Fit to Drive
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Age related differences in anticipation, adaptation and distraction: Insights from driving simulator studies

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Introduction

1. Anticipation of upcoming events is crucial for driving performance and safety.
2. Managing two or more tasks is necessary in most driving situations.
3. Driving simulation studies were conducted to investigate anticipation and dual-task behaviour.

Research questions:

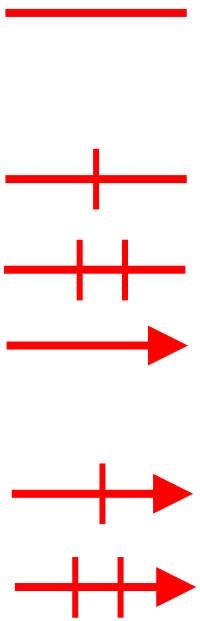
- To what extend can younger and older drivers benefit from advanced information?
- Do younger and older drivers handle dual-task situations differently?
- Does praxis help to improve dual-task management?

Experiment 1: Event Preparation

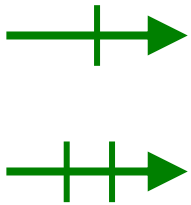
1. Lane change manoeuvres were performed by older and younger participants.
2. Systematic variation of cuing parameters: “number of lanes”, “direction”.
3. Dependent variables: RT, error rate, kinematic variables.
4. The two groups consisted of 8 younger (25 y) and 8 older (59 y) participants.

Experiment 1: Event Preparation

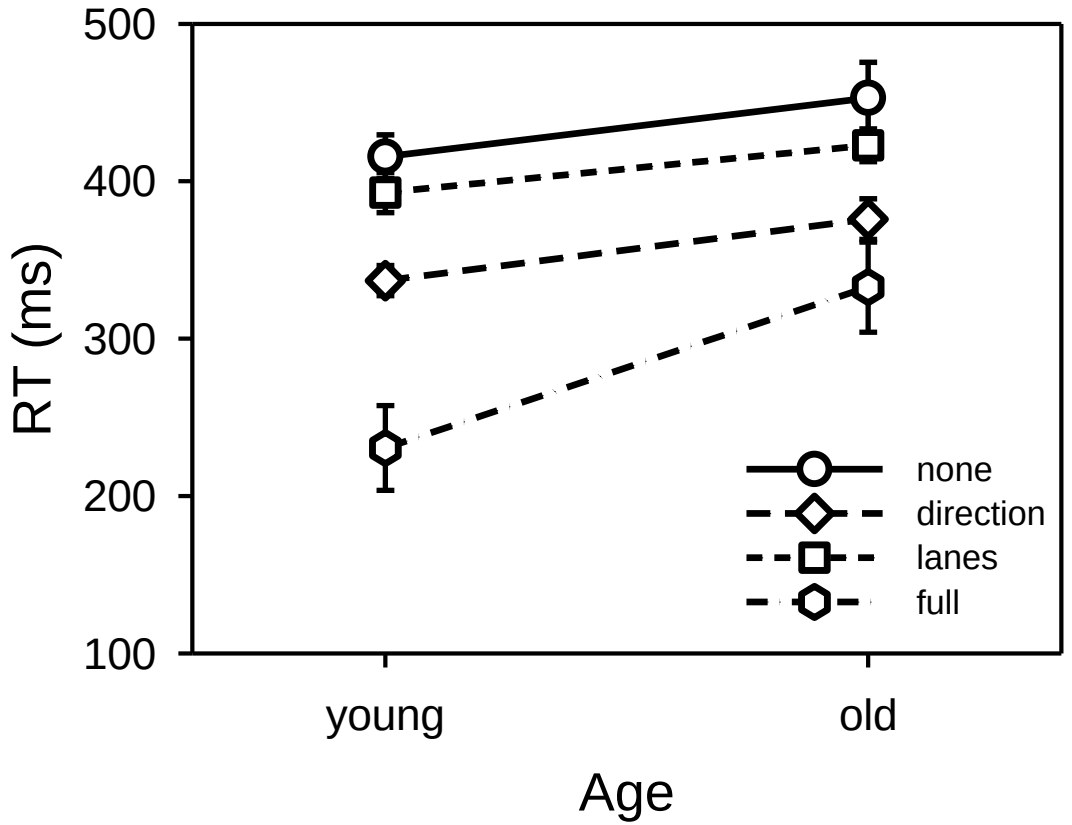
Cues:



Response Signals:

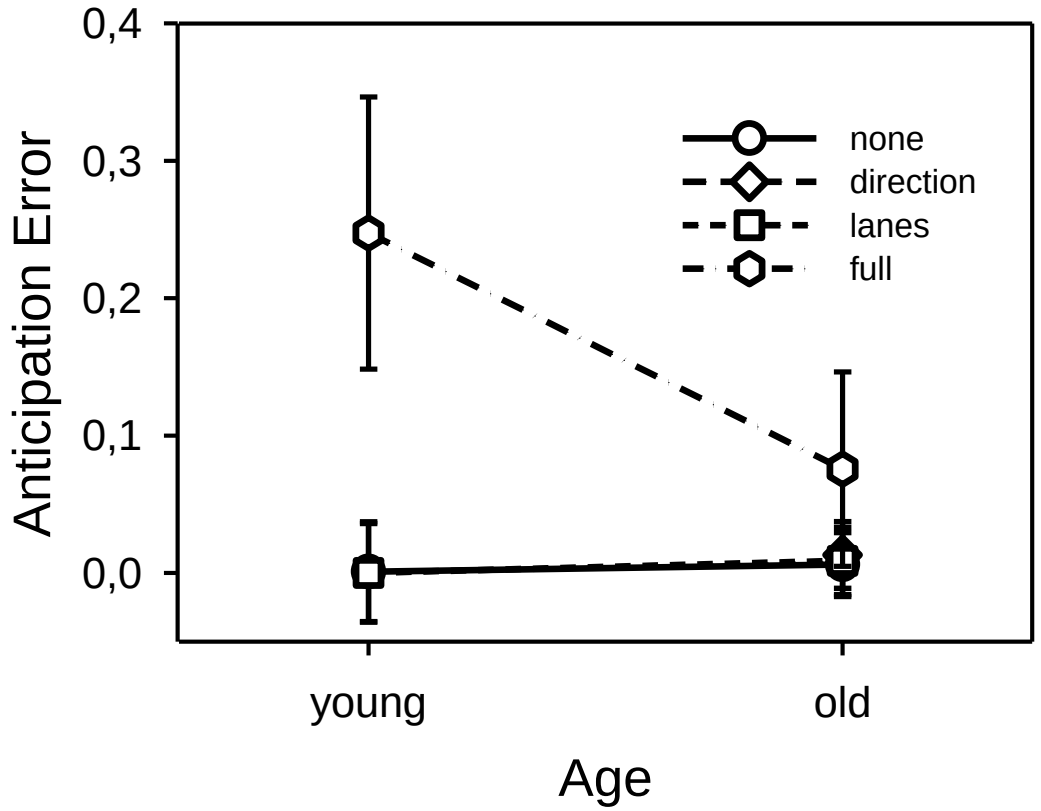


Results: Reaction Time



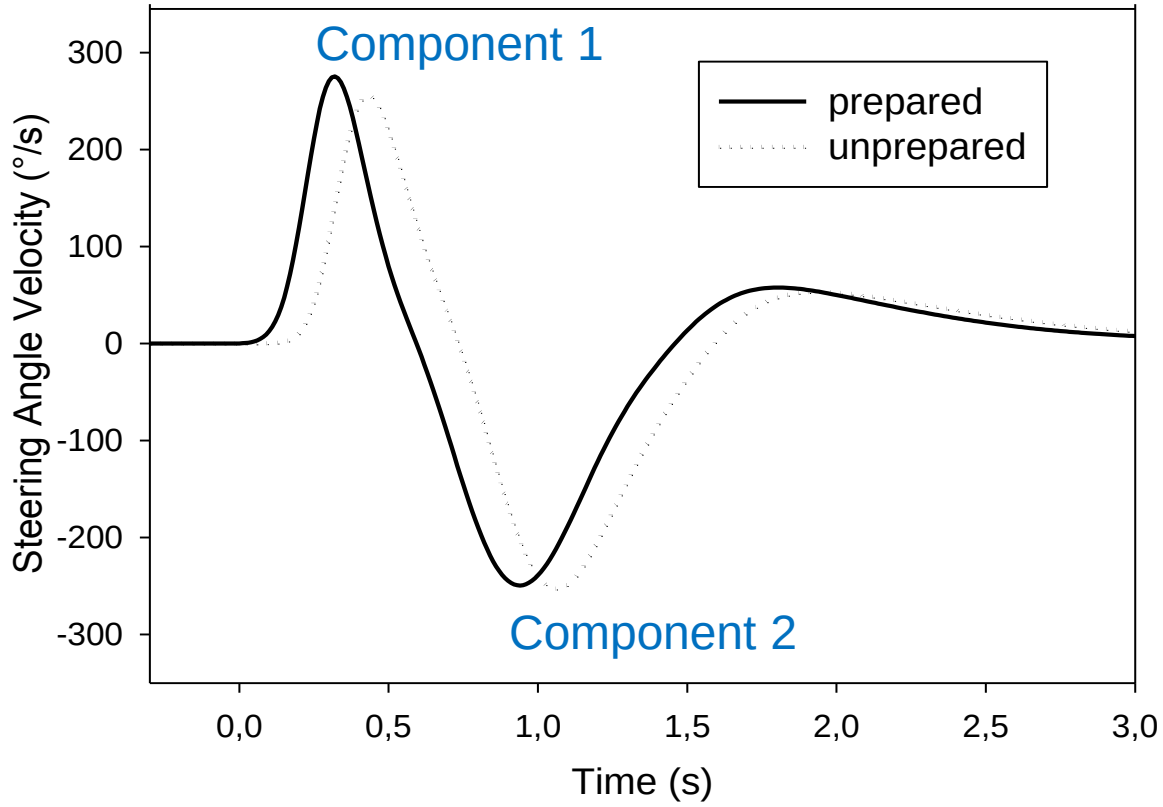
Rinkenauer (2014)

Results: Anticipation Error



Rinkenauer (2014)

Results: Kinematic effects



Results: Kinematic effects

	Age p / η_G^2	Preparation p / η_G^2	Age x Preparation p / η_G^2
Total Duration	< .03 / .32	--	--
C1 Duration	--	< .001 / .02	--
C2 Duration	<.02 / .34	--	--
C1 Shape	--	<.001 / .16	<.03 / .04
C1 Amplitude	<.05 / .25	<.02 / .001	
C2 Amplitude	<.05 / .25		

Rinkenauer (2014)

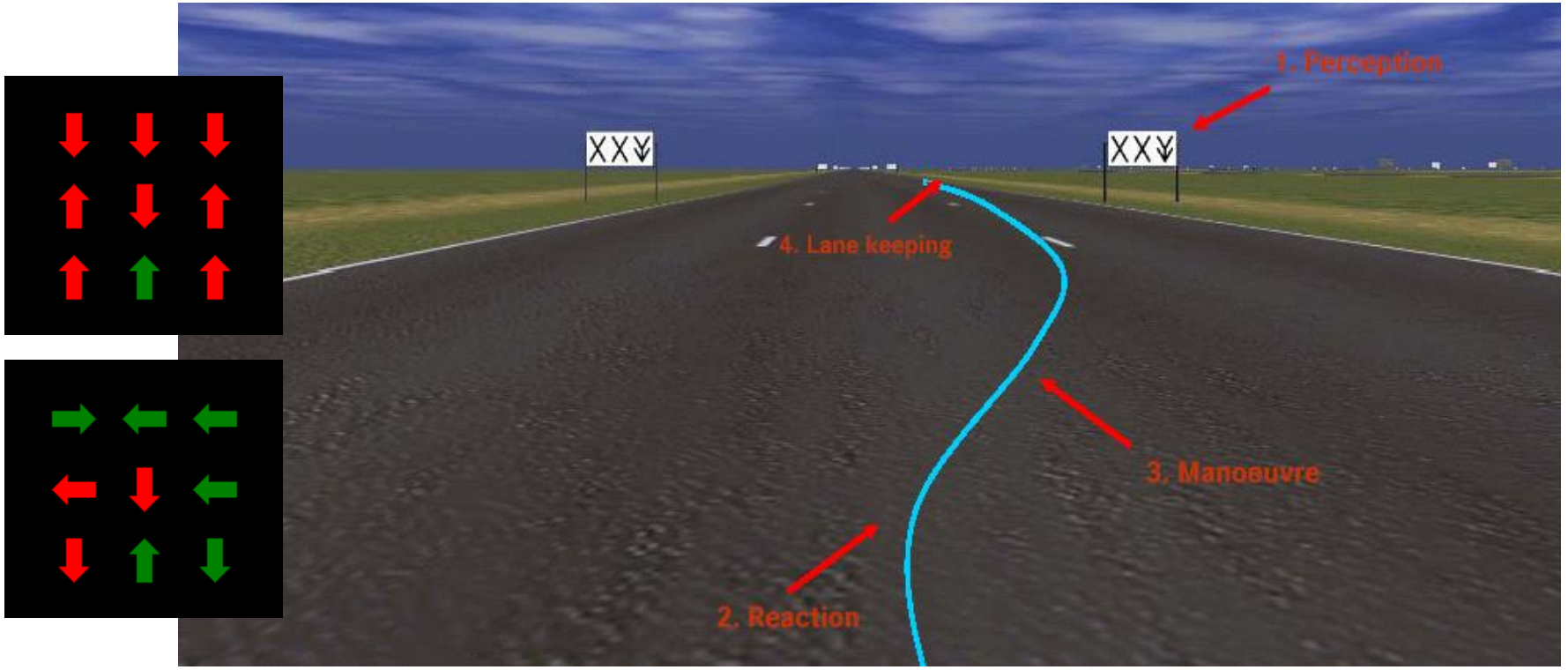
Summary Experiment 1

1. Younger and older participants benefit from advanced information.
2. There seem to be differences in information processing and steering behaviour.
3. Analysis of kinematic variables may allow to infer the state of the driver.

