

Courtney M. Goodridge  
R.M. Wilkie, C.D. Mole, J. Billington, G. Markkula

## Introduction

Initiation of sensorimotor actions can be captured using:

- **Threshold** frameworks, where responses are initiated once a fixed perceptual error threshold is surpassed.
- **Accumulator** frameworks, where perceptual information is accumulated over time until an accumulated decision boundary is surpassed.

When applied to brake reaction times, **Accumulator** frameworks better capture response distributions. Here we apply framework predictions to steering responses.

## Framework predictions

We manipulated driver's **heading** and **starting position** to induce errors in their trajectory that needed to be corrected.

Threshold and Accumulator frameworks provide hypotheses for **lateral position errors (LPEs)** at steering onset and the **timings (RTs)** of steering corrections

Larger **heading** offsets produce larger **error rates**.

**Threshold:** drivers respond at a fixed error threshold across error rates.

**Accumulator:** drivers respond at an error threshold proportional to error rates.

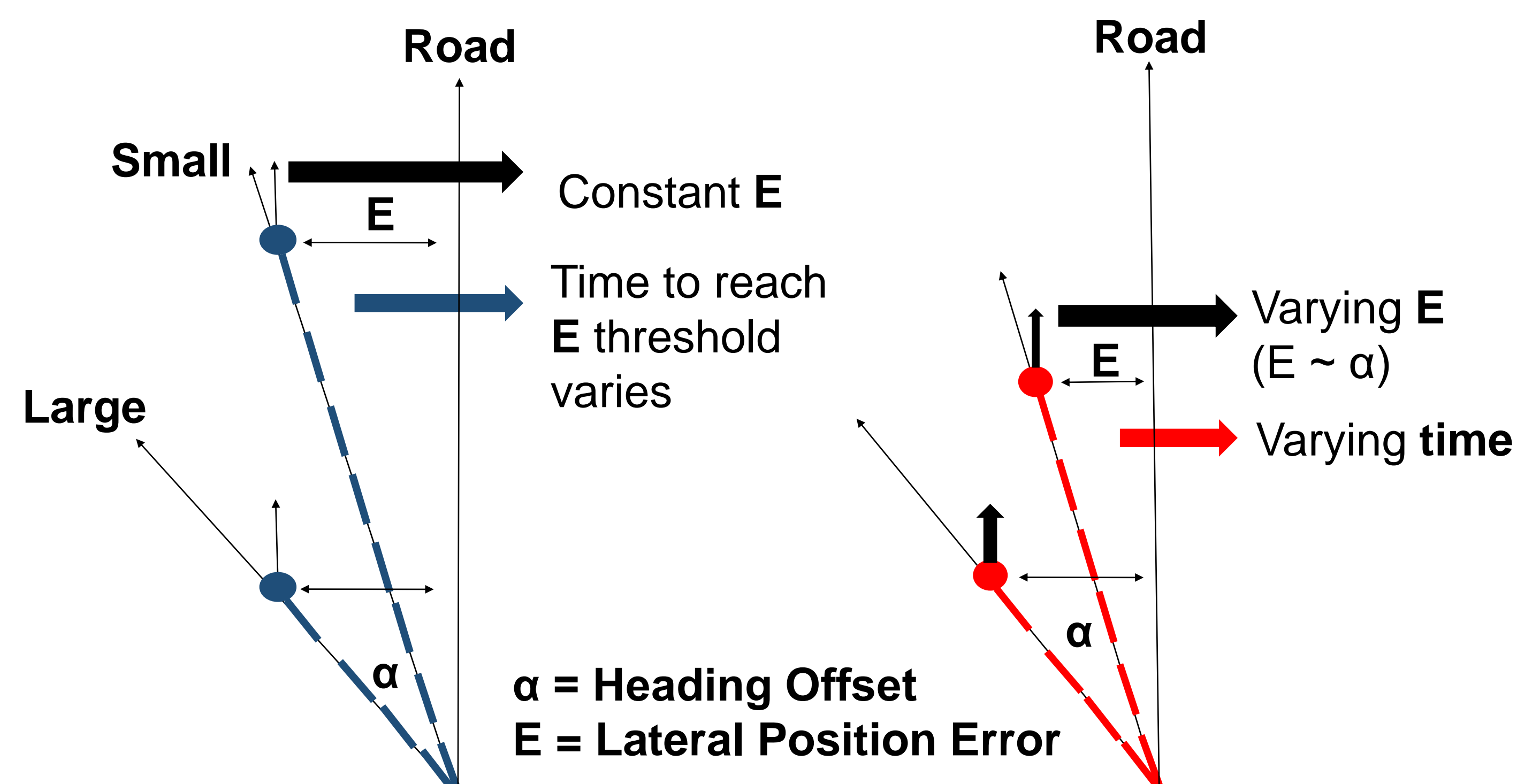


Figure 1: RTs decrease as error rate increases. LPEs remain constant as error rate increases.

Figure 2: RTs decrease and LPEs increase as error rate increases.

Larger **starting positions** produce larger **initial errors**

**Threshold:** Initial error does not influence rate at which proceeding error signal develops.

**Accumulator:** Initial error influences accumulation of the proceeding error signal.

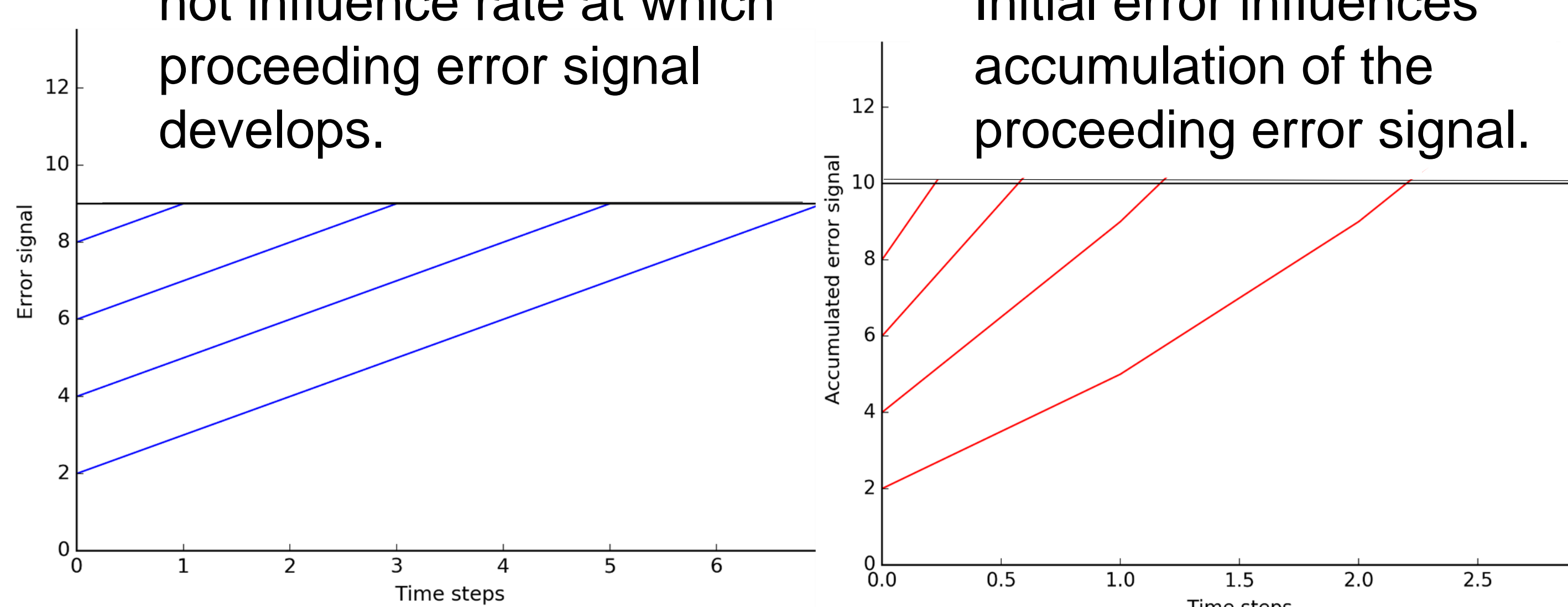


Figure 3: Between level RT differences remain constant as initial error increases.

