

Spatial attention and eye movements: a diffusion model study

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BACKGROUND

The study initially was based on work done by Fan et.al. (2002) and Callejas et.al. (2004) in the ANT paradigm. We switched the response modality from manual to oculomotor by introducing anti-saccadic task. Anti-saccades could be considered a sufficient replacement for the congruency conflict in the original ANT (Vandierendonck et.al., 2007).

Based on results of two experiments, we run a drift-diffusion model (DDM) with genetic algorithm to derive the parameters that explain RT distribution in the best way.

DRIFT-DIFFUSION MODEL

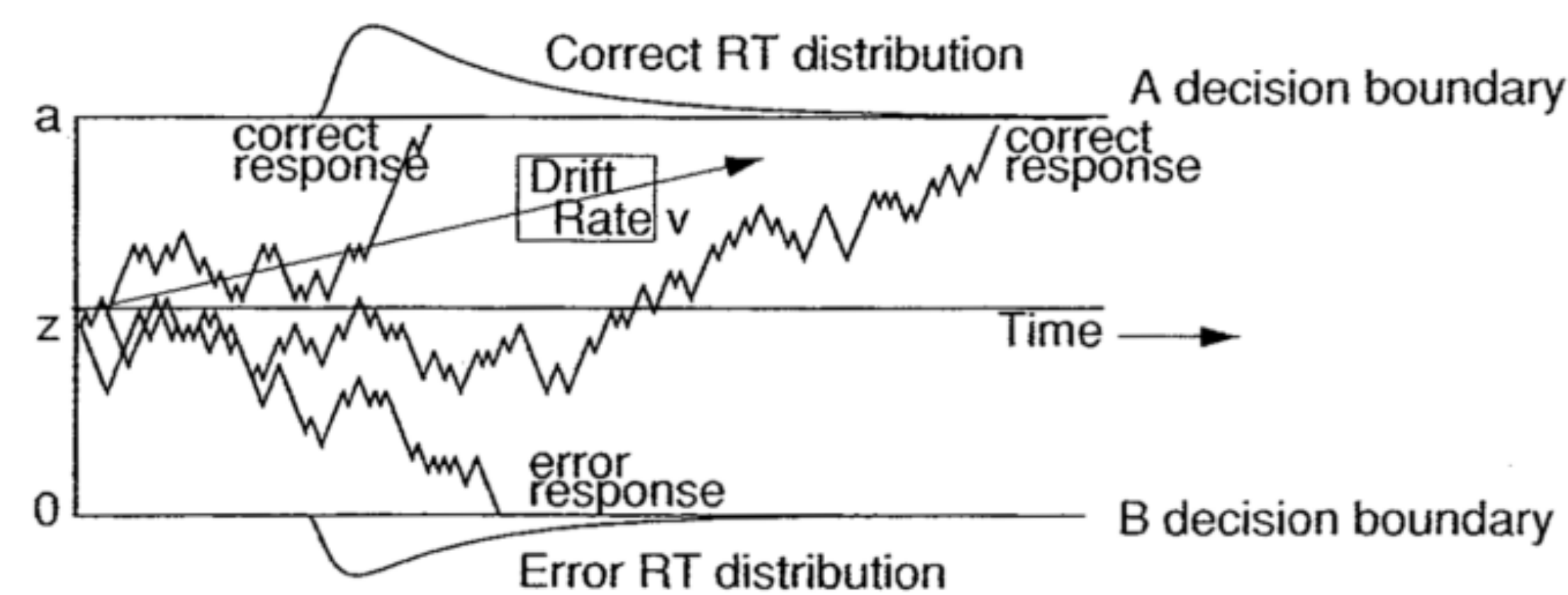


image from Ratcliff (2012)

