OBJECTIVE: To collect developmental normative data on the vowel acoustic space and compare against a population with disordered speech and known vocal tract dysmorphology, with the overall goal of establishing anatomic-acoustic correlates through the lifespan for both sexes.

BACKGROUND:
- The acoustic vowel quadrilateral area and configuration—determined by the position of the four formants—is a key indicator of the acoustics (Morgan, 1986).
- Developmental changes in TD vowel space might be due to anatomic and/or vocal tract dysmorphology.
- Studies in TD children have evaluated vowel acoustic spaces (Verdonschot et al., 1993).
- Vowel acoustic spaces are different in males and females (Freitas et al., 2016).
- Exclusion of ataxia/disorders of cerebellar control is a limitation in studies on TD vowel spaces.

METHOD:
- All TD participants were selected from the PDMA database.
- Participants were 98 TD males and 98 TD females, aged 4 to 19 years, divided into 4 equal age groups.
- Vocal tract length was measured using the F0/F2 ratio.
- A total of 196 recordings were obtained from participants between the ages 4 to 19. 150 were obtained from DS speakers with a median age of 8 years.
- Participants were 30 males and 30 females, divided into the same age groups.
- Vocal tract length was measured using the F0/F2 ratio.
- Acoustic space was measured using Praat software.
- Vowel acoustic space and configuration were measured using formulas for F1 and F2.

RESULTS:
- The TD space was larger than the DS space.
- The vowel space for TD males and females was larger than for TD males and females.
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CONCLUSIONS:
- The vowel space is larger in TD than in DS.
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- The authors wish to thank all the participants and their families for their contribution to the study.

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DISCUSSION/CONCLUSIONS:
- The study provides normative data on the development of vowel acoustic space between the ages 4 to 19 years.
- The results are consistent with previous studies on TD vowel spaces.
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