Positional variability of articulatory gestures: Effects of practice and linguistic proficiency

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research question

does variability decrease in relation to a word's short term practice and increased lexical probability? → tested with articulography

background

	hand movements [6, 5, 20, 8, 13, 15, 11, 12, 3, 16, 10, 14]	**articulation** [26, 1, 4, 21, 18, 17, 19, 9, 7, 24, 25, 2]
reduction of effort	repetition	frequency (?)
faster gestural execution	repetition	repetition, frequency
smoother gestural transitions	repetition, lower spatial uncertainty	repetition, frequency
smaller gestural variability	repetition, lower spatial uncertainty	age

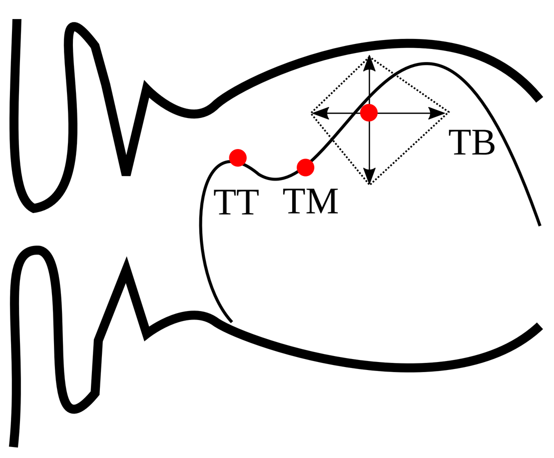
question will articulatory variability be smaller in relation to lower (spatial) uncertainty, assessed by means of conditional probability?

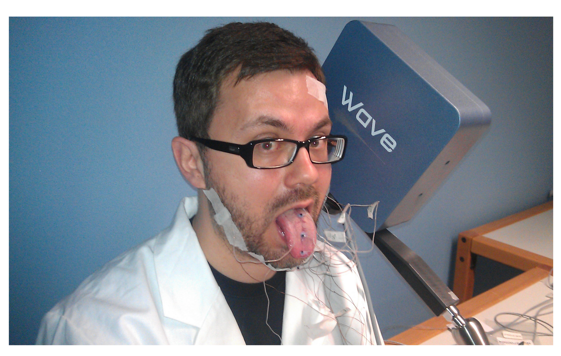
synopsis

- articulatory variability is reduced
  due to repetition
  higher predictability
- reduction is strongest at vocalic target of [zi]

methods

- electromagnetic articulography (NDI Wave)
- 100 Hz sampling rate
- automatic correction for head movements
- three sensors: tongue tip, tongue mid, tongue body





recorded material

participants

- 17 native speakers of German

speaking rate conditions

- articulated in a 'fast' and a 'slow' speaking rate condition.

target word

- articulation of Germ. 'sie' [zi] *they*
- 254 different 'sie + verb' phrases
- e.g. 'sie sagen', 'sie siegen'
- [iː], [ɪ], [a], [aː] as stem vowels in verb

analysis

statistical method

- generalized additive mixed-effects models [23]
- family: Gaussian location scale additive models (gaulss) [22]
  → gaulss models allow to fit average trajectories and standard deviation
- articulatory variability ∼ standard deviation

predictors of interest for standard deviation

- inversed conditional probability of [zi] $P(sie|verb)$, based on Google counts
- repetition during experiment
- travelled distance
- distance to target in verbal stem vowel

