

ASSESSING PARENT-EXAMINER AGREEMENT ON JUDGMENTS OF
INFANT VOCAL BEHAVIORS

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ASSESSING PARENT-EXAMINER AGREEMENT ON JUDGMENTS OF INFANT VOCAL BEHAVIORS

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University of Nebraska, 2017

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This study is part of a multi-phase investigation aimed at contributing evidence regarding the validity of a newly developed parent report measure designed to assess the prelexical vocal and early lexical development of infants and toddlers who are deaf and hard of hearing, ages 6 to 21 months. The measure, the Vocal Development Landmarks Interview (VDLI), is a 22-item interactive parent-report interview that uses audio samples of authentic infant vocalizations presented in a paired-comparison format to help make vocal landmarks clear and understandable to parents. The primary purpose of the study was to examine the extent to which parents and an examiner agree in their judgments of infant vocal behaviors surveyed on the VDLI. Vocal recordings of 40 children with normal hearing whose parents were interviewed using the VDLI were analyzed, coded, and scored by a trained examiner and compared to parents' VDLI responses. Parent-examiner agreement was assessed using two different scoring approaches: 1) adjacency and 2) presence-absence. Factors contributing to variance in parent-examiner agreement and developmental patterns in the proportions of vocal behaviors observed in the young children were also explored. Results based on adjacency scoring indicated acceptable overall agreement, but highlighted a potential confound with the frequency-based items

on the scale. Results based on presence-absence scoring revealed high overall agreement, indicating that parents and the examiner were often in agreement regarding vocal behaviors produced by children in this sample. Proportions of vocal behaviors observed in this sample aligned well with the expected developmental trajectory. These findings show promise for the use of the VDLI as a tool to evaluate developmental changes in infants' vocalizations, while highlighting the need for potential modification of the scale going forward as it is applied with different populations of children who are deaf and hard of hearing.

DEDICATION

This dissertation is dedicated to my wonderful husband, Matthew, and my two beautiful children, Franklin and Cora. Thank you for your enduring love, patience, and support through this endeavor. It is because of you that I was able to do this.

This dissertation is also dedicated to the loving memory of my mother, Joanne Easley, who despite not being here in person, was always watching over me. This one is for you, mom.

PREVIEW

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PREVIEW

CHAPTER 1: INTRODUCTION

Approximately two out of every 1,000 children in the United States are born with hearing loss, making it one of the most prevalent birth conditions screened for in America (Center for Disease Control and Prevention [CDC], 2015). If not provided with appropriate and timely intervention, children who are deaf or hard of hearing (D/HH) are at particular risk for speech, language, and literacy delays due to the restrictions hearing loss can have on auditory access and feedback (Moeller, 2001; White, 2006; Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998). Fortunately, with advances in newborn hearing screening and early hearing detection and intervention programs, more and more D/HH infants are being identified shortly after birth and enrolled in early intervention (CDC, 2015). Furthermore, due to continued improvements in hearing technologies, many receive the benefits of well-fit hearing aids and/or cochlear implants within first year of life. Such advancements, although certainly valued, have created a pressing need for measures to evaluate the success of these interventions and the impact they have on infants' early development (Eisenberg, et al., 2007).

In an effort to gain greater insight into the auditory functioning of infants who are D/HH, researchers and clinicians have begun to focus their attention on the study of their early vocal behaviors, which can serve as an indirect measure of infants' auditory abilities (Kishon-Rabin, Taitlebaum-Swead, Ezrati-Vinacour, & Hildesheimer, 2005; Kishon-Rabin, Taitlebaum-Swead, & Segal, 2009). By assessing and monitoring the early vocal development of infants who are D/HH, we can gain valuable information about the effectiveness of interventions and amplification strategies that aim to improve their auditory functioning (Moeller, Bass-Ringdahl, Ambrose, VanDam, and Tomblin, 2011).

However, traditional assessments of early vocal behavior have often relied on labor intensive evaluation and transcription, which tend to be time consuming and expensive. Furthermore, such practices tend to lack ecological validity due to taking place in laboratory settings. More recently, some investigators and practitioners have turned to parent report as a viable method for assessing the early vocal development of infants and toddlers.

