BACKGROUND

Development of Fricatives
It is commonly known that fricatives are a later acquired class of sounds for English-speaking children (Ingram et al., 1980).
• Interdental fricatives (/θ/ and /ð/) are among the latest acquired fricatives, with age of mastery in typically developing children between 5:0 and 6:0 (Ingram et al., 1980; McLeod & Bleile, 2003).
• Fricatives are often produced as stops in early typical phonological development (McLeod & Bleile, 2003).
• While stopping accounts for the frequently observed substitution of /θ/ for the voiced interdental fricative /ð/ (Ingram et al., 1980), it does not account for the commonly observed substitutions of /θ/ or /ð/ for the voiceless interdental fricative /f/. This pattern has been referred to as fricative simplification (McLeod & Bleile, 2003) and has been observed in some dialects of English (Blevins, 2004).
• Substitution patterns of fricatives are variable, ranging from “a more closed articulation (e.g., /θ/ to /ð/), or an acoustically similar fricative” (Ingram et al., 1980).

Goals of the Current Study
This study investigates the following questions:
1. What do children produce when the target is an interdental fricative?
2. Are there age-based patterns of development for interdental fricatives?
3. What is the accuracy of interdental and non-interdental fricatives in syllable onset and syllable coda positions?

METHODS

Participants
• 72 children (29 male, 43 female) ages 2.6 to 4.3
  • Age groups: 2;6-2;11 (32 participants), 3;0-3;5 (28 participants), 3;6-4;3 (19 participants)
• Residents of Northern Arizona whose primary language is American English
• Typically developing, with no history of speech, language, or hearing concerns (based on parent report)

Procedures
• The above assessments were administered as part of a larger study examining speech and language development in children ages 2.6 to 4.3.
  • Participants completed one 60-minute data collection session in a sound-treated therapy room in a university clinic or a quiet preschool room.
  • Sessions were audio recorded using a high-quality Zoom H6 digital recorder with shotgun microphone.
  • All assessment procedures were administered by a certified speech-language pathologist or trained speech-language pathology graduate student.
• The investigator who administered the assessment then completed a broad phonetic transcription of the GFTA-2 stimulus words, using the audio recording of the session.
• Target words with interdental fricatives included the following: bath, bathe, thumb, that/this, feather.
• Each participant’s audio recording and transcriptions were entered into Phon, a software system capable of conducting multiple types of phonological analyses (Rise & Stoel-Gammon, 2015).

Reliability
• Independent transcription of GFTA-2 stimulus words was performed by one researcher for 12 participants. Overall point-to-point inter-rater reliability for consonants ranged from 78% to 99% with a mean of 91%.

RESULTS

Graph 1: Productions of /θ/ by Age Group
Word initial and word-final position (both, thumb)

Graph 2: Productions of /θ/ by Age Group
Word initial and word-medial position (thumb, feather)

Patterns of Production
• Interdental fronting was the most common substitution pattern across all age groups, followed by decodalization.
• In the 3:0-3:5 age group, a more even distribution of processes was observed:
  • Interdental fronting was 38% less common than in the younger age group
  • Stopping was 12% higher (three times the frequency of the 2;6-2;11 age group)
• Correct productions were 23% more common than in the younger age group.
• Interestingly, the substitution patterns of the oldest age group were similar to the youngest age group.

Patterns of Production (continued)
• Accuracy production of /θ/ increased with age.

Table 1: Variability of /θ/ by Age Group
All word positions (both, bath, thumb)

Table 2: Accuracy of Fricatives by Syllable Position and Age Group

RESULTS (continued)

CONCLUSIONS & DISCUSSION

Patterns of Interdental Fricative Production
• Current results replicated previous findings, indicating the production of /θ/ for /f/ is the most common substitution pattern across children ages 2.6-4.3. This process can therefore be considered “typical” with regard to development of /θ/ and, for the purpose of this research, has been named Interdental fronting. Surprisingly, there was an increase in accuracy of /θ/ in the 3:0-3:5 age group, coupled with a more even distribution of other substitutions. The oldest age group demonstrated similar accuracy to the youngest age group.
• Unlike its voiceless counterpart, accuracy of /θ/ increased steadily with age. Interdental fronting (/θ/ → /f/) was not prevalent, suggesting this process is separate and distinct for /θ/ only.

Accuracy of Interdental Fricatives (Table 2)
• When all age groups were analyzed together, there were no differences in overall accuracy of interdental fricatives based on syllable position. However, the 3:0-3:5 age group showed the largest gap in performance accuracy between onset and coda positions (15%). This was the only age group with higher accuracy in coda position.

Individual Variability
• Interestingly, the group with the most evenly distributed /θ/ productions (i.e., 3:0-3:5) demonstrated the highest proportion of participants with no variability and the highest proportion of participants with complete variability.

Implications for Future Research
• These findings confirm presence of a rarely discussed pattern (interdental fronting) in typical language development, worthy of further research.
• Further research should examine older age groups to determine when the process of interdental fronting subsides, which will aid clinicians in diagnostic decision-making and intervention planning.
• Investigation should examine individual variation with emphasis on the role of misperception (substitution of an acoustically similar sound) as a possible cause of interdental fronting.

References