

Adapted Phonological Assessment for Young Children with Severe Impairments

Cynthia J. Cress, Gwen Sterup, Toni Hould
University of Nebraska-Lincoln

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Abstract: This study adapted the Bankson-Bernthal Test of Phonology (BBTOP) for object-based assessment with children under three, since standardized measures are needed to compare vocal progress of children still developing functional speech skills. Typically developing toddlers as young as 18 months successfully completed this adapted assessment. Results are also presented for phonological processes demonstrated by 15 children 3-5 years old with severe expressive impairments. Different patterns emerged for children with physical impairment, developmental apraxia, and developmental disabilities.

Background • Children with severe expressive impairments may show different speech sound acquisition patterns than typically developing children, even for early developing sounds.

- Prelinguistic vocalizations of children with developmental delay are positively correlated with later expressive vocabulary (McCathren, Yoder, & Warren, 1999).
- Children who do not develop canonical babbling within typical expectations and times are at risk for further communication impairment (Oller, 2000).
- Late talkers who had not yet entered the meaningful stage of speech scored significantly lower than age matched peers on all measures of phonetic complexity, lexical development, and grammatical complexity (Thal, Oroz, & McCaw, 1995).
- Children with Down syndrome may exhibit similar phonological patterns to typically developing children, such as babbling, place of articulation, and vowel development (Smith & Stoel-Gammon, 1996).
- Other children show different babbling and early speech patterns, such as children with developmental apraxia (Kertoy et al., 1999) or cerebral palsy (Levin, 1999), and are at risk for developing functional speech skills in later childhood.

Approach • The Bankson-Bernthal Test of Phonology (BBTOP) is a valuable and reliable measure of speech development for children over the age of three.

- Currently there are not standardized phonological measures for children under three because of difficulty in eliciting speech targets with picture labeling activities.

- The goal of the BBTOP adaptation was to maximize the target word production by young children and reduce the linguistic complexity of having to identify and label a picture.
- Children with severe expressive impairments are particularly difficult to sample with picture labeling tasks because of reluctance to initiate communication in decontextualized or test activities (Cress, Andrews, & Reynolds, 1998).

Research Questions: a) Can the BBTOP be modified by using objects to elicit target words in naturally occurring interaction for typically developing children under three years?
b) Can the adapted BBTOP elicit target words in children with severe expressive impairments who are developing functional speech skills?
c) How do consonants and phonological processes differ between children with physical impairments, developmental apraxia, and developmental disabilities on the adapted BBTOP?

Methods: Object-Based BBTOP Adaptation for Experiments 1 & 2:

- Structured activities were used to elicit target sound productions for words from the original BBTOP during interactive play.
- The examiner encouraged the children to explore a large bag of toy objects that represented BBTOP stimulus words, and name and use those in contexts such as a swimming pool set or toy play chute.
- Some words indicated qualities (e.g. “yellow” crayon) or parts (e.g. “thumb” of doll, “patch” on pants) of objects. Words that were elicited by object-related behavior included this/that, dive, and rain (e.g. do you want “that” one or “this” one).
- The objects were incorporated into interactive play, prompting children to spontaneously produce the target word as they used it. For example, after children discovered an object in a hidden location, the experimenter might ask, “what did you find”?
- If adults modeled the object name (e.g. should we put the “judge” or “kangaroo” in the boat), there was intervening play with the object before eliciting a child production of the stimulus.
- Objects were separated into three groups based on sound complexity: a) CV or CVC words, b) CCVC or CVCC words, and c) multisyllable words. Words were elicited from the simplest group first, to provide maximum range of phoneme types in case of child fatigue or task refusal before finishing.

Experiment 1: Typically Developing Children

24 typically developing children, 11 females, 13 males. Mean age 26 mos. (12.9-36.5 mos.)

Results of Experiment 1:

- All children above 18 months were successfully administered the adapted BBTOP, for some of the target words. Children attempted these percentages of target words at age ranges: a) 19-21 mos. – 18.3%, b) 22-25 mos. – 58%, c) 26-28 mos. – 67%, d) 29-32 mos. – 64%, e) 33-36 mos. – 76%.
- Older children attempted more complex words and demonstrated more types of phonological errors, consistent with typical expectations. For instance, older children showed more cluster simplification and final consonant deletion as they were attempted words containing these elements. Younger children tended to produce processes such as stopping, but no children produced multiple processes outside of typical expectations.
- As expected, consonant-specific errors were fewer for bilabials than developmentally complex consonants. Also, errors were fewer for stop and nasal consonants than fricatives or affricates, as developmentally expected.
- Tables 1-3 below show the range of phonological processes, initial and final consonant errors produced by typically developing children in different age ranges. While these tables represent relatively few children, they provide

pilot data to support the development of norms for an adapted object-based BBTOP.

