



**DDI 2024**  
MICHIGAN  
October 22–24

**tu** technische universität  
dortmund



LEIBNIZ RESEARCH CENTRE  
FOR WORKING ENVIRONMENT  
AND HUMAN FACTORS

# Effect of **Conflicting** Information on **Driving Behaviour** in a **Lane Change Task**

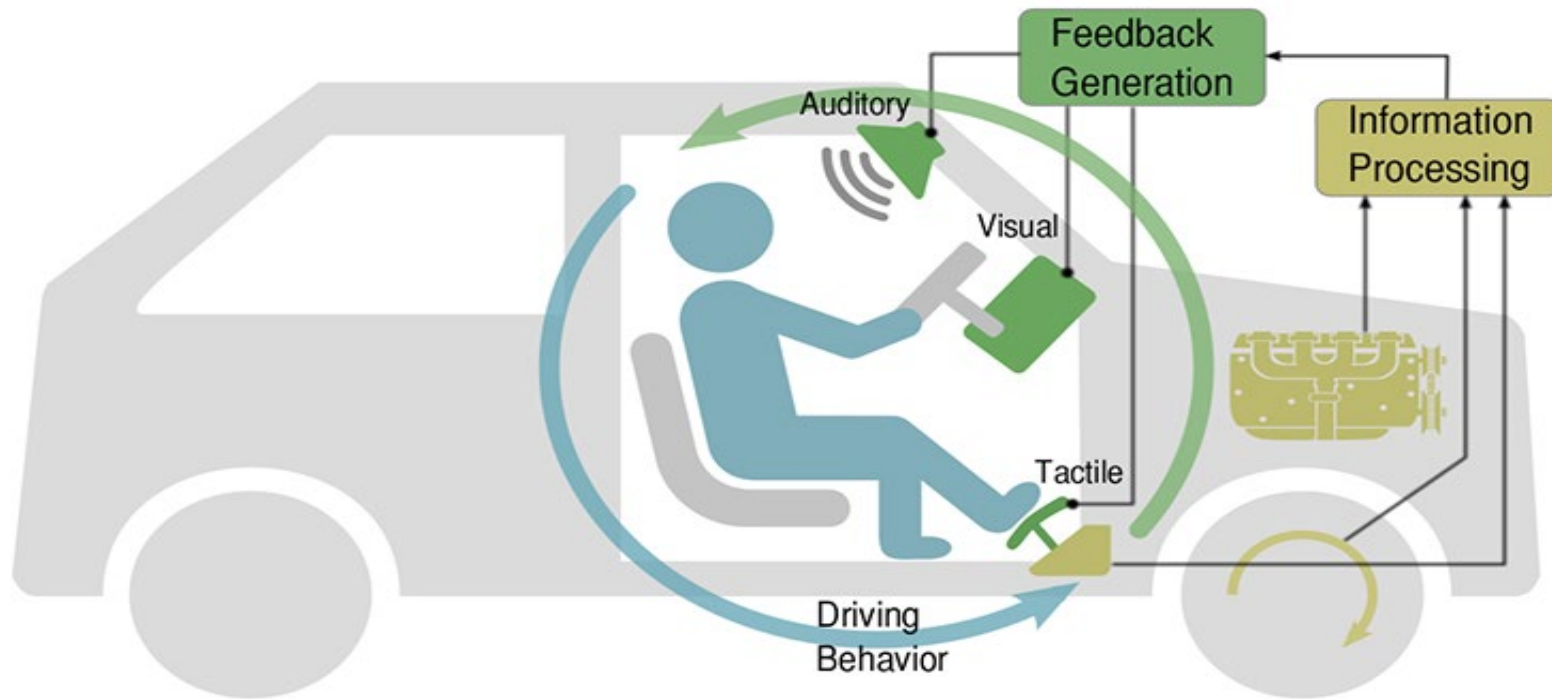
---

By

**Nikita Rajendra Sharma\*, Jai Prakash Kushvah, & Gerhard Rinkenauer**

# Introduction

- Importance of Preparatory information in driving
- Impact of conflicting information from different sensory modalities
- Driving requires real-time integration of sensory information

