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BODY MOVEMENT STRATEGIES TO INITIATE THE CROSSING OF A STREET IN FRONT OF TRADITIONAL AND SELF-DRIVING CARS IN YOUNG AND OLDER ADULTS.

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48% of pedestrians fatalities involve people aged 65 or more [1]

Deficits in street crossing behaviors in Older Adults (OA) [2, in a simulator]:
 ↓ walking speed, ↑ of risky decisions

Young adults'(YA) strategies : the head initiates the crossing movement, followed by the shoulders, elbows, wrists, hips, knees and ankles [3, in front of a TV screen]
 Head rotation is not a key factor to predict street crossing [4, using real street condition]

Self-driving vehicles = new challenges on the road[5]
 Identifying pedestrians' motion invariants could be a key to safety

To investigate body movement strategies performed before crossing the street in OA wrt. YA in complex mixed traffic

METHODS

Between-group design

30 YA, 21-39yo

30 OA, 68-81yo

Task: cross (or not) a virtual two-way street by walking in a simulator
 Conditions: 120 street crossings trials in the following conditions

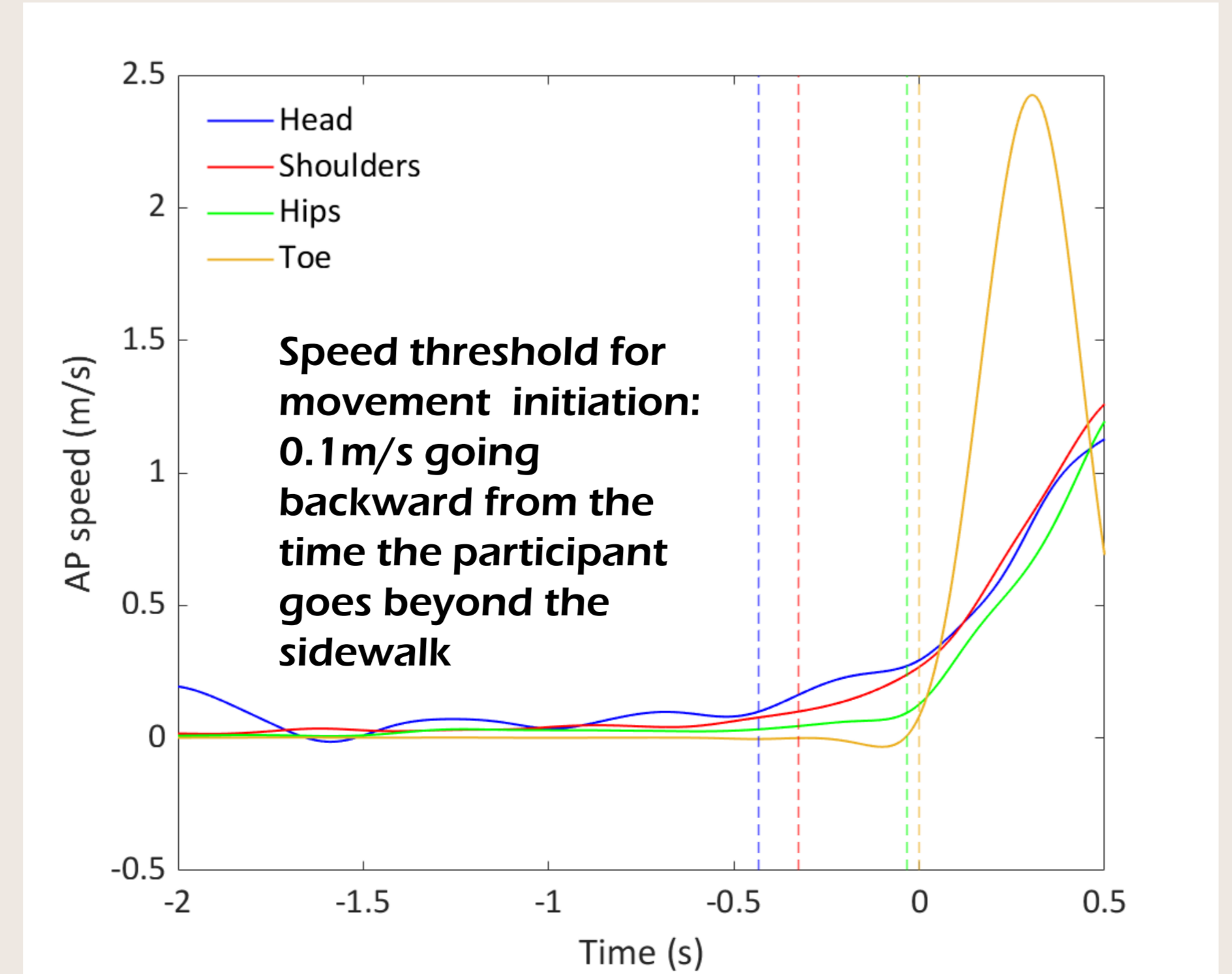
2 TYPES OF VEHICLES (4 possibilities) :
 Conventional and/or Self-driving cars (always stopping, letting the pedestrian cross)

