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A numerical investigation of a simplified human birth model ROSEANNA PEALATERE, Tulane University, ALEXA BAUMER, George Washington University, LISA FAUCI, Tulane University, MEGAN C. LEFTWICH, George Washington University — This work uses simplified models and numerical computations to explore the effects of both the fetal velocity and the viscosity of the surrounding fluid on the forces associated with human birth. The numerical results are compared with the results of an experimental model representing the fetus moving through the birth canal using a rigid cylinder (fetus) that moves at a constant velocity through the center of a passive elastic tube (birth canal). The entire system is immersed in highly viscous fluid. Due to low Reynolds number, the Stokes equations can be used to describe the relationship between velocity and forces in the system. The mathematical model uses the method of regularized Stokeslets to estimate the pulling force necessary to move the rigid inner cylinder at a constant velocity. The elastic tube through which the rigid cylinder passes is constructed by a discrete network of Hookean springs, with macroscopic elasticity matched to the tube used in the physical experiment. More complex geometries as well as peristaltic activation of the elastic tube can be added to the model to provide more insight into the relationship between force and velocity during human birth.

> Roseanna Pealatere Tulane University

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