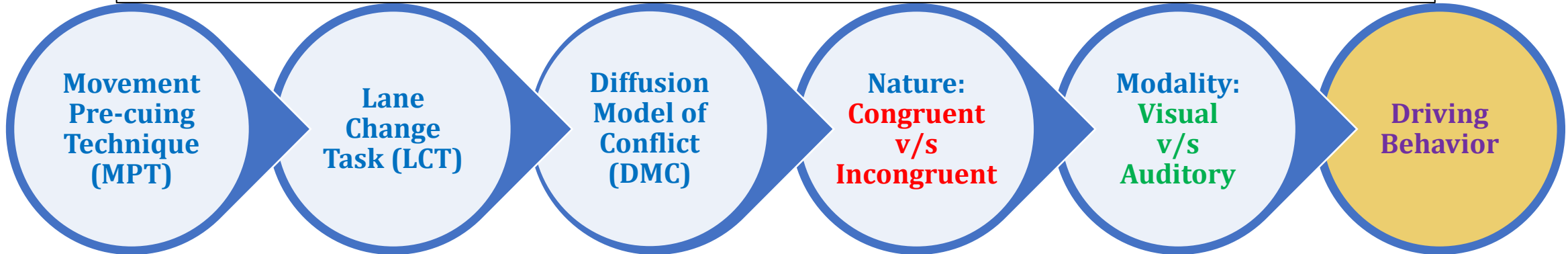
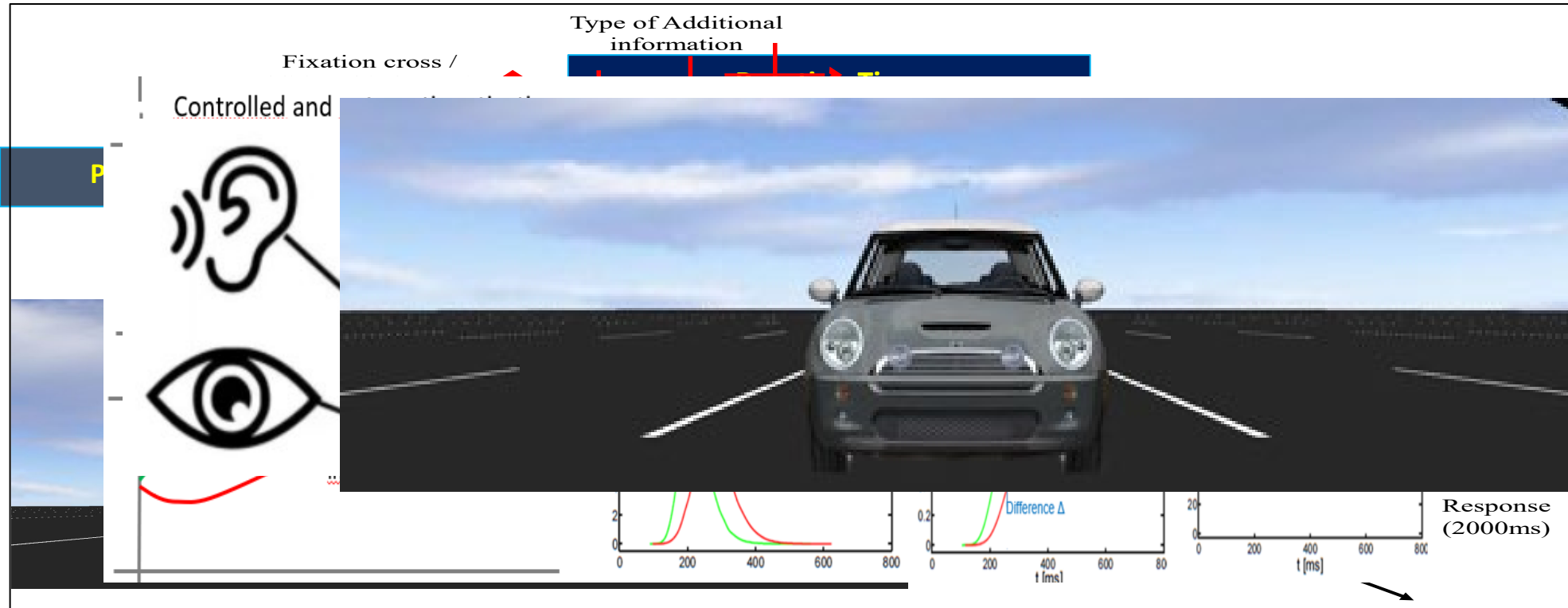