Drift rate $\Rightarrow V$
 Noise $\Rightarrow T_{er}$
 Bias $\Rightarrow Z$

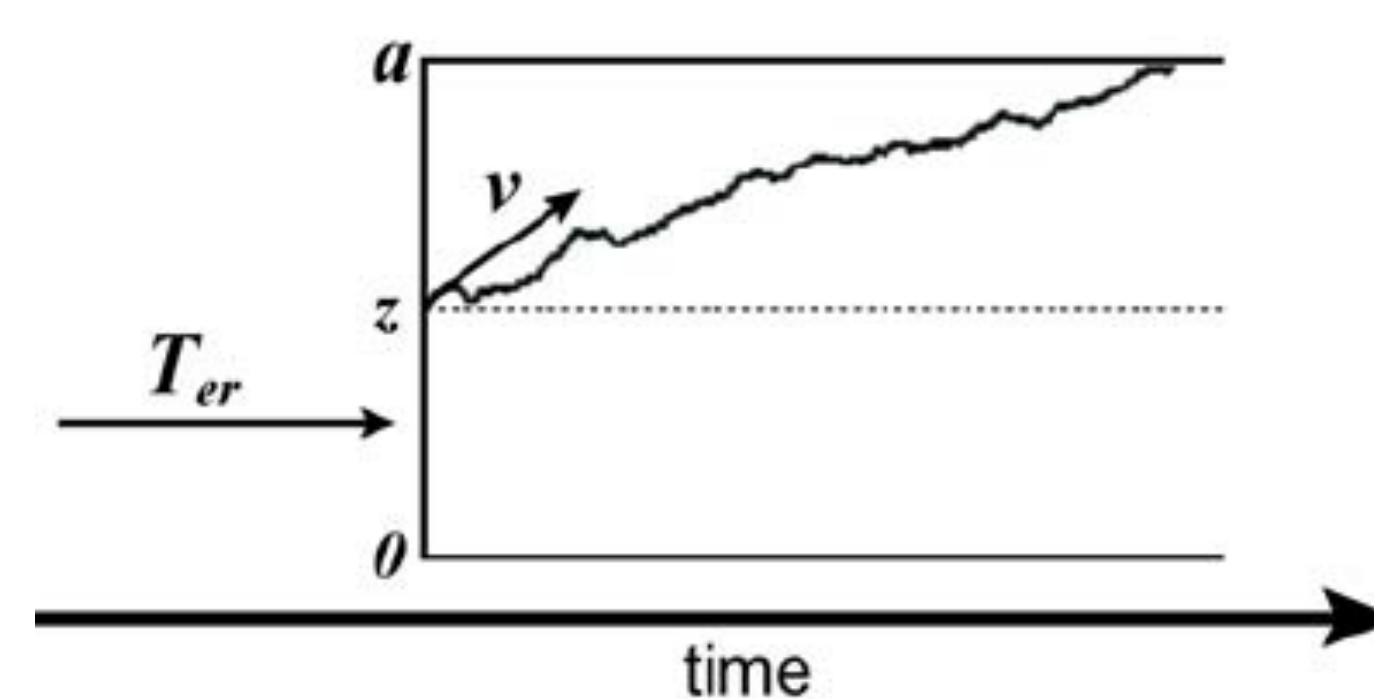


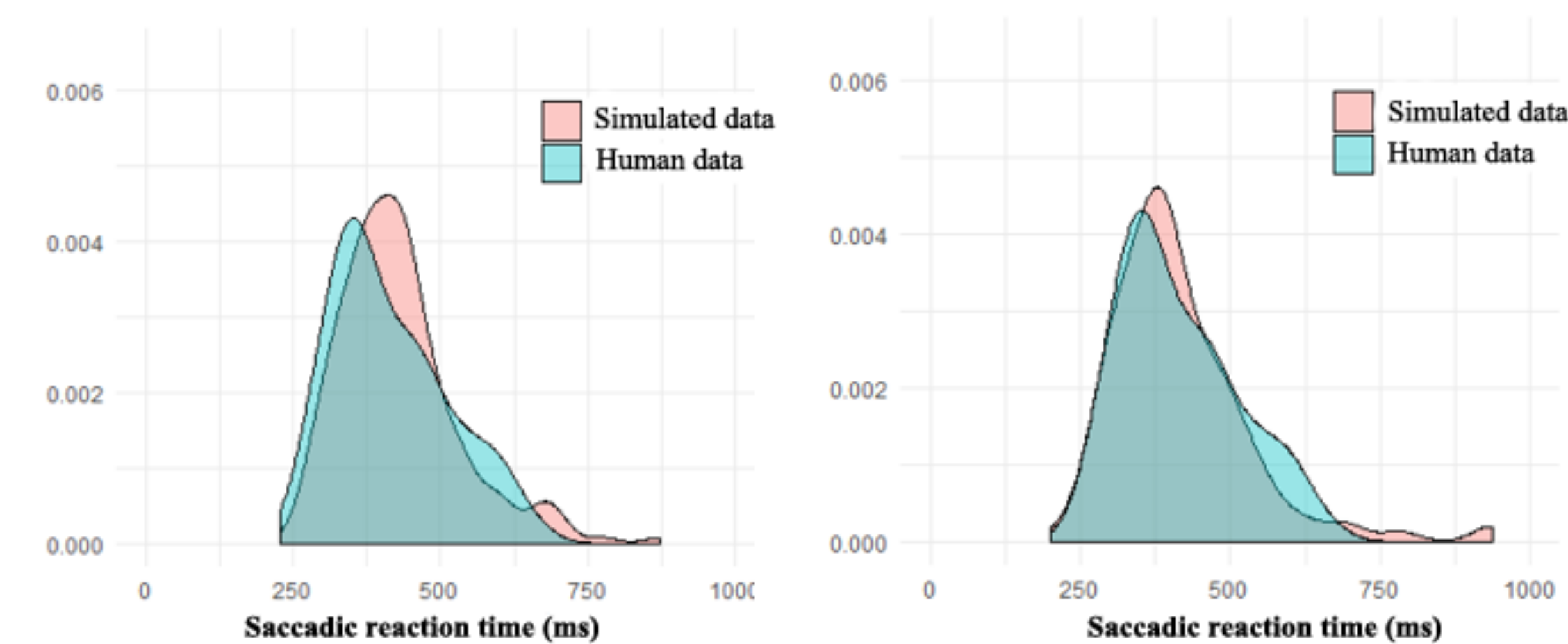
image from Mack, Palmeri (2014)

