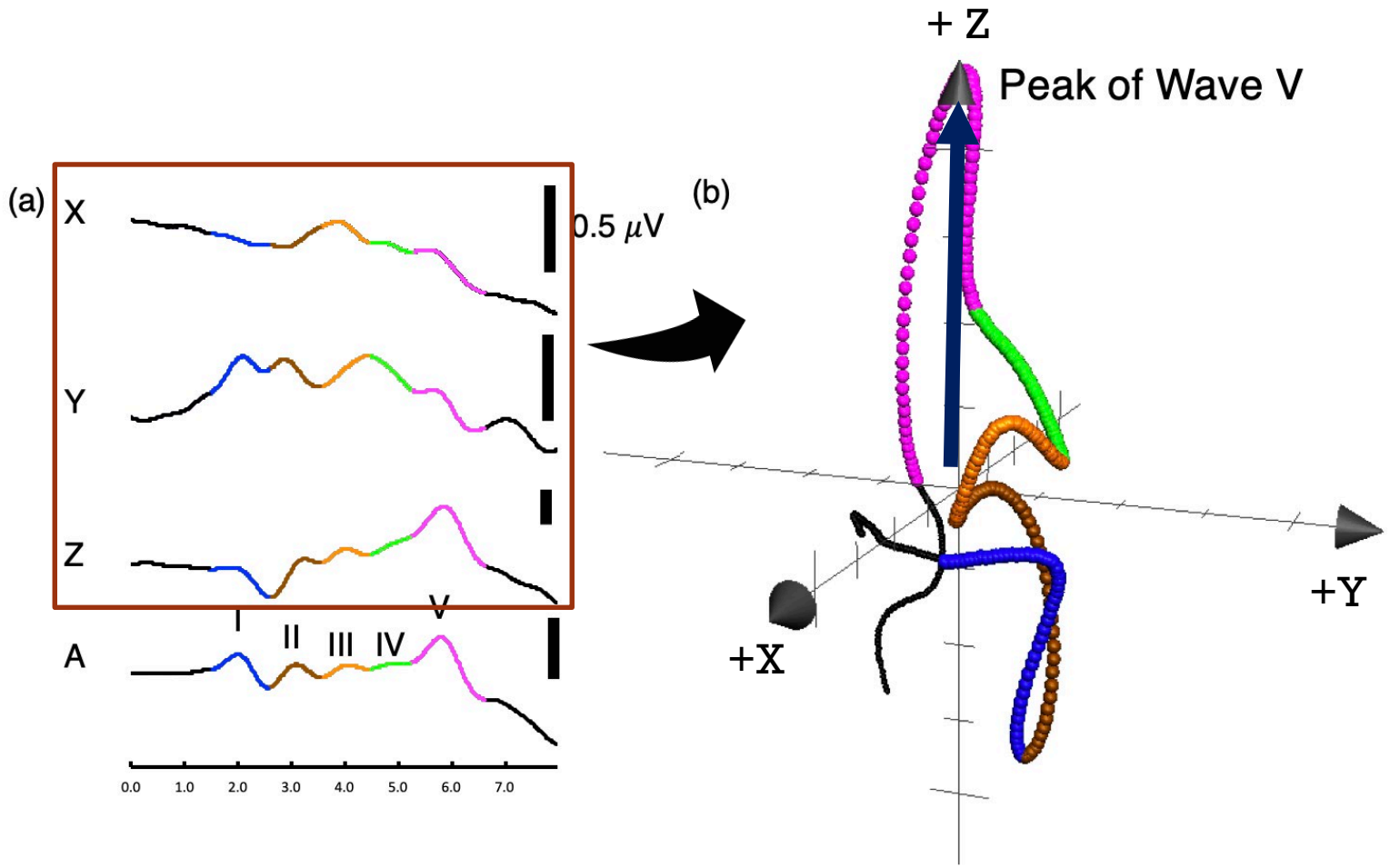
METHODS

- ABRs recorded from X, Y, Z and A channels simultaneously



3-CLT ABR FROM HIGH INTENSITY CLICKS

- X, Y and Z channels were combine to form the 3-CLT
- The principal component equivalent dipole for Wave V points in the + Z direction towards the vertex



ANALYSIS

- Average the apex vectors across subjects for each stimulus condition
- Plotted on an X Y Z axis

