BACKGROUND:
What is Down syndrome?
Approximately 1 in 800 infants are born with Down syndrome (DS), making it the most common genetic disorder. It’s caused by an extra copy of chromosome 21 and is one of the major causes of intellectual disability.

An articulatory and acoustic working space of the tongue during vowel production is defined by an analysis of the four extreme vowels, as in the words ‘heat’, ‘hoot’, ‘hat’, and ‘hot’. These vowels have, respectively, high-front, high-back, low-front, and low-back tongue positions (see Figure 2).

METHODS:
Participants: Word recordings were obtained from 53 speakers with Down syndrome between ages 4 and 36 years (some speakers had multiple recordings at different ages) and from TD children ages 4 and 5 years. Then 25 adult listeners, ages 19 years and older, heard and transcribed recordings from multiple speakers with DS and those of typically developing (TD) individuals (see Figure 3).

Stimuli: The 22 words were randomly presented aurally and pictorially using an in house software program and the speakers repeated the words. Each speaker was heard and transcribed by five different listeners.

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Procedure: At the beginning of the first session, listeners passed a hearing screening and were briefly shown the list of words the speakers produced. Then, a computer program played each word once through headphones and the listeners were instructed to type what they heard and not what they thought the speaker was attempting to say.

RESULTS:
RESULTS - VOWELS:
Figures 7 & 8 display percent high vowels /i/ and /u/ listeners identified correctly for DS and TD speakers. Findings revealed that:
• Listeners correctly identified the high vowels of DS speakers about 60% of the time and TD 4-5 year old speakers 80-100% of the time. See figures 7 & 8.
• However, listeners correctly identified the low vowels /a/ and /æ/ of DS speakers only about 30% of the time or more. See Figures 9 & 10. The majority of speakers with DS were less intelligible than TD 4 and 5 year olds.
• Findings also show a developmental trend. Percent correct identification of low vowels (/a/ and /æ/) and high vowels (/i/ and /u/), improves as age increases.

RESULTS - CONSONANTS:
Figures 5 & 6 show the percentages of initial and final consonants perceived correctly for male and female DS speakers and 4-5 year old TD speakers. Findings revealed that:
• Generally reduced intelligibility of words, vowels, and consonants, often persisting into adolescence and beyond.
• An overall pattern of improved intelligibility with age, but considerable individual variability.
• Lower percentages correct identification for the low vowels /a/ and /æ/ than for the high vowels /i/ and /u/.
• Similar percentages correct identification for initial and final consonants, with errors persisting into adulthood for some individuals.

REFERENCES: