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Age-related difference in margin of stability during curb descent in response to a subsequent precision stepping demand

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BACKGROUND

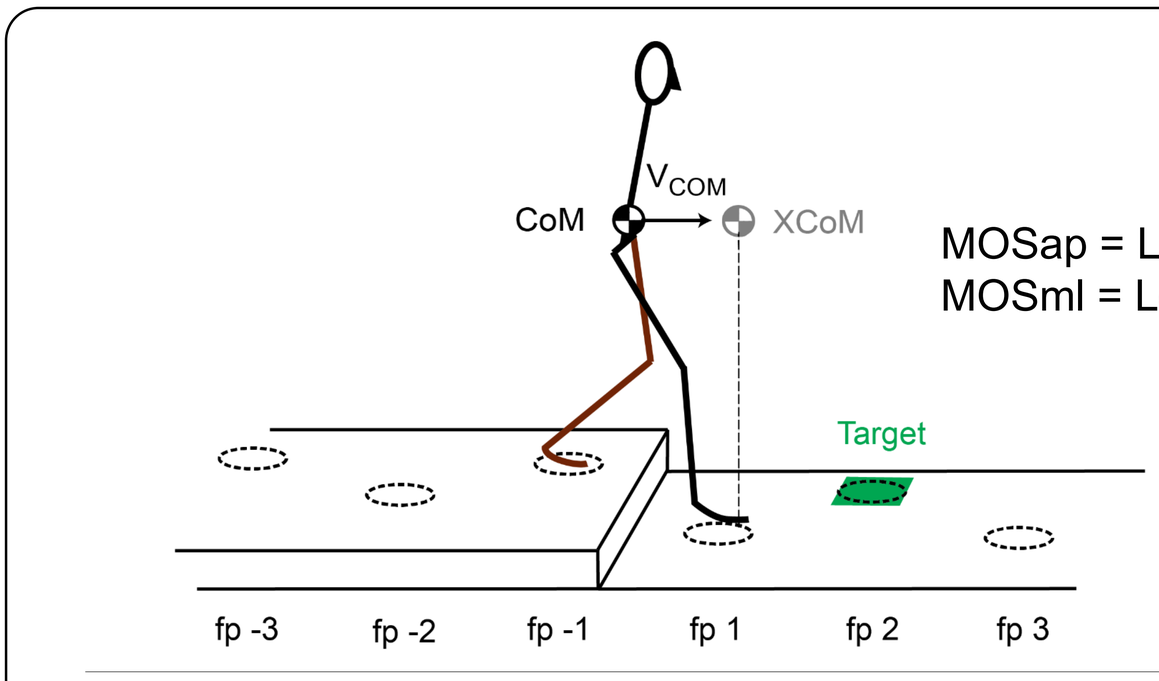
- Community ambulation requires negotiating elevations and precision stepping.
- Compared to level-ground walking, kinetic energy increases when descending steps, and demands greater stability control.
- Since stability control is primarily achieved via foot placement [1], environmental constraints on foot positions challenge stability.
- We investigated control over several steps in a multi-feature environment in healthy adults.

