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Role of body surface pressure and kinematics in fish turning JOHN COSTELLO, Providence Coll, SEAN COSTELLO, Roger Williams University, JOHN DABIRI, Stanford University, MEGAN C. LEFTWICH, George Washington University — Experiments on freely swimming zebrafish were conducted to study the relative contributions to angular acceleration from both the induced pressure field in the fluid surrounding the animal as well as changes in the body moment of inertia due bending during turning maneuvers. PIV-based pressure measurements indicated that turning is initiated by subtle changes to body posture that create large pressure gradients at the head and tail of the animal. The angular turning motion that results from this pressure-based torque is amplified by the animal bending, which reduces the body moment of inertia during the turn. The demonstrated ability to decouple torque generation and body kinematics, using a combination PIV-based pressure measurements and image-based inertia measurements, can facilitate exploration of maneuvering dynamics in a broader range of swimming species, including a search for possible convergent maneuvering strategies that might be common among aquatic animals.

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