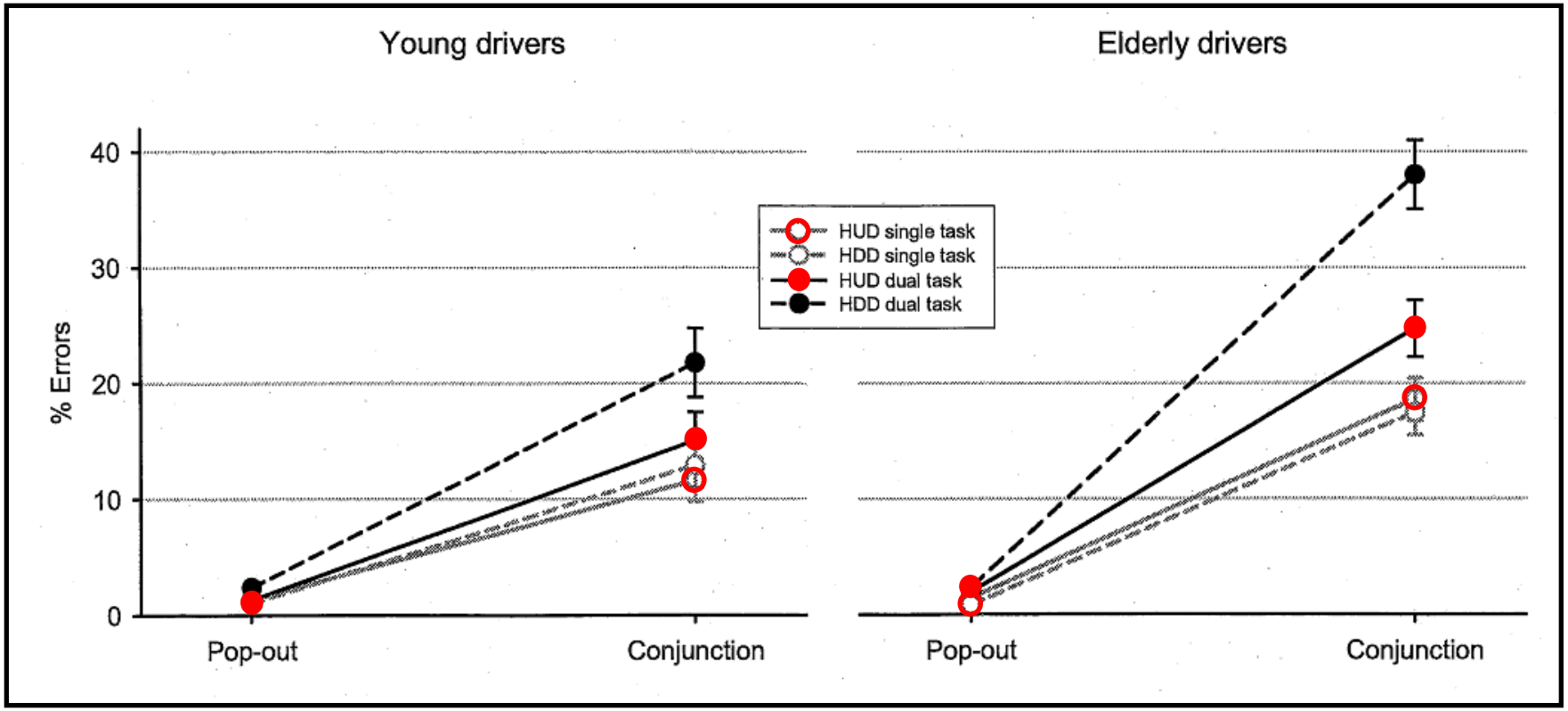
Experiment 2: Dual-Task Situation

1. Lane change manoeuvres were performed by older and younger participants.
2. Systematic variation of the complexity of a search task (secondary task).
3. Two different display locations (HUD vs. HDD).
4. Dependent variables: Error rate of secondary task.
5. The two groups consisted of 20 younger (23 y) and 20 older (60 y) participants.

Dual-Task Situation



Results: Errors in the secondary task



Wilschut, Rinkenauer, Wijers, Brookhuis, Falkenstein (2009)

