The Effects of a Unilateral Cam Boot and TayCo External AFO on the Gait of Healthy Young and Old Adults.

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Surestep

Methods

38 patients between ages 19 and 91 walked on the GaitRite gait analysis mat. 3 patients were excluded. No participants had lower extremity involvement and were otherwise typical. Average age of included patients was 52 years old. Patients were categorized into 2 groups – Young and Old. Young patients were under 50 years old; Old patients were over 50 years old. There were 17 Young patients (32.3 +/- 6.8 Years) and 19 Old Patients (71.1 +/- 6.7 Years).

Patients walked in Shoe condition first. Then were fit with either a Cam Boot or a TayCo External AFO on the right side. After doing 4 passes on the gait mat, they were then fit with the other device. The last 2 passes were used for data analysis to allow participants to practice with the device before collecting data. The order of the Cam Boot and TayCo was random to reduce effects of one device on the other.

Data was analyzed by looking at percent changes for each patient. Velocity, Step Length, Base of Support, Foot Length and Stance Timing Parameters (Total Stance Percentage of Gait Cycle, Heel On to Toe On Percentage of Stance and Foot Flat Percentage of Stance) were evaluated. Percent changes reported were Cam Boot compared to Shoes Only and TayCo compared to Shoes Only.

Symmetry was also reported for Step Length, Foot Length, Stance Percentage of Gait Cycle, Heel On to Toe On Percentage of Stance and Foot Flat Percentage of Stance. This was calculated as Device Side/No Device Side for each condition (Shoes Only, Cam Boot, TayCo).

Results

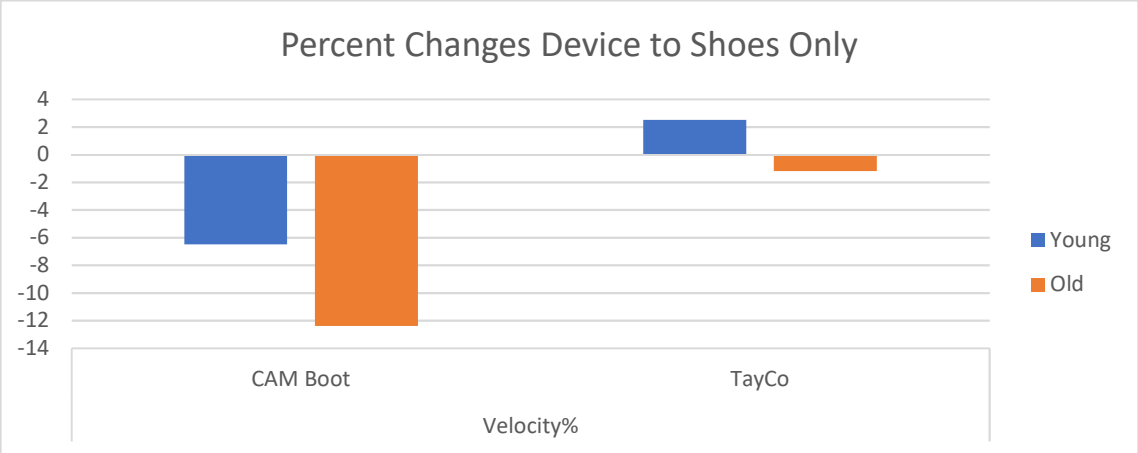
Percent Changes Compared to Shoes

Velocity

Cam Boot: Velocity decreased in both Young (-6.5%) and Old (-12.4%) groups.

TayCo: Velocity increased slightly in the Young (2.5%) and decreased slightly in the Old (-1.2%) group.

