

EVOKED POTENTIALS OVERVIEW

MSET Spring Meeting
Alpha Neuroscience Institute
May 5, 2012

EVOKED POTENTIALS Assessment

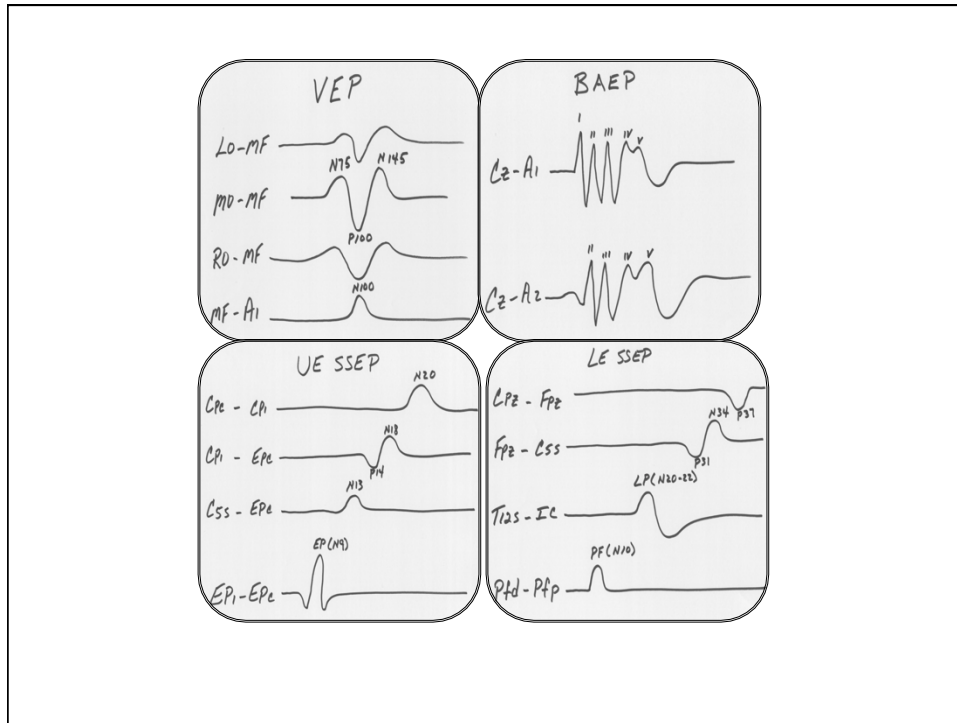
- Nervous system response to sensory stimulus
- Sensory Assessment
 - Peripheral apparatus
 - Central nervous system
- Afferent pathway

Modalities

- Visual Evoked Potential (VEP)
- Brainstem Auditory Evoked Potential (BAEP)
- Somatosensory Evoked Potential (SSEP)
 - Upper extremity
 - Lower extremity

CONCEPT

- STIMULATION
 - Peripheral Nerves
 - VEP
 - Retina of Eye
 - BAEP
 - Auditory Nerve of Ear
 - UE SSEP
 - Median or Ulnar Nerve of Arm
 - LE SSEP
 - Posterior Tibial or Common Peroneal Nerve of Leg



Evoked Potentials Characterized By

- Latency
- Absolute
- Interpeak
- Amplitude
- Polarity
- Morphology

Evoked Potentials

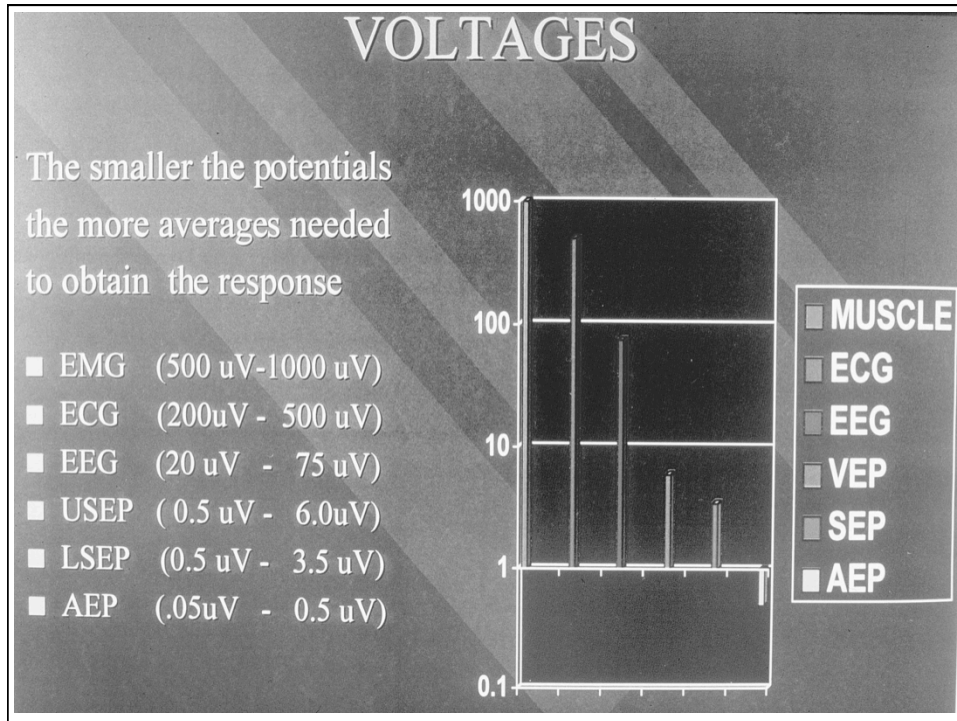
- Nervous system activity time-locked to a stimulus
- Multiple responses averaged to extract the signal from noise

7

Noise

- EEG
- EMG
- EOG
- EKG
- Extraneous

8



Near Field

- Recording Electrode close to Generator Site
- Localized Scalp Distribution
- 1 – 10 uV

Far Field

- Recording Electrode at a distance from Generator Site
- Wide Scalp Distribution
- < 1 uV

Stimulus Types

- VEP Alternating Checkerboard
 TV Pattern

- BAEP Earphone Generated
 Broadband Clicks

- SEP Electrical Pulsations

11

Stimulus Characteristics

- Intensity Strength of Stimulus

- Duration Length of Stimulus

- Rate Number of times a
 Stimulus is
 administered
 in a second

- Repetitions Number of stimuli
 (Sweeps) presented to
 adequately
 waveforms
 resolve

12

Averaging

- Extracts Responses Time-Locked to Stimulus (Signal) from on-going Background Activity (Noise)
- Enhances Signal by reducing Noise

13

Averaging

- Repeated Presentation of Sensory Stimuli
- Response Recorded w/in Analysis Time
- Converts Continuous Voltage Fluctuations (Analog Signal) into a Sequence of Numbers (Digital Signal)
- Individual Responses Added
- Sum of Responses Divided by Total Number of Responses

14

Number of Sweeps

- VEP 50 – 200
- BAEP 1,000 – 4,000
- SEP 500 - 2000

15

Trial

- Total Number of Sweeps Needed to Produce a Replicable EP
- Completed Trial = No Change in
 - Latency
 - Amplitude
 - Morphology

