

V O L V O

Child safety in novel vehicle seating configurations

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Child occupant protection: Latest knowledge and future opportunities

SAFER, Gothenburg, Sweden.

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Background



- Studies shown people desire to travel in face-to-face configurations for longer travels and when you are several in the cars ^{1) 2)3)}
- Reclined seating position is desired for a more comfortable and relaxed seating experience

Research ongoing for adult occupant safety in reclined seating positions

- Improving the tools
- Investigating protection principles

Aim of the presentation

Part 1)

Aim to explore possible challenges for child occupants in reclined seating positions, by investigating some potential influencing restraint parameters in the context of current protection systems using the Piper 6y Human Body Model

Part 2)

An overview of possible opportunities and challenges for child occupant protection in other novel seating configurations

Part 1)

This study will be presented at the AAAM conference 12-14 of October 2022.
It will soon be available in Traffic injury Prevention.

TRAFFIC INJURY PREVENTION
<https://doi.org/10.1080/15389588.2022.2125304>



Effects of restraint parameters using piper 6y in reclined seating during frontal impact

Katarina Bohman, Sarah El-Mobader, and Lotta Jakobsson

Volvo Car Corporation, Gothenburg, Sweden

Part 1) - Conclusions

- Reclined seating position may increase the risk of submarining
- No submarining occurred when seatbelt pretensioning was included
- Initial shoulder belt to shoulder contact improves early coupling of torso
- Include the whole context of child occupant protection when addressing novel seating



Part 2)

Novel seating

– opportunities and challenges

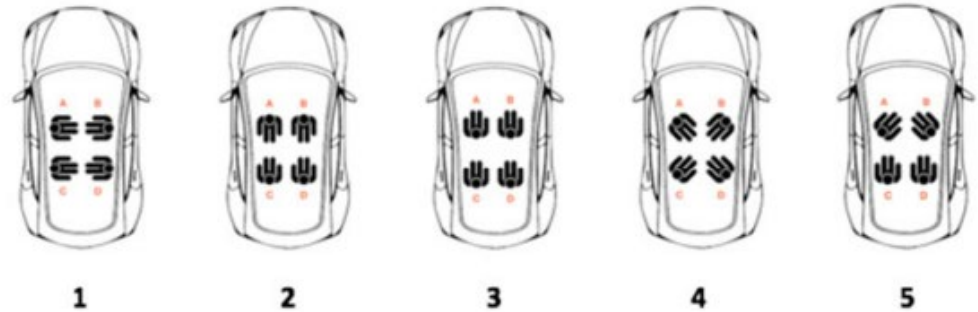
How do people want to travel in future AD vehicle?

On line survey,

including participants from Australia, Spain, Sweden, Lebanon, Colombia ¹⁾

Travelling with children – preferred seating configuration;

- 40% traditional configuration (nr 3)
- 19% face to face configuration (nr 2)



User study conducted at an exhibition in Sweden ²⁾

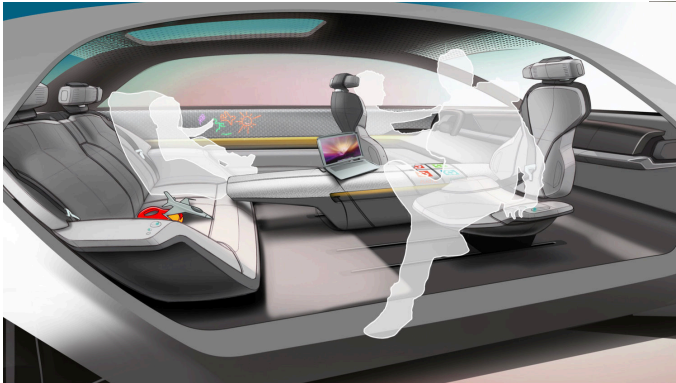
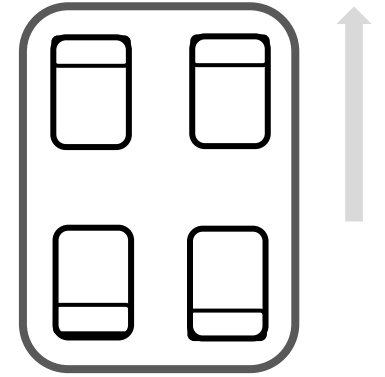
- Shorter trips – people expect to be alone, they prefer traditional forward-facing configuration with possibility to recline the seat
- Longer trips – people expect to be with other people. Prefer living room configurations
- Children showed a more acceptable attitude towards use of extra restraints in future vehicles, compared to adults.

Source: ¹⁾Koppel et al. Seating configuration and position preferences in fully automated vehicles TIP/AAAM, 2019.

²⁾Jorlov et al. Seating Positions and Activities in Highly Automated Cars – A Qualitative Study of Future Automated Driving Scenarios, IRCOBI, 2017.

Opportunities with Face-to-Face configurations

- Increased communication possibility when facing each other
- Rear-facing front seats –
 - Offers rear-facing travelling for both adults and children



Source: www.granstudie.com/grammer

2022.09.21



Source: Volvo Cars



Source: Levallois, Bohman, Recko, Renaudin, Novel seating positions in automated vehicles, POCC, 2019.

Challenge:

Potential confusion when installing child restraints in vehicle seating configurations with different orientations

- Increased risk of misuse when installing child restraints with different travel directions in vehicle seating configurations with different orientations

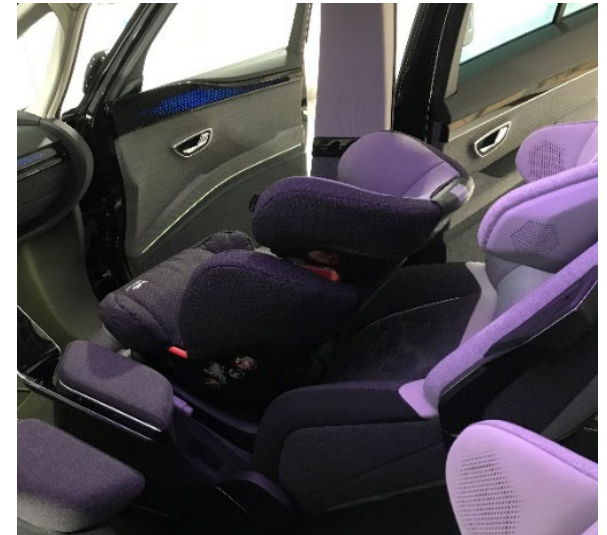
Misuse example: rearward facing CRS in a rearward facing first row seat.



Source: Levallois, Bohman, Recko, Renaudin, Novel seating positions in automated vehicles, POCC, 2019.

Challenge: Child seats installed in reclined vehicle seating positions

- Booster seat not compatible with reclined vehicle seat
- How to install a forward facing harness seat in a reclined vehicle seat?



Source: Levallois, Bohman, Recko, Renaudin, Novel seating positions in automated vehicles, POCC, 2019.

Challenge: Child seats installed behind a reclined front seat

- Limited space behind the reclined front seat



Source: Levallois, Bohman, Recko, Renaudin, Novel seating positions in automated vehicles, POCC, 2019.

Shared mobility

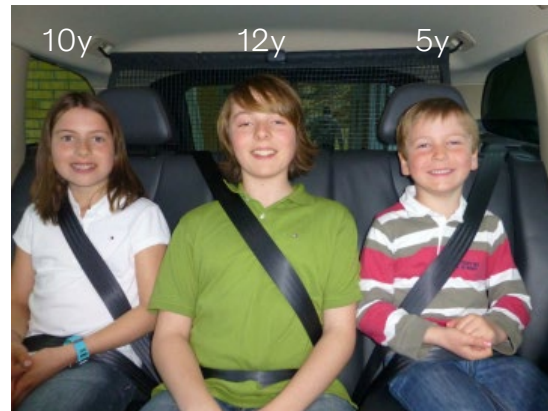
- Novel seating in automated vehicles may also be strongly connected with shared mobility
- To ensure child restraint usage in shared mobility
 - Accessible
 - Portable or integrated child restraint system
 - Easy to use



Summary

Include the whole context of child occupant protection when addressing novel seating

- Development of tools, methods, legal requirements, and restraint systems for child occupant safety in novel seating have to start NOW
- Boosters should be developed in modern vehicles restraint environment
- Booster, vehicle seat and seat belt ->one restraint system



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