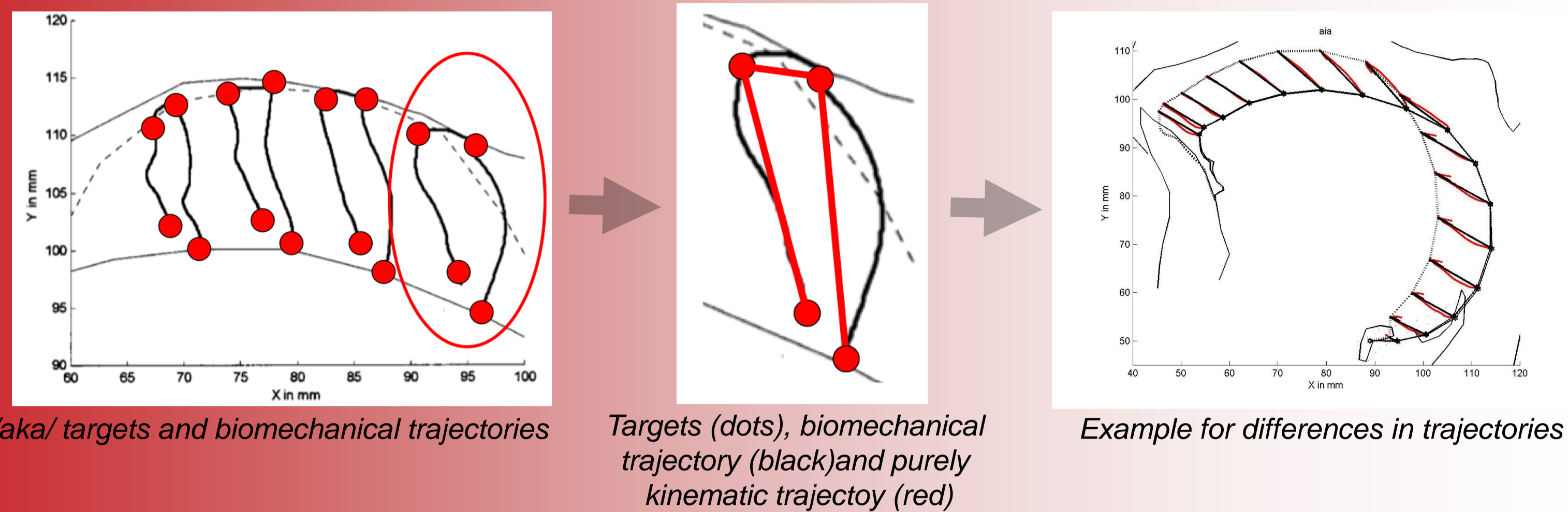


# Does physical realism of articulatory modeling improve the perception of synthetic speech?

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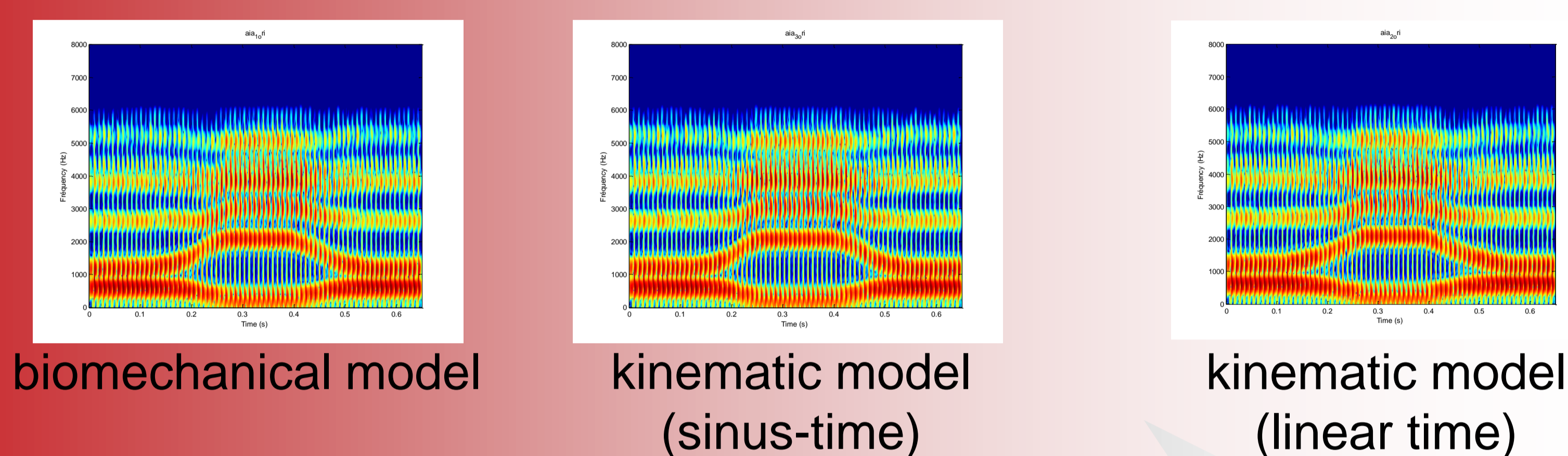


