Phonological similarity as an index of short-term memory precision in monolingual and trilingual speakers

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Introduction

Short-term memory (STM)

- Often defined in terms of capacity (Miller, 1956; Cowan, 2010)
  - Limited number of items one is capable of recalling
- Binary measure STM performance
  - Item recalled or forgotten

→ Nature and quality of representations?

Introduction

STM precision

- Resolution of representations in STM (Joseph et al., 2015)
- Memory trace degraded, but not fully erased
- Quality rather than quantity of representations (Ma et al., 2014)
- Flexible resource allocation (Ma et al., 2014)

- Mainly studied in the visuo-spatial domain (Bays et al., 2009; Zokaei et al., 2011; Burnett Heyes et al., 2012; Klyszejko et al., 2014)
- Less in the auditory-verbal domain (Joseph et al., 2015; Gilbert et al., 2017; Clark et al., 2017)

Introduction

Use of a **phonological similarity gradient** between memory and probe items

- In monolinguals (Study 1)
- In trilinguals (Study 2)

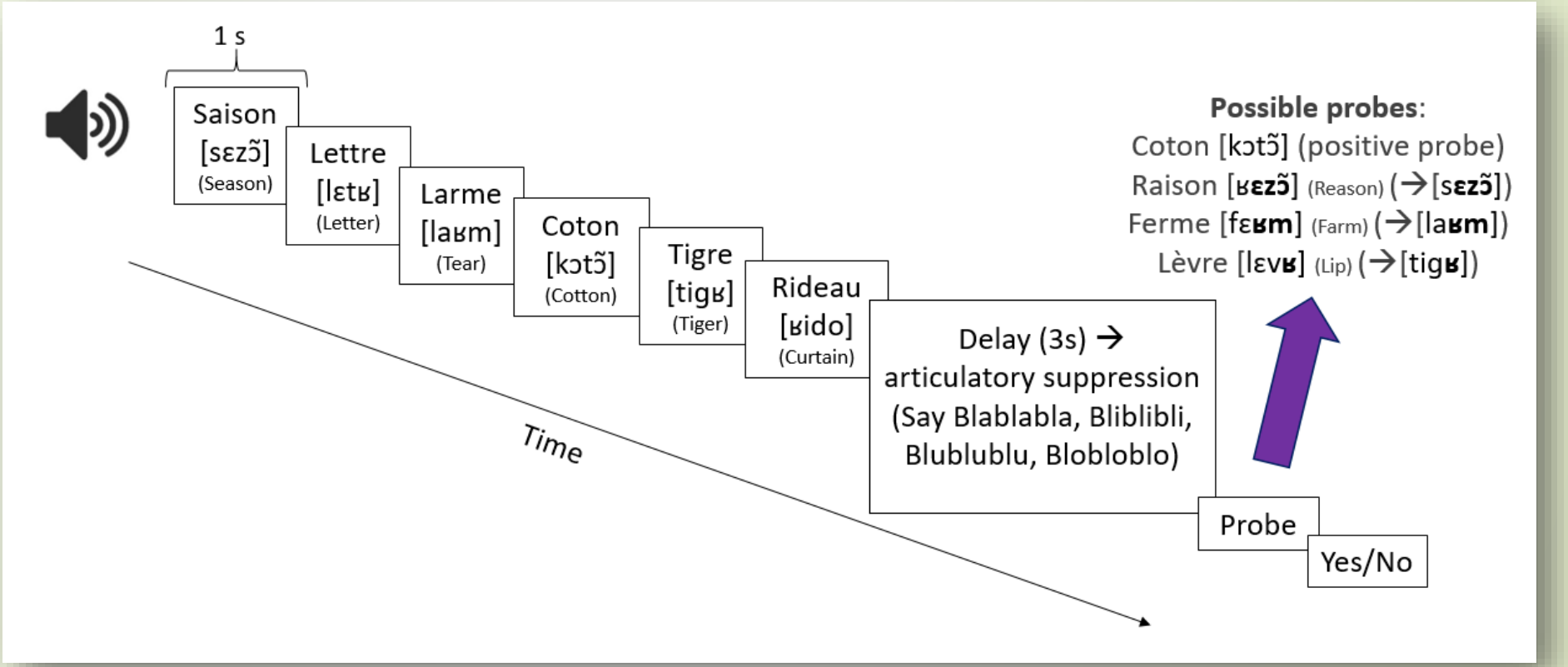
Hypotheses

- More errors with increased similarity
- Performance impacted by language proficiency
  - ✓ Interdependence between language and verbal STM
- Interindividual differences

Study 1

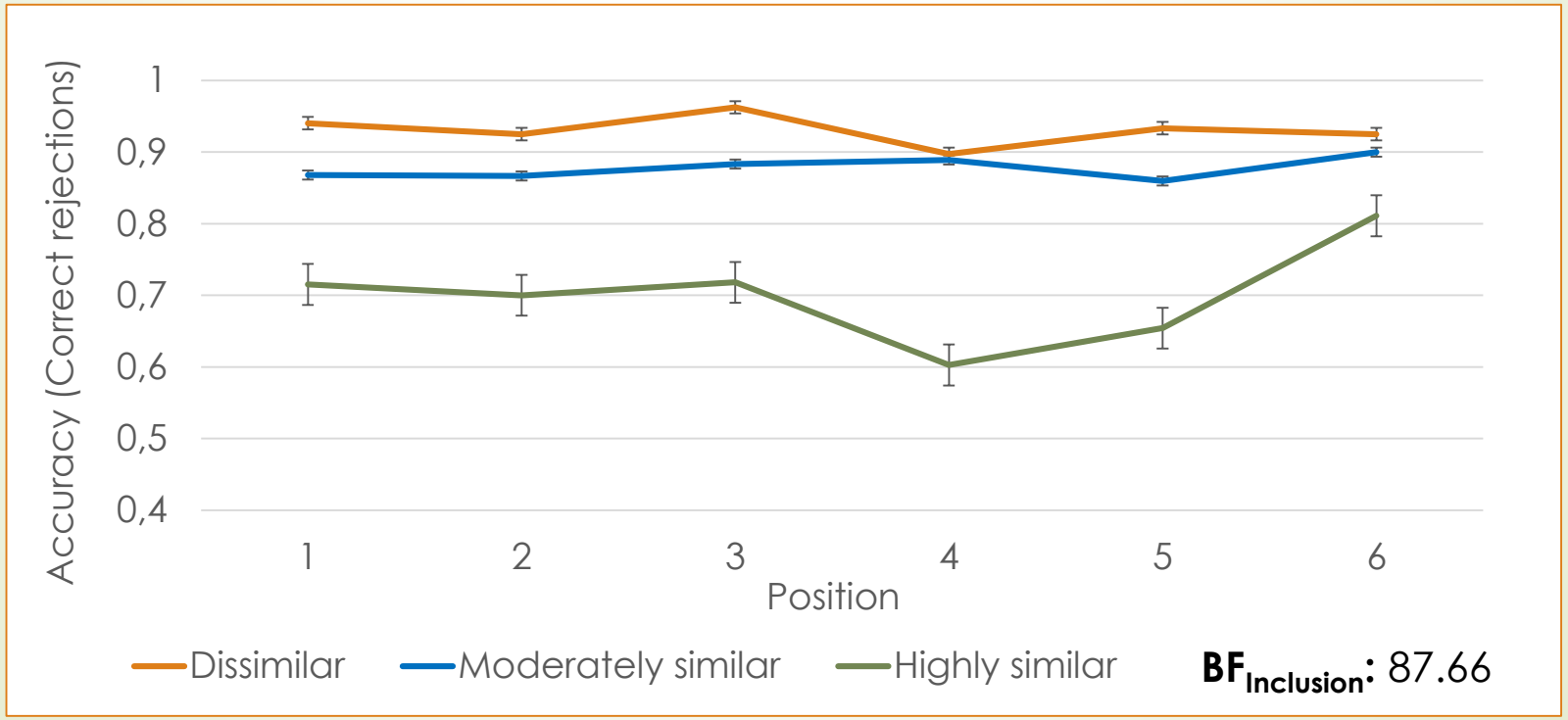
- Phonological similarity for French words
- Probe recognition task
- Participants
  - 60 French-speaking participants (30 women)
  - 18-30 years ($\bar{x}$ = 22.63; σ = 2.840)
  - No neurological disorder or learning disability

