

# **SPEECH TRACKING REVISITED**

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# BASIC METHOD



- Talker produces a sentence or phrase
- Listener repeats what is heard
- If repetition is correct, talker produces next utterance
- If incorrect, talker repeats utterance or a portion of it.
- Tracking rate (wpm) is used as a measure of performance

# A BRIEF HISTORY OF SPEECH TRACKING

- Continuous Discourse Tracking (CDT) is based on the Repeat-the-Question method of oral teaching used at CID  
(De Filippo & Scott, 1978)
- CDT was designed for evaluation & training with tactile aids, but initially was widely used with cochlear prostheses, 1980-1988
- Problems with CDT reviewed by Tye-Murray & Tyler (1988)

# REVISIONS OF TRACKING METHOD

- CDT has been modified by different groups over the years
- Speech Tracking is the generic term for the different versions of CDT
- Rules vary regarding the allowable number repetitions
- Problems with CDT are similar to those of live-voice speech testing

# STRENGTHS OF SPEECH TRACKING TECHNIQUE

- Focus is on interactive communication
- Training covers a wide range of communication skills
- Can be used with or without visual cues
- Applicable for both training and evaluation
- Training materials can be entertaining and tailored to the client

# PROBLEMS WITH SPEECH TRACKING TECHNIQUE

- Large differences between talkers
- Correction strategies vary across users
- Dependent on complexity of the material
- Dependent on listener's motivation and alertness
- Substantial involvement of clinician time

# COMPUTER-ASSISTED SPEECH TRACKING

- KTH Speech Tracking Method provides computer-assisted guidance to talker (Gnosspeilius and Spens, 1992)
- Computer-Assisted Tracking Simulation (CATS) uses pre-recorded speech under computer control (Dempsey et al., 1992)

# ADVANTAGES OF COMPUTER-ASSISTED SPEECH TRACKING

- Strict rules are implemented using predetermined correction strategies
- Difficulty of material is controlled
- Client's performance is monitored unobtrusively
- Detailed analysis of client's performance is available immediately after testing/training session
- Pre-recorded speech eliminates problems of live-voice testing




# DISADVANTAGES OF COMPUTER-ASSISTED SPEECH TRACKING

- Pre-determined correction strategies are useful, but may be inappropriate for enhancing interactive communication
- Efficient use of clinician's time is important, but needs to be accomplished without reducing the clinician's primary role in the rehabilitation process



# USE OF PRE-RECORDED MATERIAL IN SPEECH TRACKING

- Each sentence in the test/training material is recorded in several ways
  - Current version of CATS begins with a sentence spoken in a normal conversational mode
  - Additional recordings of the sentence, or portions of it, are made using precise articulation
  - A third set of recordings is made using emphatic “clear speech”
  - Recordings of several representative talkers are used
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# RULES FOR IMPLEMENTING PRE-RECORDED SPEECH

- Initial version of CATS required the test administrator to determine:
  - a) if the first half of an utterance was repeated correctly, and
  - b) if the second half of the utterance was repeated correctly.
- The computer then selected an appropriate recording for the next utterance
- Current version selects recordings based on the listener's responses

**PLAY VIDEO  
RECORDING**

# EVALUATIONS OF COMPUTER-ASSISTED SPEECH TRACKING

- Comparison between traditional and KTH speech tracking showed smaller inter-session variability for KTH (Bernstein, et al, in press)
- Experimental evaluation of CATS showed substantial reduction in test-retest variability
- (Dempsey, et al, 1992)

# COMPUTER-ASSISTED TRACKING AS AN EVALUATIVE TOOL

- The substantial reduction in test-to-test variability opens up innovative new possibilities for evaluating communication skills
- An important problem is evaluating ability to understand conversational speech in a noisy environment
- A variation of CATS monitors the frequency of listener errors in a conversation
- The noise level is adjusted adaptively to the SNR at which the listener can just understand the conversation.

# COMPUTER-ASSISTED TRACKING: OTHER APPLICATIONS

- Computer-based speech tracking methods, such as CATS, can be modified for convenient home use
- Recent advances in cloud computing allow for inexpensive implementation of the technique
- Interesting, entertaining training materials can be used to maintain motivation and increase time on task

**REHAB WITH A SMILE  
IS  
REHAB WORTH WHILE**



# CONCLUSIONS

- Computer-assisted speech tracking is less variable than traditional method.
- No evidence, as yet, whether computer assisted tracking is more or less effective as a training tool
- Automated speech tracking can evaluate communication skills in innovative new ways
- Computer-based tracking methods, such as CATS, can be used for convenient , entertaining in-home training

# A CONUNDRUM

- There is a substantive body of evidence showing that rehab training with speech tracking shows significant benefit, but the technique is not as widely used as it once was.
- There are some practical problems in implementing speech tracking. Although these problems can be addressed using modern technology, there has been little effort in making more effective use of speech tracking in auditory rehabilitation.

**You Can Wake Up Now**

**THANK YOU!**