16

Replication

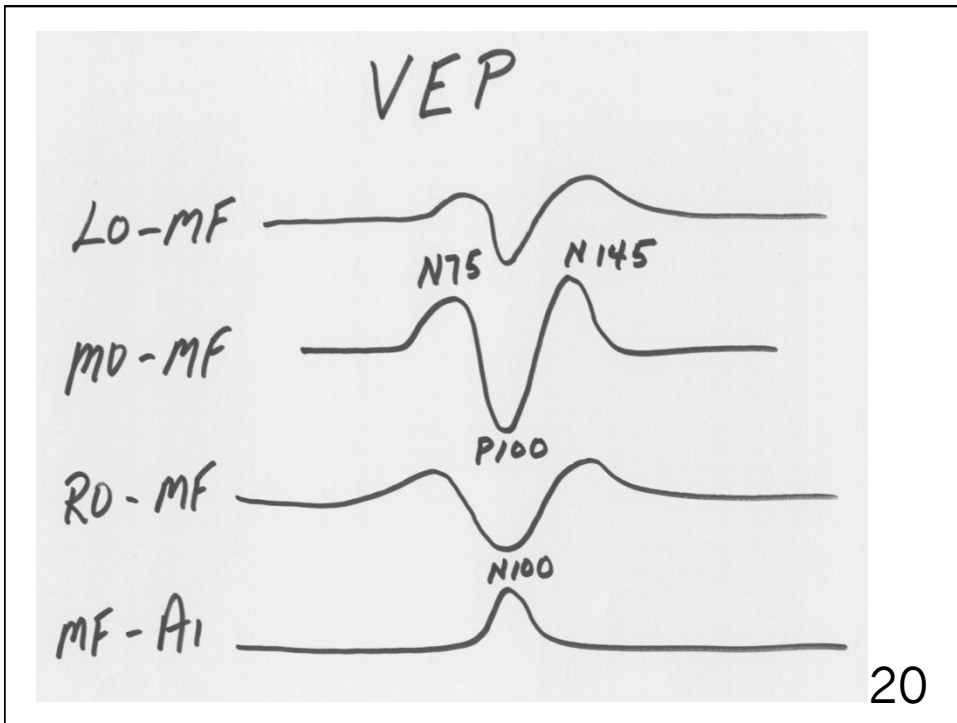
- Separate Superimposed Trials Match
 - Latency
 - Within 1 % of Analysis Time
 - Amplitude
 - Within 15 % of Each Other

