



Incorporating CAEP Testing in the Pediatric Clinic

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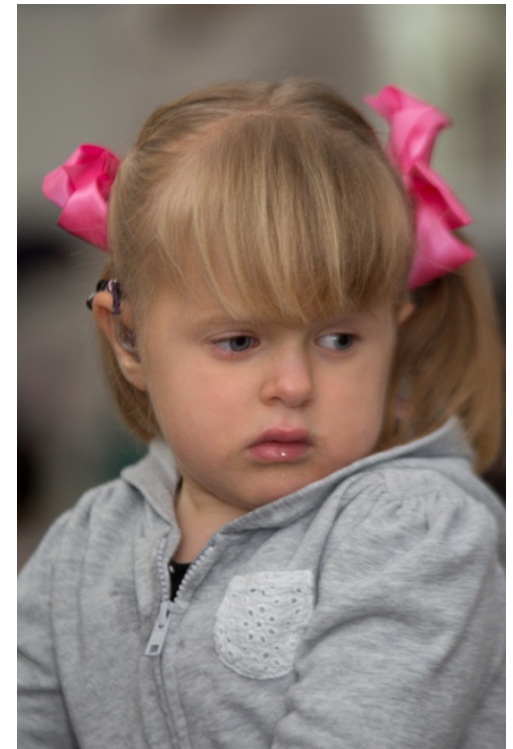
Presenter Disclosure Information



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No relationships to disclose.



Incorporating New Technology Into the Clinic

- Determine need/usefulness and validity for clinical use
- Obtain the equipment
- Incorporate into clinical protocol



New Equipment Available

FDA approved 2013

Cortical Auditory Evoked Potential
Analyzer

Equipment available with automatic
statistical analysis calculates “p” value
(probability) that waveform is actually a
response



Determine Need for New Equipment

Need: Always need more objective tools that do not require sedation for children



Validity/ Research Support for Clinical Use

- Presence of CAEP elicited by speech found to be objective indication of audibility and central auditory processing with and without amplification (hearing aid or CI)

Gravel et al, 1989, Hyde, 1997, Sharma et al, 2005,

Golding et al, 2006, H. W. Chang, et al, 2012, Purdy, 2013

- Beneficial for verification of hearing aid or cochlear implant benefit (Cone B., 2013)

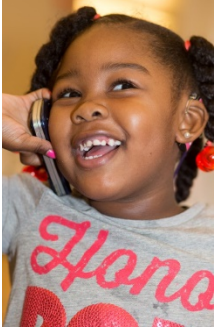


Support for CAEP with Statistical Detection Method

Measuring CAEP with assistance of statistical detection method intended to provide audiologists with assistance in the interpretation of infant CAEP waveforms.

(H.W. Chang, et al, 2012)





Research Support: CAEP Pre and Post CI

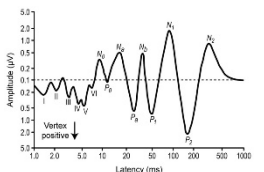
- Development of a CAEP, or P1 response
 - And show success with listening and spoken language
 - Within the first 6-8 months after CI activation (no response prior) if a CI is received within first 3.5 years of life



