Dizziness and a feeling of imbalance are troublesome for as many as 30% of patients following a traumatic brain injury (TBI) despite an often unremarkable neurological and physical exam. The purpose of this study was to quantitatively identify dynamic instability during gait for individuals having these complaints. Ten subjects (6 men and 4 women, ranging in age from 19 to 62 years, and at least 3 months post injury) with documented TBI and complaints of “imbalance” or “unsteadiness” while walking and ten age, gender, and stature-matched healthy individuals were recruited for this study. Subjects were instructed to walk along a 10m walkway at a comfortable self-selected speed while barefoot. A six-camera motion analysis system was used to collect 3-dimensional trajectories of markers placed on bony landmarks of the subject. A 13-link biomechanical model of the human body was used to compute the kinematics of the whole body center of mass (COM). Subjects with a TBI displayed significantly greater and faster COM motion in the frontal plane than their matched controls (p<0.002). Also, COM motion in the sagittal plane was significantly lower in TBI subjects (p≤0.021). Our data imply that the feasible range of COM movement during which balance can be successfully maintained in the sagittal plane has been reduced in the TBI subjects relative to their controls. Furthermore, the increased COM medio-lateral excursion and peak velocity in the TBI subjects are similar to those reported for the balance-impaired elderly adults, which indicates poor sideways stability.