Currently, only a handful of clinical measures exist that are specifically designed for assessing early vocal development in infants and toddlers. Two such measures, the *Production Infant Scale Evaluation Questionnaire* (PRISE; Kishon-Rabin et al., 2005; 2009) and the *Infant Monitor of Vocal Production* (IMP; Cantle-Moore, 2004), while useful in providing parent-reported information about the early vocal development of infants, rely solely on the verbal description and adult modeling of targeted vocal behaviors. Although the authors of the PRISE and IMP make a concerted effort to provide clear and accurate descriptions of vocal landmarks, such verbal description may fall short of providing parents with the information they need to accurately distinguish and report on the types of vocalizations their child is producing.

In an effort to address the potential limitations of these existing tools, the *Vocal Development Landmarks Interview* (VDLI) was developed (Ambrose, Thomas, & Moeller, 2016; Moeller et al., 2011; See Appendix A). The VDLI is an interactive parent report interview that uses audio samples of authentic infant vocalizations to make vocal landmarks clear and understandable to parents without the need of technical terms, verbal descriptions, or adult modeling of infant vocalizations. The VDLI was originally developed for use in the Outcomes of Children with Hearing Loss (OCHL) project where

it was piloted with parents of 80 children who were hard of hearing and 21 children with normal hearing (Ambrose et al., 2016). Results from this pilot study revealed that the VDLI was sensitive to age and hearing status and was related to performance on concurrent measures of early communication abilities. In a follow-up validation study (Thomas, Ambrose, Oleson, & Moeller, 2016), the VDLI was tested with a large group ($N = 160$) of typically developing children with normal hearing in order to establish preliminary validity and a normative data set. Results from that study indicated that the VDLI accurately captured the developmental trajectory of children's achievement of vocal landmarks over time and was related to performance on a concurrent measure of early communication development.

Study Purpose

The main purpose of the current investigation was to examine the validity of the VDLI by assessing whether parents and an examiner agree in their judgments of infant vocal behaviors assessed using the VDLI.

Research Questions

The current project addressed four primary research questions, three of which were experimental with stated hypotheses that were tested, and one of which was exploratory:

1. How well do parents and an examiner agree in their judgments of infant vocal behaviors that are surveyed on the VDLI?
 - a. What is the percentage of agreement overall?
 - b. What is the percentage of agreement per VDLI subscale?
 - c. What is the percentage of agreement per vocal behavior?

Based on previous literature, we know that parents can reliably report on their infants' vocalizations beginning at the canonical stage of vocal development.

However, we don't know if parents can recognize subtle vocal development shifts, like those represented at the precanonical level. Therefore, it was predicted that agreement would be higher for the canonical and word subscales compared to that of the precanonical subscale.

2. What factors contribute to variance in overall agreement between parents and examiners?

It was predicted that child age, VDLI subscale given, and socio-economic status (SES) would contribute to variance in parent-examiner agreement. Specifically, parents' reporting on the youngest infants, those responding to the precanonical-canonical subscales, and those with lower SES status are expected to demonstrate the lowest levels of agreement.

3. How do the proportions of observed vocalizations at the precanonical, canonical, and word level change as a function of age?

Based on previous literature, we know that vocal development follows a continuum of predictable phases, beginning with precanonical forms, followed by the introduction of canonical forms, and then finally words. It was predicted that a developmental pattern would emerge in the data that is consistent with the literature.

4. How does parent-examiner agreement change if scoring is based on the presence or absence of a vocal behavior?

CHAPTER 2: LITERATURE REVIEW

Infants' prelexical vocalizations serve an important role in facilitating the development of early speech and language skills. Long before uttering their first words, infants proceed through a series of systematic and progressive vocal stages that lay the foundation for the production of meaningful speech (Oller, Eilers, Neal, & Schwartz, 1999; Vihman, Macken, Miller, Simmons, & Miller, 1985). However, for children who are deaf or hard of hearing (D/HH), this predictable pattern of vocal development may be delayed or disrupted due to limited auditory experience and feedback (Koopmans-van Beinum, Clement, & van den Dikkenberg-Pot, 2001). Although significant advancements have been made in the areas of screening, identification, and the early provision of hearing technology and intervention, children who are D/HH continue to exhibit deficits and delays in the achievement of important vocal milestones (Moeller, Hoover, Putman, et al., 2007a; von Hapsburg & Davis, 2006). Given that auditory experience is known to contribute to the development of infants' vocalizations (Koopmans-van Beinum et al., 2001; Oller & Eilers, 1988; Stoel-Gammon, 1988), it is important for clinicians and practitioners to monitor the prelexical vocal and early lexical development of young children who are D/HH (Kishon-Rabin et al., 2005; Moeller et al., 2011). Such information has the potential to guide early intervention teams in evaluating functional effectiveness of amplification and intervention strategies. However, few clinical tools currently exist that can accurately assess changes in the early vocal and verbal development of these children.