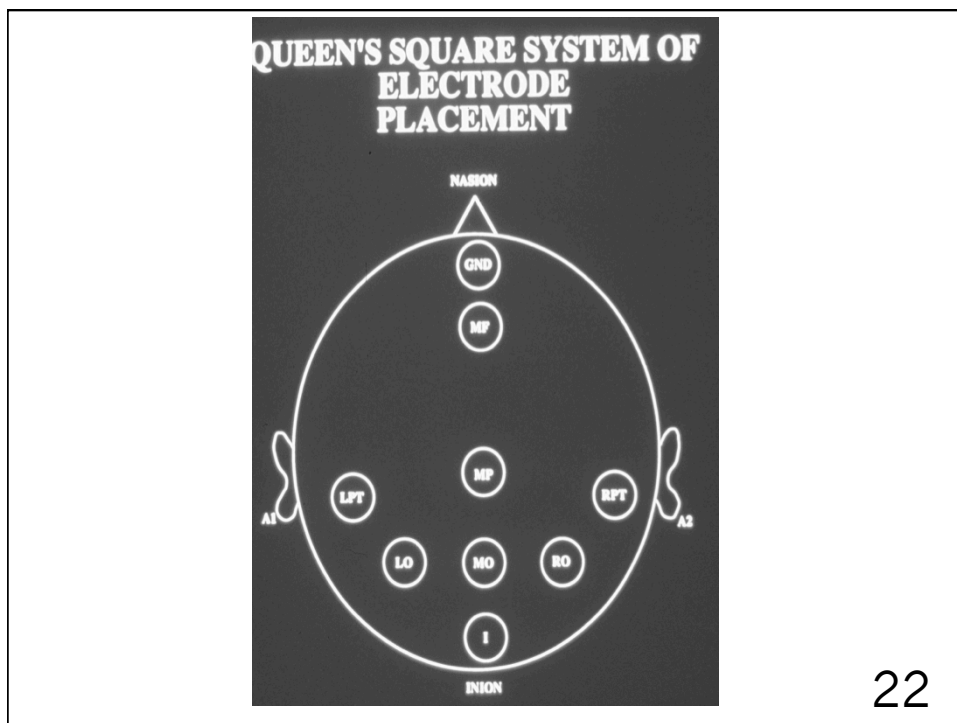
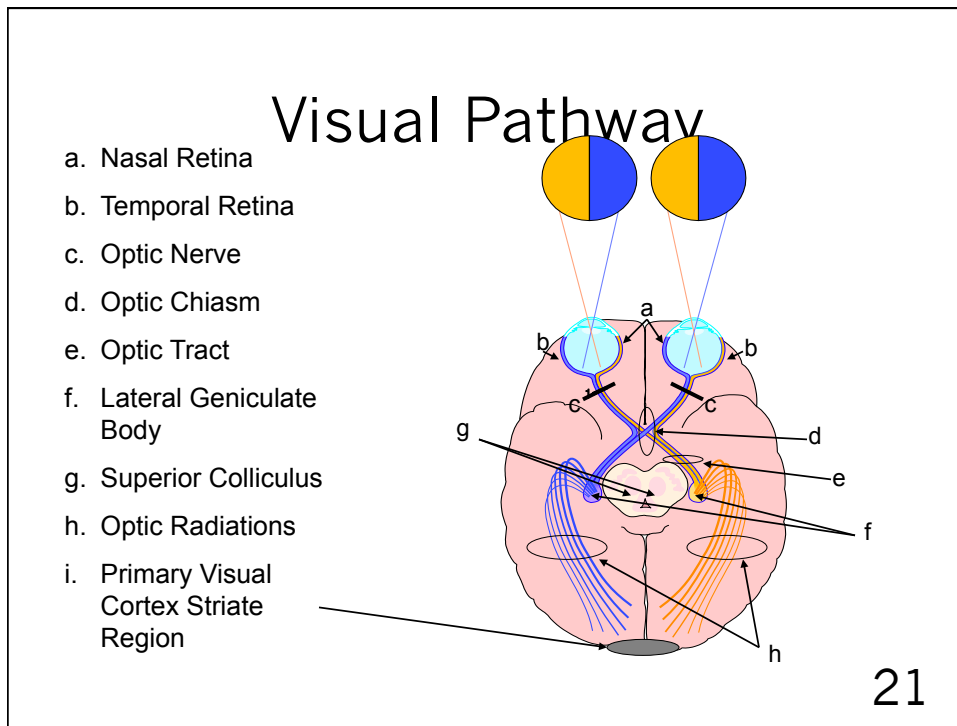
17

