

Independent vs Relational Phonological Analyses

Independent

- Based solely on transcription form
- Can be used with unintelligible productions
- Suitable measures for very immature children
- Reflect child's phonetic ability at different levels of structure

Relational

- Based on transcription and target forms
- Requires gloss of child's production
- Better measures for more mature children
- Reflects child's phonological accuracy at different levels of structure

Independent Analyses

- "Inventories" of...
 - stress patterns
 - word shapes
 - vowels
 - consonants
- Syllable Structural Level

Uses of Independent Analyses

- Identify gaps in the child's inventories
 - focus attention in therapy on expansion of stress patterns, word shapes, or segments in particular classes to fill those gaps
- Attend to possible sensory, motor, or structural causes of such gaps
 - oral-peripheral examination
 - audiological, medical or dental referral
- Measure phonological change in children whose productions are not easily glossed

Relational Analyses

- "Target analyses" of...
 - stress patterns
 - word shapes
 - vowels
 - consonants
- Percentage Consonants Correct (PCC)
- PMLU and PWP
- Error Breakdown
- Phonological process analysis

Uses of Relational Analyses

- Identify patterns of error affecting stress patterns, word shapes, vowels, and consonants
- Quantify severity of impairment
- Quantify level of intelligibility
- Measure change in severity/intelligibility over time as an indicator of clinical improvement
- Assess the naturalness of child's errors
- Assess the variability of error patterns

Special Analysis: Variability

- Number of repeated words, showing same error
- Number of repeated words, all produced correctly
- Number of repeated words, showing different errors (A)
- Number of repeated words, one or more produced correctly (B)
- Number of repeated words (C)
- Variability index = $A / (C - B)$

Uses of Variability Analysis

- Identify instability in phonological system
 - therapy may then focus initially on trying to achieve greater consistency of production
- Identify phonological change in progress
 - therapy may then neglect those elements of the system that appear to be changing on their own
- Measure change in variability over time as an indicator of clinical improvement

Special Analysis: Homonymy

- lexical type: an adult word used by the child; for example, "dog", "cat", and "blanket" are three lexical types.
- phonetic form: a distinct phonetic shape independent of lexical type; for example, the forms [kæ], [dæ], [dɔ], [dɔg], and [dɔk] are five phonetic forms, no matter how many lexical types they represent.
- phonetic type: a distinct phonetic shape for any particular lexical type; for example, "cat" might be produced by the same speaker as [kæ], [dæ], or [tæ] and would thus have three phonetic types

Special Analysis: Homonymy

- homonymous form: a phonetic form that represents two or more lexical types; for example, [bat] is used for both "bath" and "blanket".
- homonymous type: a lexical type that has a homonymous form as one of its phonetic types; for example, "bath" and "blanket" both have [bat] as one of their phonetic types and thus they are both homonymous types.

Special Analysis: Homonymy

- Proportion of homonymous types = number of homonymous types / number of lexical types
- Ratio of homonymous types = (number of lexical types - number of homonymous types) / number of homonymous types
 - The ratio is then simplified so that the denominator is 1. For example, a ratio of 55 nonhomonymous types/11 homonymous types would give a ratio of 5:1.
 - This would mean that the child uses 5 non-homonymous types for every homonymous type used.

Uses of Homonymy Analysis

- Identify occurrence of homonymy
 - it can then be considered as an issue in target selection
 - transcription of homonymous forms should be verified to determine if child is marking phonemic contrasts in minimally perceptible ways
 - provides targets to be used in "minimal contrast" treatment activities
- Measure change in homonymy over time as an indicator of clinical improvement

Severity Ratings and Production Accuracy

- Shriberg & Kwiatkowski (1982) showed that Percentage of Consonants Correct (PCC) correlates significantly with clinical ratings of severity.
- Created a severity scale based on PCC that creates a set of consistent categories.

PCC and Severity

<u>Range</u>	<u>Severity</u>
85% +	Mild
65-85%	Mild-moderate
50-65%	Moderate-severe
< 50%	Severe

Two New Measures

- Ingram & Ingram (2001) noted that PCC ignores the complexity of the words being produced.
- Proposed two new measures:
 - PMLU – phonological mean length of utterance
 - PWP – proportion of whole-word proximity (how correct the words tend to be)

PMLU

- Based on words rather than utterances.
- Assumes that length of the words is a proxy for complexity.
- Compute an average of at least 25 DIFFERENT words.
- 1 point for each segment produced (consonants and vowels).
- 1 point for each correct consonant.

PWP

- Compute PMLU for each word and divide by the PMLU of the target (i.e., the score for a fully correct version of the word).
- Compute an average for at least 25 different words.

Example

- Child says /tɔr/ for /skɔr/ "score"
- PMLU = 4 points: 3 segments produced; 1 correct consonant.
- PMLU of target = 7 points: 4 total segments; 3 total consonants.
- PWP = $4/7 = 0.57$

PMLU and PWP

- Not clear if either of these represents a better index of clinical severity than PCC.

Study of PMLU / PWP and Severity Ratings

- Five experienced clinicians with at least 10 years experience rated 17 speech samples.
 - 7 point severity scale.
- PMLU and PWP calculated on same samples (52-97 different words per sample).
- Also calculated PCC and PPC (percentage of phonemes correct).

PCC and Severity Ratings

- Using median PCC scores, 13/17 (76%) children were correctly categorized into the PCC severity categories by the current listeners.
 - 2 were rated 1 category lower than expected.
 - 2 were rated 1 category higher than expected.
- Suggested that the current ratings were consistent with the original (1982) study and that PCC is a reliable index of severity.

PMLU / PWP and Severity Ratings

- Significant correlations obtained with median severity ratings:
 - PMLU -.781
 - PWP -.756
 - PPC -.743
 - PCC -.706 *
- * Shriberg & Kwiatkowski (1982) value = -.62.

PMLU / PWP and Severity Ratings

- Correlation coefficients suggest that PMLU and PWP may have a slightly stronger relationship with severity ratings.
- PPC and PCC involve a much simpler calculation but computerized analysis would eliminate this advantage.

PWP and Intelligibility

- Ingram & Ingram (2001) suggest that PWP is a good proxy for intelligibility.
- Using the ASHA project data set Intelligibility Index (II; % of words understood in conversation) was then calculated.
- Correlations obtained:
 - II and PWP = .767
 - II and PCC = .618
 - II and PPC = .772

Summary

- PMLU and PWP are word level measures that may have some clinical value
- PCC and PPC are segment level measures with a longer history in the field
- In general, we should expect these measures to be highly correlated
- Any striking differences among the 4 measures may indicate a specific problem area for a given child