ABSTRACT

A healthy human accomplishes day-to-day activities of standing, walking, and running efficiently and with relative ease despite the complex mechanical structure and coupled dynamics of the lower limb. Walking is one of the most relevant tasks that a person performs in his daily routine, which requires actuation and coordination of both inter and intra limb parameters of the lower extremity to adjust to the changing conditions of the environment like an unexpected perturbation or a change in terrain. Incidentally, with aging or due to an occurrence of a neuro-musculoskeletal disorder, human performance while walking degrades significantly. In this work, a Wearable Adaptive Rehabilitation Suit (WeARS) for lower extremity has been developed that uses externally actuated cables to resemble the role of agonist and antagonist muscles as in a biological system. Two sets of experiments were conducted over eight healthy participants in each. Experiment I and Experiment II involved applying resistive force on the posterior thigh and anterior side of the foot to resist the motion of the hip joint and ankle joint, respectively. The results showed certain gait characteristics similar to what is seen in stroke-survivors providing an opportunity to understand the relationship between external intervention and abnormal gait characteristics to design better control strategies and gait rehabilitative paradigms for stroke-survivors.