## Introduction



- Viviani and colleagues (e.g. Viviani & Stucchi 1992) show that movement identification in vision integrates knowledge about the physical characteristics of the human movements:
- Our research question:
  - Does physical realism of the trajectories influence speech perception?**
- Use of the 2D biomechanical model (Perrier et al. 2003)

## Perceptual experiments



+ physical realism

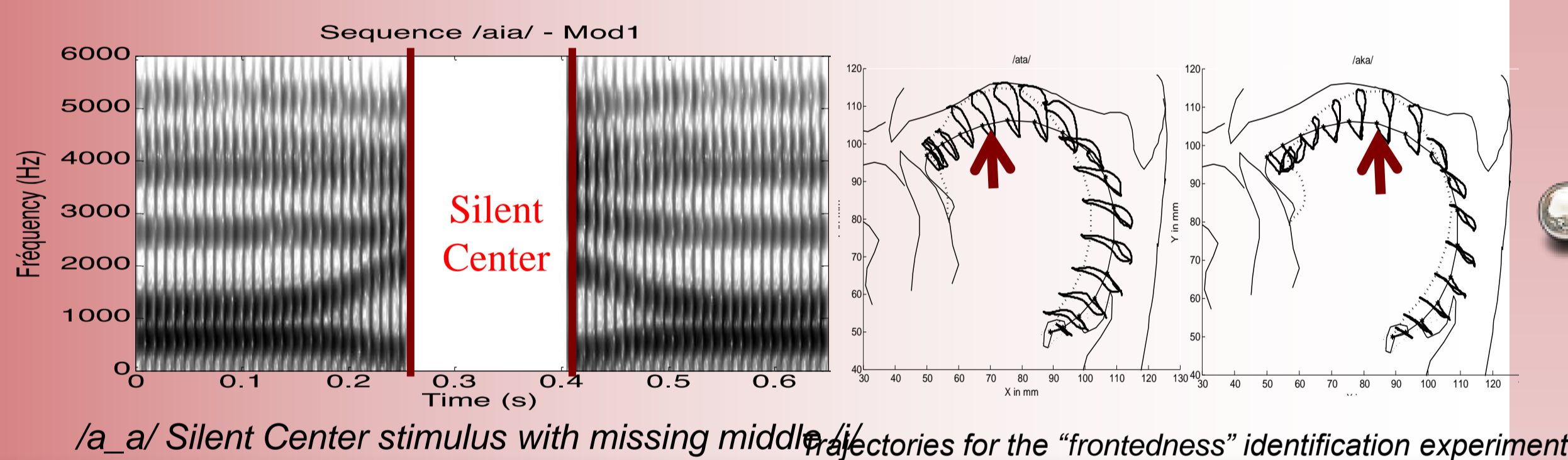
differences

Are they perceptible?  
 Discrimination experiments (difference limen dl)

Do they facilitate perception?  
 Identification experiments

Silent Center

“frontedness”



## Stimuli generation

- for all models and all phonemes, the targets were identical
- biomechanical model:**
  - physically the most realistic
- kinematic models:**
  - physically less/least realistic
  - transition are linear interpolations between consecutive targets with either constant or bell-shaped velocity profiles

## Identification/Discrimination

- Perturbed condition:**
  - Silent Center paradigm: the acoustic target of the central vowel is completely removed, the listener can only rely on information available in the trajectories towards and from the target
- Unperturbed condition:**
  - Discrimination (dl) for VVV and VCV
  - Identification of “frontedness” VCV

