P3-B-5 Gait phase-specific linear and angular momentum generation during 90-degree left turns in healthy older adults

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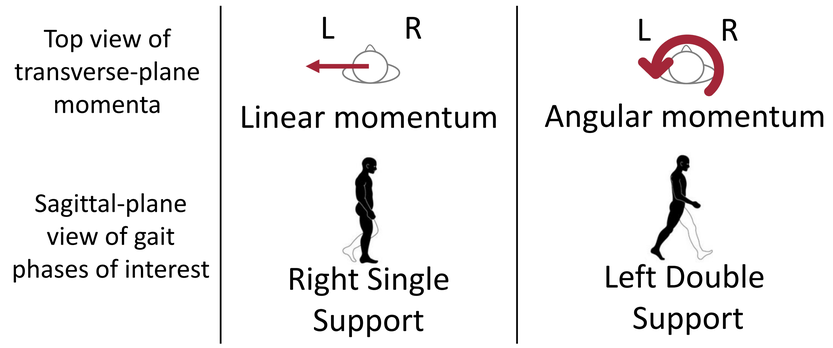
Introduction

We previously found that for young adults during straight-line gait and turning, leftward transverse-plane **linear** and **angular** momentum are generated during **right single support** and **left double support**, respectively [1].



Hypothesis: During straight-line gait and turns, similar to young adults, older adults generate the largest leftward linear momentum during right single support, and the largest angular momentum during left double support

Methods

Participants & Equipment

- Nine participants (2 m 7 f; 71 ± 6 yrs)
- Reflective markers on 13 segments (250 fps, Optitrack)

Tasks

- 10 m straight-line gait x 10 repetitions
- 90-degree left turns x 10 repetitions

Metrics

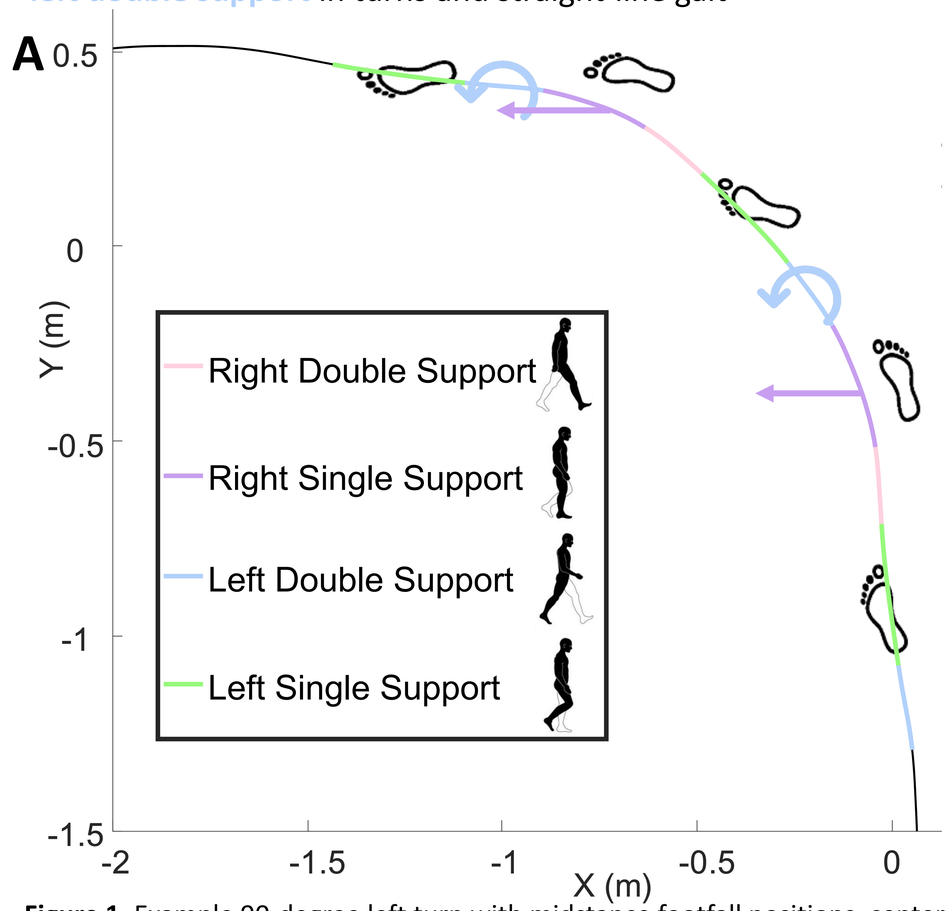
- Momenta generation in the direction of the turn (change in momenta) per gait phase (left and right single and double support)
- Linear momentum (ΔPx, global X axis, Figure 1A)
  - Leftward is negative (-X axis)
- Angular momentum (ΔHz, about global Z axis)
  - Leftward rotation is positive

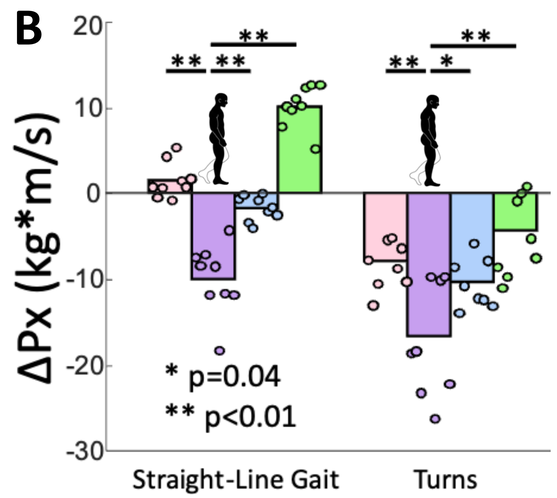
Statistics

- Sign test between gait phases within each task, for each metric

Results

- **Linear** momentum is generated more towards the left during **right single support** in turns and straight-line gait
- **Angular** momentum is generated more towards the left during **left double support** in turns and straight-line gait





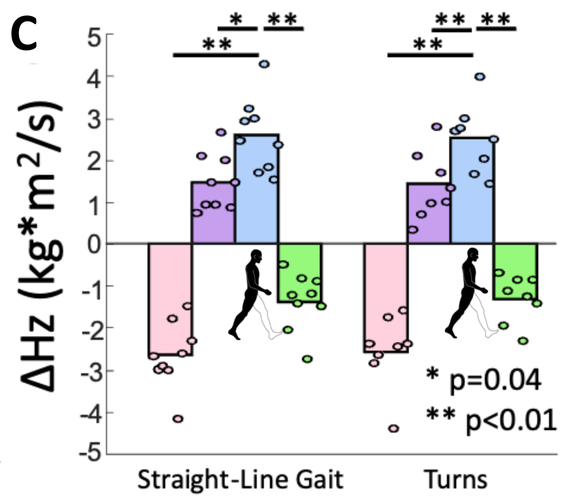


Figure 1. Example 90-degree left turn with midstance footfall positions, center of mass trajectory colored by gait phase during the turn ***(A)***. Summary data for linear ***(B)*** and angular ***(C)*** momentum. Each point is the average of all trials for one participant.

Discussion & Conclusion

- Similar to young adults, healthy older adults may leverage momenta generation strategies during turns that are used during straight-line gait [1]
  - Both old and young adults use a variety of footfalls for 90-degree left turns (3-5 and 3-6 steps, respectively) [1]
- Future work: identifying advantages of these strategies to develop targeted interventions

References

1. Tillman et al., Sci. Reports, 2023.

Acknowledgements

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