MODELLING

Drift-diffusion model (Ratcliff & McKoon, 2012; Ratcliff, Murdock, & Murdock, 1976) was fit to the baseline condition data (unalerted neutrally cued trials) to determine the parameters that differentiate reaction times in saccades versus antisaccades. Parameters were learned with genetic algorithm that was run for around 500 generations each time. K-S test was used as fit functions. Distributions were compared with z-score. The less k value is, the better the fit is.

RESULTS

SACCADES

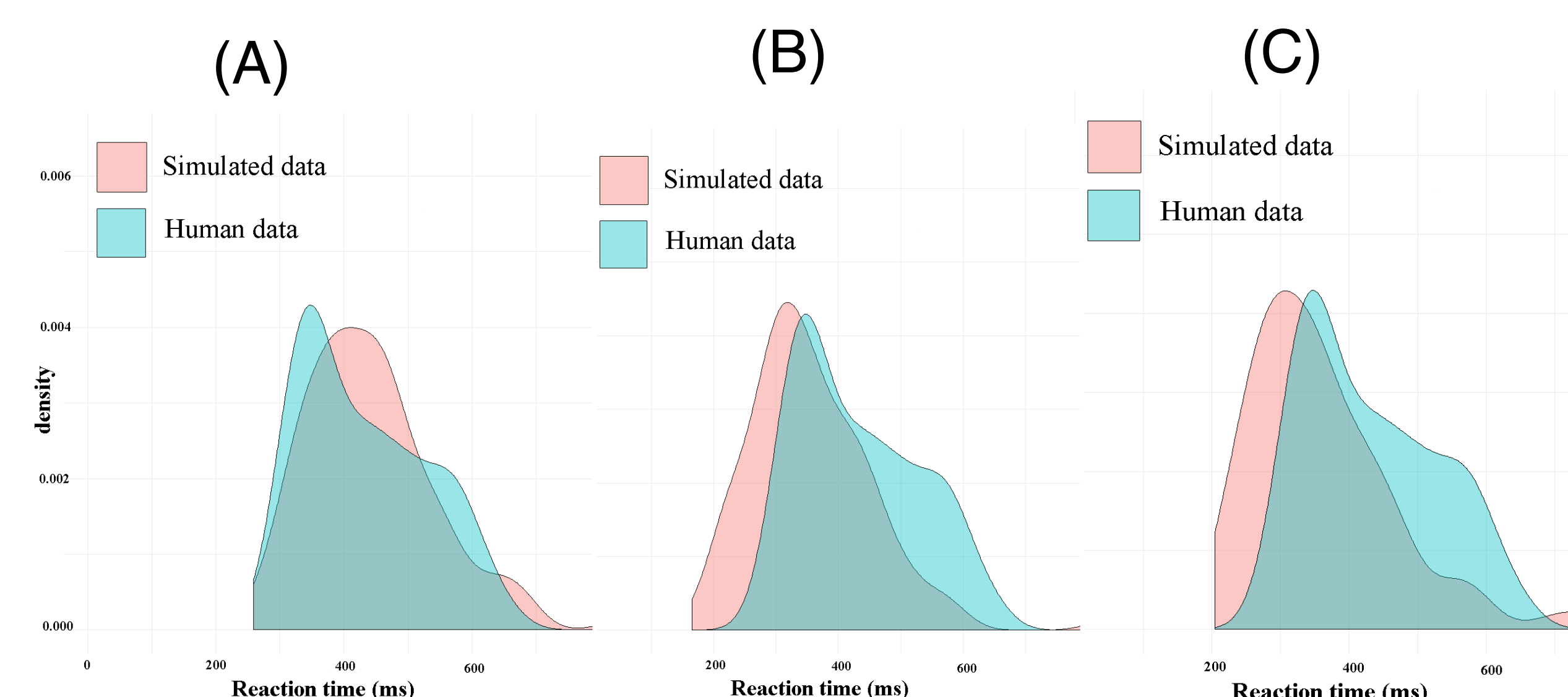


After 300 generations: k value $\sim .1000$

After 500 generations: k value $\sim .0647$

Model	Information accumulation	Nondecision component	Bias component
Saccadic baseline	0.0128	35.4612	0.6704
Antisaccadic baseline	0.0042	81.6102	0.1650

ANTI-SACCADES



(A) **Drift rate:** $k = .1128$, $p = .3466$
 slower than in saccadic trials

(B) **Noise:** $k = .1353$, $p = .1614$
 three times higher than for saccades

(C) **Bias:** $k = .0977$, $p = .5278$
 smaller than for saccades