

# The effect of temporal auditory cues on road hazard perception

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## Introduction



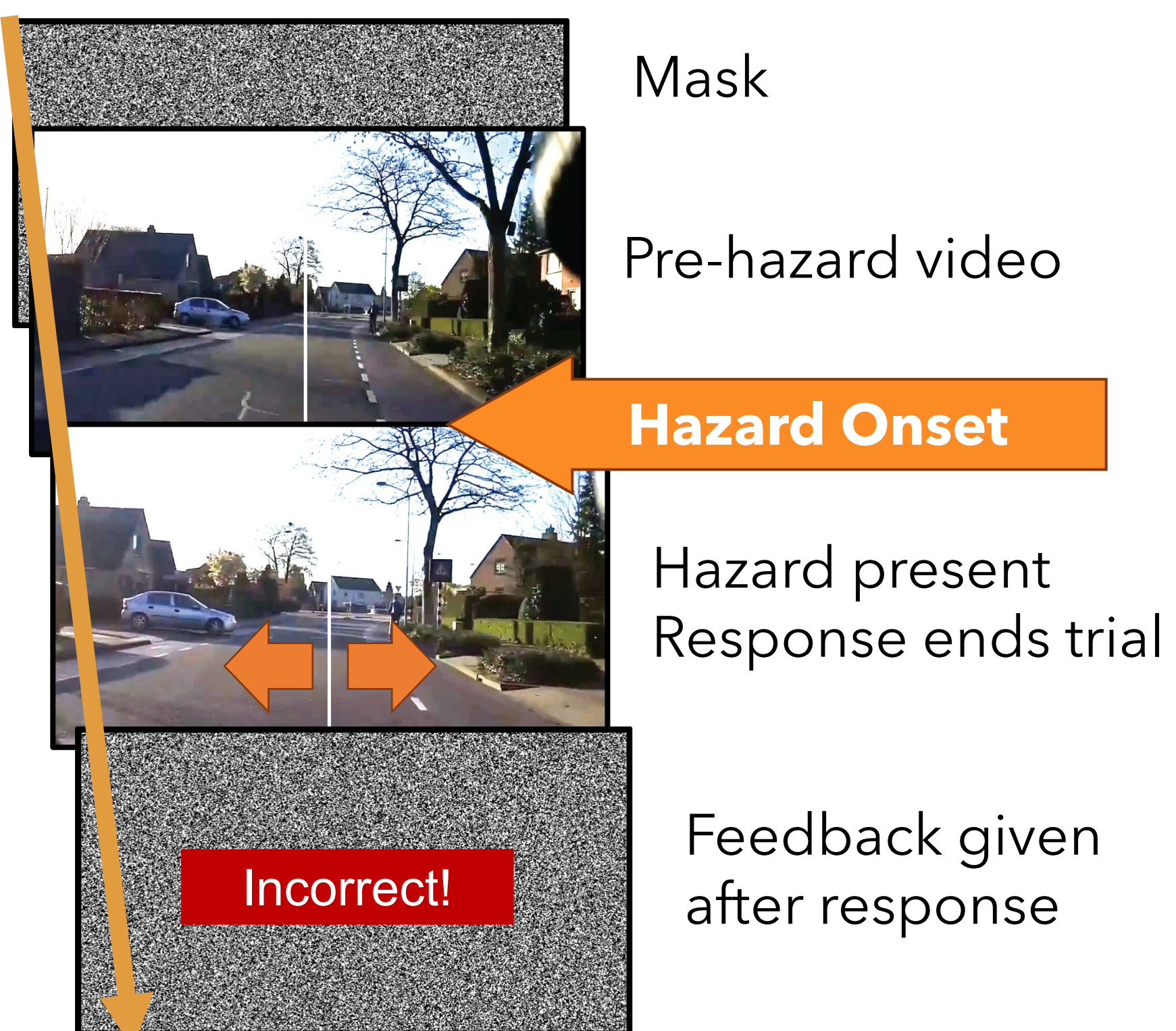
- Safe driving requires knowing when and where a hazard occurs
- Cuing the driver's attention to the hazard location can speed hazard localization<sup>1</sup>