# Research Gap

- **Proof of Concept** ~ Advance response preparation during lane change task  
    **Conflicting processing of visual and auditory information while driving a car**
- **The impact of conflicting modalities on response preparation during driving (Lane Change) is not adequately addressed.**



# Theoretical Framework





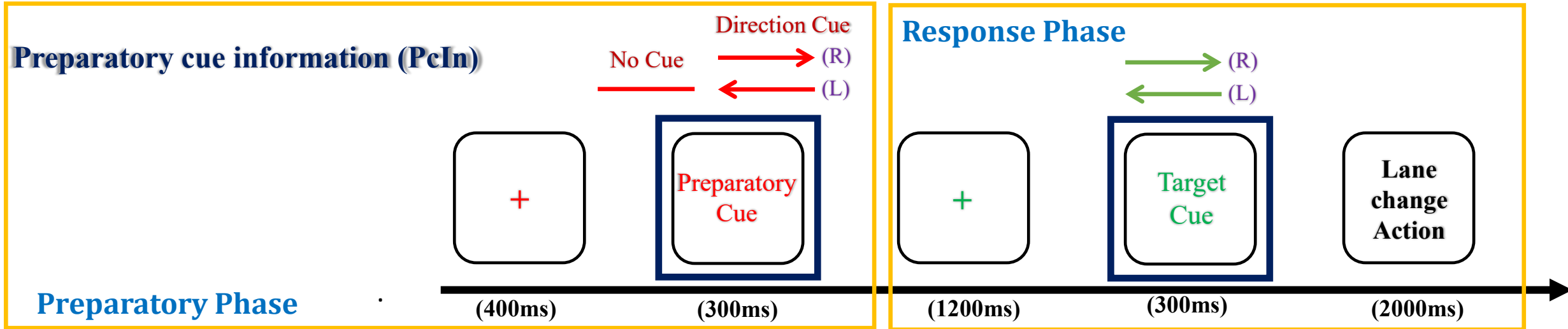
# Research Objective

- **Examine the effect of preparatory and conflicting information**
- **Investigate visual versus auditory cues in the lane change task**

## Hypothesis

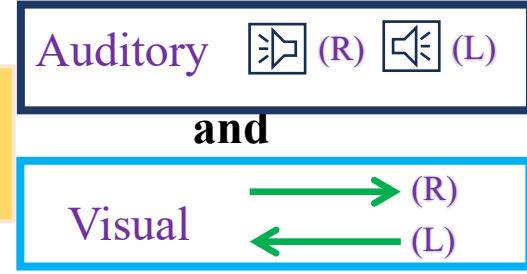
- **Anticipatory response preparation improves reaction time and steering performance**
- **Conflicting information leads to longer response time and also impairs performance, especially with auditory cues ~ Visual cues are expected to be more effective cues in lane change**

# Method (Task overview)



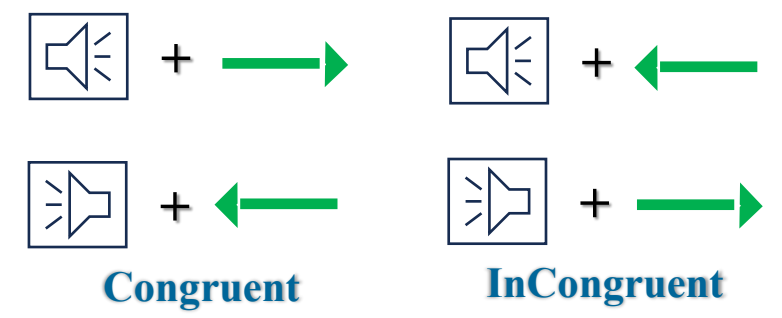
## Sensory Mode of Target cue (SMTc)

Participants were presented with Target cues in both auditory and visual mode but instructed to act according to only one modality cues (visual or auditory)