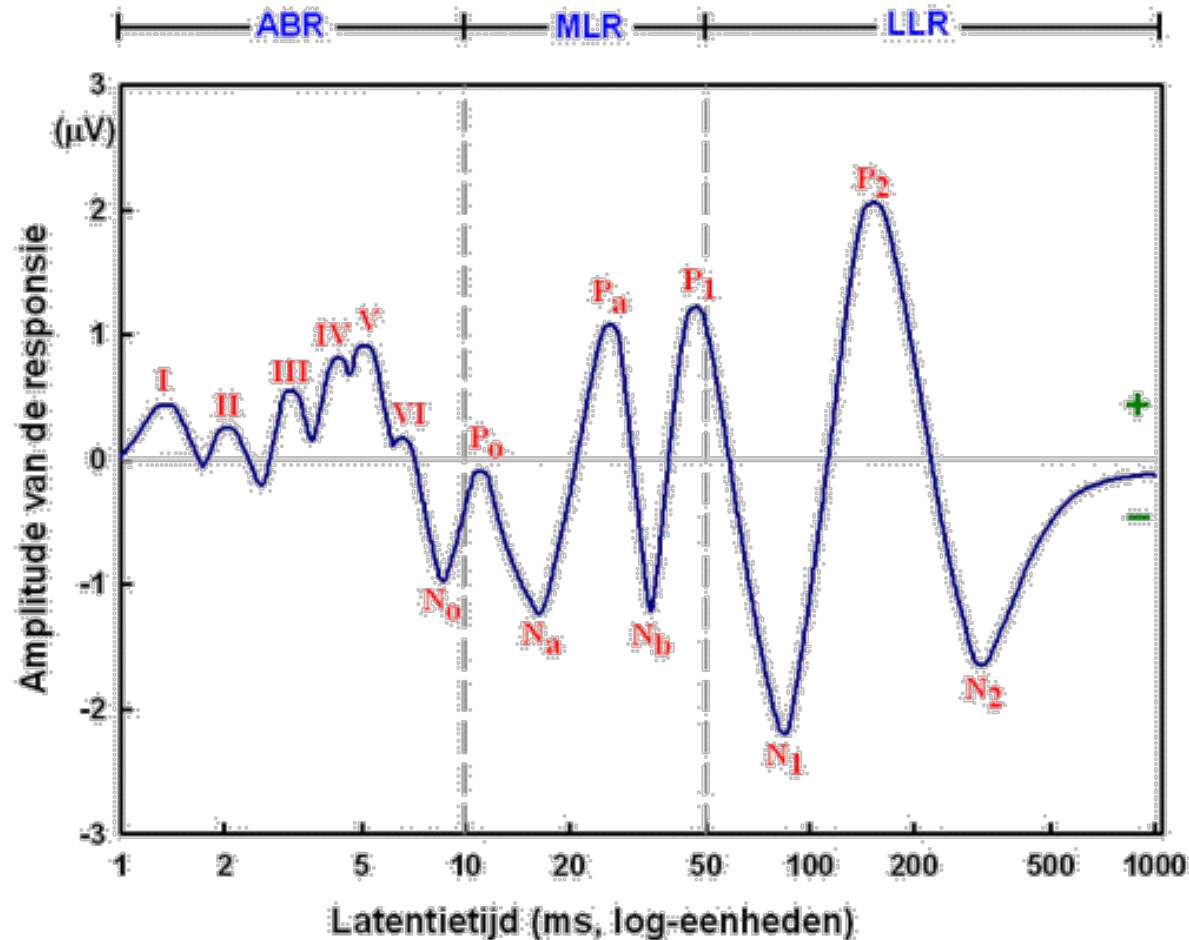
(Sharma, Dorman and Spahr 2002; Nash, 2007, Dorman, et al 2007, Silva 2014)

Cortical Auditory Evoked Potentials

- Electrical signals generated by the auditory cortex (brain level) in response to auditory signals
- N1 and P2 are thought to have multiple generators in Heschl's gyrus (auditory cortex),
- They are event-related, which means they are evoked by the onset of the stimulus.
- Similar to doing an ABR, however, higher level of processing (Auditory Late Responses)