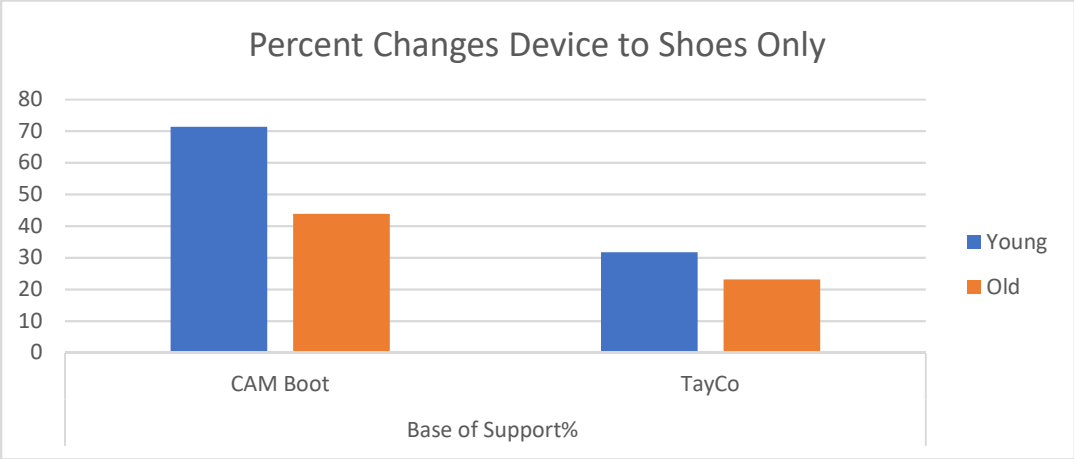
Summary: Both groups walked slower with the Cam Boot, with the Old group slowing down more than the Young group. With the TayCo, the Young group walked slightly faster, while the Old group walked slightly slower. The velocity changes with the TayCo were not significant.



Base of Support
Cam Boot: Base of support increased in both Young (71.3%) and Old (43.9%) groups.

TayCo: Base of support increased in both Young (31.7%) and Old (23.1%) groups.

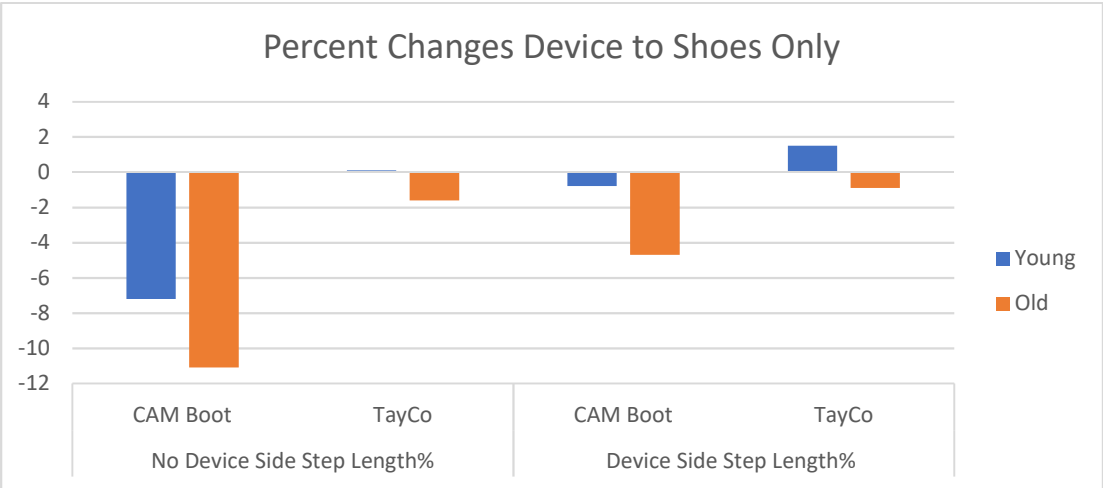
Summary: An increase in base of support can indicate a lack of stability. There were significant changes with both devices, but less in the TayCo than the Cam Boot.



Step Length
Cam Boot: No Device Side Step Length decreased in both the Young (-7.2%) and Old (-11.1%) groups. Device Side Step Length decreased in both the Young (-0.8%) and Old (-4.7%) groups.

TayCo: No Device Side Step Length did not change in the Young (0.1%) and decreased slightly in the Old (-1.6%) group. Device Side Step Length increased in the Young (1.5%) and decreased in the Old (-0.9%) group.