## What happens when the car is wrong?

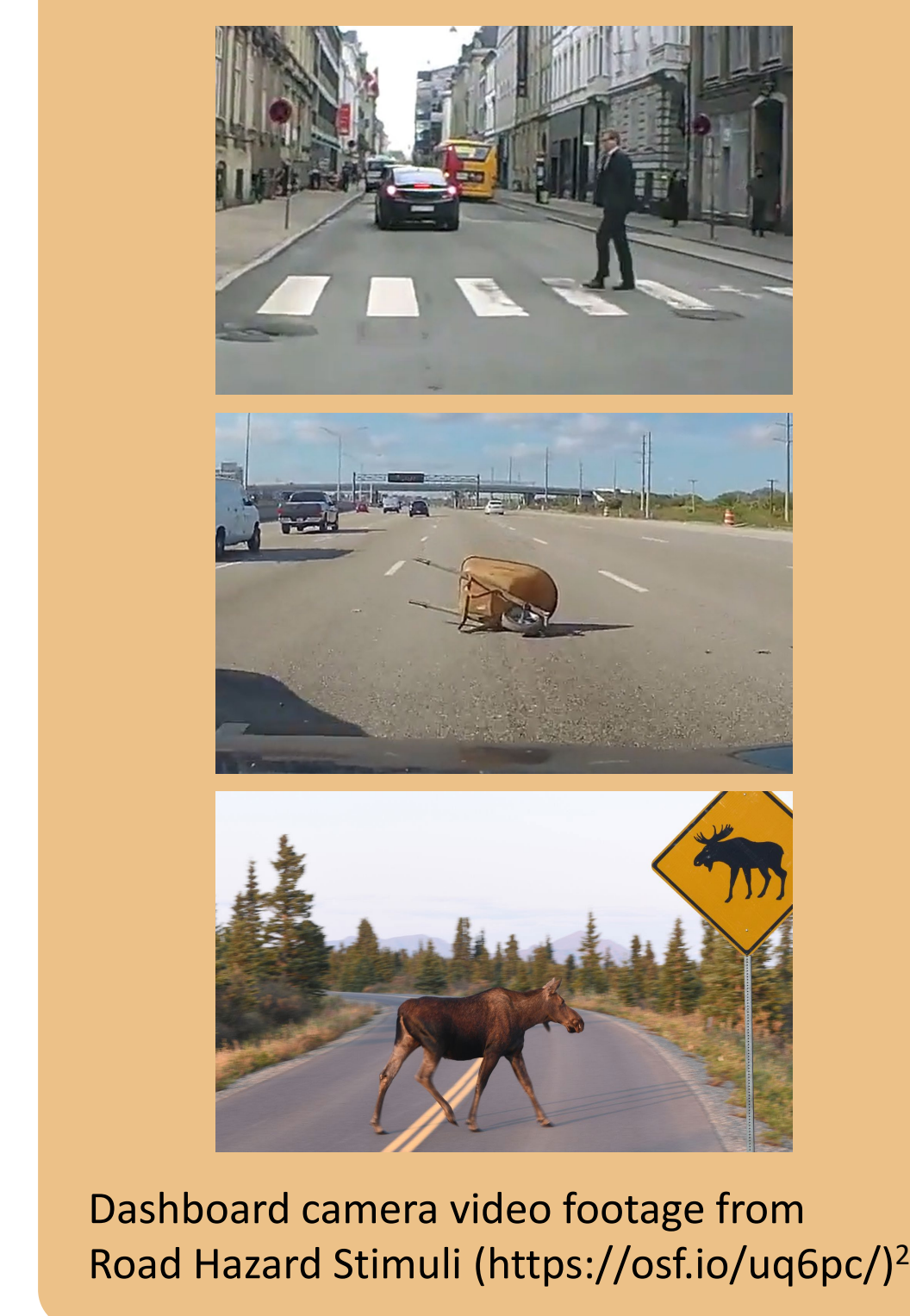
Exp 1: Are early or late warnings helpful?  
 Exp 2: How useful are unreliable cues?