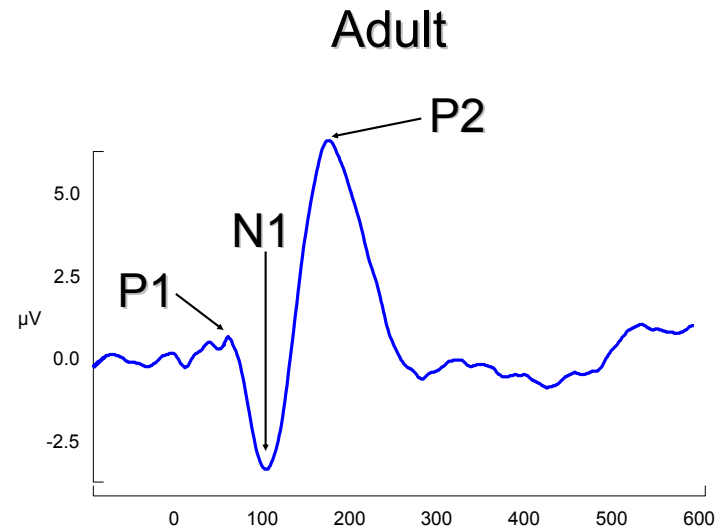


Similar to an ABR, but occurs later in time

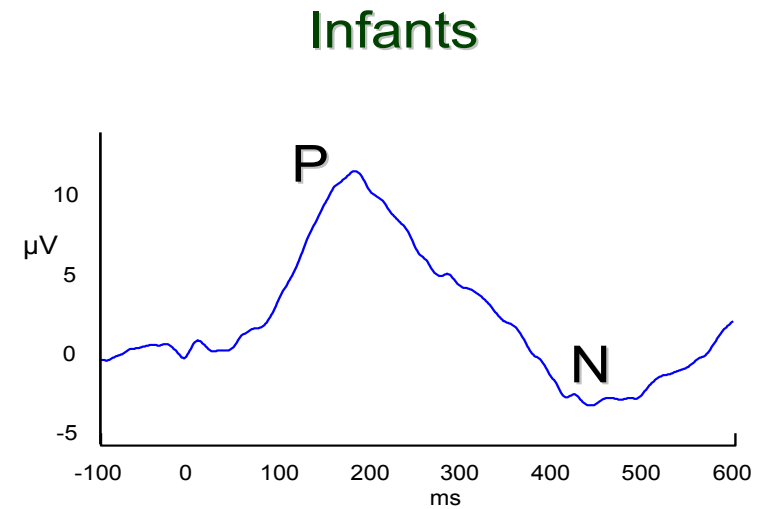


(Lamore, 2009)

CAEP Example



NAL: Dillon, Van Dun, Carter, Gardner-Berry

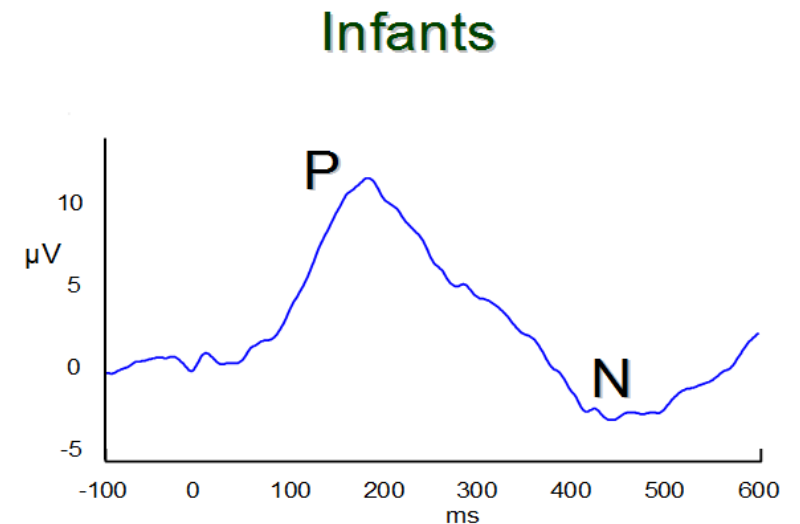


NAL: Dillon, Van Dun, Carter, Gardner-Berry

What are we looking for?

