Incorporating Computer-Aided Language Sample Analysis into Clinical Practice

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The case study was collected by the second author while she was working at Northeast Georgia Medical Center (NGMC).
IRB approvals were obtained from University of North Carolina at Chapel Hill and from NGMC.

Useful Publications on CLSA


Language Sample Analysis (LSA)


- Offers benefits over standardized tests

What are the benefits of LSA over using standardized tests?

<table>
<thead>
<tr>
<th>Benefit</th>
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</thead>
<tbody>
<tr>
<td>Describe current expressive language abilities during tasks that are</td>
</tr>
<tr>
<td>typical of classroom</td>
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<tr>
<td>Reveal how the child integrates skills across the various domains of</td>
</tr>
<tr>
<td>language, including semantics, syntax, morphology, pragmatics, and</td>
</tr>
<tr>
<td>phonology</td>
</tr>
<tr>
<td>Good alternative for children from culturally and linguistically</td>
</tr>
<tr>
<td>diverse populations for dx of disorder (CLD; Roseberry-McKibbon, 2007)</td>
</tr>
<tr>
<td>Documenting response to treatment</td>
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</tbody>
</table>
Document Response to Treatment

Measures need to be:
1. Sensitive enough to show small but clinically important changes in behavior
2. Collected in the context in which the skills need to be used
3. Can be repeated frequently
4. Able to measure both treated behaviors and untreated behaviors  (Bain et al., 1992)

Language sample analysis meets all these criteria…

…and computer-aided language sample analysis (CSLA) makes it possible!
What do you need to conduct CLSA?

1. Computer with a sound card and adequate storage space on the hard drive
2. External microphone and a microphone jack on the computer
3. Audio recording software (e.g., Audacity)
4. Materials for eliciting the language samples (e.g., interview protocol for conversational sample; wordless books for narrative sample)
5. Software in which to transcribe the sample (e.g., Notepad, Word, Transcriber)
6. Software for language analysis (e.g., SALT)

Today’s Agenda: Describe a 4-step Process for Conducting CLSA

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Elicit the language sample and record digital audio files onto your computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Transcribe the sample and mark the language features</td>
</tr>
<tr>
<td>Step 3</td>
<td>Analyze the sample</td>
</tr>
<tr>
<td>Step 4</td>
<td>Interpret the analyses and develop goals (or evaluate progress)</td>
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Jill (pseudonym)

- 6-year-old girl in the first grade
- Reason for parent referral at age 4:
  - unusual difficulty learning basic vocabulary and concepts
  - family hx of learning disabilities
  - articulation errors

- Data collected by second author, Colleen Cook, in hospital outpatient rehab setting

Jill’s Evaluation Info at 5;10 years old

<table>
<thead>
<tr>
<th>Test</th>
<th>Standard Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPVT-III</td>
<td>93</td>
</tr>
<tr>
<td>CELF-P2 Receptive</td>
<td>89</td>
</tr>
<tr>
<td>Language Content</td>
<td>91</td>
</tr>
<tr>
<td>Language Structures</td>
<td>80</td>
</tr>
<tr>
<td>Expressive Language</td>
<td>83</td>
</tr>
</tbody>
</table>
Jill: Goals for Treatment Based on Standardized Test Results

- Patient will use “she” as a subjective pronoun with 70% accuracy in spontaneous speech.
- Patient will use regular plurals in sentences with 80% accuracy.
- Pt will use the present progressive (“is ___ing”) form in structured sentences with 70% accuracy.
- Patient will sequence 3-frame stories and retell them using correct grammar with 80% accuracy.
- Patient will frame a question using correct grammar given structured prompts with 70% accuracy.

C: Okay now tell me about Sadie (Jill’s cat).
E: She’s feeling better.
C: Her (firstEW:fur’s] fur’s coming back.
E: Her fur’s coming back?
C: What happened?
C: But I didn’t know she was sick.
E: Tell me about what happened to her.
C: (She) sometimes she do’nt throw up.
C: (Um) she went to the vet every time (um) we got her dry cat food.
C: She do’nt[EW:does/’nt] like it though.
C: We got her something else at the vet.