## Methods

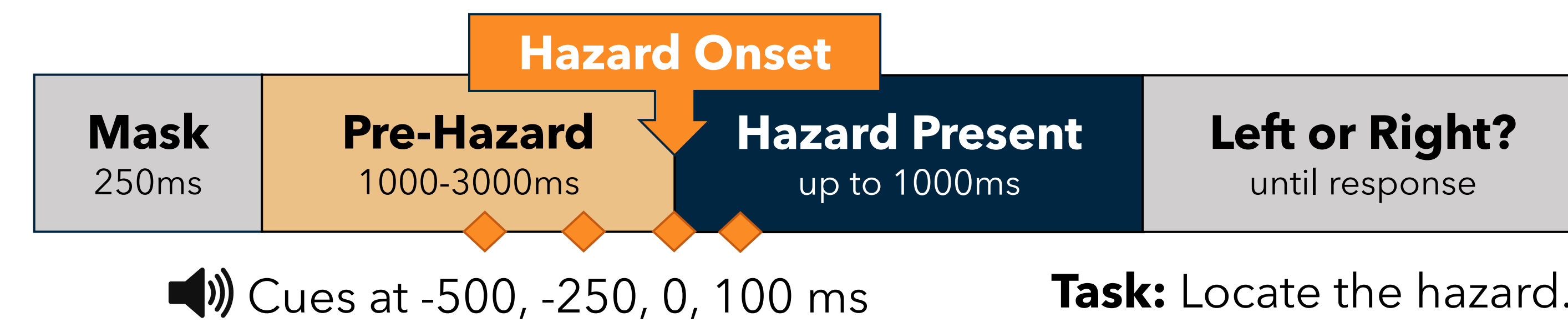
### Stimuli



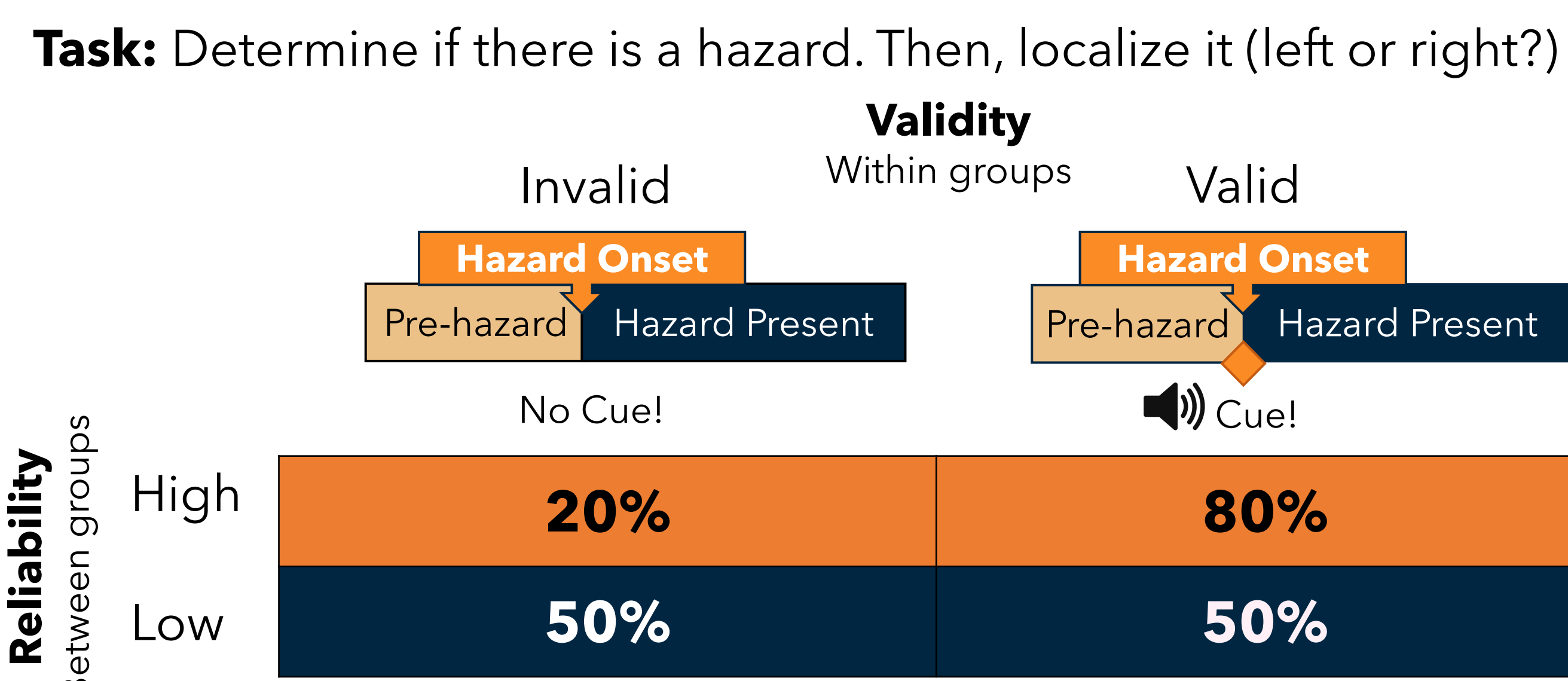