Study 1: Methods



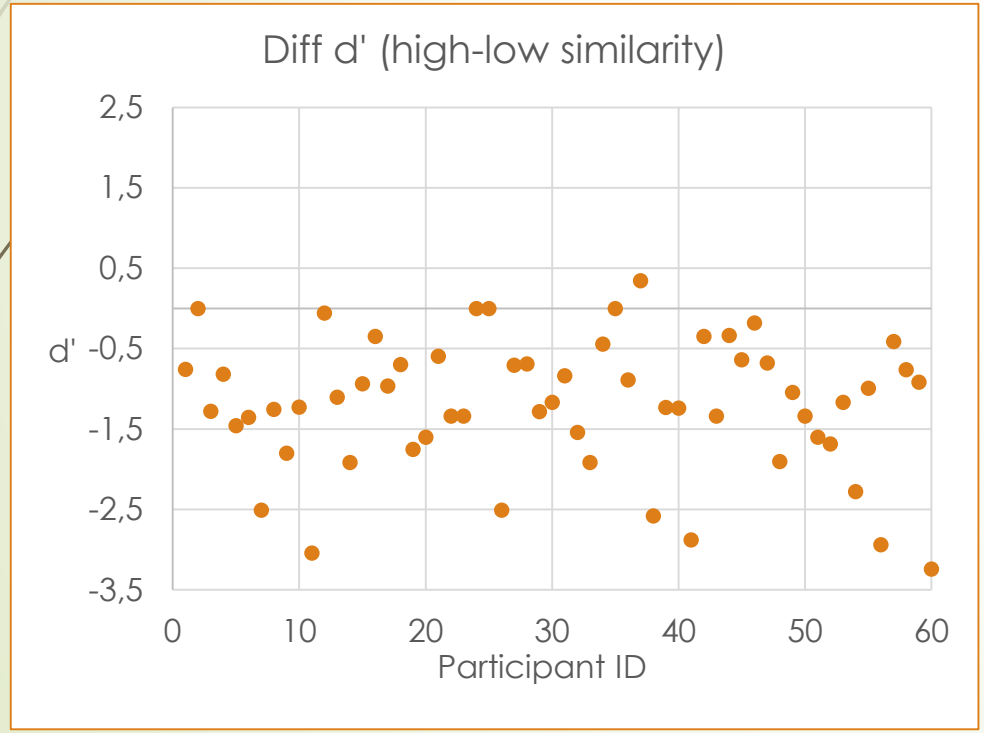
Study 1: Resutls

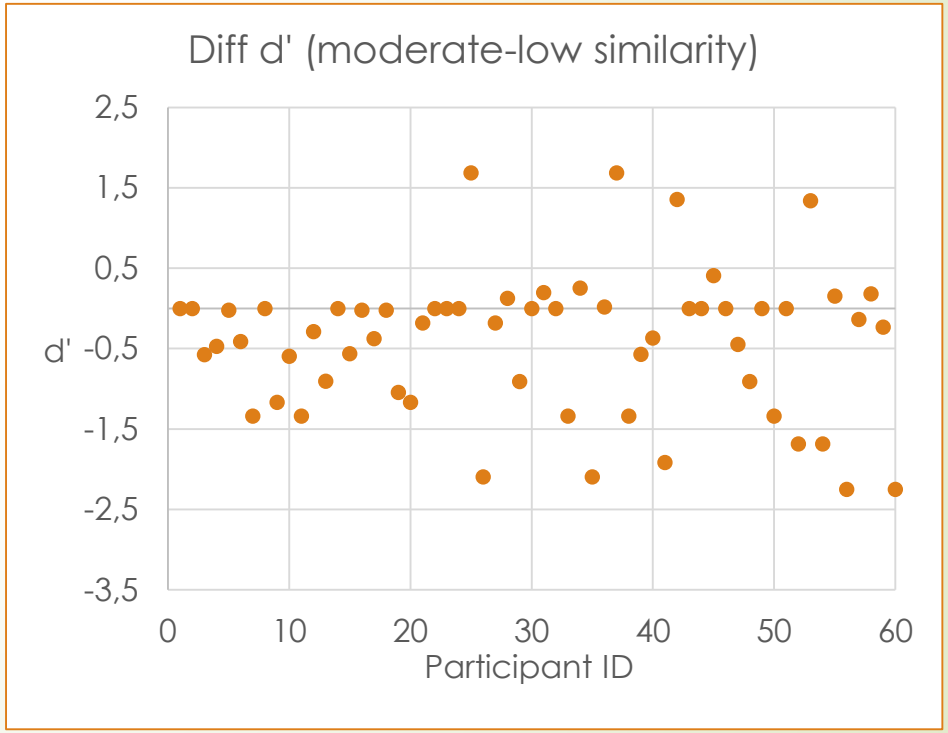
- Accuracy (correct rejection+ hits)