C: (Dr. Madoodle my mama got) when I got outta school she (um) got her some food for her [EU].
E: So you went after school to the vet.
E: (And he gave her some) he said she should have dry food?
C: Because 04 she (um) throw/3s up every time.
E: She’s been throwing up?
C: Mhm.
C: Not very[EW:every] time though.
C: (She really) she’s doing fine though.
E: But you said something about her fur coming back.
C: (Did her fur) did she lose her fur?
C: Uhuh (no).
C: It’s coming back though.
E: But where did it go?
C: It went away.
Step 1: Elicit a Sample and Record Digital Audio

Need three components:
1. A sound card installed on computer
2. An external microphone
3. An audio recording software program

Microphones

- ALWAYS use an external microphone $13 at B&H
- Hook into a line-in or mic jack
- Long cord $63 at B&H
Software for Recording Audio

- Goldwave – www.goldwave.com - $30
- Garage Band on Mac
- QuickTime Pro - $30
Set Preferences for CD-Quality Audio

- Baseline sample rate converter: Fast Sinc Interpolation
- Baseline sample rate converter: High-quality Sinc Interpolation
- Baseline dither: None
- High-quality dither: Triangle
Export as WAV file

Always run a test sample first!!
Methods for Eliciting Language Samples

- Elicit samples in two different discourse contexts (conversation, narrative)

- Use Standardized Procedures to collect the sample.

Collect a conversation and/or narrative sample

<table>
<thead>
<tr>
<th>Preschoolers</th>
<th>School-age children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeplay or interview</td>
<td>Conversation sample using interview format (Evans &amp;</td>
</tr>
<tr>
<td>conversation sample (Evans &amp;</td>
<td>Craig, 1992)</td>
</tr>
<tr>
<td>Craig, 1992)</td>
<td></td>
</tr>
<tr>
<td>Elicit personal narratives</td>
<td>Story retelling sample using a wordless picture book,</td>
</tr>
<tr>
<td>and/or elicit a story</td>
<td>imposing a 1-minute wait time after presentation of</td>
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<tr>
<td>retelling sample (e.g., Rollins,</td>
<td>the story (Hadley, 1998; Hughes, McCabe, &amp; Bliss, 2000)</td>
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<tr>
<td>McCabe, &amp; Bliss, 2000)</td>
<td>(Evans &amp; Craig, 1992)</td>
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<tr>
<td></td>
<td>Southwood &amp; Russell, 2004)</td>
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</tbody>
</table>
Conversational Language Sampling Interview

- Tell me about your family.
- Tell me about your house. Tell me about the rooms in your house.
- Tell me about your neighborhood.
- Do you have any pets? Tell me about your pets. Tell me about how you have take care of them.
- Are you in school? Tell me about the things you do in school.
- Tell me some things you like to do when you are not in school.
- Did you do something special for (some recent holiday)? Tell me about what you will do for (some upcoming holiday).


Eliciting Narratives

- Do you know the story of Goldilocks and the Three Bears (or some story likely to be familiar)? I’m not sure if I remember how it goes; tell me the story.
- Have you seen a movie lately? I haven’t seen that; tell me about it.
- What is your favorite television show? Tell me about the last one you watched.
- One time I... (e.g., fell and cut my chin. I had to go to the hospital and get stitches.) Have you ever hurt yourself? Tell me about what happened to you. (Rollins et al., 2000, Culturally sensitive assessment of narrative in children. Seminars in speech & language, 21, 223-234)
- Wordless picture books – retelling task
  (From SALT; Evans & Craig, 1992; Rollins et al., 2006)
Conversation Partner

- SLP unless the child is from a culturally and linguistically diverse population or is an English-language learner.
  - In that case, recruit a parent, sibling or peer to be the communication partner (American Speech-Language-Hearing Association, 2008; Brice, 2002; Gutiérrez-Clellen, Restrepo, Bedore, Peña, & Anderson, 2000; Lynch & Hanson, 2004; Owens, 2004; Paul, 2001; Restrepo, 1998)

Be a Responsive and Not Controlling Communication Partner

- Use...
  - Minimally-invasive responses (oh, I see, really)
  - Open-ended prompts (tell me more about that) (Rollins et al., 2000)
  - Topic-continuing wh-questions (Yoder, Davies, & Bishop, 1994)
How long does the sample need to be?

- Samples of 35 to 50 utterances offer stability for most measures (Johnston, Thordardottir, Ballen, Miller, & Heilmann, 2005; Miller, 1996; Miller et al., 2006).

Step 1: Jill

- We wanted to compare Jill’s samples to those in the SALT Wisconsin conversation and San Diego narrative reference databases.