5 TYPES OF GAPS (1,2,3,4, and 5s) 2 SPEEDS (30 or 50 km/h)

Motion capture using Vicon System (120Hz), Full Body 27 markers

Analyses:

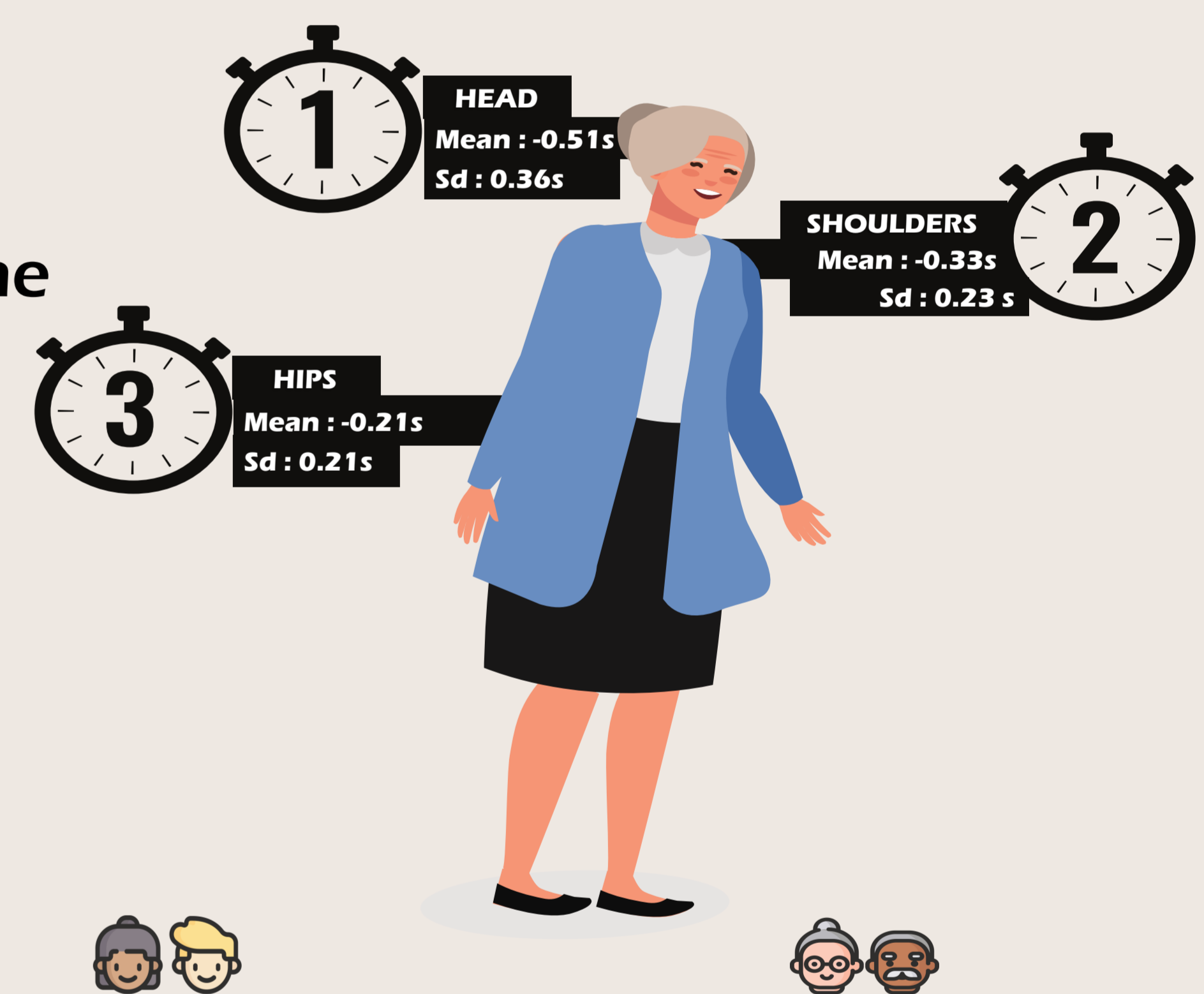
- Comparison of the delays to initiate the crossing movement for head, shoulders and hips with respect to the feet
- Hierarchical clustering on body segments angles profile 2s before the initiation of crossing by the toe to identify specific groups of behavior.



