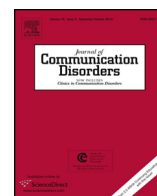




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Fricatives at 18 months as a measure for predicting vocabulary and grammar at 24 and 30 months



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ABSTRACT

Purpose: Language develops at variable rates in young children, yet markers for different developmental trajectories, have not been identified. Production of fricatives in words may be one marker because they are later developing sounds and contribute to syntactic production. We examined whether children who produced fricatives in words by 18 months had better vocabulary and grammar scores at 18, 24, and 30 months than children who did not.

Method: The expressive language skills of 37 toddlers who did and did not produce fricatives in words by 18 months of age were compared at 18, 24 and 30 months of age. **Results:** Expressive vocabulary scores and the use of grammatical markers were significantly better for children who produced fricatives by 18 months than for those who did not. This effect was consistent across scores at 18, 24, and 30 months. The total number of consonants and total number of fricatives produced at 18 months did not significantly predict expressive vocabulary scores.

Conclusions: Because the children who produced fricatives by 18 months demonstrated better expressive language skills than their peers who did not produce fricatives by 18 months, the early production of fricatives by toddlers may be a marker of a faster expressive language developmental trajectory.

Learning outcomes: Readers will: (1) describe the relationship between early phonological development and early expressive lexical development, (2) describe the role of perceptual and motor development in speech sound the acquisition, and (3) describe the potential relationship between the production of fricatives and expressive language development.

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Early and accurate identification of language impairment is critical for children's social, emotional and academic development. There is abundant research regarding the negative effects of language impairment on literacy and school success and the need for early intervention to assure that children are prepared for school (Aram & Nation, 1980; Brinton & Fujiki, 2004; Catts, 1993; Catts, Fey, Zhang & Tomblin, 1999; Hall & Tomblin, 1978). Early markers that identify children who

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may be at risk for a delayed or disordered trajectory of expressive language and markers that differentiate late talkers from those who will require services for language delay are thus highly important.

The rate and pattern of speech and language development is highly variable among young children (Berntal, Bankson, & Flipsen, 2013; Sander, 1972; Smit, 1986). To be most useful, it is important that early markers be easily identifiable by the various professionals who assess the development of young children. Predictors of language development that have been identified as relevant at or before 18 months include: joint attention (Brooks & Meltzoff, 2005; Watt, Wetherby, & Shumway, 2006), play (Rescorla & Goossens, 1992; Watt et al., 2006; Weismer, Murray-Brance, & Miller, 1994), comprehension (Buschmann et al., 2009; Thal, Tobias, & Morrison, 1991; Watt et al., 2006), vocabulary (Rescorla & Schwartz, 1990; Rice & Bode, 1993; Weismer et al., 1994), word combinations (Rescorla & Schwartz, 1990), gesture development (Thal & Tobias, 1992, 1994; Watt et al., 2006), and speech development (Kuhl et al., 2008; McCune & Vihman, 2001; Mirak & Rescorla, 1998; Oller, Eilers, Neal, & Schwartz, 1999). Indicators of speech and language developmental trajectories related specifically to speech include early speech perception skills (Kuhl et al., 2008), age of onset of canonical babbling (Oller et al., 1999), number of phonemes available in the repertoire (McCune & Vihman, 2001), diversity of the consonant inventories and syllable shapes in early vocalizations (McCune & Vihman, 2001; Rescorla & Ratner, 1996), and the relationship among these variables (Whitehurst, Smith, Fischel, Arnold, & Lonigan, 1991). Collectively, these indicators have been identified as markers to assist with the identification of children who are at risk for expressive language delay, but many of them require extensive periods of observation or advanced training in speech and language analysis. The identification of indicators of language development which are readily identifiable without extensive training and/or testing could assist speech-language pathologists and other professionals in determining the potential course of language development.

