

## Development of a Wearable Gait Monitoring System for Evaluating Efficacy of Walking Training in Rehabilitation

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To evaluate the efficacy of walking training in rehabilitation, physical therapists need to assess motion characteristics. However, they often evaluate these activities subjectively by direct observation. In this study, we have developed a wearable system for monitoring posture changes and walking speed in patients with hemiplegia. The system can be used to measure the angle changes relative to the sagittal plane of the trunk, thigh, and shank, and walking speed using the angle changes of the lower limb and leg length. In 12 healthy subjects (from 21 to 75 years) and 10 patients with hemiplegia (from 50 to 87 years), we evaluated the measurement accuracy of the system by simultaneous recordings using charge-coupled device (CCD) cameras. Also, in four patients with hemiplegia, the gait motions were monitored during the rehabilitation to evaluate its applicability to the quantitative determination of the efficacy of the walking training. The results demonstrated that the system could be used to measure the angle changes of the body parts ( $r = 0.99$ ) and walking speed (healthy subjects:  $r = 0.99$ , patients:  $r = 0.95$ ) with high accuracy. It is also clearly shown through practical monitoring that the system can be a useful means of evaluating the motion characteristics during the rehabilitation of the patients, therefore, the efficacy of the rehabilitation can be quantitatively evaluated using the system.

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