Hypothesis 1 NOT supported

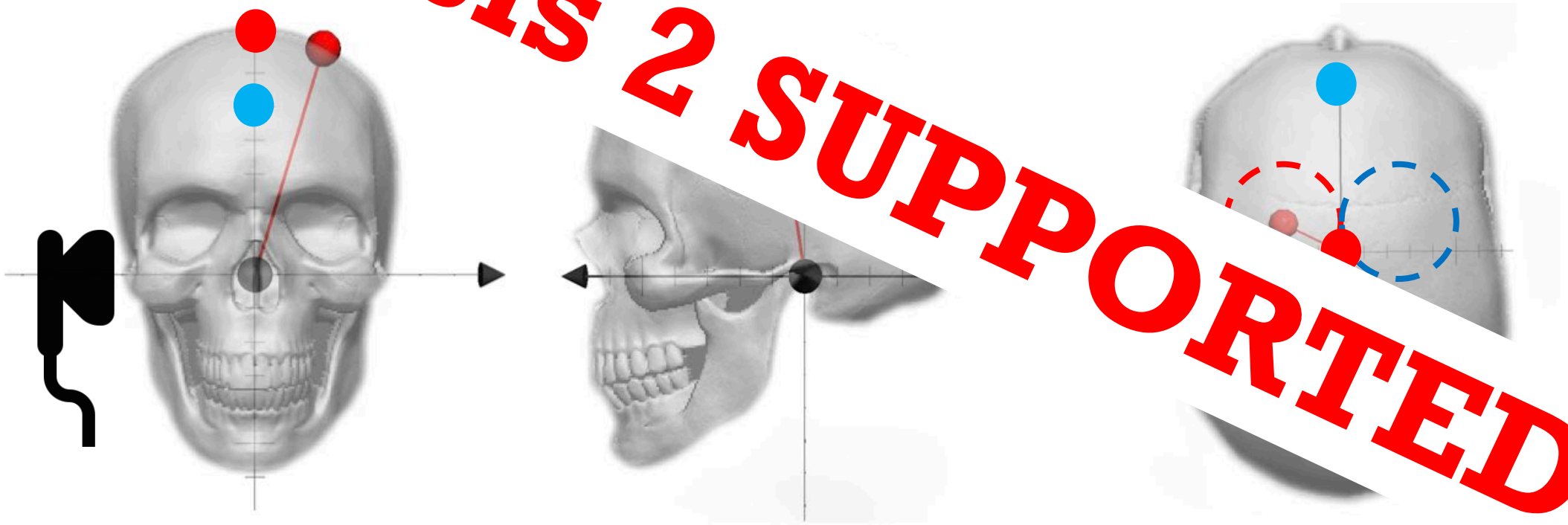
- **No significant differences were found in dipole orientations across stimulus [illegible]itions**

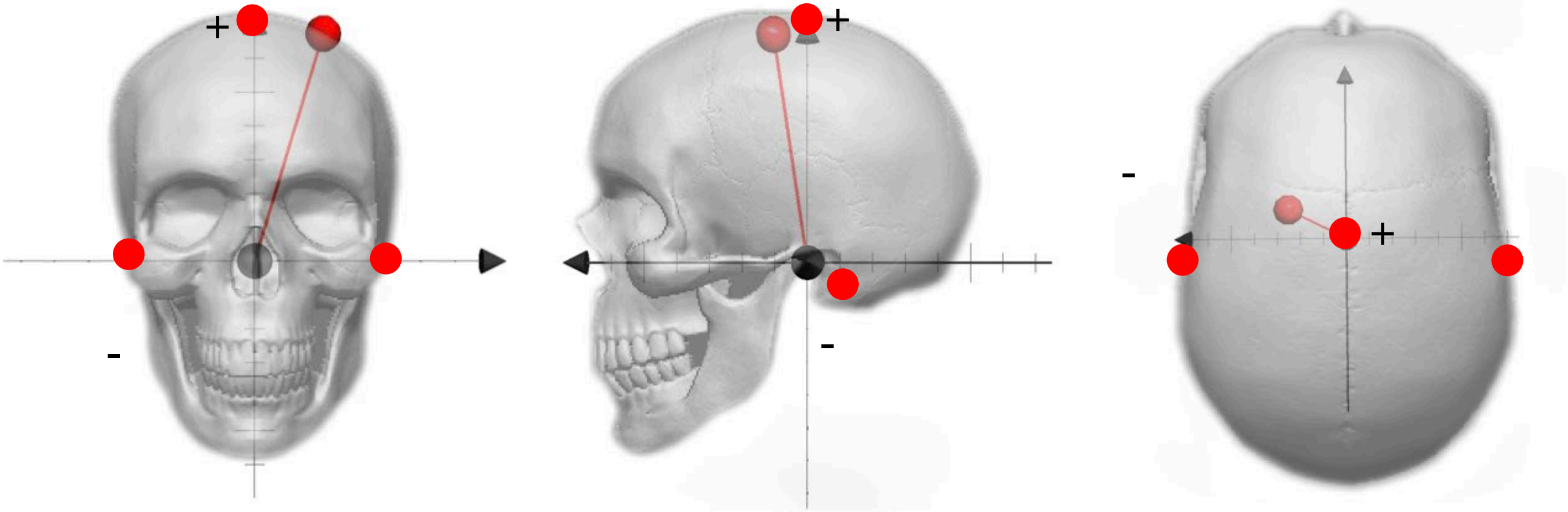
Hypothesis 2 SUPPORTED

montage

Dipole determined montage

58 % an





RECOMMENDATION

Use **Vertex – Linked mastoids** recording electrode configuration for ABR threshold testing

Thank you

Any questions?