Volume 13
Washington University Undergraduate Research Digest

Spring 2018

Design and Use of a Bilateral Grip Strength Device for Assessing Forelimb Function in Rodents

Griffin Kivitz
Washington University in St. Louis

Design and Use of a Bilateral Grip Strength Device for Assessing Forelimb Function in Rodents

Griffin Kivitz

Mentor: Spencer Lake

Post traumatic joint contracture (PTJC) is a debilitating condition that effects up to 50% of patients after suffering an elbow dislocation or fracture. We sought to make limb-specific longitudinal strength measurements to assess how PTJC affects elbow joint function, however commercially available devices compute an average value across both limbs. A custom grip strength device was developed to track individual limb function during rehabilitation in our unilateral elbow injury model. In this study, we describe the novel grip strength device and demonstrate its use by showing functional differences between injured limbs and control/contralateral limbs in our rat model of PTJC.

Long-Evans rats received a clinically relevant elbow injury. After recovery, grip strength measurements were obtained using our custom grip strength device. The grip strength device consists of two sets of metal rungs, or ladders, each held in place by a linear slide and connected to separate load cells. This setup allows for the measurement of individual limb strength, important for tracking progression/recovery of a unilateral injury, and for variability in the pronation-supination positioning of the rungs.

The grip strength measurements indicated a significant loss of strength in the injured limb without causing any loss of strength of the contralateral limb. These findings prove our model of PTJC to be effective, and future work includes tests to track recovery of limb strength postimmobilization in both the pronated and supinated positions. We will also make longitudinal measurements to evaluate the effectiveness of therapy strategies looking to reduce or prevent PTJC in our rat elbow model.