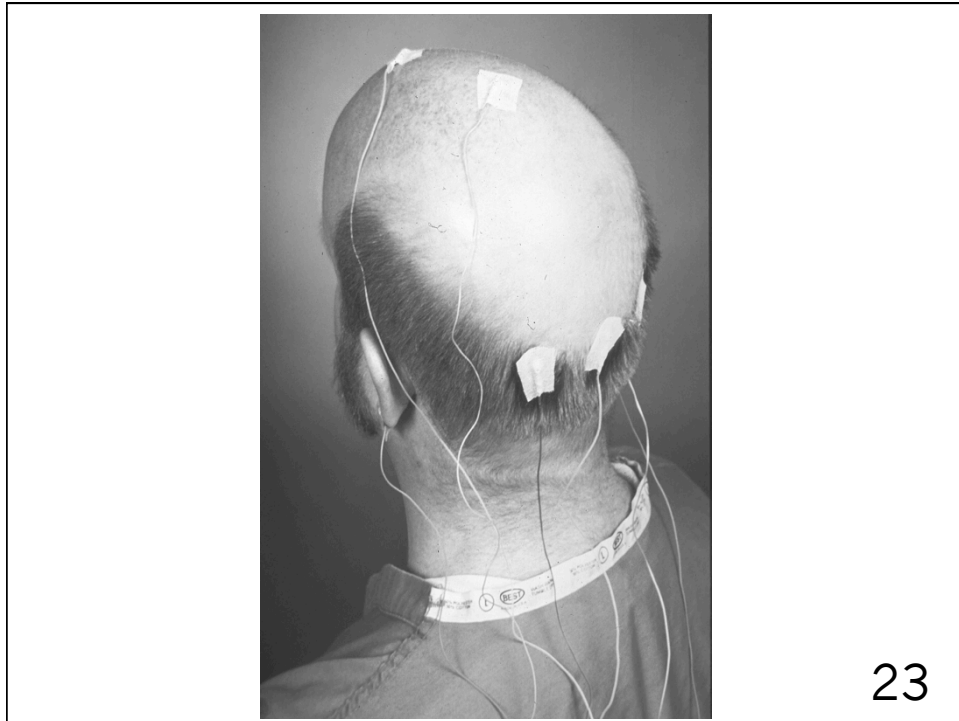
Assessment

- Latency
- Amplitude

Visual Evoked Potential VEP







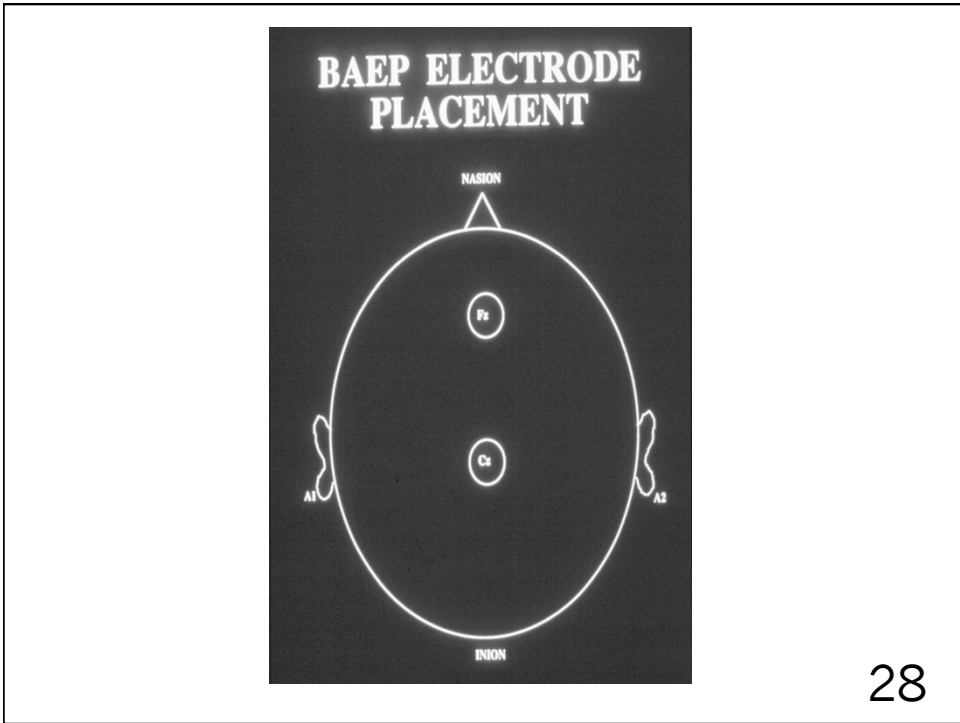
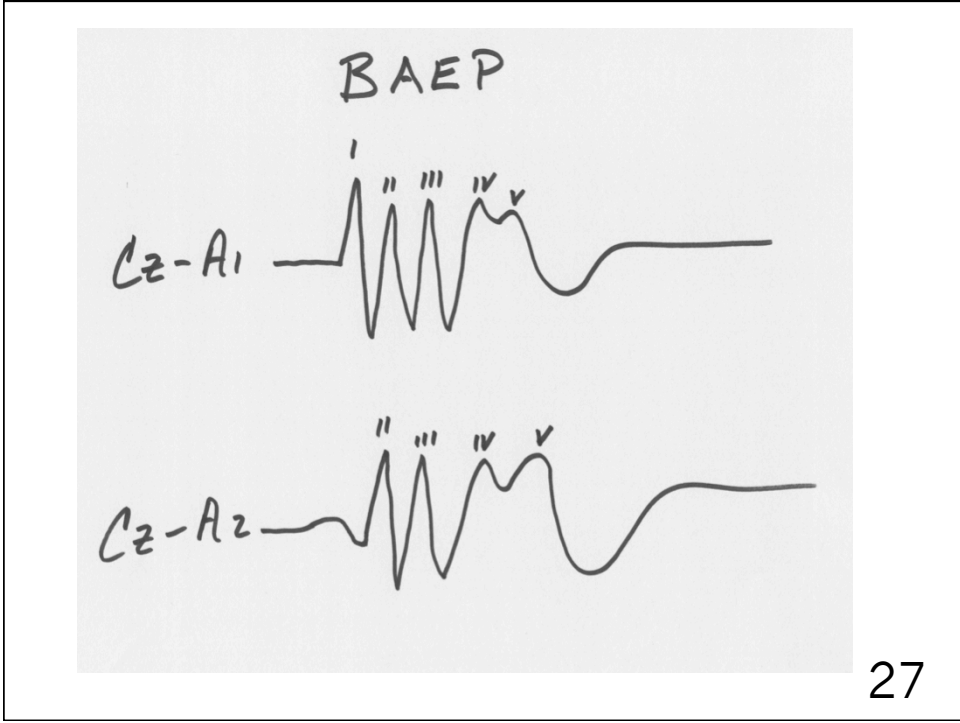
Visual Angle

