It has been noted that tripping and falling are the greatest source of accidental injury in children with motor disabilities[1]. Tripping most commonly occurs due to a decrease in foot clearance or ineffective limb shortening during the swing phase of gait. Moosabohy and Gard developed equations based on a planar model of the leg to look directly at joint contributions to foot clearance (Fig. 1a,2). We modified and applied the analytical techniques used by Moosabohy and Gard to analyze a new population of patients.

**RESULTS**

**Toe off** (TO) of controls, occurred at 65% of the gait cycle, first dashed vertical line (Fig. 2 and 4). TO for the patients, indicated by the first solid vertical line (64.7%, 57% and 60%, 67%) demonstrate earlier TO on the pathologic side (Fig. 2, 4). The second set of vertical dashed and solid lines denote the times of minimal ELL for the controls and the patients (Fig. 2, 4).

**CONCLUSIONS**

- In typically developing pediatric patients, the point of minimal foot clearance was found to occur at 89% of the gait cycle on the left and the right. Through sensitivity analysis, the hip flexion has the largest contribution to foot clearance followed by the ankle dorsiflexion and knee flexion (Fig. 2).
- For the transverse myelitis case, the quantitative analysis correctly identified the gait pathology (stiff right knee) and added additional information about compensation of the other joints (increased ipsilateral ankle dorsiflexion and increased hip flexion) (Fig. 2).
- For the CP patient, the quantitative analysis showed that significant left ankle plantarflexion allowed the right hip to overextend and not flex during swing on the right without tripping. The left ankle plantarflexion during swing impaired ELL the greatest (4c) and the right ankle compensated with vaulting during stance (4d) [Fig. 4].

**METHODS**

Participants 5 boys and 7 girls aged 6-12 years old, including 10 typically developing and 2 with different gait pathologies. The controls were chosen based on their self-selected walking speed being within 10% of children with gait pathologies.

**Data collection and processing**

Previously collected Visual 3D kinematic files were analyzed in Matlab to quantify the joint contribution to foot clearance and limb shortening. The joint contributions were calculated based on modified Matlab code developed by Little, McGuirk, and Patton[3].

**REFERENCES**


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