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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Deficits in street crossing behaviors in Older Adults (OA) [2, in a simulator]: & 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]


Identifying pedestrians’ motion invariants could be a key to safety

Between-group design

30 YA, 21-39yo

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)

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 profiles 2s before the initiation of crossing by the toe to identify specific groups of behavior.

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

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