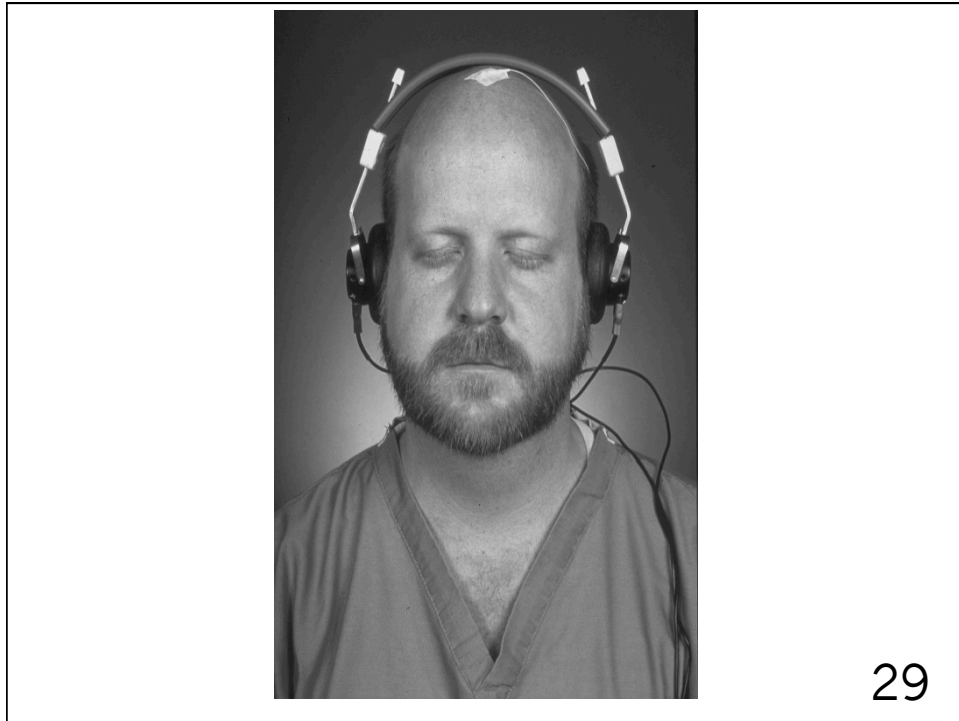
- Size of image of one light or dark square at retina
- Angle between line of sight of the extremities of an object

24



Potentials
BAEP





UE & LE Somatosensory
Evoked Potential SSEP