### Hazard Examples



## Exp 1: Are early or late warnings helpful?



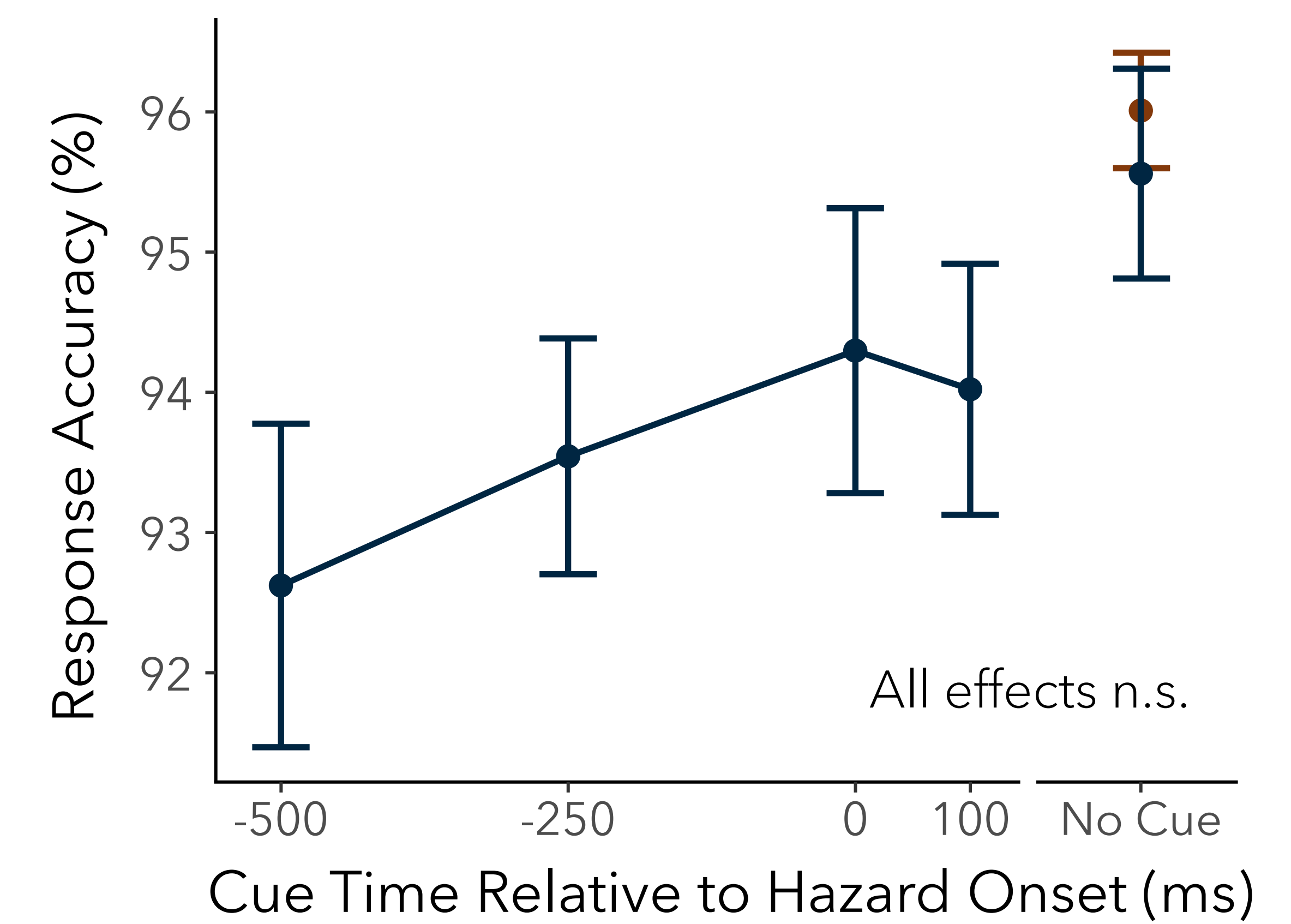