Summary: Step Length decreased bilaterally with the Cam Boot. It decreased more on the No Device Side. This can be due to a lack of stability on the Device Side. This appeared to affect the Old group more than the Young group. With the TayCo, there were no significant changes in Step Length on either side.

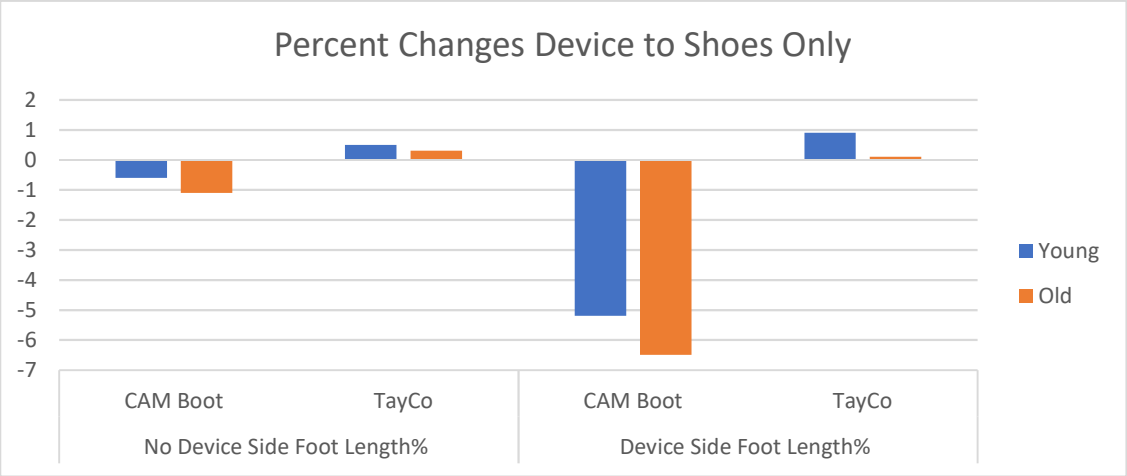


Foot Length

Cam Boot: No Device Side Foot Length decreased slightly in both the Young (-0.6%) and Old (-1.1%) groups. Device Side Foot Length decreased in both the Young (-5.2%) and Old (-6.5%) groups.

TayCo: No Device Side Foot Length increased slightly in the Young (0.5%) and Old (0.3%) groups. Device Side Foot Length increased slightly in the Young (0.9%) and Old (0.1%) groups.

Summary: Less of the device side foot made contact with the mat with the Cam Boot. This is most likely due to the rockers on the plantar surface of the boot. There were no significant changes in foot length with the TayCo on either side.