AIM

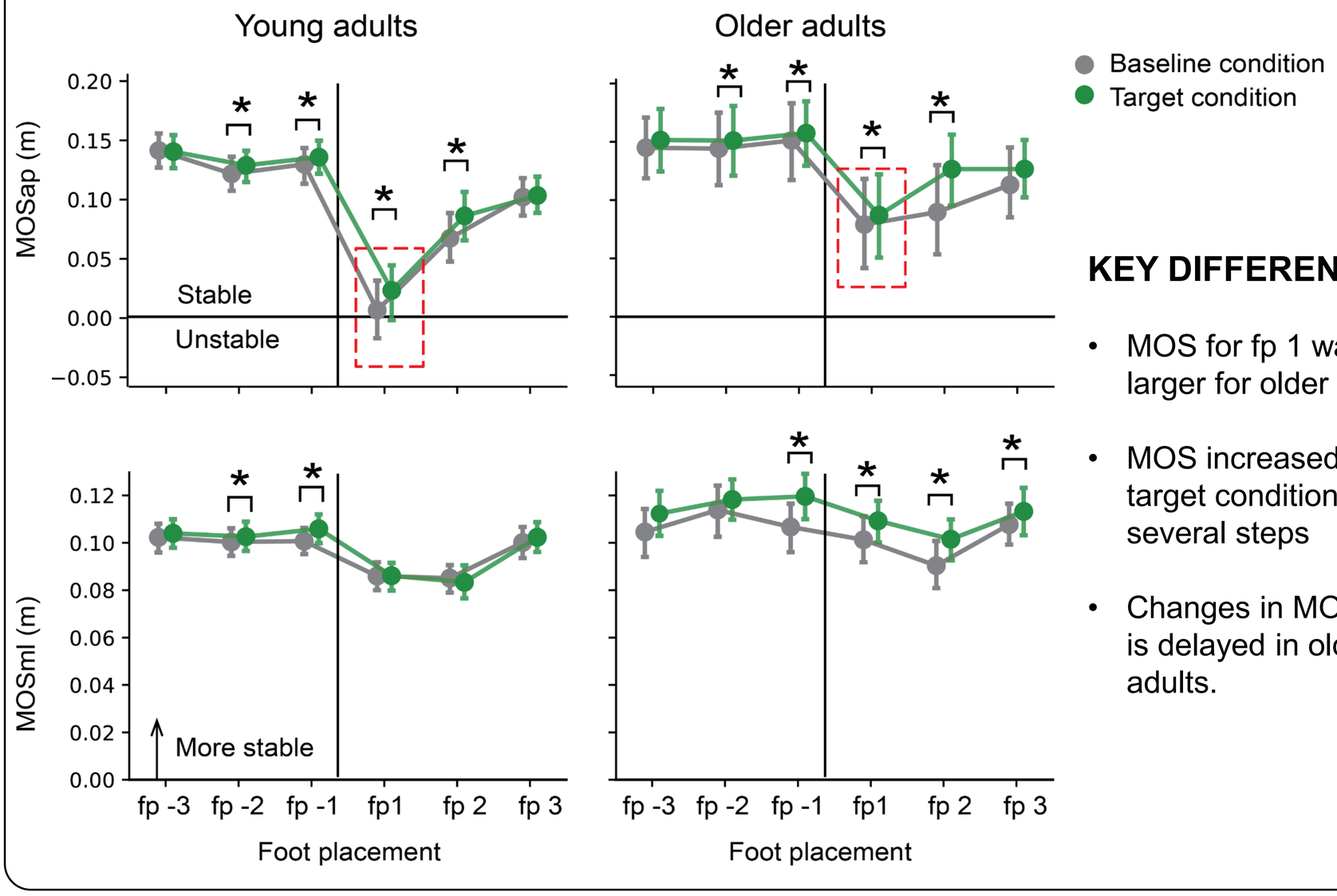
To examine age-related changes in stability control for curb descent in response to a subsequent precision stepping task.

METHODS

- 18 young (24+4 yrs) and 10 older healthy adults (70+6 yrs)
- Two blocked conditions: (1) Baseline (2)Target
- Measures: Margin of stability (MOS) in AP and ML directions at foot contact for six foot placements (fp-3,-2,-1,1,2,3)



MOSap = Lead foot toe position – $XcoM_{AP}$
MOSml = Lead foot 5th metatarsal – $XcoM_{ML}$



KEY DIFFERENCES

- MOS for fp 1 was larger for older adults
- MOS increased for target condition for several steps
- Changes in MOS ML is delayed in older adults.

DISCUSSION

- While young people utilized the gained kinetic energy to passively propel the forward locomotion, older adults prioritized safety over energy efficiency.
- Increased MOS for steps leading up to target demonstrated anticipatory adjustment in passive stability while navigating in a complex environment.
- This delayed changes in MOS in ML direction may be due to decline in gait adaptability with ageing [2], or a superior strategy for achieving precision. Further investigation is required to distinguish between these possibilities.

REFERENCES
[1] Winter 1995;
[2] Caetano et al. 2016

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