Study 1: Results

- Individual differences and Precision scores





Interim summary

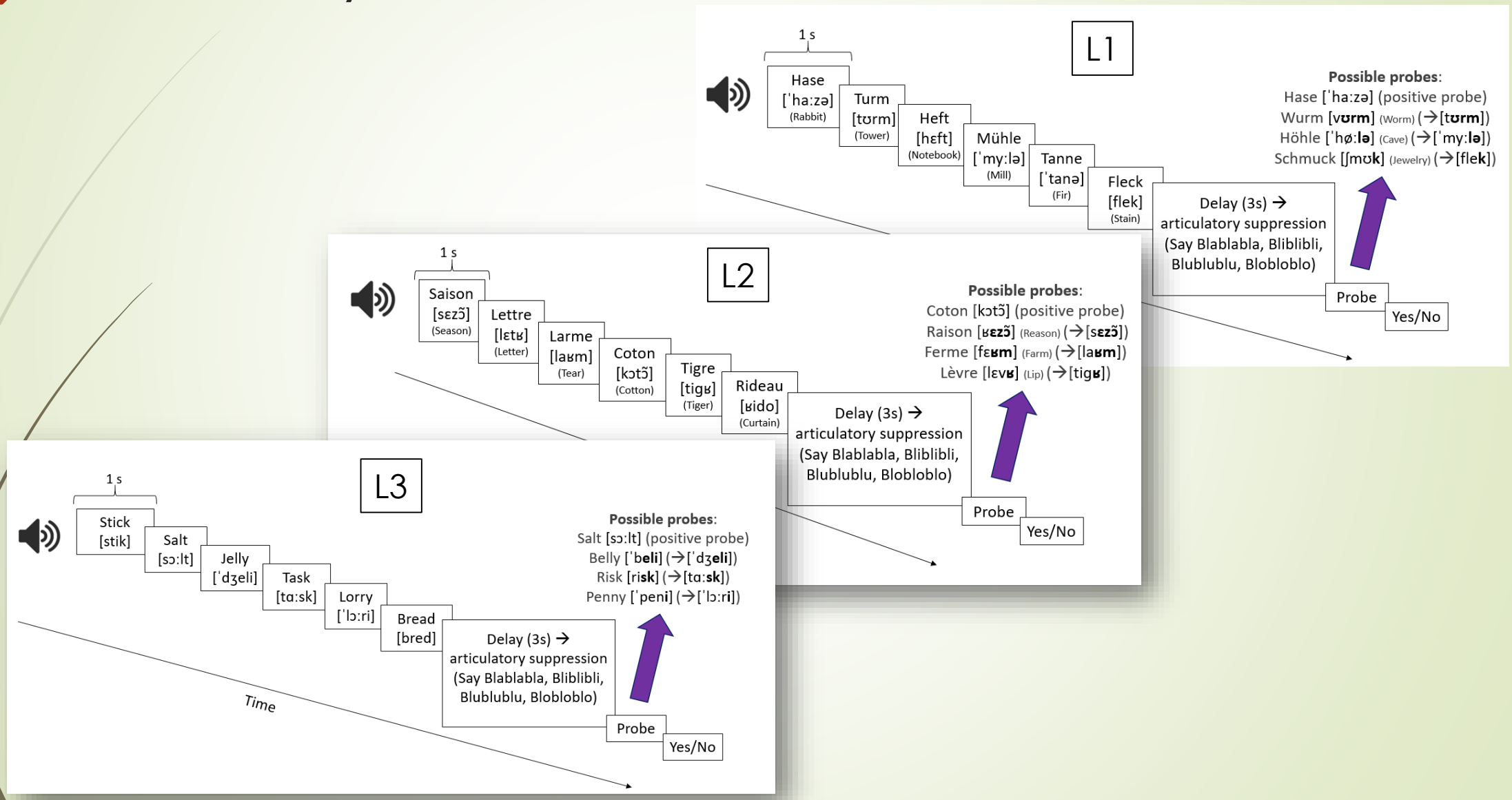
- Effect of similarity gradient
- Interindividual variability
- What about precision **for L2 and L3**?
  - Varying language representations
  - Depending on language proficiency