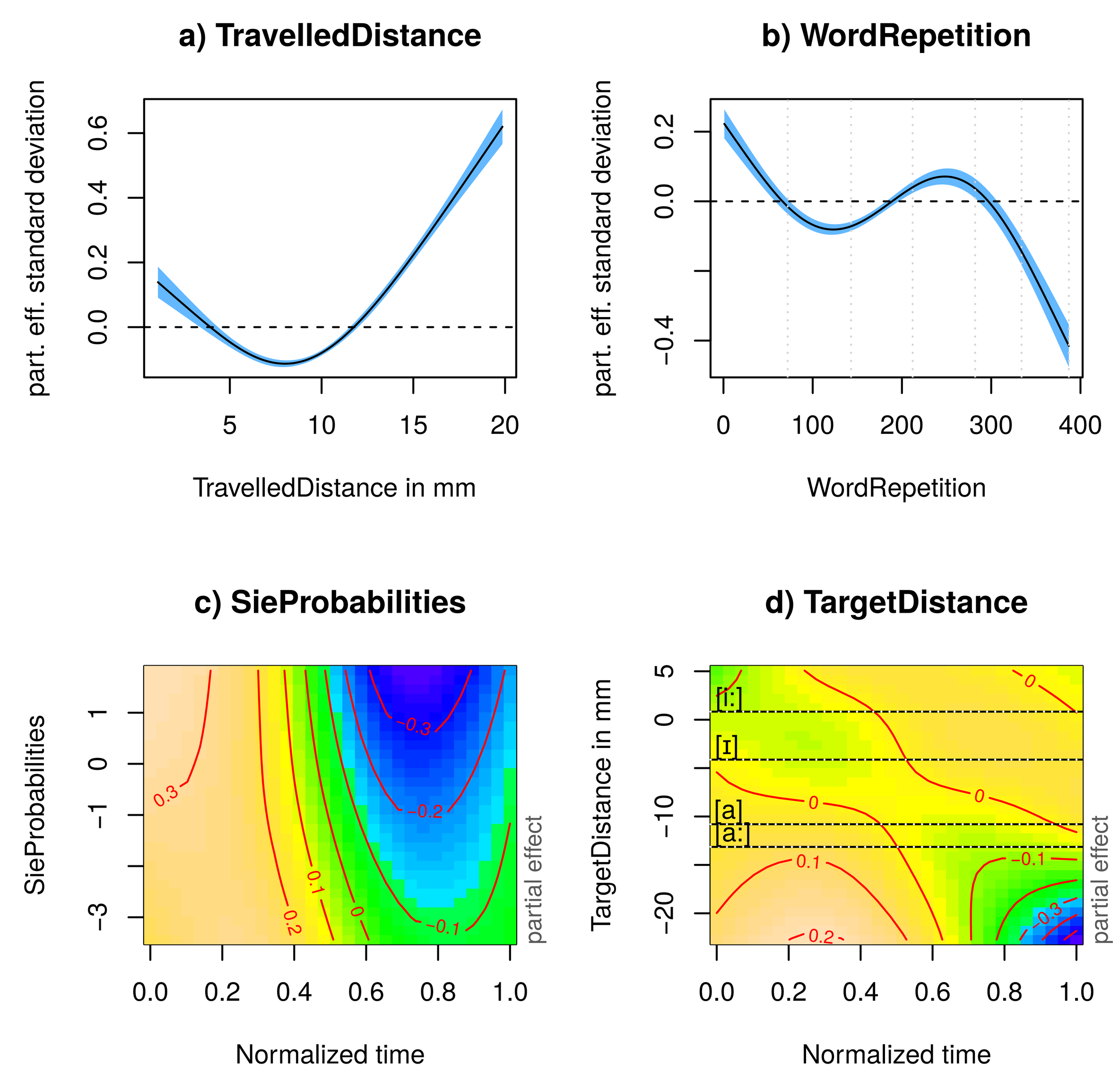
average trajectory controlled for

- speaking rate condition
- word duration of [zi]
- anticipatory coarticulation of following consonant
- anticipatory coarticulation of stem vowel in verb
- repetition during experiment

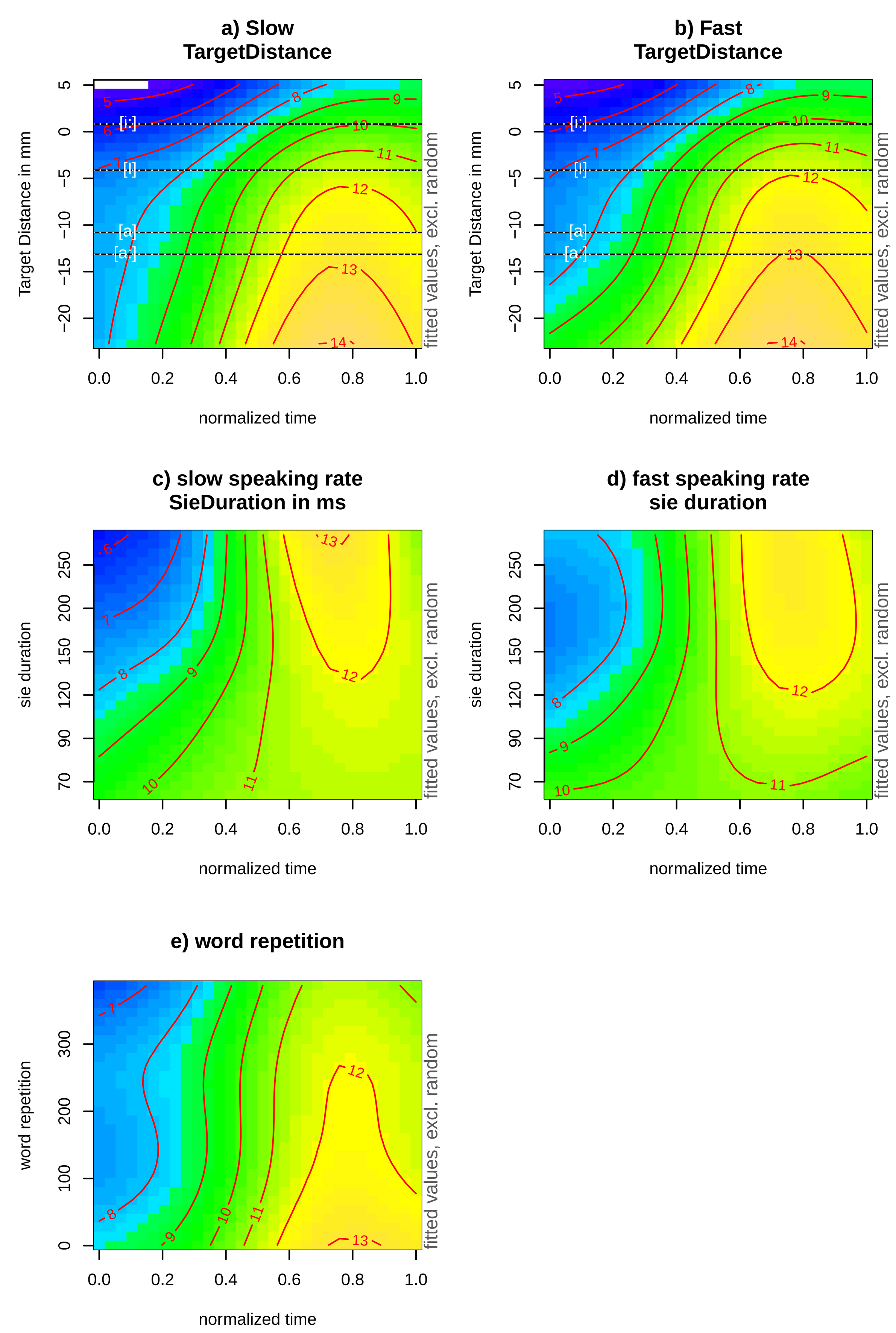
standard deviation controlled for

- tongue's travelled distance
- anticipatory coarticulation of stem vowel in verb

results: standard deviation



results: average trajectory



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