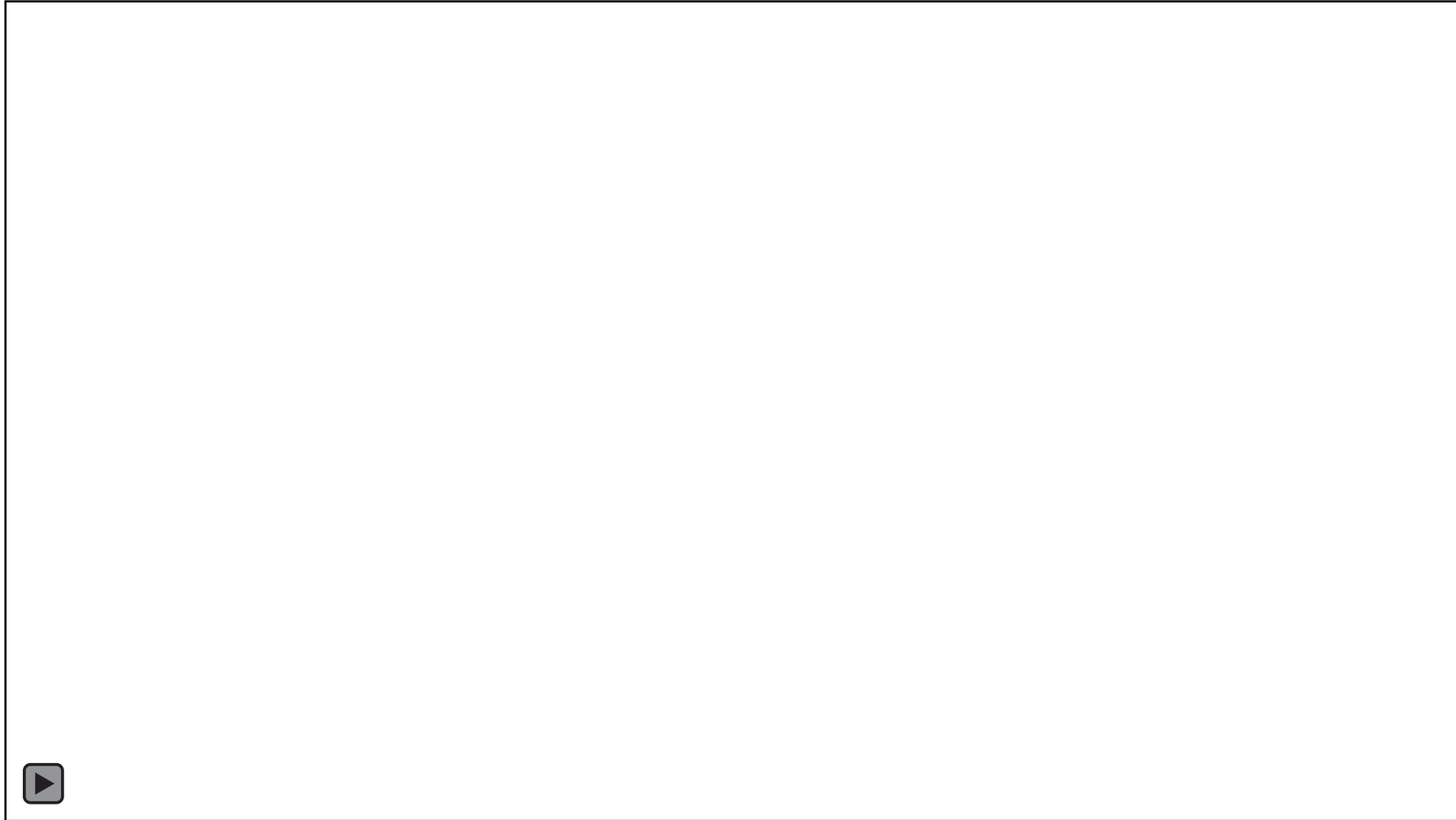


## Target cue Type (TcT)

*The preparatory cues were always consistent with the target cue. So where is the conflict?*



