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Gait analysis has gained increasing prevalence as a tool for quantitatively measuring specific joint impairments. In conjunction with global measures of walking performance such as speed, endurance, and efficiency of gait, gait analysis can help provide a comprehensive understanding of the effects of an intervention on gait. With the introduction of user-friendly options for real-time display of gait parameters in motion capture software, it is now feasible to provide feedback to patients about their gait, in an attempt to enhance learning and retraining of correct gait patterns. However, one aspect where we are lacking is in the use of available gamut of measurement devices and tools to our full advantage. While sophisticated motion capture systems are common in universities and research institutes, they are neither readily available to all clinicians nor transportable for patients to take home with them. When outside of the clinic or the gait research lab, a majority of patients do not have the judgment to perceive subtle deviations in their gait or posture that need correction. The learning of correct gait patterns achieved during gait training facilitated with corrective feedback using real-time information in the gait laboratory or cueing by clinicians in the rehabilitation clinic is therefore not optimally carried-over to activitities of daily living. There is a need to develop ‘wearable sensors’ that be prescribed to patients to enable them to obtain feedback about their targeted gait parameters and therefore to continue corrective gait training during community ambulation.

Recommendation: Develop portable, user-friendly, cost-effective measurement devices that can be prescribed by researchers and clinicians to provide patients with real-time corrective feedback about their gait or posture throughout the day.

These wearable sensors will provide useful information to researchers, clinicians, and patients. Researchers and clinicians can download data stored in the wearable sensors to obtain quantitative information about compliance with home-exercise or postural retraining programs. The sensors can also help facilitate the transfer of gait improvements achieved in the clinic or research lab to community ambulation. The optimum type and frequency of feedback that maximizes learning is an area that needs further investigation, and can be decided by the clinician or researcher to best fit each patients’ needs. Some examples include: (1) Shoes instrumented with force sensors that provide an auditory cue to post-stroke individuals when a targeted magnitude of forward propulsion force is not generated by their paretic limb consecutively for 10 strides; (2) Custom-fitted vests instrumented with inclinometers that provide information to the patient about their pelvic tilt angle to facilitate training of a correct lumbo-pelvic posture during activities of daily living; (3) A wearable device that provides 3-dimensional inertial sensing of foot movements to provide auditory cues when a patient recovering from ankle instability inverts the foot excessively during walking on uneven surfaces. Furthermore, data from such sensors can provide researchers and clinicians with outcomes that measure the quality of gait or posture during community ambulation and activities of daily living, which are currently available primarily from patient self-reports. In conjunction with supervised gait training sessions conducted in the clinic or the gait laboratory, these ‘take-home’ devices will have the potential to enhance and to better assess the efficacy of rehabilitation.