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Study Examines the Potential of Growth Modeling to Predict Growth Timing and Magnitude in Craniofacial Traits

Alexandria, VA, USA, June 17, 2022 – A study demonstrating the effectiveness of individual growth modeling as a means to estimate peak growth velocity (PGV), age at peak growth velocity (aPGV), and other clinically relevant values such as age at growth cessation and size at cessation will be presented by Kevin Middleton of the University of Missouri, Columbia, USA at the 100th General Session and Exhibition of the IADR, to be held in conjunction with the 5th Meeting of the IADR Asia Pacific Region. The Interactive Talk presentation, "Individual Variation in Growth Timing and Magnitude in Craniofacial Traits", will take place on **Wednesday, June 22nd, 2022 at 1:30 p.m. China Standard Time (UTC+08:00)** during the "Morphometric Analyses" session.

Modelling the predicted patterns of growth in the craniofacial skeleton allows estimation of peak growth velocity (PGV) and age at peak growth velocity (aPGV) as well as other clinically relevant values such as age at growth cessation and size at cessation. The study used dense, longitudinal craniometric data in the Craniofacial Growth Consortium Study (CGCS), selecting individuals with nine or more serial radiographs. The sample included 5,692 to 6,177 observations from 497 to 548 individuals, depending on sex and trait. The study focused initially on four craniometric traits that define anterior and posterior facial heights as well as palatal and mandibular lengths. Multilevel Bayesian double-logistic growth models were fit separately by sex, allowing all six parameters to vary by individual. This method produces a unique growth curve for each individual, which is simultaneously informed by the population pattern.

Fully parameterized models were fit successfully to four traits in both sexes, and population parameter estimates for these models closely approximated less complex models. The observed growth pattern for each individual was fit much better in the complex model. Across all traits and both sexes, we found a consistent negative correlation between PGV and aPGV ranging from -0.06 to -0.28.

The results show that growth modelling at the individual level is both possible and beneficial, providing insights into the association between determinants of adult morphology. Bayesian approaches are more successful than polynomial- or spline-based models largely due to the parameter constraints imposed by priors. As predicted, a negative correlation was found between PGV and aPGV, indicating that individuals with chronologically early growth spurts have higher PGV.

View this Interactive Talk in the IADR General Session Virtual Experience Platform.

About IADR
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