# Method (Task run)



**Sample: 20 frequent car drivers (24.40 ± 3.27 years, Mean Driving experience = 6.10 ± 3.14 years)**

# Result

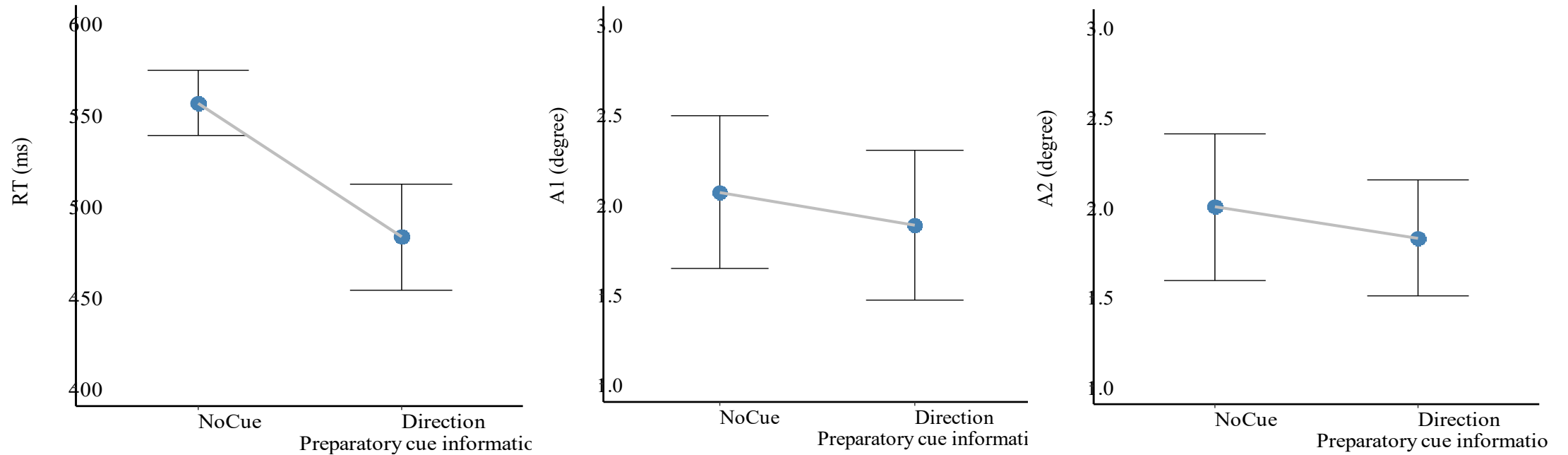
- Analysis of Results

□ Sta	LCT Measure	Experimental effects	F	P	$\omega^2$
	RT	PCIn	41.55	<.001	0.35
		TcT	52.34	<.001	0.15
□ Int		SMTc	12.65	.002	0.13
□ Sp		SMTc X TcT	41.51	<.001	0.11
		PCIn X TcT	6.78	0.02	0.01
	A1	PCIn	31.75	0.001	0.64
		SMTc	4.32	0.05	0.19
		SMTc X TcT	5.64	0.03	0.24
	A2	PCIn	8.38	0.01	0.01
		TcT	4.42	0.05	0.003
		PCIn X Gender	4.47	0.05	0.005

*ANOVA results assessing the relationship between experimental main effects and LCT measures.*

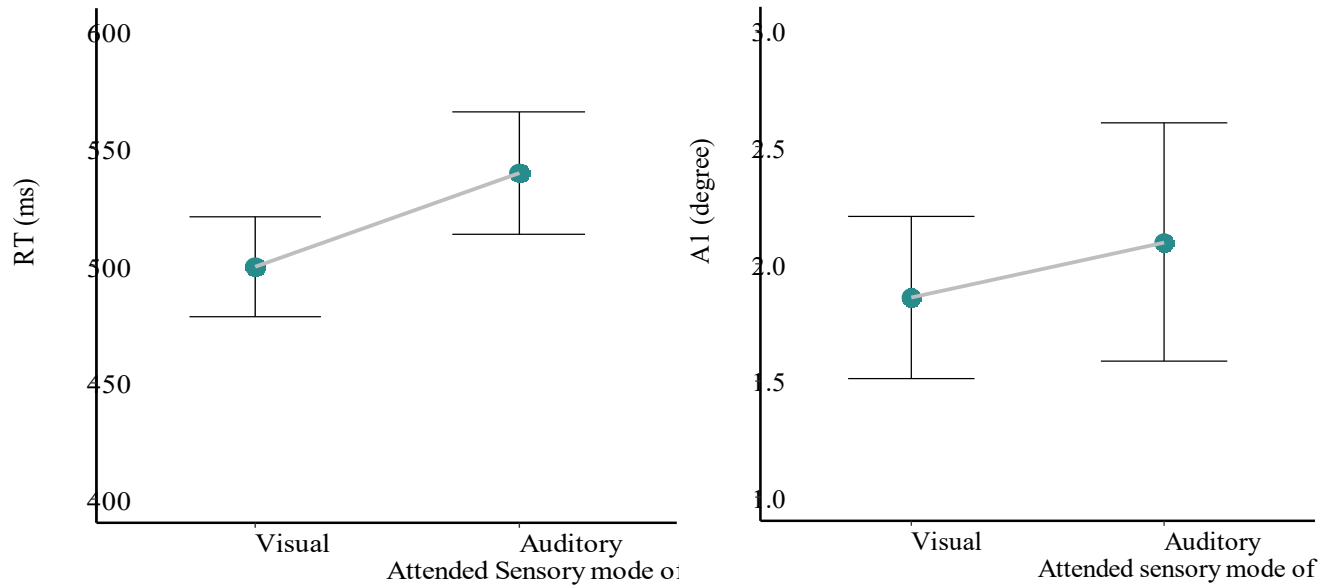
*PCIn: Preparatory Cue Information, TcT: Target Cue Type, SMTc: Sensory Mode of Target Cue.*