Figure 4: Between level RT differences decrease as initial error increases.

Email: [pscmgo@leeds.ac.uk](mailto:pscmgo@leeds.ac.uk) Twitter: @cmgoodridge

## Method

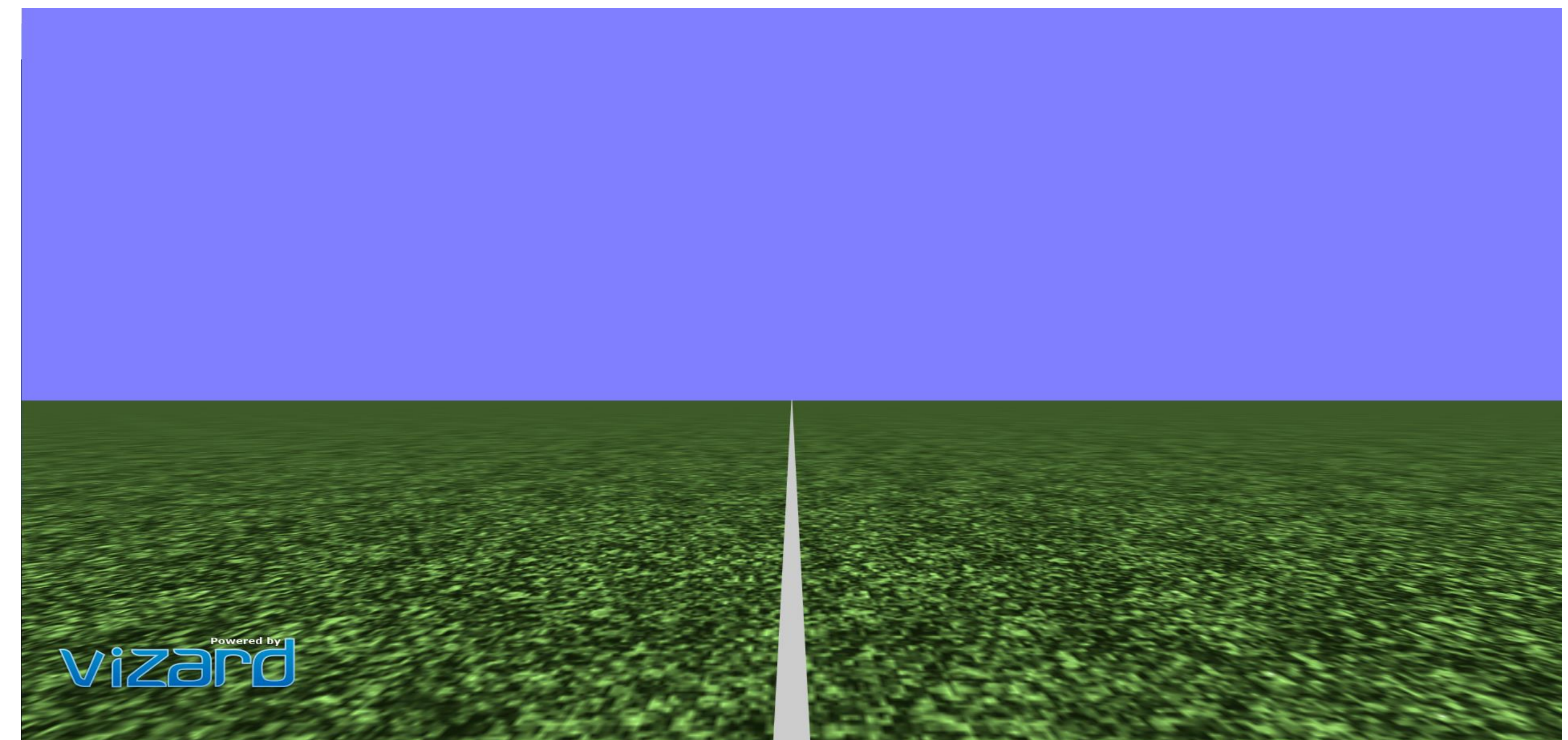


Figure 5: Driver heading was offset relative to the road line at 0°, 1°, 2°. Driver starting position was 0m, 4m or 8m.