- Therefore, we collected the following:
  - 99 utterances of conversation using interview format
  - 43 utterance narrative retelling of *Frog, Where are you?* (Mayer, 1980)
Step 2: Transcribe the Sample

- Transcribe child utterances
- Mark the language features

Two Options:
- Into a text file (Word, Notepad, TextEdit)
- Use Transcriber software

Transcribe the sample?!?!?
Aaaaahhh!
Transcriber Software

- Segment the audio into utterances
- Transcribe each utterance
- Export to TEXT file
- Copy and paste the sample in the text file into SALT

Download Transcriber

Transcriber is a tool for segmenting, labeling and transcribing speech. It provides a user-friendly graphical user interface for segmenting long duration speech recordings, transcribing them, and labeling speech turns, topic changes and acoustic conditions. It is more specifically designed for the annotation of broadcast news recordings, for creating corpora used in the development of automatic broadcast news transcription systems, but its features might be found useful in other areas of speech research.

Transcriber is developed with the scripting language Tcl/Tk and C extensions. It relies on the Standford NLP parser, which allows support for most common audio formats, and on the TTS speech synthesizer. It has been tested on various Unix systems (Linux, Sun Solaris, Silicon Graphics) and Windows XP/2k. Transcriber is distributed as free software under
Always Mark these Features of Language for Analysis

**Bound Morphemes**
- Plurals marked with s (ticket/s, toy/s)
- Possessives marked with z (Brian/z)
- Past tense (wait/ed, work/ed)
- Third person singular (does = do/3s, looks = look/3s)
- Verb inflections (do/ing, bounce/ing)
- Negative contractions (did/n’t, can/n’t)
- Contractible verb forms (l’m, they’re, she’s)

**Omitted Words**
- Partial words (I nee ne need it.)
- Omitted words marked with asterisk before the word (they had *a play room too)
- Omitted bound morphemes (all the frog/*s say goodbye)

**Error Words & Utterances**
- Error words (e.g., when they was[EW:were] in bed)
- Error utterances (and then he’s haul/ing on the log [EU])
- Root word errors (comed|come[EW:came].)
IF the child exhibits:

- 3+ reformulations and/or
- Within-utterances pauses of 2+ seconds

THEN also Mark the Following:

**Mazes**

- Because (nothing) nothing was wrong with my eye/s.
- Then we gotta [EW: got] one of these (um) ice cream ticket/s.
- Then the dog has (his um) a jar (in his) on his head.

**Duration of pauses**

(e.g., (um) :03 it's kinda (um) like (um) :06 (um) :02 I don't know.)

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From Transcriber, Export to Text
(make sure you named a speaker!)
Step 3: Analyze the Sample
Analysis Software

- SALT 2008 – Systematic Analysis of Language Transcripts
  - has databases to compare samples to children the same age/gender – $99 English, $99 Bilingual
  http://www.languageanalysislab.com/
  - Only available for Windows computers
  - Most user friendly software program available that generates clinically useful data

- CLAN – free download – CHILDES (Child Language Data Exchange System)
  http://childes.psy.cmu.edu/
  http://www.cnts.ua.ac.be/childes/

- Computerized Profiling – DOS program free download
  http://www.computerizedprofiling.org/

Language Analysis Lab website

- http://www.languageanalysislab.com/training/
  - Information on elicitation of sample, transcription conventions
  - Tutorials and tip sheets
  - 3 Case examples
## SALT Transcript Screen

![SALT Transcript Screen](image)

### Profile → Standard Analyses

![Profile → Standard Analyses](image)
Profile → Standard Analyses
An abbreviated list of what this analysis will give you...

- Transcript Length
  - Total Utterances
  - Elapsed Time
- Syntax/Morphology
  - MLU in words
  - MLU in morphemes
- Semantics
  - TTR
  - NDW roots
- Omissions & Error Codes
  - Omitted Words
  - Omitted Bound Morphemes
  - Word-level Error Codes
  - Utterance-level Error Codes
- Mazes & Abandoned Utterances
  - Utterances with Mazes
  - Number of Mazes
  - Number of Maze Words
  - % Maze Words/Total Words
  - Abandoned Utterances
- Verbal Facility & Rate
  - Words per Minute
  - Between Utterance Pause Time
  - Within Utterance Pause Time

Choose the database you want to compare the child to...
Choose the comparison sample from the available options...