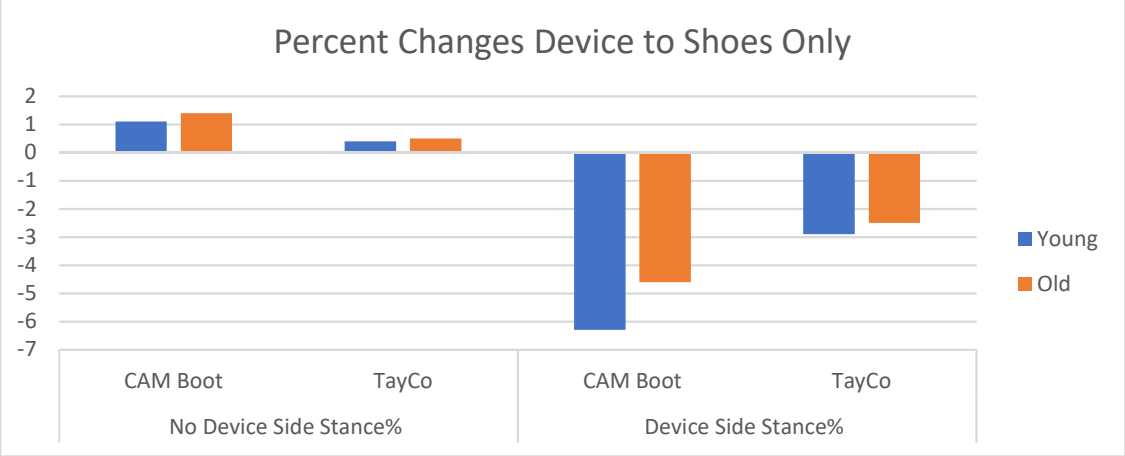


Stance% Gait Cycle

Cam Boot: No Device Side Stance% increased in both the Young (1.1%) and Old (1.4%) groups. Device Side Stance% decreased in both the Young (-6.3%) and Old (-4.6%) groups.

TayCo: No Device Side Stance% increased slightly in both the Young (0.4%) and Old (0.5%) groups. Device Side Stance% decreased slightly in both the Young (-2.9%) and Old (-2.5%) groups.

Summary: With both devices, Stance% increased on the No Device Side and decreased on the Device Side. This can be associated with a lack of stability on the device side. The percentage difference was closer to the Shoes Only condition (device had less effect) with the TayCo.

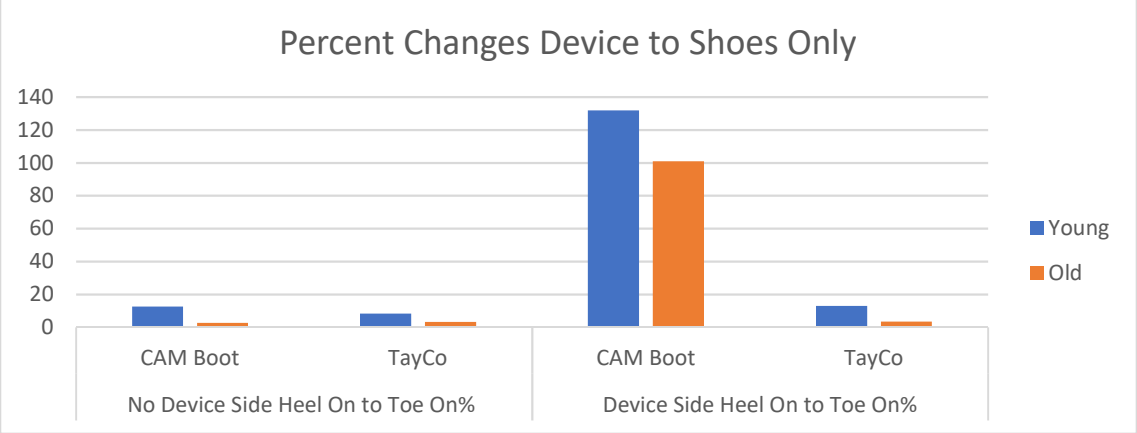


Heel On to Toe On% Stance

Cam Boot: No Device Side Heel/Toe% increased in both the Young (12.6%) and Old (2.6%) groups. Device Side Heel/Toe% increased significantly in both the Young (131.9%) and Old (100.9%) groups.

TayCo: No Device Side Heel/Toe% increased in both the Young (8.2%) and Old (3.1%) groups. Device Side Heel/Toe% increased in both the Young (13%) and Old (3.3%) groups.

Summary: The time it took for the Device Side to transition from the heel to toe took much longer with the Cam Boot. This transition only increased slightly with the TayCo. The timing of this transition can affect ground reaction forces up the chain at the knee, hip and back.

