2017

Development and Verification of a Mechanical Loading Device for Microfluidics

Stefan Habean
Cleveland State University

Erin Tesny
Cleveland State University

Development and Verification of a Mechanical Loading Device for Microfluidics

Washkewicz College of Engineering

Student Researcher: Stefan Habean

Faculty Advisor: Jason Halloran

Abstract

Establishing the role that mechanics play in nerve cell (e.g. neurons) function requires experimental testing. Microfluidic based experiments are commonly used to study neuron growth and function, and studies have found mechanics to play an important role in neuron health. External loads can be applied to a microfluidic device using a motor, which presumably influences the mechanical environment of the cells. While a motor can easily apply known displacements, a "load cell" is necessary to measure corresponding forces. In an existing prototype microfluidic loading device, a load cell was integrated and verified. The manufacturer's calibration of the load cell was verified by measuring 4 known weights 32 times each. For repeatability testing with a microfluidic device, force was measured at 0.5 mm increments up to a total of 3 mm displacement (~10% strain). The repeatability test was performed 10 times. For ease of future use, a user interface was also developed that can quickly specify parameterized loading profiles. With the load cell integrated, experiments can be easily setup and general materials testing can also be conducted. Likely of greater benefit, when used with simulation, force-displacement data can relate external microfluidic forces to the actual mechanical environment of tested neurons.