An example of what the Profile → Standard Analyses looks like
Additional Analyses

When you are comfortable with the Standard Analyses, you can try these

- Analyze → Maze Summary
- Analyze → Error Codes Summary

And in the future you can compare the first transcript to a second one to see if the child has made progress

- Link → Link Transcripts

Step 4: Interpret the Analyses and Develop Goals
Step 4: Jill’s Analyses

- Description of the language difficulty.
- Quantitative data useful for determining diagnosis (e.g., number of standard deviations from the mean).
- Identify specific language intervention goals

<table>
<thead>
<tr>
<th></th>
<th>CON (96 utt)</th>
<th>+/- SD</th>
<th>NAR (31 utt)</th>
<th>+/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of mazes</td>
<td>29</td>
<td>-0.40</td>
<td>6</td>
<td>-1.03</td>
</tr>
<tr>
<td>Word-level errors</td>
<td>17**</td>
<td>4.7</td>
<td>4</td>
<td>.58</td>
</tr>
<tr>
<td>Utterance-level errors</td>
<td>5*</td>
<td>0.99</td>
<td>3**</td>
<td>2.5</td>
</tr>
<tr>
<td>MLU in morphemes</td>
<td>5.68</td>
<td>-0.37</td>
<td>6.23**</td>
<td>-1.66</td>
</tr>
</tbody>
</table>
45 C (um) :03 it’s kinda (um) like (um) :06 (um) :02 I don’t know.
47 C (um) I (:02) (um) we had to sit and stuff.
50 C that lady (um) :06 I do/n’t know what’s[EW:what] her name is.
55 C (um) look at the picture/s first.
57 C (say something) to do something.
69 C then we gotta[EW:got] one of these (um) ice cream ticket/s.
71 C no it was a (poo* poo con* poocon) :03 coupon [EU].
102 C and it was green (green).
103 C and (l) the[EW:my] momma and Ryan and daddy he was off [EU].
111 C (mmm) uhuh.
115 C he work/ed at (um) :02 it has that big old bubble has
blastigen[EU:plastic] stuff?
119 C mhm has (snowma*) a snowman and sander[EW:santa] clause.
151 C I think it’s tight because it’s (um) has lots of thing/s in there and
stuff.
153 C because (nothing) nothing was wrong with my eye/s.
Goals for Sentence Formulation

Jill will increase correct use of regular and irregular past tense, present progressive, and third person singular during conversation production measured by a 50% decrease in word-level error codes. (Thus, in a future conversational sample similar in length, we expect Jill's word-level errors to decrease from 17 to less than 8.)

Jill will improve her ability to repair communication by increasing accuracy of her answers to simple who, what, where, and when questions to 80% during structured activities, to 80% during story retelling tasks, and 70% during conversation.

Jill will construct sentences whose noun phrases contain a specific referent or an appropriate pronoun with 85% accuracy during structured tasks.

Goals for Sentence Formulation

Jill will increase her MLUm during narrative retelling from 6 to 9 morphemes.

Jill will decrease her use of mazes in utterances of 8 or more morphemes in the context of narrative retelling tasks from 75% to 45%.
Lexical Diversity Constraints

<table>
<thead>
<tr>
<th></th>
<th>CON (96 utt)</th>
<th>+/- SD</th>
<th>NAR (31 utt)</th>
<th>+/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDW</td>
<td>178</td>
<td>-0.55</td>
<td>74*</td>
<td>-1.22</td>
</tr>
<tr>
<td>NTW</td>
<td>484</td>
<td>-0.49</td>
<td>171*</td>
<td>-1.77</td>
</tr>
<tr>
<td>Types of Conjunction words</td>
<td>5*</td>
<td>-1.05</td>
<td>2**</td>
<td>-1.99</td>
</tr>
<tr>
<td>Types of Pronoun words</td>
<td>7**</td>
<td>-1.97</td>
<td>4</td>
<td>-0.14</td>
</tr>
</tbody>
</table>

Goals for Lexical Diversity

Jill will increase the number of different words she uses during narrative retelling to within one standard deviation of her peers in samples of comparable length.

Jill will produce diverse pronoun types including *us, them, they,* and *we* during structured activities with 80% accuracy.

Jill will improve sentence formulation and lexical diversity by using the conjunctions *but, so, because* and *after* appropriately in structured tasks with 70% accuracy.
Additional References


Selected References for Using LSA with Culturally & Linguistically Diverse Children