Experiment 2: Children with Severe Expressive Impairments

Subjects: 15 children with severe expressive impairments: 6 females, 9 males. Mean age 48 mos. (range 38-57 mos.), developmental ages averaged 31 mos. (range 23-48 mos.).

- Children had one of three primary disabilities affecting expressive communication: physical impairments (n =6, e.g. cerebral palsy, spina bifida with Arnold Chiari malformation), developmental apraxia of speech (n=3), or acquired/developmental disabilities (n=6, e.g. traumatic brain injury, congenital heart disease, achondroplasia, hydrocephalus).
- These data were collected as part of a longitudinal study of 42 children with severe expressive impairments (Cress, 1995), conducted in the child's home. The children who completed the adapted BBTOP were reported or observed to attempt to label familiar objects/events in daily activities.
- Children were selected for the original longitudinal study at 12-24 months of age because of specific risk factors for being nonspeaking, and expressive communication skills at least 1 standard deviation below expectations. By 48 months, 5 of the children in the present study (2 with PI, 2 with DD, 1 with DAS) demonstrated expressive language skills within expectations on the Battelle Developmental Inventory (Newborg, et al., 1994). Children continued to demonstrate risk factors for speech development because of swallowing and motor issues, as described on Table 4 below.

Results of Experiment 2:

- All children successfully completed the adapted BBTOP measure, producing at least 80% of the target words. Some of the children with physical impairments fatigued before completion or refused tasks involving multisyllable words.
- All children but 2 scored below the 10th percentile on phonological processes, which is consistent with a diagnosis of severe expressive disabilities. Ten children were at least 2 standard deviations below the mean. The 2 children with physical impairments who scored within expectations for phonological processes scored well below expectations on consonant inventory, and both refused to attempt multisyllable words. All children scored at the 5th percentile or lower for consonant inventory.
- Children showed different profiles by disability category. Tables 5 and 6 show patterns of consonant production and phonological processes for children with physical impairment, developmental disability, and apraxia of speech.

- Children with physical impairments showed much higher final consonant deletion and poorer accuracy at relatively early sounds than the other groups, particularly sounds requiring tongue movement (e.g. t, d). These children made frequent use of bilabials, and glottal stops in final consonant substitutions.
- Children with developmental disabilities showed more gliding, stopping, and vowel errors than the other groups. These children showed relatively more errors at late developing consonants such as /z/, /l/, and "th" phonemes than children with physical impairments, and often refused these sounds in probes.
- Children with developmental apraxia of speech used cluster simplification, weak syllable deletion, gliding and stopping more than the other groups. These children showed similar limitations in "th" and "sh" phonemes and /l/ as children with DD, but showed relatively better production of /r/, /t/, and /d/ than the other two groups.

Discussion

Question #1: Is the adapted BBTOP useful for eliciting target words for children under 3 years?

- Yes, the adapted BBTOP successfully elicited target words from children 18 months and older, using objects in interactive play.
- Limitations in the range of words elicited from children 18-36 months may be influenced by children's vocabulary, oral motor, and deferred imitation skills.

Question #2: Can the adapted BBTOP elicit targets in children with severe expressive impairments?

- Yes, the adapted BBTOP elicited over 80% of the target words from children with severe expressive impairments at 48 months.
- The interactive play facilitated target word production in children who consistently refused any 'test' tasks, even receptive language tasks, using this measure.

Question #3: How do consonants and phonological processes differ on the adapted BBTOP between children with physical impairments, developmental apraxia, and developmental disabilities?

- Children with physical impairments showed patterns of cluster reduction, final consonant deletion, and bilabial production that have been reported in other literature with similar populations (Kertoy, et al., 1999, Levin, 2000). Final consonant deletion in particular may be influenced by motor fatigue, and distinguished children with PI in this sample from other groups.

- Children with acquired/developmental disabilities showed delayed but relatively predictable phonological skills relative to typical expectations, as has been reported elsewhere (Marchman, Miller, & Bates, 1991). In addition, children with DD in this sample showed more non-developmental processes such as vowel errors and initial consonant deletion than typically expected.
- Children with developmental apraxia of speech showed the types of reduced consonant inventories and atypical errors reported by Davis, Jakielski, and Marquardt (1998). Children with DAS showed particular problems with palatal consonants and processes compared to other groups.

Clinical Implications

- The adapted object-based BBTOP has the potential to be developed as an alternative standardized phonological assessment for young and “hard-to-test” children.
- Normative comparisons for children under 3 years on this measure would require more expansive assessment with a larger population.
- Interactive play may be an acceptable modification of the existing BBTOP picture prompts for children who do not label pictures as a test task.
- Standardized phonological assessment may be a productive means to assess and track progress in spoken language development even in children at risk for being “nonspeaking”.

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References: Available from website posting of conference presentation, www.unl.edu/barkley/faculty/cress.html, under presentations.