The objective of this chapter is to review what is currently known about the development and assessment of vocal milestones in infants and toddlers who are D/HH

and discuss the potential for new tools to monitor changes in the vocal development of this population of children. This chapter begins with an overview of some prominent theoretical perspectives surrounding the nature of infant vocal development and how these perspectives have shaped our current understanding of this phenomenon. Next, this chapter will provide a review what is currently known about the typical prelexical vocal development stages of infants and toddlers who are normal hearing and contrast this to what is currently known about these stages for children who are D/HH, focusing on the important role audition plays in the achievement of early vocal landmarks. This chapter will conclude with a review of current assessment practices of early interventionists who provide services to children who are D/HH, highlighting the measures currently available to assess the early vocal development of infants who are D/HH and the valuable role parent report can play in assessing the developmental status of young children.

Prelexical Vocalizations and Phonological Development

Many terms are used to describe the types of pre-speech vocalizations infants produce during the first year of life, including: prelinguistic, precanonical, canonical, prelexical, preverbal, protophones, and babbling. For the purpose of this paper, the term prelexical is used to refer to the types of vocalizations infants produce prior to the emergence of true words and the term lexical is used to refer to vocalizations containing true word forms. Prelexical vocalizations include both precanonical and canonical vocalizations. As the name implies, precanonical vocalizations are those that are produced prior to the emergence of canonical syllables and are characterized by the lack of well-formed vowels and/or consonants. Canonical vocalizations are well-formed, well-timed, speech-like syllables containing both consonants and vowels (Oller, 2000).

Another term that is used in this chapter is phonological development.

Phonological development refers to the advancements in the speech-sound system and consists of three components: 1) the perception of speech sounds, 2) the production of speech sounds, and 3) the rules linking perception and production of speech sounds (Ingram, 1989). Phonological development begins with the emergence of infants' prelexical vocalizations (Stoel-Gammon, 2011).

Theoretical Perspectives of Vocal Development

The nature of infants' prelexical vocalizations and the role they play in the development of meaningful speech has been the subject of debate for decades (Jakobson, 1968). Over the past 70 years, a number of theoretical perspectives and models emerging from varied scientific disciplines (e.g., linguistics, psychology, phonology) have been proposed to explain the development of speech sounds in infants. Many of the early models were narrow in focus and as a result, often failed to address the overlap between various developmental domains (Vihman, 1996). However, with methodological advancements (e.g., audio and video recording), the understanding of infant vocal development began to broaden, taking into consideration other components of development (e.g., perceptual, motor, cognitive, linguistic) and the influence these have on the emergence of early vocalizations.

Structuralist perspective. One of the earliest, most well-known and highly controversial theories of prelexical vocal development originated from Roman Jakobson's (1968) structuralist view of phonological development. Jakobson argued that children develop phonology in an orderly and predictable sequence, regardless of language spoken. He argued that the phonological system developed according to a rigid

sequence of phonemic “oppositions,” in which contrasting “classes” of phonemes emerged in succession, establishing the basis of the adult phonological system. This notion of a universal pattern of phoneme acquisition has been generally confirmed through empirical research (see review in Locke, 1983). However, it was Jakobson’s views on infant babbling that gained him widespread criticism. Unlike early word forms, which were seen as having a clear, continuous connection to later speech, Jakobson argued that there was no relationship between babbling and speech. Jakobson viewed the sounds of babbling as “wild” and “random” and argued that these sounds disappear from an infant’s repertoire upon the production of meaningful speech, putting forth the notion of “discontinuity” between babbling and speech.

Jakobson’s perspective on babbling was difficult to dispute due to the limited methods that were used to describe and categorize infants’ prelexical vocalizations at that time (Nathani & Oller, 2001; Oller, 2000). During the 1940s and 1950s, many examiners were using the International Phonetic Alphabet (IPA) to transcribe and categorize speech sounds, including the vocalizations of infants. However, contrary to the thinking at the time, the IPA was not designed to identify and categorize precanonical vocalizations produced during infancy (e.g., squeals, gurgles, and coos). Rather, the IPA was designed to characterize the mature, well-formed (canonical) speech sounds and syllables of adult speech. As a result, many examiners, having difficulty characterizing precanonical vocalizations, ended up collapsing these non-speech vocalizations with speech-like vocalizations. This practice resulted in “shoehorning” infant vocalizations into operational speech categories, leading to a gross misrepresentation of infants’ vocal

abilities and a failure to find a clear link between infants' early vocalizations and later speech (Nathani & Oller, 2001; Oller, 2000).