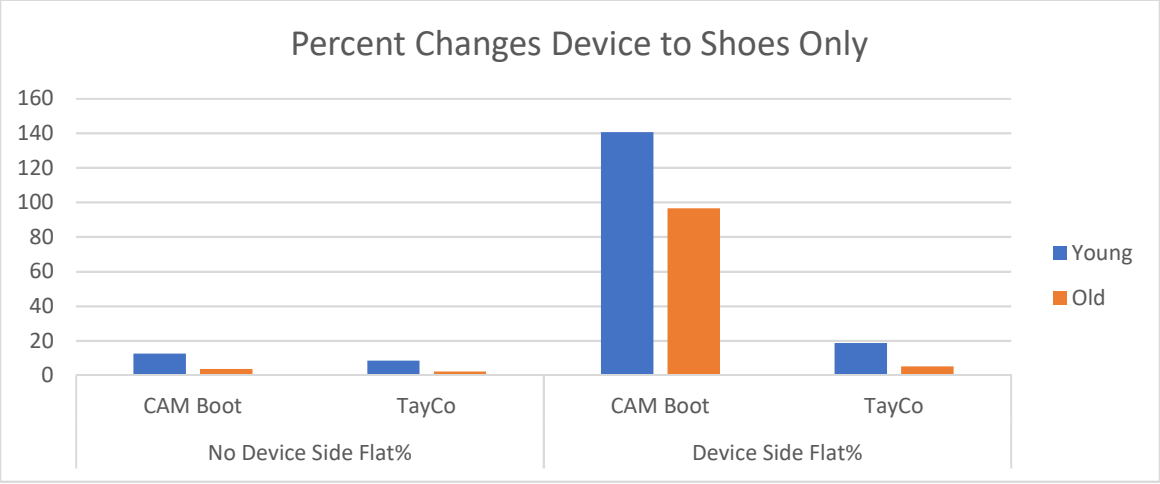


Flat% Stance

Cam Boot: No Device Side Flat% increased in both the Young (12.6%) and Old (3.7%) groups. Device Side Flat% increased significantly in both the Young (140.7%) and Old (96.6%) groups.

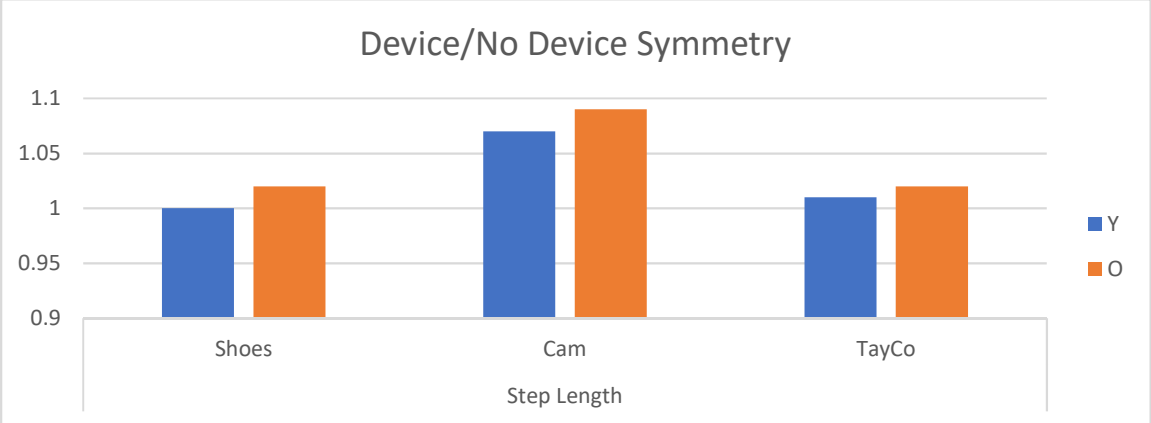
TayCo: No Device Side Flat% increased in both the Young (8.5%) and Old (2.2%) groups. Device Side Flat% increased in both the Young (18.6%) and Old (5.1%) groups.

Summary: The time the foot spent in foot flat (midfoot only contact) increased significantly with the Cam Boot. It also increased with the TayCo, but at a much lower percentage. In the TayCo condition, the No Device Side was not as affected as the Cam Boot Condition.