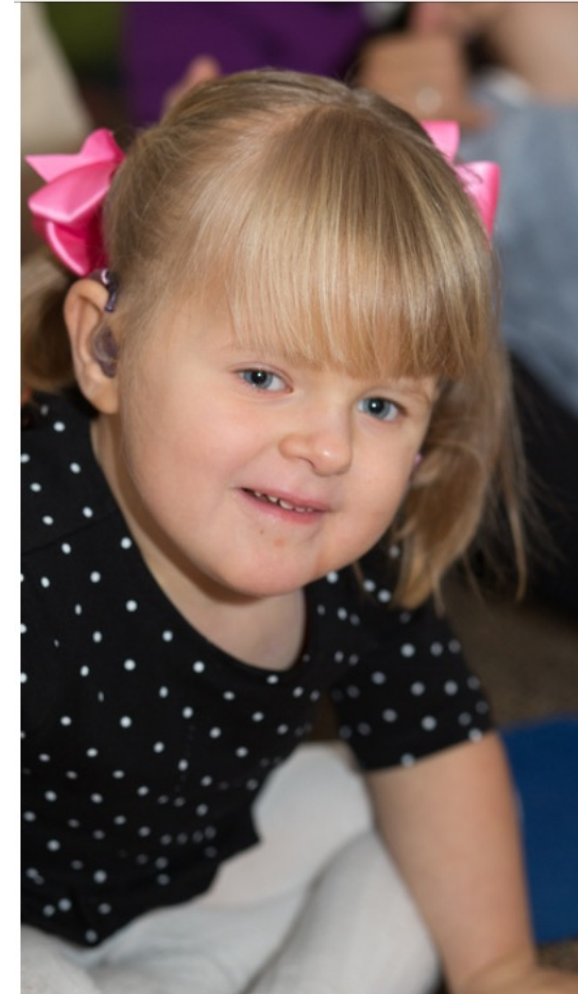
Infant CAEP's

- Positive peak near 200 milliseconds
- Size of response is robust



Normal development of CAEP

- Latency changes occur with increasing age
- Reflects auditory maturation



Next Steps

- ☒ Determine need/usefulness
- ☒ Validity for clinical use
- ☐ Obtain the equipment
- ☐ Incorporate into clinical protocol



Next Steps

☒ Obtain the equipment:

Generous grant/donation

☐ Incorporate into clinical protocol:

Considerations-

Development of new protocol

Define target population

Determine scheduling and billing



Target Population

1. Helpful for difficult to test population to confirm access to speech
2. Evaluation of Hearing Aid Benefit/Fitting:
 - Very young infants without behavioral audiograms
3. Help to determine next steps for intervention
 - Refer for CI?
 - Adequate access with hearing aids?
 - Access without hearing aids?
4. Auditory neuropathy spectrum disorder (ANSD) patients
 - Access to speech with and without hearing aids?



How are they done?

- Can be reliably recorded in children who are awake, but calm
- Without or without hearing aids on
- Child listens to various speech sounds

Speech Sounds: /m/ /g/ /t/ /s/

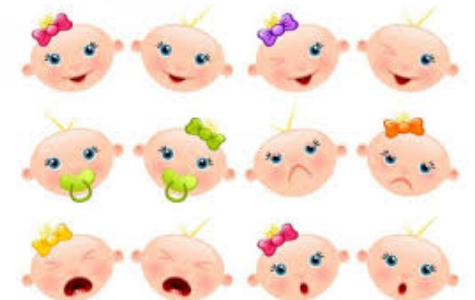
Presentation levels: 55 / 65 / 75 dB SPL

- Speaker or insert earphones



Challenges

- A noisy population: Toddlers, children on vents, etc. are noisy and not happy about staying seated on their parents lap for an extended period of time.
- Moving equipment and set-up each time (clinic specific)
- Learning curve of understanding how to mark the waveforms and gain confidence in results.
- Scheduling: Long block of time- going from 2 to 1 hours



