

The Scaling of Postural Adjustments during Bimanual Load-lifting in Traumatic Brain-injured Adults

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Previous postural studies of traumatic brain injury (TBI) patients have been limited to identifying deficits in static and quasi-dynamic postural control tasks such as weight shifting. In this study, we examined whether or not patients with TBI are able to scale adequately their postural adjustments during the performance of the dynamic task of bimanual load-lifting. An age matched group of healthy adults served as controls. We used the Tetrax posturography system that calculates a stability score (ST) based on fluctuations in vertical ground reaction forces, normalized for body weight. During quiet standing, the ST scores of the TBI group were significantly higher than the control group. Forward weight shift and percentage change in the vertical ground forces (lift postural adjustment (LPA) and post-lift postural adjustment (PLPA) scores) linearly increased with increasing load weight in both healthy and TBI subjects. Group differences were found in the magnitude of forward weight shift but not in the relative increase of the LPA and PLPA scores during the lifting and post-lifting stage respectively. The forward weight shift of the TBI group was lower-than-normal and asymmetrical – there was significantly less forward weight shift on the more affected than on the less affected limb. In addition, a significant amplitude coupling was found between the scaling of the weight shift of the heel and forefoot of each limb. However, no coupling was found between the weight shift amplitudes of homologous parts of both limbs in the TBI group. The results showed that scaling based on prior experience was preserved in the TBI group, though some TBI subject demonstrated absent scaling in either the more affected or less affected heel or forefoot. The differences between the normal and TBI groups in postural adjustments are not necessarily a sign of pathology; rather they may represent a deliberate choice of the central nervous system to counteract predictable disturbances.