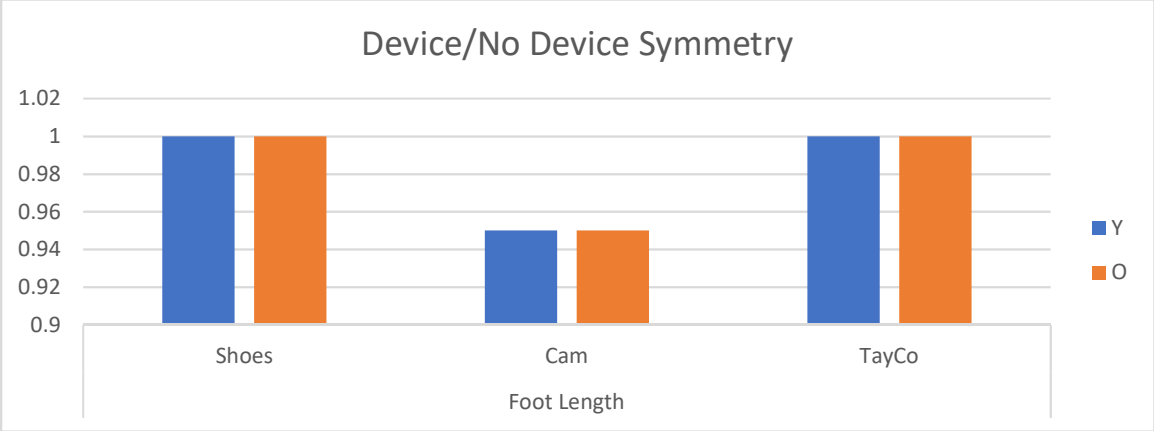


Symmetry – Device/No Device

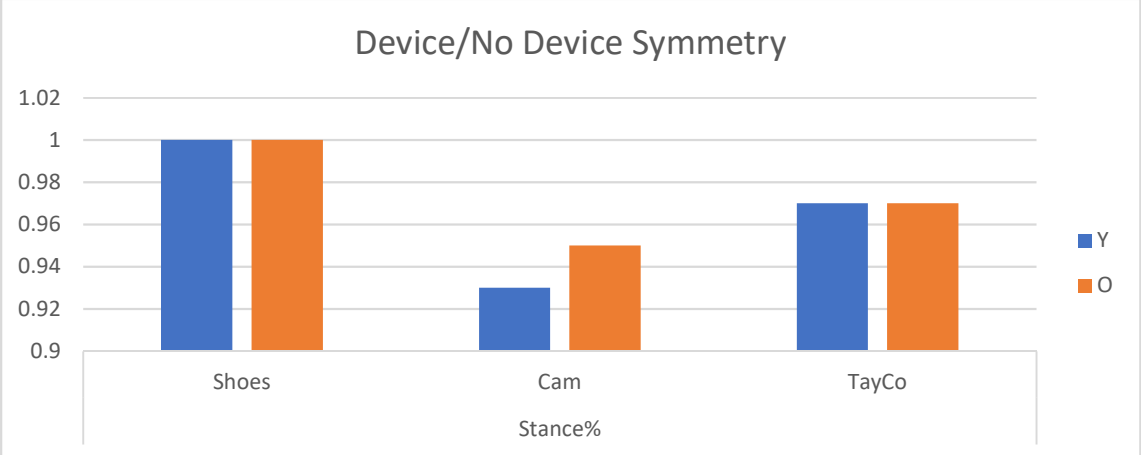
Step Length: Step length was asymmetrical in the Cam Boot condition, with the Device Step Length being longer than the No Device Side. There was no significant difference in the symmetry of Step Length between the TayCo and Shoes Only Conditions.



Foot Length: Foot length was asymmetrical in the Cam Boot condition, with the No Device Foot Length being longer than the Device Side. There was no significant difference in the symmetry of the Foot Length between the TayCo and the Shoes Only Conditions.

