

Collision avoidance in older adults

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Context

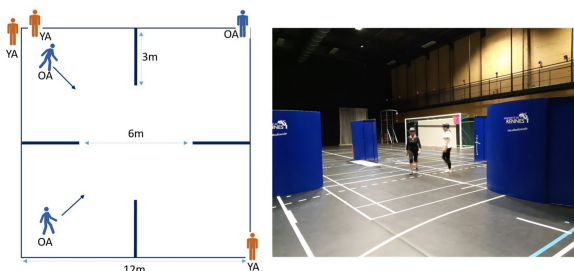
- Every year, 1 in 3 older adults are likely to fall at least once [1]
- Many falls occurs while walking [2] where an individual needs to adapt to environmental hazards
- Studies with older adults interacting within an environment:
 - Difficulties in estimating time-to-arrival of vehicles [3]
 - Larger critical ratio, more variability in door aperture task [4]
 - Larger clearance distance when avoiding a moving object [5]
- Walker-walker collision avoidance findings:
 - Actions are mutually solved [6]
 - Motion adaptation depends on future risk of collision [2] and crossing order [7]
 - Crossing order early determined and unchanged [7]
 - Higher risk of collision in older adults if dual task [8]

Aim and Hypothesis

- Aim: study person-person collision avoidance behaviours in Older Adults (OA) in comparison to Young Adults (YA) walkers
- Hypothesis: OA will have delayed visuomotor processing leading to “risky” adaptations in a collision avoidance task

Methods

- 18 OA (65-74 years old) and 18 YA (18-30 years old)
- 687 collision avoidance trials: 2 participants walked towards a goal with orthogonal crossing trajectories.
- 3 types of interaction: OA/OA, YA/YA and OA/YA



- Analysis:
 - Initial Minimum Predicted Distance [6] (MPD) threshold for motion adaptation
 - Inversions of crossing order
 - Clearance distance when adaptation occurs
 - Contributions to avoid the collision based on MPD [7]

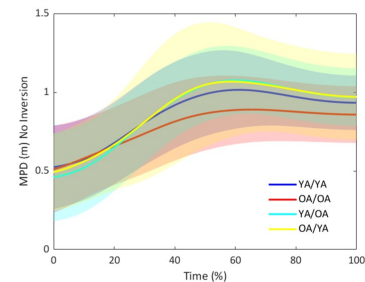
Results and Discussion

- No collision occurred, OA & YA were able to act appropriately
- Larger threshold needed to trigger avoidance when OA is second in crossing order, possibly due to visuomotor delays
- More crossing inversions with OA second, poor visuomotor processing
- Smaller clearance distance in OA/OA, “risky” behaviours

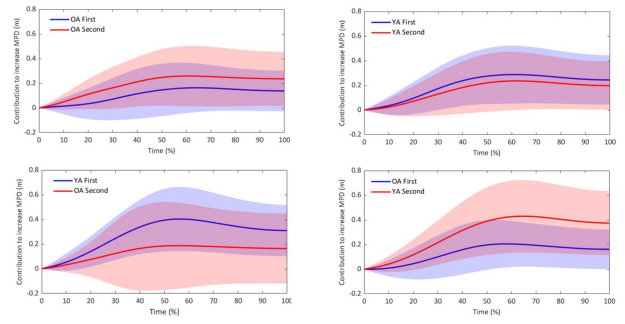
Condition	OA/OA	YA /YA	OA/YA*	YA/OA**
Threshold for adaptation (m)	1.12	1.01	1.06	1.12
Crossing order inversion (%)	25	13.8	12.7	23
Median Clearance distance (m)	0.79	0.93	0.93	0.89

*OA crossed first and YA second, ** YA crossed first and OA second

- MPD evolution (trials without inversion)
 - Similar and correct avoidance strategies in OA
 - Under-adaptation in OA/OA



- When OA and YA interact, YA avoids more



Conclusions

- OA have similar strategies than YA to avoid a collision
- But OA appear to have visuomotor processing deficits leading to “risky” avoidance behaviours
- Future works: investigate the role of social aspects vs. motion difference in YA/OA interactions using VR

Acknowledgements

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