# Result

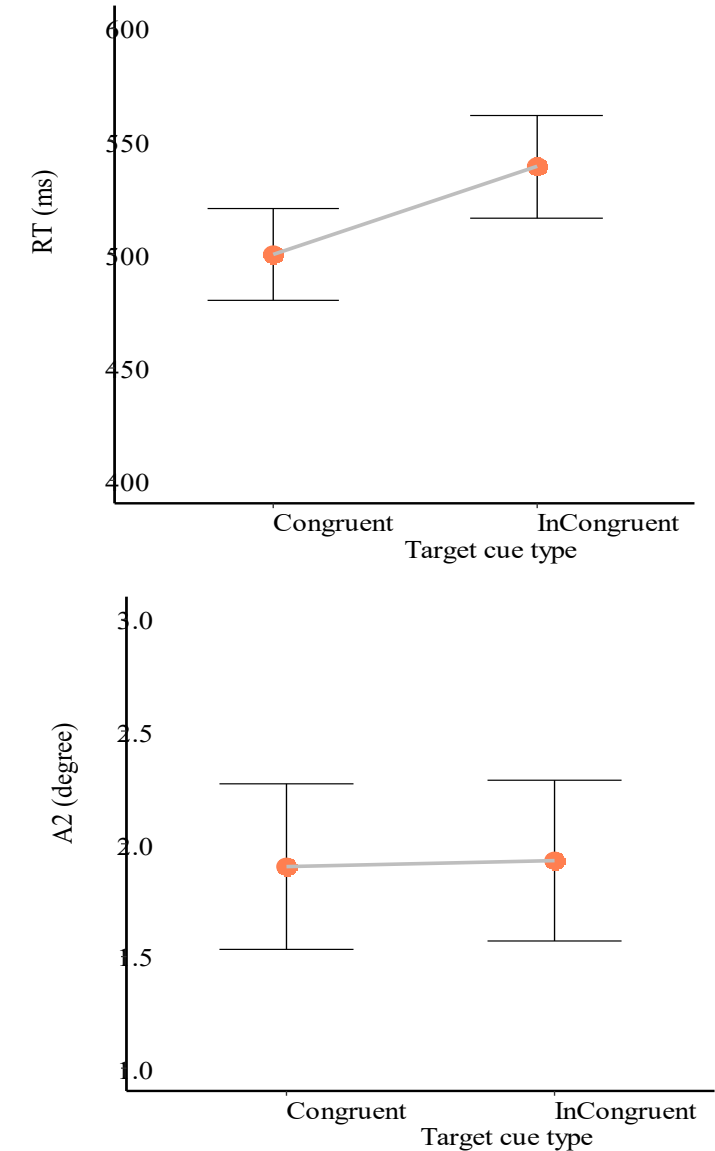


*Plots showing the mean comparison (with  $\pm 95\%$  confidence interval (CI)) for RT, A1, and A2 as a function of Preparatory Cue Informativity (PCIn).*

