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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Anne-Hélène Olivier, Antoine Marin, Joris Boulo, Aurélie Dommes, Gaetan Merlhiot, et al.. Body movement strategies to initiate the crossing of a street in front of traditional and self-driving cars in young and older adults. ISPGR 2022 - Congres on International Society of Posture & Gait Research, Jul 2022, Montréal, Canada. pp.1-1. hal-03921438

HAL Id: hal-03921438
https://hal.inria.fr/hal-03921438

Submitted on 3 Jan 2023

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P1-C-11

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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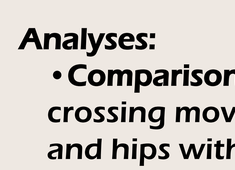
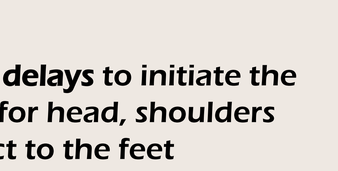
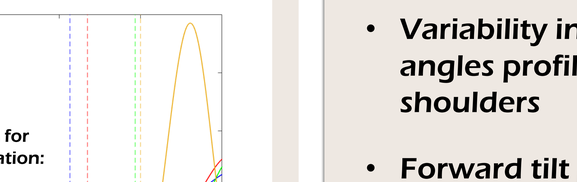


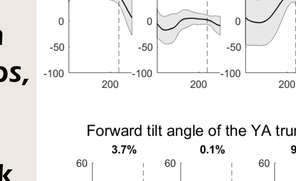
48% of pedestrians fatalities involve people aged 65 or more [1]



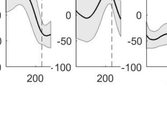
Deficits in street crossing behaviors in **Older Adults** (OA) [2, *in a simulator*]:
↘ walking speed, ↗ of risky decisions



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*]



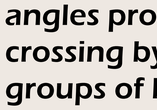
Self-driving vehicles = new challenges on the road[5]
Identifying pedestrians' motion invariants could be a key to safety



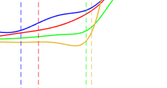
To investigate body movement strategies performed before crossing the street in OA wrt. YA in complex mixed traffic

METHODS

Between-group design

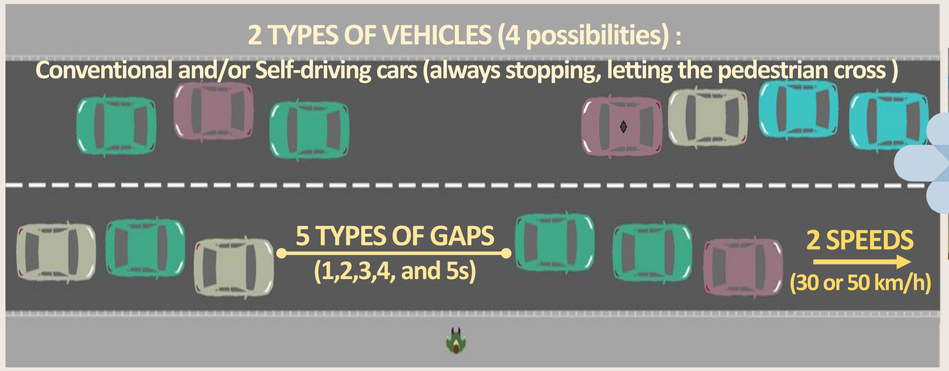


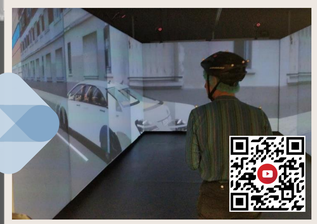
30 YA, 21-39yo



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*





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

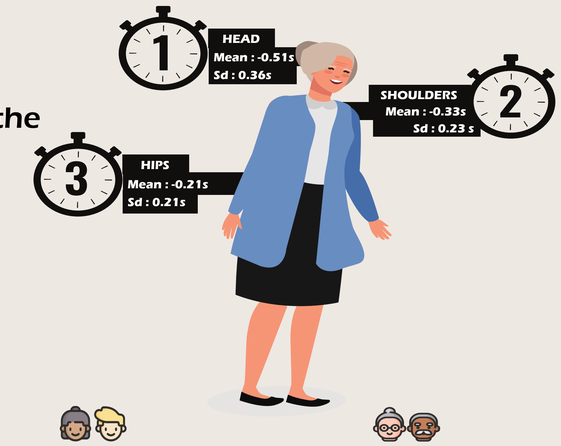
Analyses:

- **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

Acknowledgements: The present work was supported by grants from the French Ministry of the Interior, Road Safety Department. The author would like to thank the young and older adults participants for their participation, interest, and cooperation.

References: : **[1]** Sécurité Routière 2017-France **[2]** Dommes et al. Accident; Analysis and Prevention, 59, 135-143. (2013) , **[3]** Kalantarov et al. Transportation Research Part F: Traffic Psychology and Behaviour, 53, 155-171. (2018), **[4]** Sprenger et al. CASA 2019, [5] Amini et al. *Transport Reviews, 41*(6), 788-813 (2021).

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