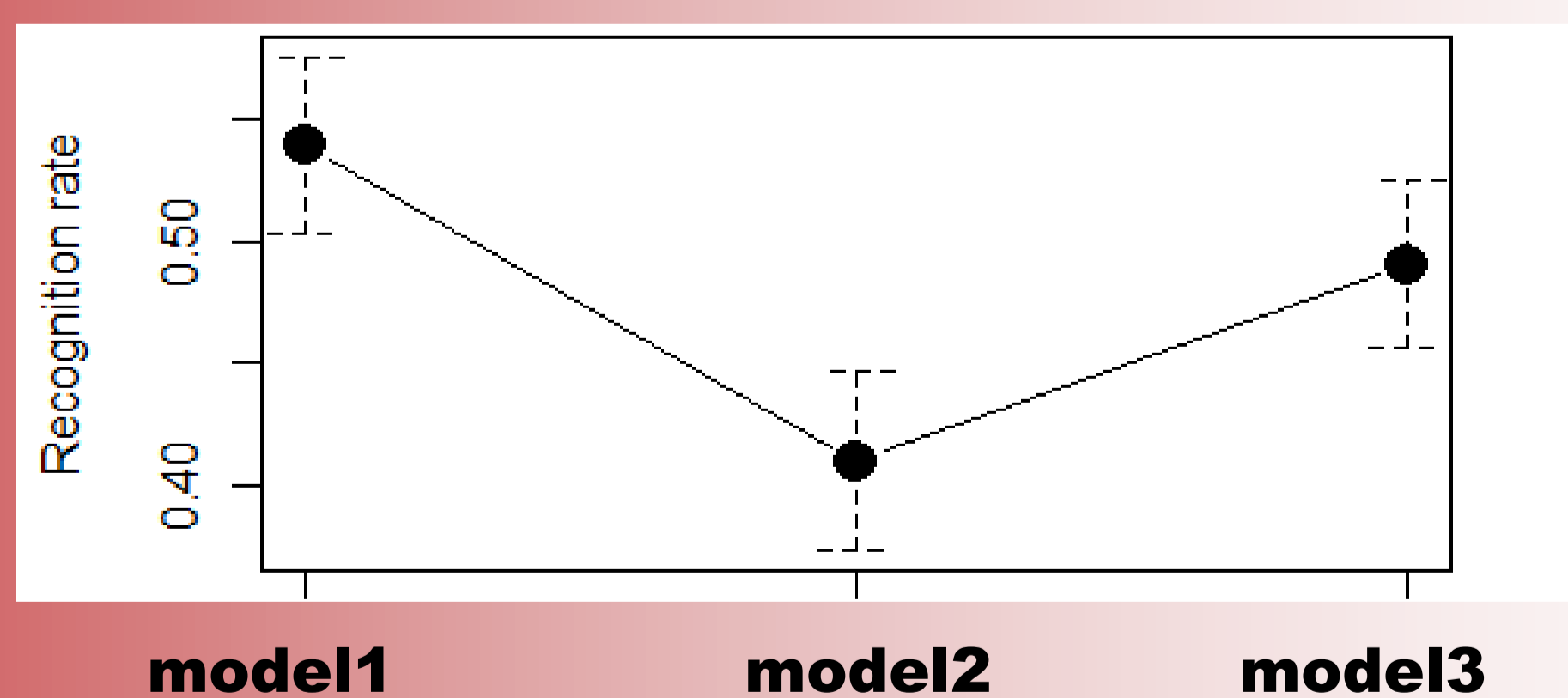
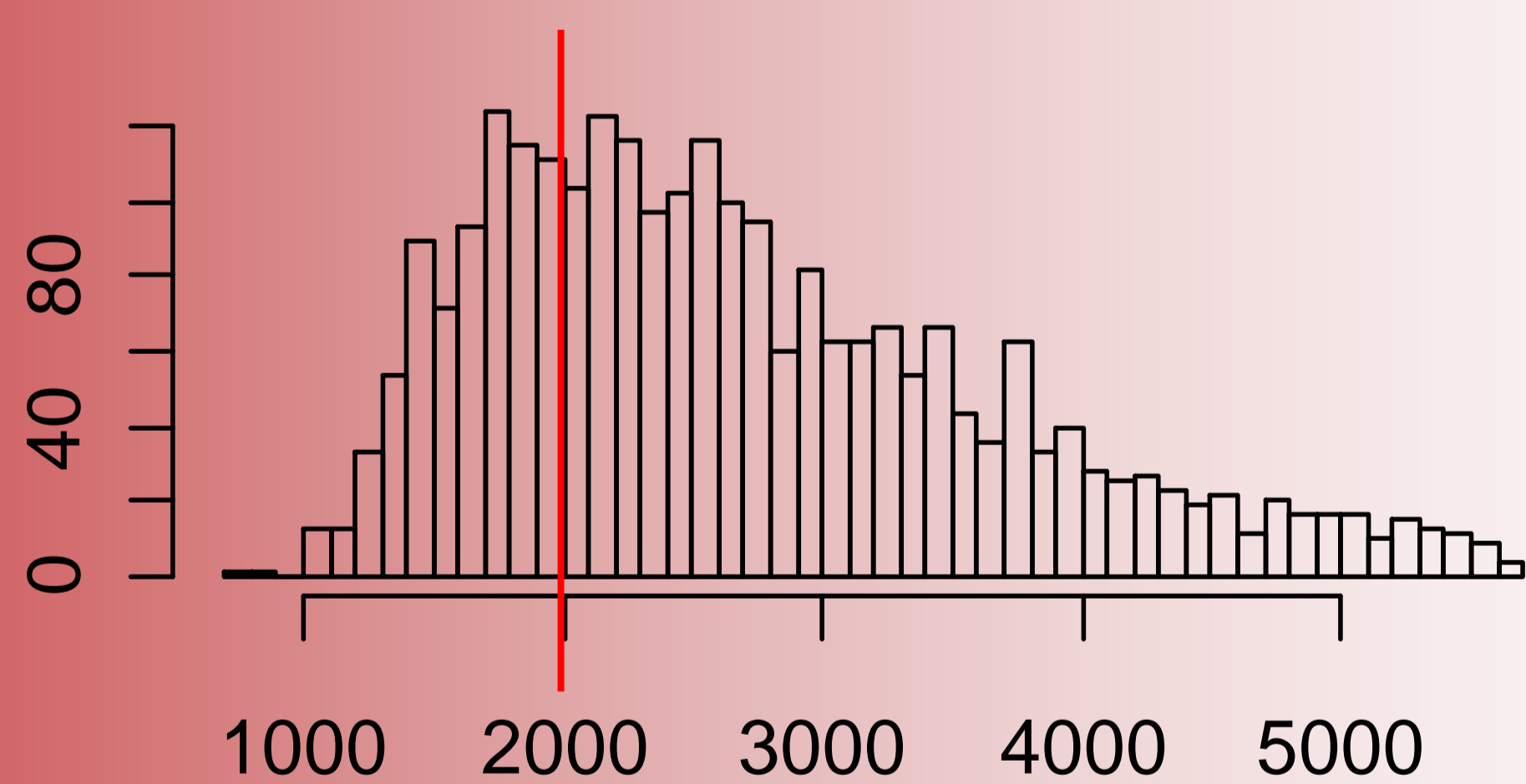
## Results

- Data split according to peak in the RTs histograms
  - Short RTs (<2s) : low-level processing
  - Long RTs: high-level processing
  - Only short RTs are considered
- Silent Center Condition:**
  - Identification:
    - Significantly better identification for the biomechanical as compared to the linear model with constant velocity
    - Tendency for better identification of the biomechanical model as compared to the linear model with bell-shaped velocity profile
- Unperturbed condition:**
  - No significant differences in all unperturbed conditions, neither for discrimination nor for “frontedness” identification

## Discussion

- No discrimination differences for physically realistic transitions or unrealistic ones!
- More/better information can be retrieved from signals generated with a physically realistic model for identification in perturbed conditions

## Results+Discussion



Identification scores for the Silent Center experiment (mod1-mod2:  $pMCMC=0.016$ ,  $t=-2.45$ , significant; mod2-mod3:  $pMCMC=0.0874$ ,  $t=1.678$ , n.s.; mod1-mod3:  $pMCMC=0.4098$ ,  $t=-0.839$ , n.s.)