# Result

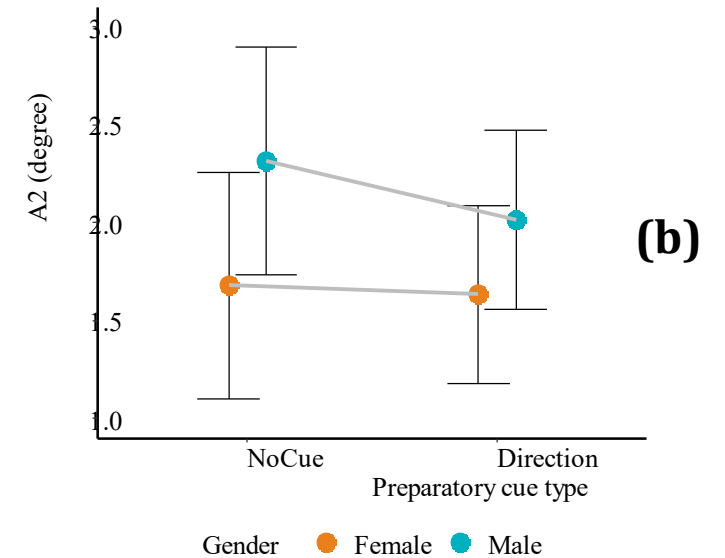
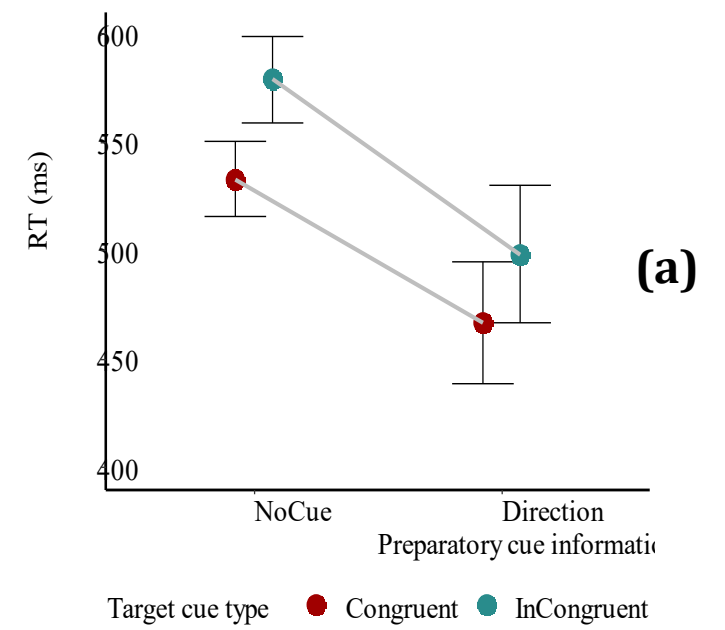
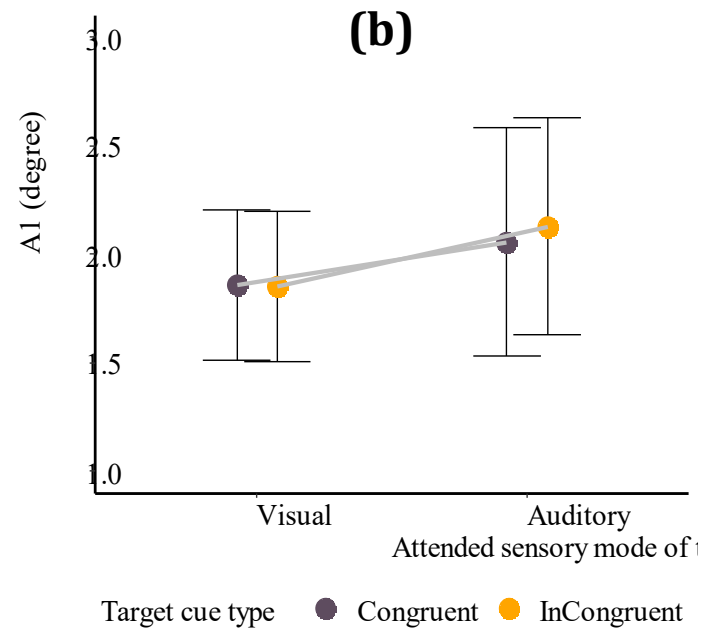
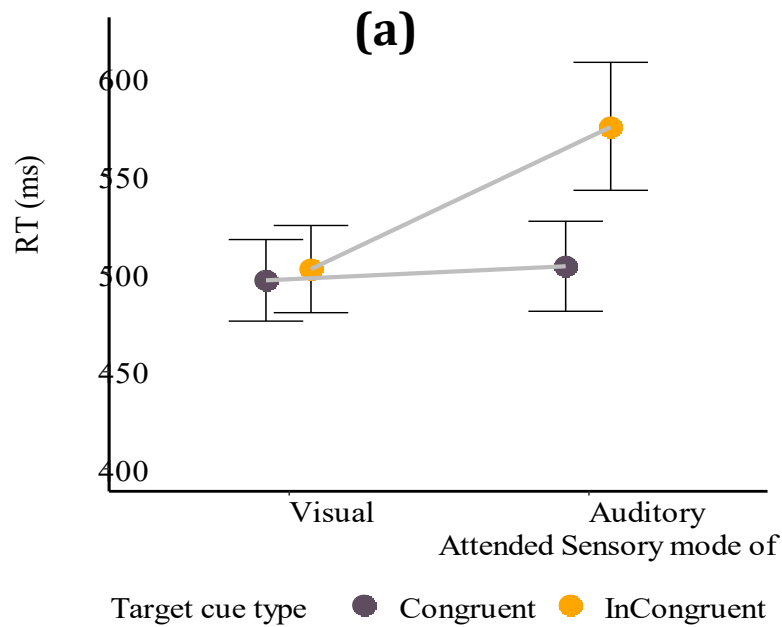


