Development of a Device to Assess the Impact of Real-Time Auditory Biofeedback on Gait in Patients with Multiple Sclerosis

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The three typically-recognized sources of sensory input relevant to the human balance system are the eyes, nerves in muscles and joints, and the vestibular system. This project set out to design a device that can determine the extent to which sound can affect balance and walking patterns. The resulting device consists of a belt containing an Arduino board and pressure sensors that are placed inside of each of a wearer’s shoes. It works by synthesizing tones in accordance with the wearer’s footsteps, creating a beep (through headphones) each time their heel strikes the ground. The mode of the device can be modified wirelessly by a researcher so that these tones are produced at varying levels of synchrony with the wearer's steps in order to test how various modifications to the auditory feedback can affect the wearer's gait. Additionally, the device tracks and stores information about the mode of the device and the time length of every step, which in turn allows data to be collected and analyzed to determine the effects of the tone synthesis pattern on the subject’s gait. This device is currently being used in a study to determine how the feedback it generates can affect the gait and balance of patients with multiple sclerosis, and, as such, the project board reflects both the development of the device and the preliminary results of the study.