Fricatives may give us a novel framework for looking at the expressive language trajectory of an individual child. Developmental data suggests that this class of sounds is mastered later in development (Goldman, Fristoe, & Williams, 2000; Ingram, Christensen, Veach, & Webster, 1980; Shriberg, 1993) and this is believed to be because these sounds are phonologically more marked, require greater perceptual skills, and greater motor coordination (Ferguson, 1978; Ingram, 1976; Kent, 1992). Current research shows that the phonological, perceptual, and motor systems interact closely to form a foundation for early speech and language development (Kent, 2000; Kuhl, Conboy, Padden, Nelson, & Pruitt, 2005; Rescorla & Ratner, 1996). The ability to produce a fricative in a meaningful way at an early age may represent a minimum competence across the perceptual, motor, and linguistic systems that can positively influence the child's further acquisition of the linguistic system, including the lexicon and morphosyntax (Davis & MacNeilage, 1995; Gildersleeve-Neumann, Davis, & MacNeilage, 2000; Kent, 2000; Moeller et al., 2007; Nittrouer, 2002).

Perceptual and motor maturation appear to have a role in children's relatively late acquisition of fricatives (Faber & Best, 1994). Children's ability to perceive fricatives matures or modifies with age (Nittrouer, 2002; Wagner, Ernestus, & Cutler, 2006). The reported later development of fricatives in speech production may reflect differences in the perceptual characteristics of fricatives compared to other phonemes (Faber & Best, 1994; Kuhl, 1994, 2000, 2004; Kuhl et al., 2008; Werker & Tees, 1984). Fricative sounds are more difficult to parse from the speech stream as they are produced at a higher frequency with less intensity than other classes of sounds (Ferguson, 1978). Fricative production requires more precise motor control than the early developing sound classes, stops, nasals and glides (Kent & Murray, 1982). Accurate fricative production requires not only the precise placement of the tongue, but also an additional synchrony of all independent articulators to produce the force and control and the degree of movement needed to generate the noisy turbulence that characterizes fricatives (Kent, 1992). Children with more advanced motor control for word production may produce words earlier than peers without the same level of control (Hoff & Parra, 2011).

From a linguistic viewpoint, markedness is considered a factor in the sequence of sound acquisition (Jakobson, 1968). Fricatives are considered more complex or more marked than stops, nasals, and glides. A natural constraint against production of fricatives, which are marked sounds, is related to their less frequent representation in languages although fricatives are frequent in English (Ingram, 1976; Shriberg & Kwiatkowski, 1980). They also appear later in the child's phonetic repertoire (Barlow & Gierut, 1999; Ingram et al., 1980). Given that fricatives are more complex than other early developing sounds (stops, nasals, glides), their acquisition indicates greater phonological knowledge. The child's acquisition of these more complex sounds can suggest that the child's system is primed to acquire the more complex sound combinations required for production of words and sentences. Accurate production of fricatives may also support the production of some grammatical morphemes (plurals, possessives and verb forms) because they are realized by the /s/ and /z/ phonemes. Given that standardized expressive language measures (Wiig, Secord, & Semel, 2004) require a child to produce these responses, interpretation can be more accurate when a child's post-vocalic phonetic inventory includes /s/ and /z/ (Brown, 1973; Petinou, Schwartz, Gravel, & Raphael, 2001).

The relationship between early phonological development and early expressive lexical development has been described by several researchers (Schwartz & Leonard, 1982; Stoel-Gammon, 1991, 2011). Production of a new word requires semantic knowledge as well as an awareness of the articulatory movements required for that word's production (Stoel-Gammon, 2011). Word learning is related to phonological development during early language acquisition; children are more likely to attempt to imitate and spontaneously produce words containing phonemes already within their repertoire (Paul & Jennings, 1992; Stoel-Gammon, 1991; Vihman & Greenlee, 1987). Schwartz & Leonard (1982) found that word learning prior to 18 months is related to the presence or absence of the phonemes included in the words, and Stoel-Gammon (1998) found that these general patterns of development continue beyond the early word learning period. Overall, toddlers with expressive

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