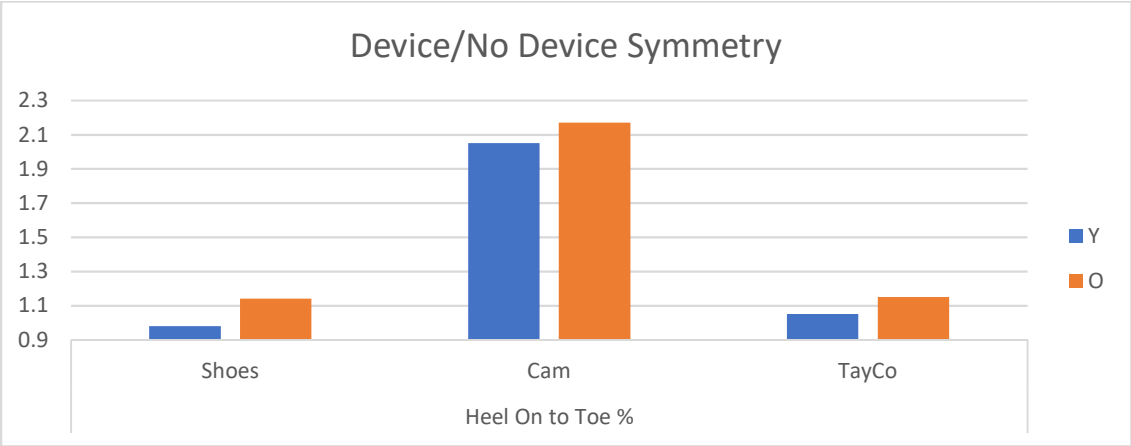


Stance%: Stance% was asymmetrical with both the Cam and TayCo conditions, with the No Device Stance% being longer than the Device. The Cam condition was more asymmetrical than the TayCo.

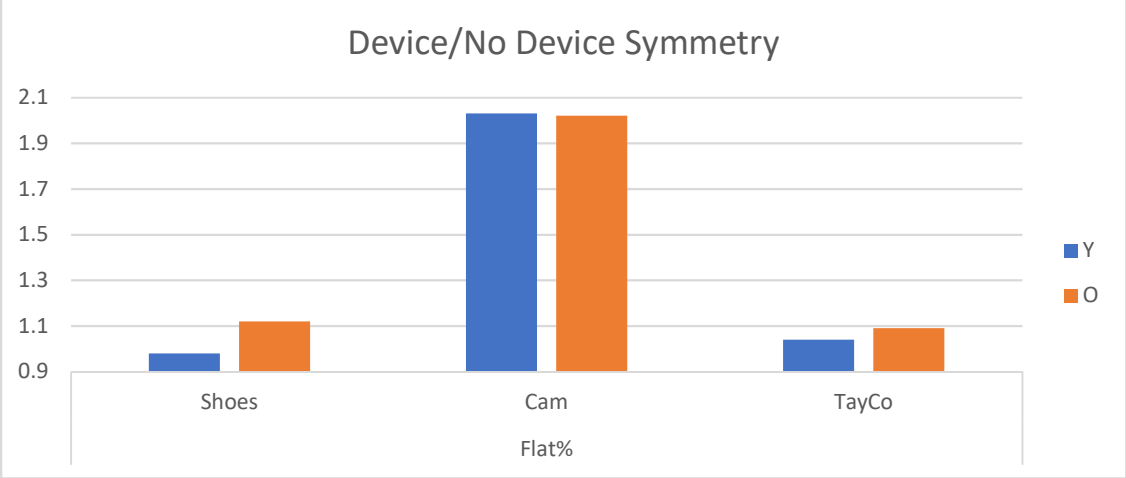


Heel On to Toe On%: There was slight asymmetry in the Shoes Only condition in both the Young and Old groups. There was a significant asymmetry in the Cam Boot condition, with the Device

Side longer than the No Device Side. There was only slight asymmetry with the TayCo, with the Device Side longer than the No Device Side.



Flat%: There was slight asymmetry in the Shoes Only condition in both the Young and Old groups. There was a significant asymmetry in the Cam Boot condition, with the Device Side longer than the No Device Side. There was only a slight asymmetry with the TayCo, with the Device Side longer than the No Device Side.



Summary

The Cam Boot introduced numerous gait changes and asymmetries on both the Device Side and No Device Side. The TayCo introduced a smaller number and smaller magnitude of changes and asymmetries.