Plots showing the mean comparison (with  $\pm 95\%$  confidence interval (CI)) for RT and A1 as a function of Sensory Mode of Target cue (**SMTc**).



Plots showing the mean comparison (with  $\pm 95\%$  confidence interval (CI)) for RT and A2 as a function of Target cue Type (**TcT**).

# Result



Plots showing the mean comparison (with  $\pm 95\%$  confidence interval (CI)) for (a) RT and (b) A1 as a function of attended Sensory Mode of Target cue (SMTC) and Target cue Type (TcT)

Plots showing the mean comparison (with  $\pm 95\%$  confidence interval (CI)) for (a) RT as a function of Preparatory Cue Information (PCIn) and Target cue Type (TcT), and (b) A2 as a function of Preparatory Cue Information (PCIn) and Gender.

# Discussion

## Key Findings:

- Preparatory information reduced RT and improved steering control.
- Visual cues outperformed auditory cues in facilitating responses

## In-depth Results

### Conflict Effects:

- Greater conflicts were observed when participants followed auditory cues.
- Significant increases in RTs and steering angle deviations during incongruent trials.

Analysing the steering reaction dynamics beyond the RT analysis provides information on how conflicts in information processing affect the post-RT action processes and helps to gain a deeper understanding of the mechanisms of conflictual information processing while driving.

## Connection to Literature

### Key Points:

- Align findings with existing research.
- Contribution to the diffusion model of conflict.



## Traffic Psychology

- Novel insights into sensory processing in driving.
- Importance of congruency in the information presented to drivers.
- Implications for designing more effective driver assistance systems.

## Real World Application

- Recommendations for integrating findings into driver training programs.
- Potential for improving technology in navigation and assistance systems.
- Importance of understanding cognitive interference during distraction in real-world driving scenarios.

## Limitation and Future Research

- Acknowledgment of study limitations (e.g., small sample size).
- Suggestions for further research exploring diverse populations and driving conditions.
- Explore the implications for driver assistance systems

## Conclusion

- Reiterating the significance of congruent information in enhancing driving performance.
- Conflicting information has a pronounced negative effect on driving performance, especially with auditory cues.
- Importance of congruent and well-timed cues in driving contexts.
- Call for continued research in this area to inform future safety measures

# Acknowledgement



Prof. Dr. Gerhard Rinkenauer  
(Supervisor)



Jai Prakash Kushvah  
(PhD student)

Hanno Mussmann  
(Technical staff)

Larisa  
(Student assistant)

Carola Reiffen  
(Lab manager)

**THANK YOU**



**“What are your thoughts on how conflicting information impacts our daily driving?”**