Use of the LENA Tool to Evaluate the Effectiveness of a Parent Intervention Program

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Overview

• Application of LENA system to a parent intervention program
  – LENA
    • New research tool
    • Automatic analyses of naturalistic language
  – Adapted version of *It Takes Two to Talk: Hanen Program for Parents*
  – Pilot study
The Language Environment Analysis (LENA) tool is a small wireless digital language processor worn in a special vest for up to sixteen hours per day.

Automated LENA measures:
- Adult Word Count (AWC): total words spoken to the child (near and clear)
- Child Vocalizations (CVC): total word and vocalization output from the child; meaningful child speech surrounded by 300 ms of silence or non-meaningful speech
- Conversational Turns (CTC): child vocalizes & adult responds or adult speaks & child responds
Application of LENA

• Clinical uses of LENA:
  – Assessment and diagnosis
  – Audio environment analysis
  – Enhanced treatment through in-home feedback
  – Monitoring treatment fidelity & effectiveness
    • AWC and CTC measures increased after treatment in LENA Foundation case studies (LTR-09-1)
    • Efficient
Parent-focused Intervention

• Early exposure to a language rich environment promotes later academic success (Hart & Risley, 1995)
• Late Talkers are sensitive to the amount and type of talk from their parents
• Parent-focused language intervention programs aim to teach parents strategies to facilitate language development
• Parent-based interventions and traditional therapy implemented by a SLP were found to be equally effective (Law, Garret, & Nye, 2004)
It Takes Two To Talk: Hanen Program for Parents

• A family-centered intervention program
• Focuses on teaching parents techniques to build language skills during child-lead interactions.
• After enrollment in 10-week ITTTT program (Girolametto, Pearce, & Weitzman, 1996):
  – parents’ language input to their child increased
  – children made expressive language gains
  – mothers’ language input was slower, less complex, and more focused
  – children had larger vocabularies, used more multiword combinations, and used more early morphemes
4-week Adapted It Takes Two To Talk: Hanen Program for Parents

- Covers the content of the first five weeks of the traditional 11-week ITTTT program (8 parent education sessions & 3 videotaped feedback sessions)
- Two 2-hour parent-education sessions
- Two 30-minute individual videotaped feedback coaching sessions
- Covers the core content of the ITTTT program
  - Let Your Child Lead
    - Get face to face
    - Observe, Wait and Listen (OWL)
  - Follow Your Child’s Lead
    - Imitate, Interpret, Comment
    - Match Your Turns to Your Child’s Turns
    - Ask Questions That Keep the Conversation Going
- Parents also receive a It Takes Two to Talk handbook (Pepper & Weitzman, 2004)
Research Questions

• Do parents enrolled in a short-term parent-based intervention program demonstrate an increase in language input to their late-talking toddlers?
  – AWC and CT values > post tx?

• Do late-talking children whose parents enrolled in the parent-based intervention program demonstrate an increase in expressive vocabulary skills (a) parent report and (b) naturalistic child vocalization output?
  – MBCDI and CV values > post tx?
Participants

• Eight participants were recruited
  – 1 lost to technical error
  – 1 lost to attrition

• Results from 6 Participants reported (ages 20 to 30 months at the start of the study)

• Mono-lingual English speaking

• All children demonstrated the following:
  – expressive and/or expressive-receptive mixed language deficit (i.e., “late talkers”)
  – below the 10th percentile for total productive vocabulary on the MacArthur-Bates Communicative Development Inventory
  – normal oral and speech motor abilities
  – normal hearing ability
  – no frank neurological, gross-motor, or cognitive impairments.
Design

• Quasi-experimental
  – 4 families in experimental group (2 families lost)
  – 4 families in Wait-list control group
  – Pre-and post-tx data on 6 families

• Pilot Study
Procedures

• Experimental Group (N = 2)
  – Pre-intervention LENA recording
  – Receive 4-week ITTTT intervention
  – Post-intervention LENA recording

• Wait-list Control Group (N = 4)
  – Pre-wait LENA recording
  – Wait 4-weeks while experimental group takes ITTTT class
  – Pre-intervention LENA recording
  – Receive 4-week ITTTT intervention
  – Post-intervention LENA recording
Plan of Analysis

• Do parents enrolled in a short-term parent-based intervention program demonstrate an increase in language input to their late-talking toddlers?
  – AWC and CT values > post tx?

• Do late-talking children whose parents enrolled in the parent-based intervention program demonstrate an increase in expressive vocabulary skills (a) parent report and (b) naturalistic child vocalization output?
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Group Data

Adult Word Count (AWC)

Conversational Turns (CTC)

Child Vocalizations (CVC)

MacArthur-Bates Communicative Development Inventory (MBCDI)

Error Bars: ± 1 SE
Findings

• Due to small sample size we cannot make definitive conclusions about the effectiveness of the adapted *It Takes Two To Talk: Hanen Program for Parents*

• For individual participants
  – AWC, CT, and CV measures tended to remain stable or increase after intervention
  – MBCDI measures tended to remain stable or increase after intervention
Interpreting LENA

• Let’s look more closely at LENA’s automated measures
• What factors may impact LENA’s ability to detect changes?
• What do we need to be aware of when interpreting LENA’s automated output?
Factors

• Large Coefficient of Variation
• Amount of Awake Time
• Quantity vs. Quality
Adult Word Count

- In LENA normative study (N = 314), AWC coefficient of variation was 52.5%
  - A family can vary their AWC by more than 50% of the average amount
  - E.g., a family may produce as few as 6,000 words or as many as 19,000 words on a given day.
- AWC sample mean and standard deviation (M=11,270, SD=4,239).
Case Example: Variability in AWC

Case Example: C3

- PreWait 9/13/09
- PreTx 10/10/09
- Pre Tx. 10/24/09
- PostTx 11/18/09
Conversational Turns

• In LENA normative study, coefficient of variation was 53% for a family with a 24-month-old.
  – Average CTC of 520 turns per day for a 24-month-old
  – On any given day CTC could be as few as 250 and as many as 800.
Case Example: Variability in CTC
• Given the variability from day to day what magnitude of change on each LENA measure would be needed to show gains due to intervention?

• Multiple recordings (e.g., 2 weekdays and 1 weekend day) at each measurement point may be necessary
Awake Time

- AWC influenced by child awake time (AWC/awake mins * 60 * 9.6)
- AWC values changed more dramatically for kids who were awake less on the post-intervention recording day
  - C1: Pre-intervention: awake 735 mins
    Post-intervention: awake 330 mins
  - C3: Pre-intervention 1: awake 602 mins
    Post-intervention: awake 485 mins
  - C4: Pre-intervention: awake 546 mins
    Post-intervention: awake 417 mins

* (AWC/awake mins) x 60 min x 9.59 hours. 9.59 hours was the average amount of awake time across the recordings of all participants.
Quantity vs. Quality

• Consider goals of intervention program

• Do LENA’s automated measures reflect the goals of the intervention?
  – E.g., ITTTT aims to teach parents to follow their child’s lead which may decrease overall AWC if child has low language

• Advanced LENA analyses may capture more qualitative information
Ongoing Analyses

- Continued analysis using the Advanced Data Extractor (ADEX) LENA software tool may reveal additional findings in this pilot study
  - Separate out male vs. female AWC values
  - Looking at child initiation and response time within conversational blocks
Research/Clinical Utility

• LENA system was useful in clinician-researcher collaboration
• Easy for clinician to collect data despite hectic clinic schedule
• Automated output was easily analyzed, understood, and shared