20 subjects (M = 26.74yrs, 12 females) driving at 8m/s steered toward the line, visible for 2.5s. 30 trials were presented at each heading.

## Results

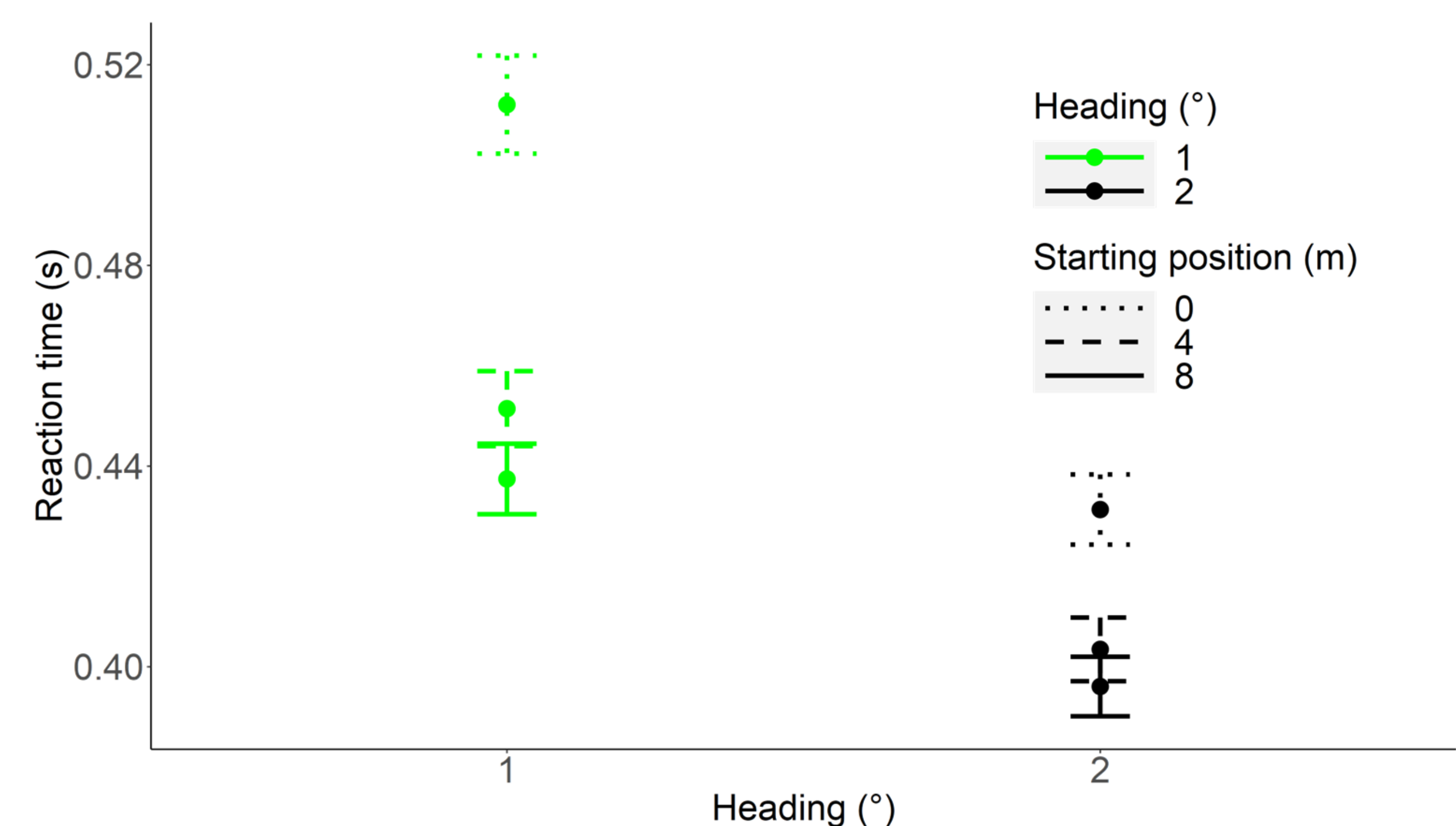


Figure 6: As per **Accumulator** and **Threshold** predictions: RTs decreased as error rate and initial error increased

As per **Accumulator** predictions: between level RTs difference decrease as initial error increased.