Limitations

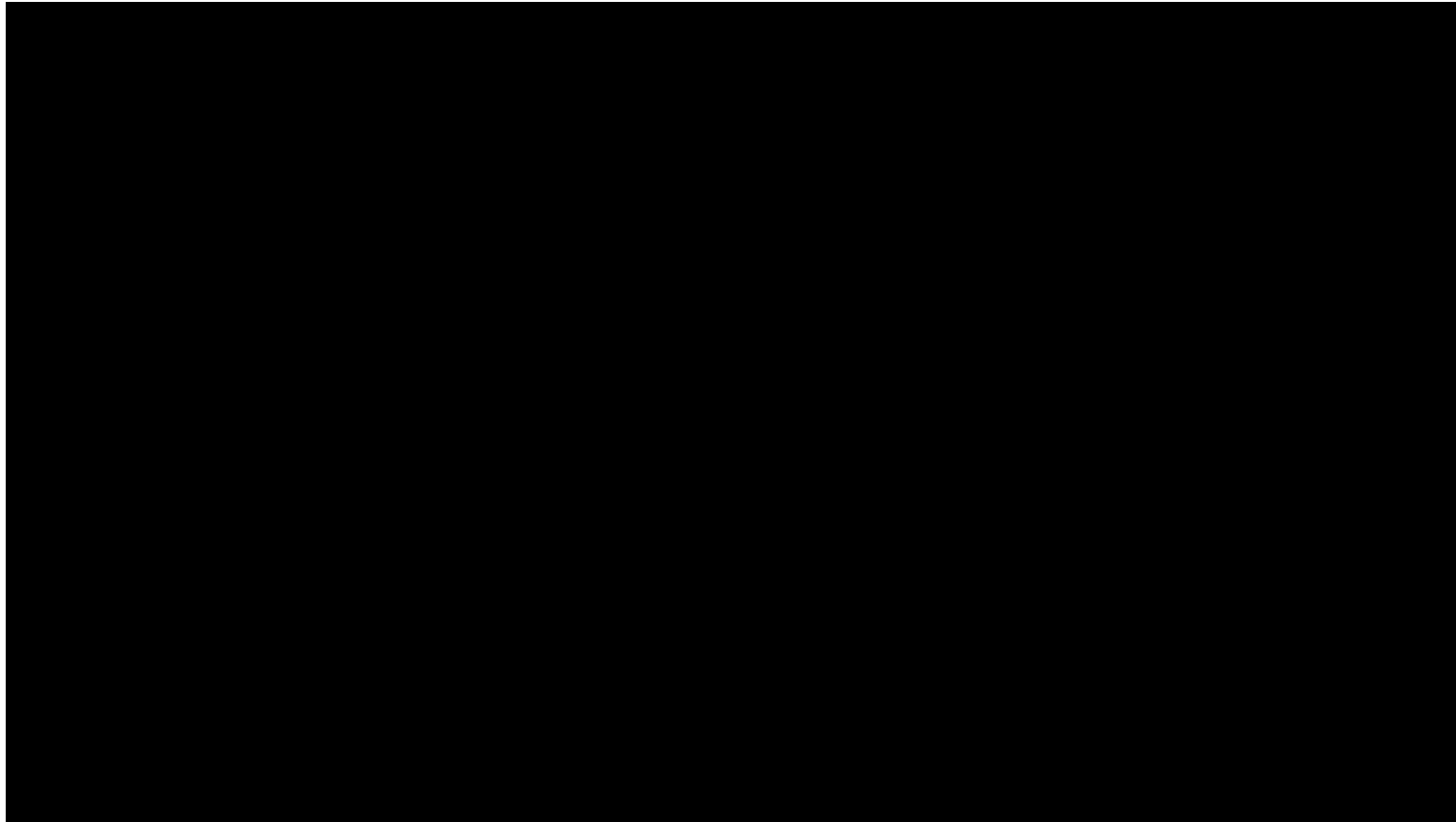
- Provides useful information, however, studies have shown atypical P1 responses with those who have excellent speech scores. (Nash, 2007)
- Cannot be considered a substitute for behavioral testing; can only be considered a part of the battery of tests.
- Presence of CAEP does not necessarily indicate aids are providing effective amplification, may only be just audible and still elicit a response. (H. Chang, Et Al, 2012)
- Use of an automatic statistical criterion may underestimate identified responses compared to visual inspection. (H.W. Chang et al., 2012)