Summary of Experiment 2

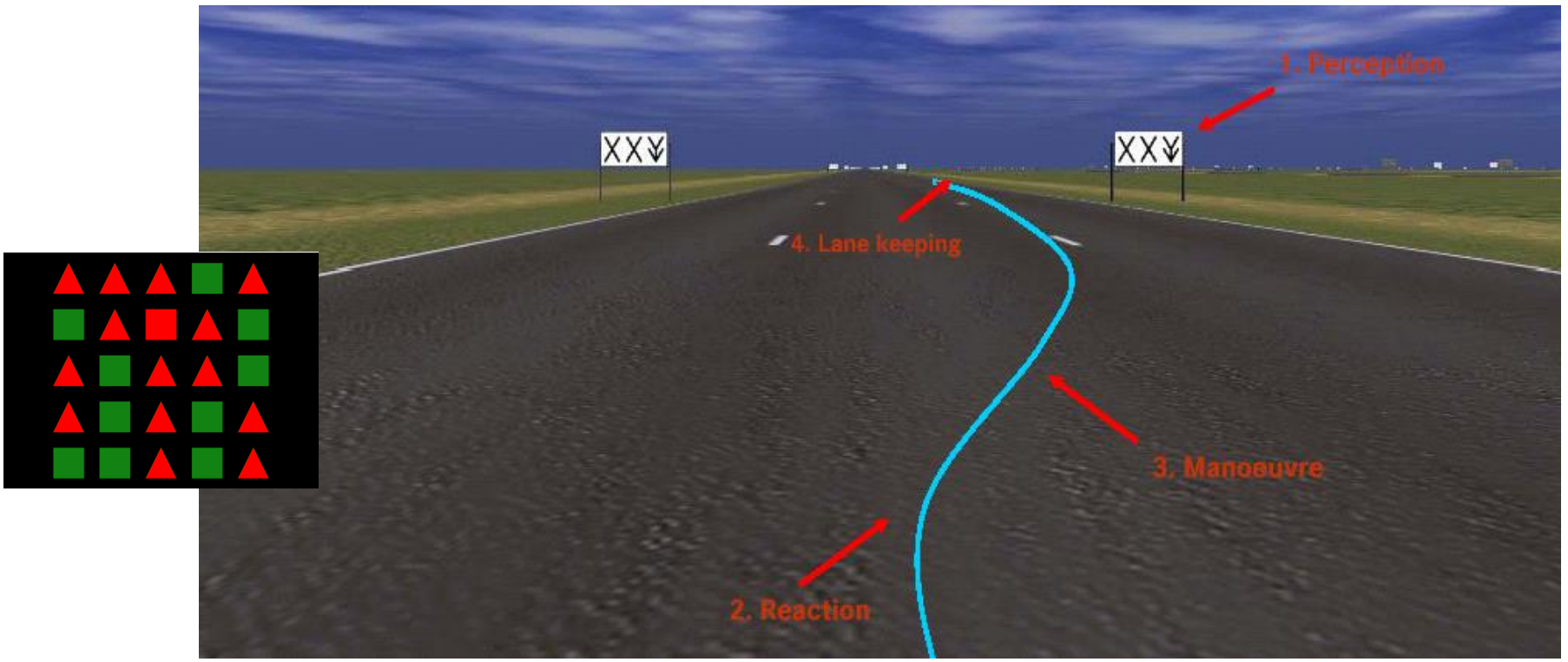
1. Older participants are suffering from high loads of secondary task information.
2. If secondary task load reaches a certain level, the task cannot be processed anymore.
3. The location of complex secondary task information reduces task load at least partially.