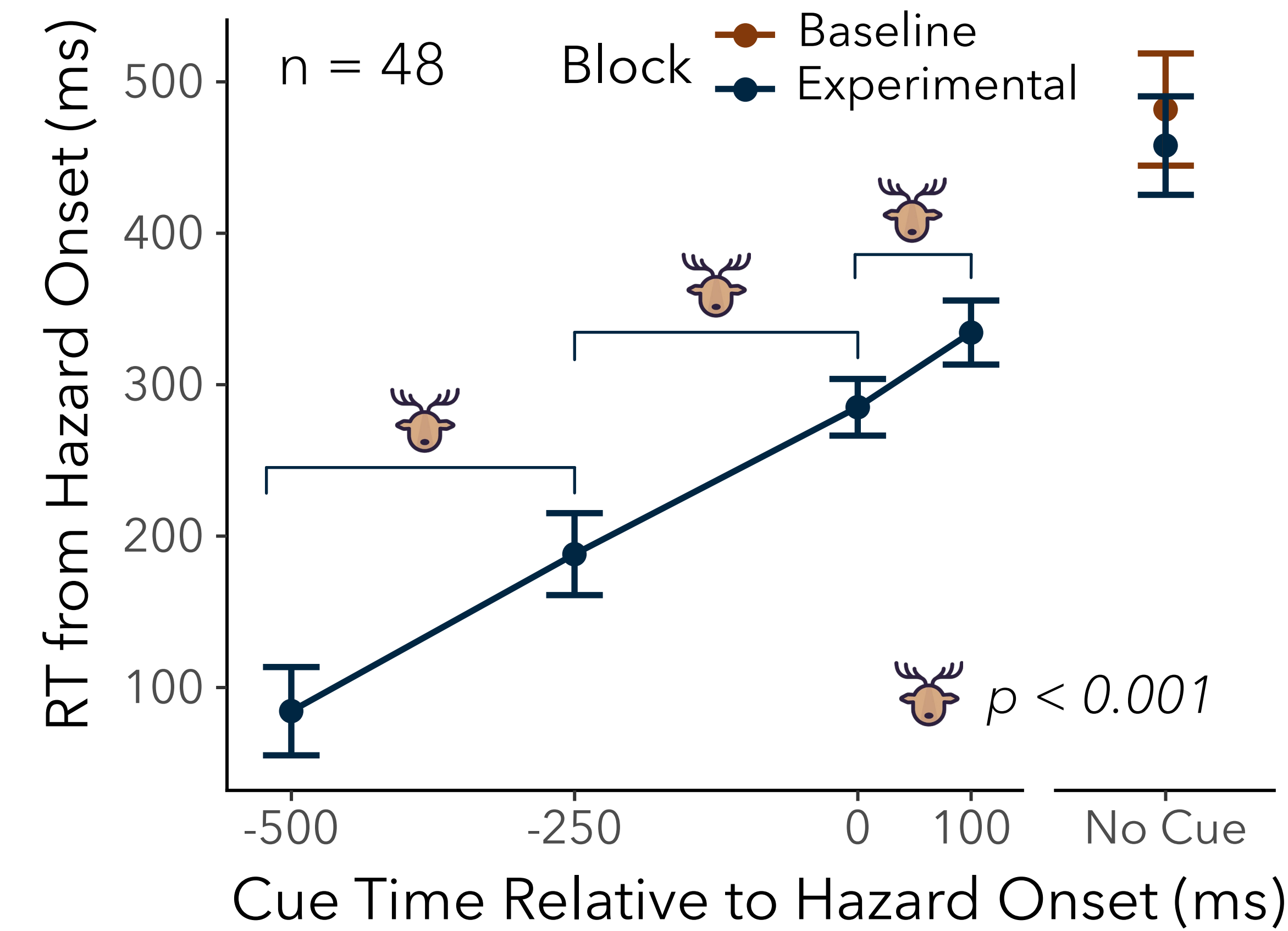
## Exp 2: How useful are unreliable cues?