PRELIMINARY RESULTS & DISCUSSION

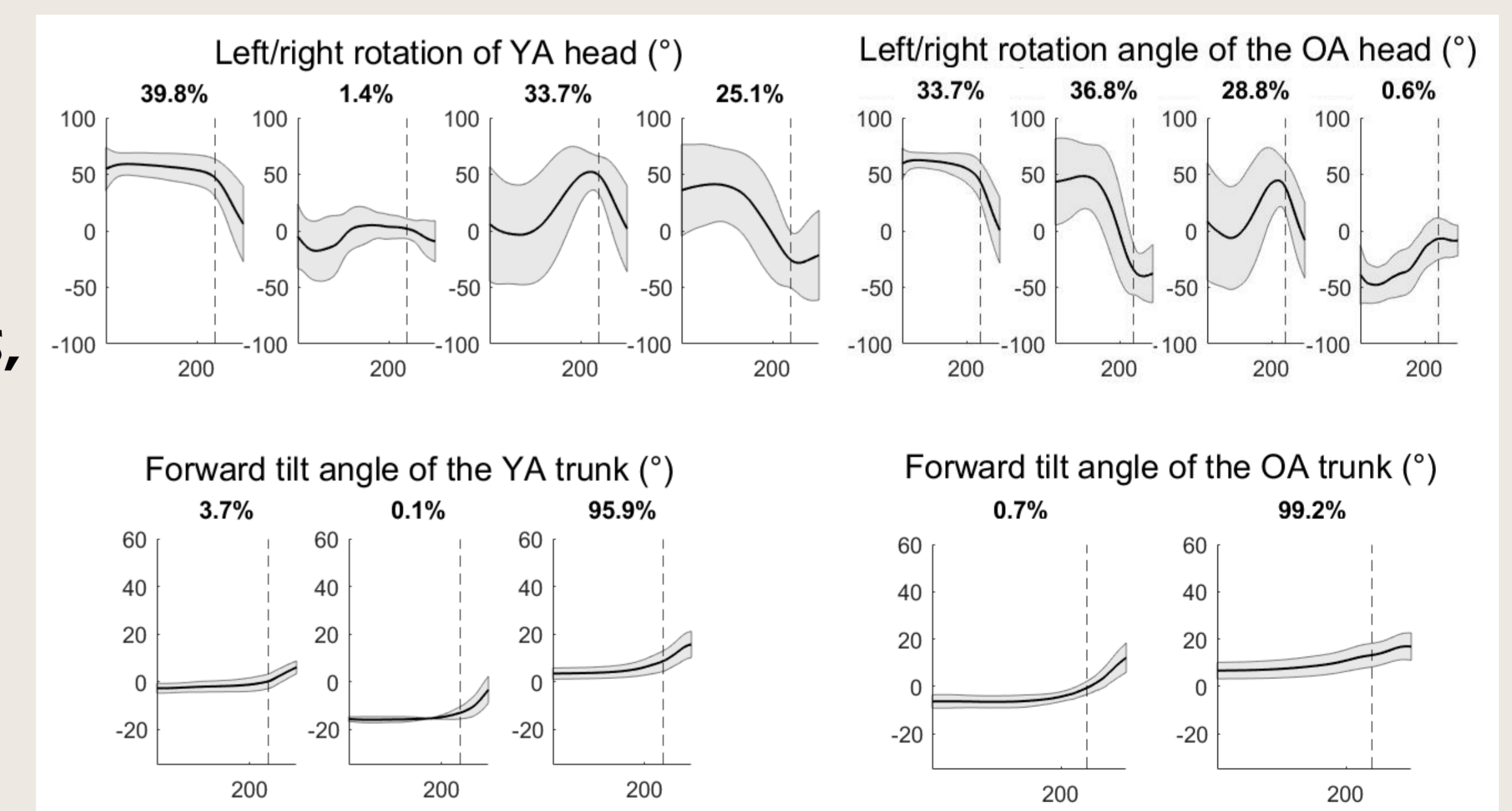
❖ Delays in body movement initiation (12 YA-16 OA)

- YA & OA: Top-down sequence to initiate the street crossing in accordance with [3]
 Head → Shoulders → Hips → Toe
- Very small effect of aging and traffic conditions (resp. $p < .001$, $\eta^2 = .04$, $p < .005$, $\eta^2 = .01$)



❖ Body segment angles profiles (29 YA-20 OA)

- Variability in left-right rotation angles profiles of the head, hips, shoulders
- Forward tilt profile of the trunk more consistent



➡ Forward head motion & trunk tilt angle promising predictors of street crossing
 ➡ Consistent body behavior between YA and OA to initiate street crossing