Infraphonological perspective. Beginning in the 1970s, prompted by methodological advancements (e.g., audio and video equipment) and a surge of experimental research that focused on infant vocal development, several researchers chose to abandon the methodology of strict phonetic transcription to categorize infant sounds, and instead began using global categories (e.g., quasivowels, gooing, raspberries, squeals) to describe the characteristics and infrastructure of infant vocalizations (Oller, 2000). This approach, referred to as “infraphonology” or the “infraphonological approach”, allowed examiners to categorize infant vocalizations according to their own natural structure and establish a relationship to mature speech sounds based on the principles of syllable “well-formedness” (Oller, 2000; Oller & Lynch, 1992). The term “protophones” was used to distinguish only those vocalizations that were deemed as precursors to speech sounds (e.g., quasi-vowels, vowels, marginal syllable, canonical syllables). Non-speech related sounds, such as vegetative (e.g., burps, coughs, hiccups) and reflexive (e.g., crying, squealing, laughing) sounds, were not considered to be precursors to speech according to this model. Unlike Jakobson’s approach, which didn’t differentiate between these vocalizations due to an overestimation of the latter’s sophistication, the infraphonological approach provided a new way to represent and track the progression of vocal and early word development.

Biological perspectives. In an effort to gain a more comprehensive understanding of the origins and development of phonology, examiners in the 1980s and 1990s began to focus their attention on the link between speech perception and production, and the

various mechanisms underlying infants' transition to meaningful speech (Vihman, 1996). Up until this point, most theoretical models focused on only one aspect of phonological development, either production or perception, but examiners such as Locke (1983), Koopmans-van Beinum and van der Stelt (1986), and MacNeilage and Davis (1990), among others, proposed that it was necessary to explore the relationship between perception and production, as well as the influence/interaction of other components (e.g., motor, cognitive, social), in order to truly understand the development of early speech and language.

Neurobiological perceptive. One of the first examiners to embrace a biological approach to phonological development was John Locke (1983). Locke proposed that the acquisition of phonology is influenced by a number of interrelated components (e.g., physiological, perceptual, social, and cognitive). Contrary to Jakobson's notion of discontinuity between babbling and speech, Locke believed there was a "link" between babbling and speech, and provided evidence of this in the form of sound inventories and frequencies collected from infants learning various languages. Locke's research indicated that infants, regardless of native language exposure, develop a small "core repertoire" of sounds during babbling from which early word forms of their ambient language are shaped. As they develop, infants make attempts to approximate the sounds of their ambient language using this repertoire of sounds, first through babbling and then through word approximations. Locke (1993) later elaborated on his neurobiological perspective by proposing that infants are inherently biased toward the speech sounds of their ambient language and that this bias not only directs their attention towards speech input, but motivates them try and replicate it, thus promoting acquisition of the language.

Locke's argument for the continuity of babbling is supported by many researchers, including Stoel-Gammon (2011), who also examined the sound (i.e., consonant-vowel) inventories of infants and found strong correlations between the types and amount of vocalizations produced in infancy, and the speech and language skills used in childhood. Stoel-Gammon postulated that the canonical syllables produced in babble underlie the phonological patterns found in early word productions and pointed out how the syllables in early word forms (e.g., mommy, daddy, and bye-bye) closely resemble those of babble. She also found evidence that infants who produce a greater amount and variety of canonical utterances developed larger inventories of syllables that could be used later in word production.

Sensorimotor perspective. Complementary to Locke's neurobiological perspective of phonological development is Koopmans-van Beinum and van der Stelt's (1986) sensorimotor approach which posits that the movements of the speech production mechanism (i.e., the larynx, tongue and vocal tract) are central to the development of infant vocalizations. Unlike researchers who describe the development of infant vocalizations according to phonetic-linguistic characteristics (e.g., Oller, 1980; Stark, 1980), Koopmans-van Beinum and van der Stelt describe the stages of infant vocal development according to the phonatory and articulatory movements of the speech production instrument. They argue that such an approach provides examiners the opportunity to identify where in the developmental process anatomical and physiological features of infants' vocalizations become overruled by more language-specific features. Furthermore, they have used their sensorimotor approach to identify the important role auditory experience plays in the development of early vocal milestones. Through their