## Exp 1: Are early or late warnings helpful?

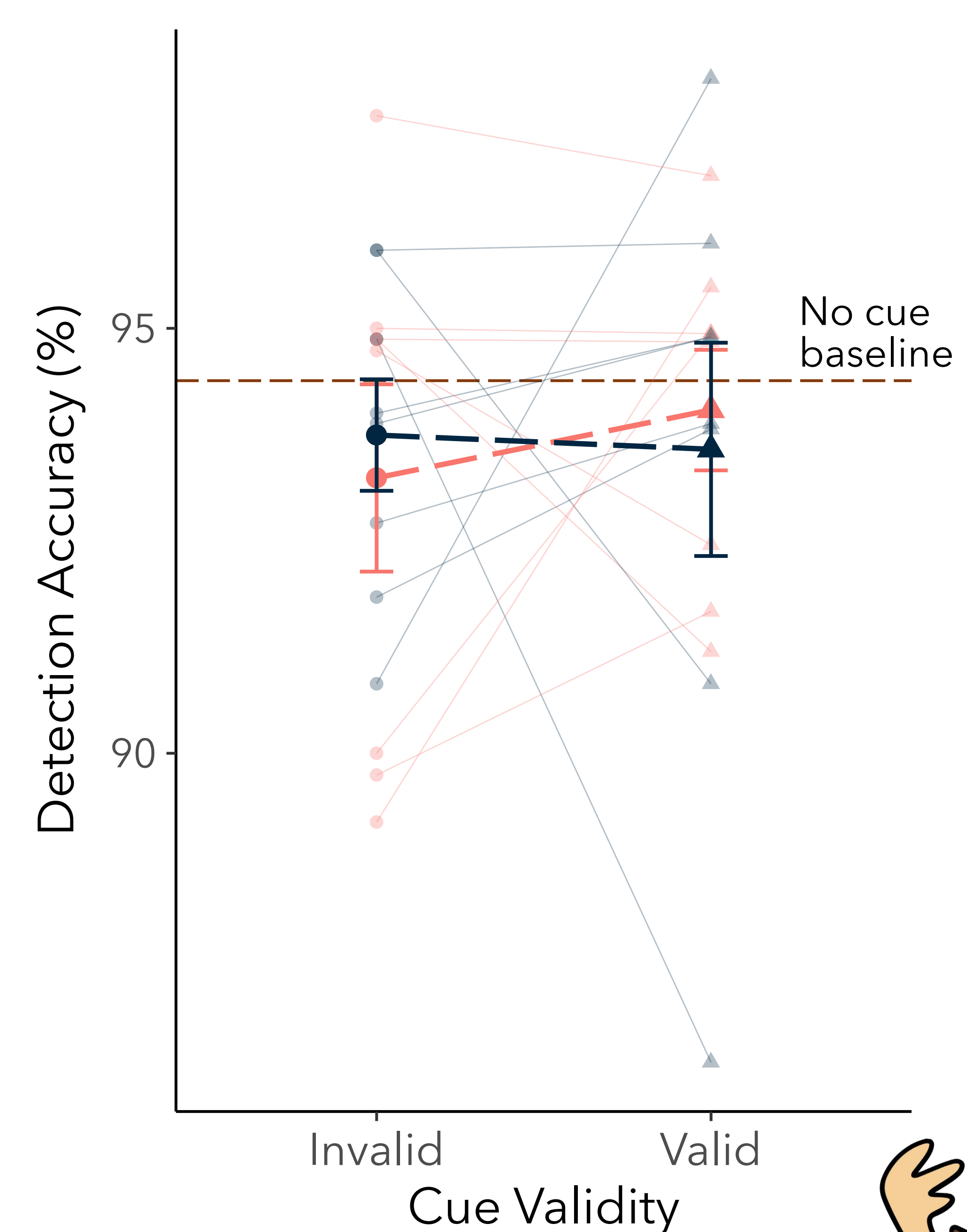
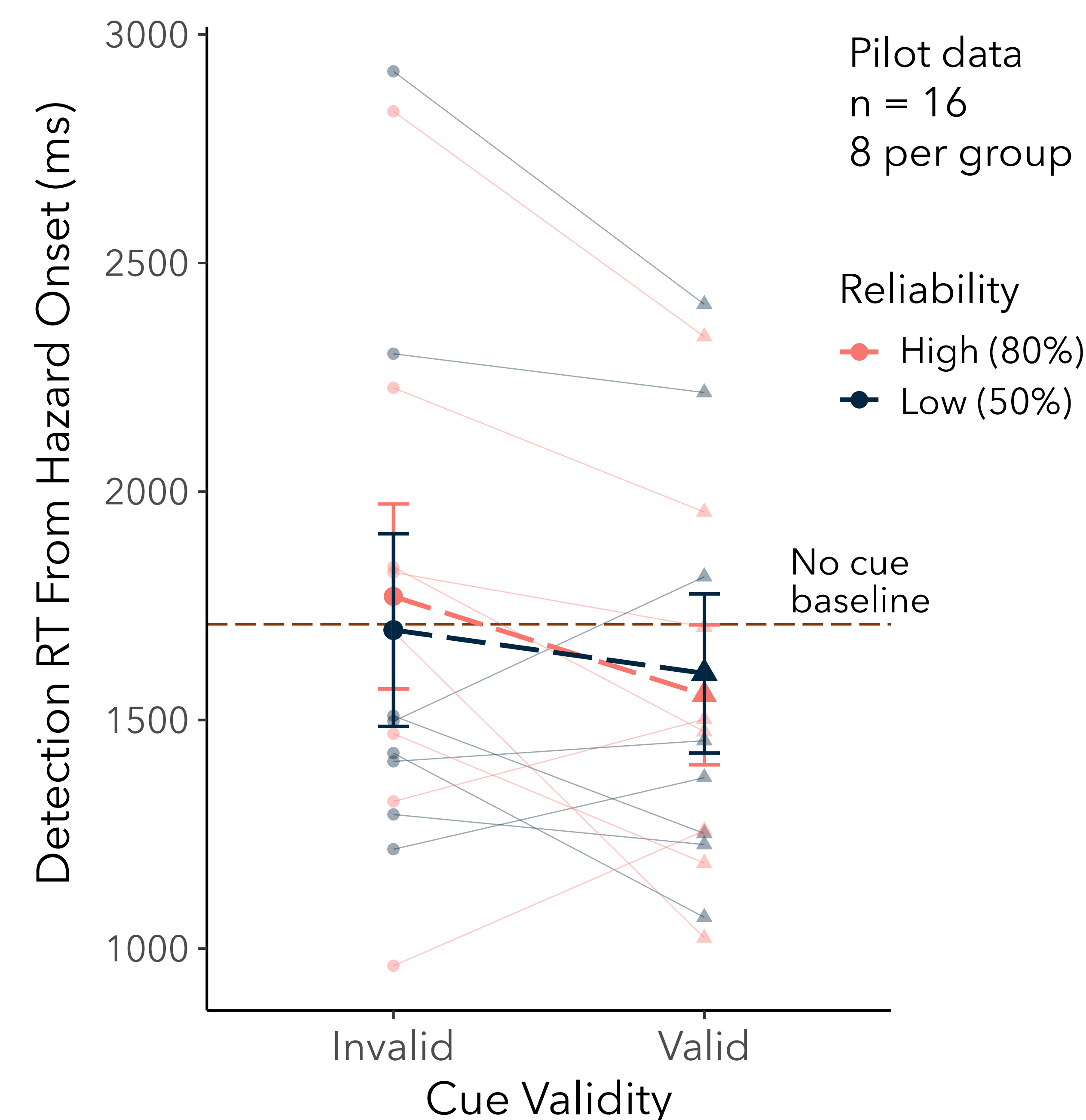
### Predictions

- Earlier cues speed hazard localization
- Speed-accuracy trade-off: faster RT, poorer accuracy
- Late cues are distracting: slower RT, poorer accuracy



Cues speeded hazard localization with no detriment to accuracy. Earlier cues reduced reaction time up to 400ms compared to no cue.

## Exp 2: How useful are unreliable cues?



## Conclusions

- Drivers can use auditory warnings as early as **500ms before hazard onset** to speed hazard localization
- Accuracy is unaffected by cue timing** when the cue is valid
- Reliability did not affect** hazard localization

## Why should we care?

- Early auditory warnings** are a promising way to alert drivers to impending hazards
- Accuracy matters**, only accurate cues benefit reaction time
- Accuracy of computerized systems producing warnings is crucial

- Valid cues may speed detection
- Invalid cues produce small impairments, if any
- Cues are equally **useful regardless of reliability**

Work in Progress



## References

- [1] B. Wolfe, et al., *Cogn. Res. Princ. Implic.* 6:80 (2021).  
 [2] B. Wolfe, et al., *J. Exp. Psychol.* 149:490 (2020).