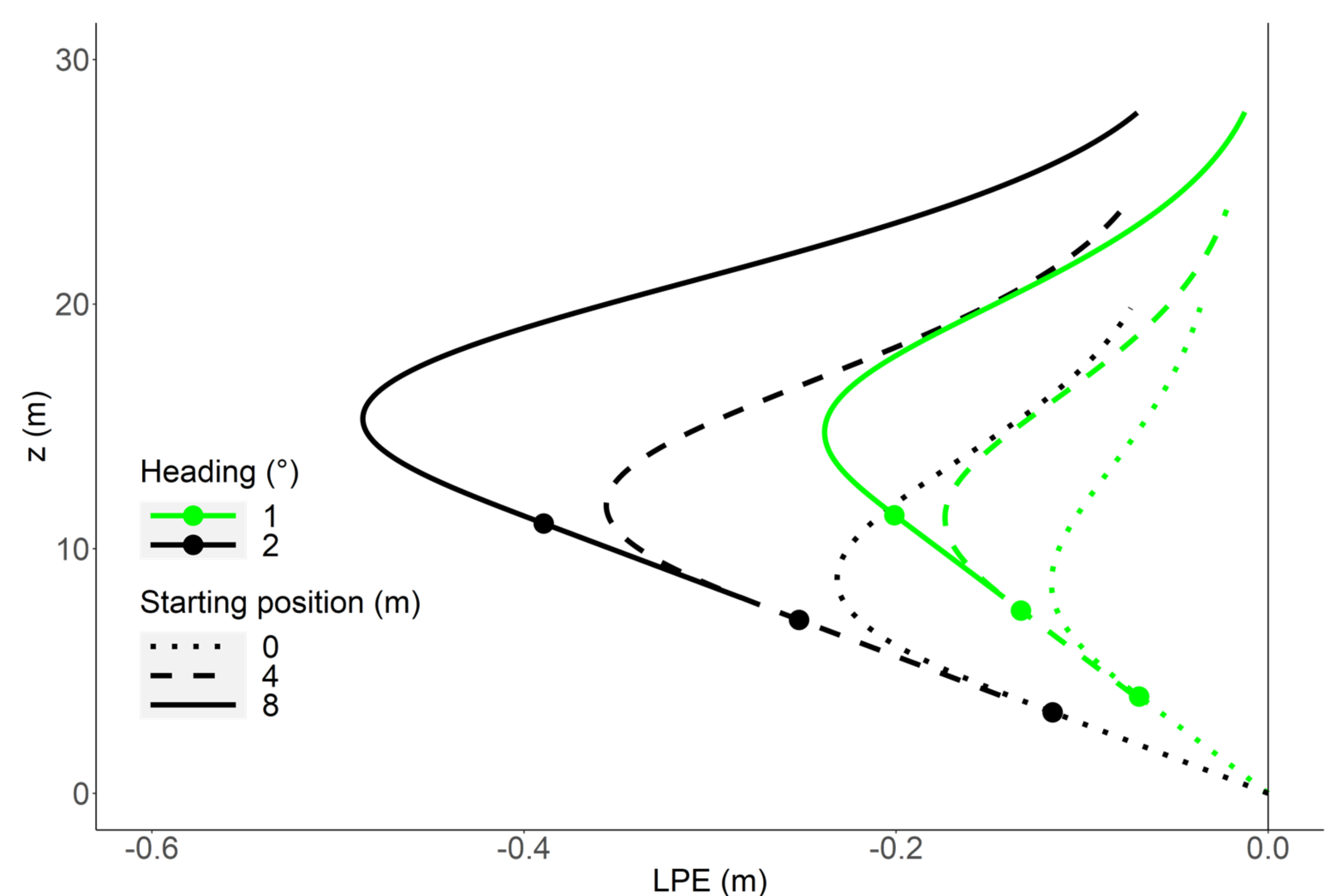


Figure 7: As per **Accumulator** predictions: LPE increased as error rate and initial error increased.

## Future Work

Investigate perceptual information being used:

- How might optic flow information influence steering?

Relevance of these findings?:

- Adds to body of research indicating humans accumulate perceptual information to initiate sensorimotor action.