Experiment 3: Adaptation to Dual Tasks

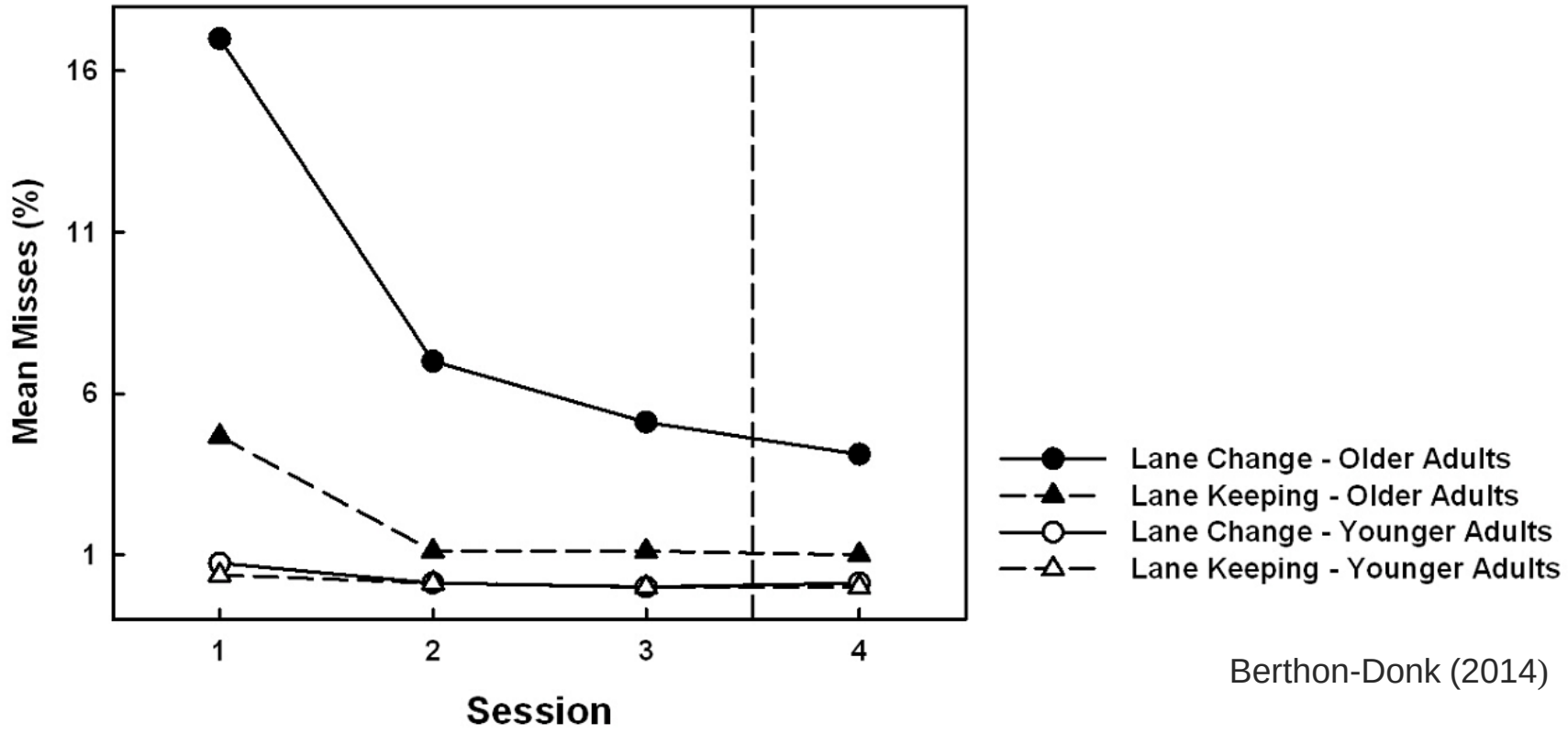
1. Lane change manoeuvres were performed by older and younger participants.
2. Systematic variation of the complexity of a search task (secondary task).
3. Performance of the secondary task in easy and difficult driving situations.
4. Conduction of 4 experimental sessions distributed over several weeks.
5. Dependent variables: Error rate of secondary task (Misses).
6. The two groups consisted of 10 younger (23 y) and 10 older (70 y) participants.

Adaptation of Dual Tasks

adaptation
A Marie Curie Initial Training Network



Adaptation to Dual Tasks



Berthon-Donk (2014)

Summary and Conclusion

1. Younger and older participants benefit from advanced information, however there seem to be differences in information processing and steering behaviour.
2. Older participants are suffering from high loads of secondary task information.
3. The location of the secondary task information reduces task load at least partially.
4. A considerable benefit of training was found for older participants.

The findings of the three experiments may have implications for the information design of driver support systems. Advanced information facilitates the responses to upcoming events for both age groups but may lead to risky behaviour in younger drivers. Especially older driver benefit from training to reduce secondary task load which may initially occur during the introduction of new support systems.

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