Benefit

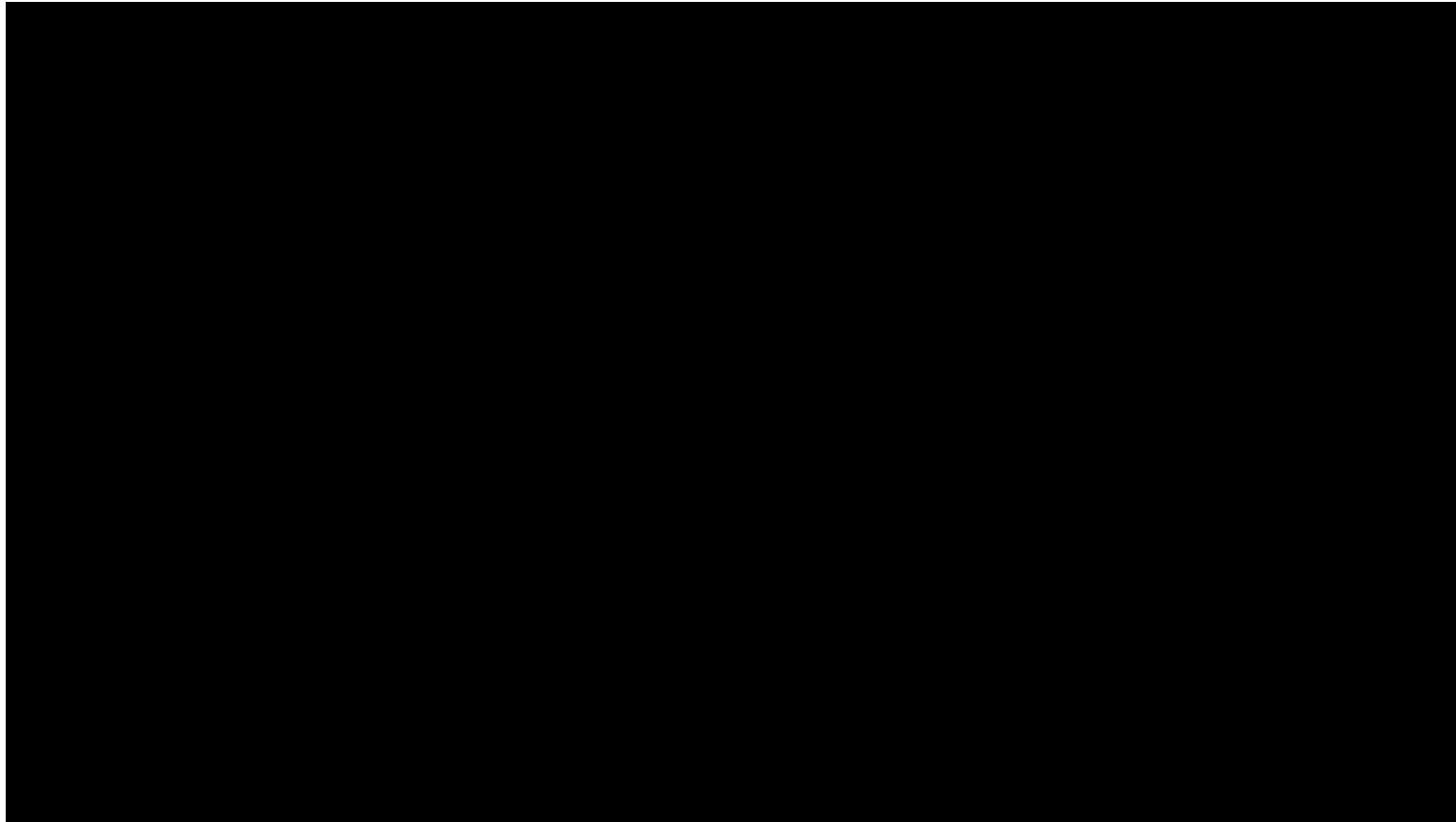
- Obtaining further information on a difficult population
- Providing parents with additional information and explanation
- Provide clinical audiologist with more information for counselling purposes
- Fairly easy to incorporate into small test population while clinicians become skilled testing



CAEP – The Noisy Toddler



CAEP – When things go well...



Final Thoughts



Provides further information regarding access to speech stimuli, BUT we need to incorporate teacher, family and provider feedback to understand the child's language milestones and development.

As clinics are fitting more children who present with Deaf +, more sophisticated testing is needed in order to determine and verify the fitting of different technologies.