Children’s Word Recognition, Detection, and Learning with Transcutaneous and Percutaneous Stimulation

Andrea Pittman, PhD CCC-A
Arizona State University, Tempe Arizona USA
Disclosures

This project was funded by a grant from Oticon Medical

Collaborators (subject recruitment):
  Judy Attaway – Casa Colina Hospital, California
  Rachel Krupa – Mesa Schools, Arizona
  ...

A. Pittman Copyright © 2017 All rights reserved
Purpose

To compare children’s performance with a bone-conduction device coupled percutaneously via an abutment and transcutaneously via a Softband.
Hypothesis

If the quality of the acoustic signal is improved with percutaneous coupling, then differences in performance will be evident for auditory tasks that are dependent on the quality of that acoustic signal.
Predictions

1. No difference in performance will be observed for traditional measures of speech perception
2. Differences will be observed for tasks containing unfamiliar stimuli (nonsense words)
Method

Children:

4 boys and 5 girls
8 to 15 years (mean = 11 years)
7 bilateral conductive losses
1 single-sided deafness
1 single-sided conductive
All children used an implanted bone-conduction device (Ponto or Baha)
Fitting two Ponto processors during testing: 1) Direct, 2) Softband
Fitted two Ponto processors during testing: 1) Direct, 2) Softband.
Testing

Stimulus presentation:

Free field
0° azimuth
65 dB SPL
Quiet

Device activation was counterbalanced

Responses collected using interactive computer games
Auditory Tasks

1) Traditional word recognition using Nu-6 word lists

(% correct)
Auditory Tasks

2) Auditory Lexical Decision Task
Repeat aloud real and nonsense words and indicate the category of each word.
(% correct)
3) Non-Word Detection
Identify the position of nonsense words embedded in short sentences.
(D-Prime)
4) Rapid Word Learning

Associate nonsense words with novel images through a process of trial and error.

(Speed: the number of trials required to achieve 70% performance.)
Group Results

- **Performance (% Correct)**
  - Word Recognition
  - Lexical Decision
  - Softband
  - Direct
  - *p* < 0.05

- **Nonsense Word Sensitivity (D-Prime)**
  - Non-Word Detection
  - *p* < 0.05

- **Learning (Speed)**
  - Word Learning
Individual Results

- Word Recognition
- Lexical Decision
- Non-Word Detection
- Word Learning

A. Pittman Copyright © 2017 All rights reserved
Group Results (without outlier)

Performance (% Correct)

- Softband
- Direct

Word Recognition
Lexical Decision

Nonsense Word Sensitivity (D-Prime)

Non-Word Detection

Learning (Speed)

Word Learning

A. Pittman Copyright © 2017 All rights reserved
Conclusions

Preliminary findings suggest that:

1) traditional word recognition tests are relatively insensitive to differences in signal quality

2) significantly greater benefits are provided by percutaneous over transcutaneous coupling for identifying and learning new information