Study 2: Methods

- Participants:
  - 35 Belgian German speakers (18 women)
  - 18-30 years ($\bar{x}$ = 22.11; σ = 3.35)
- Same task…

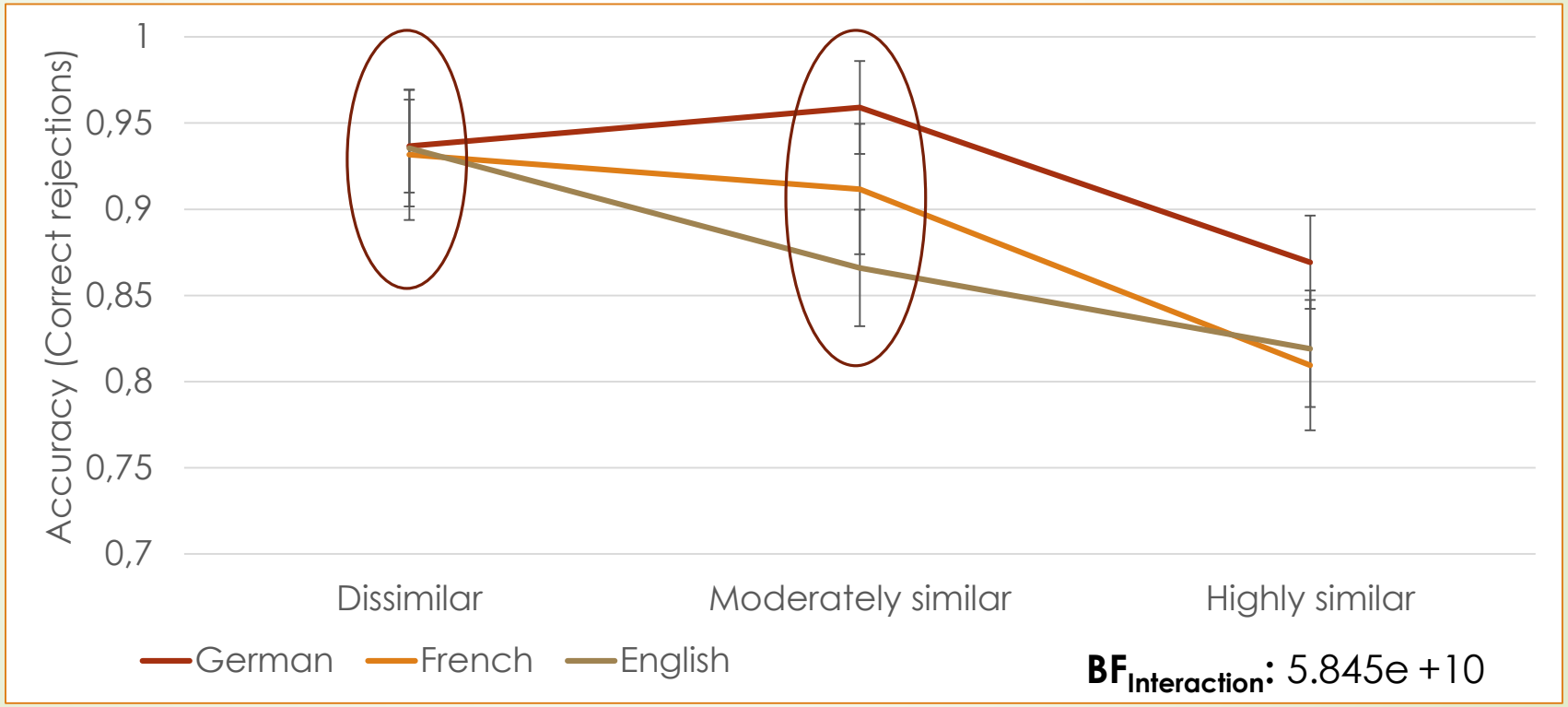
  …in German (L1), French (L2) and English (L3)
- Evaluation of receptive (Dunn & Dunn, 1997) and productive vocabulary (Bonin et al., 2003)
- Three testing sessions

Study 2: Methods



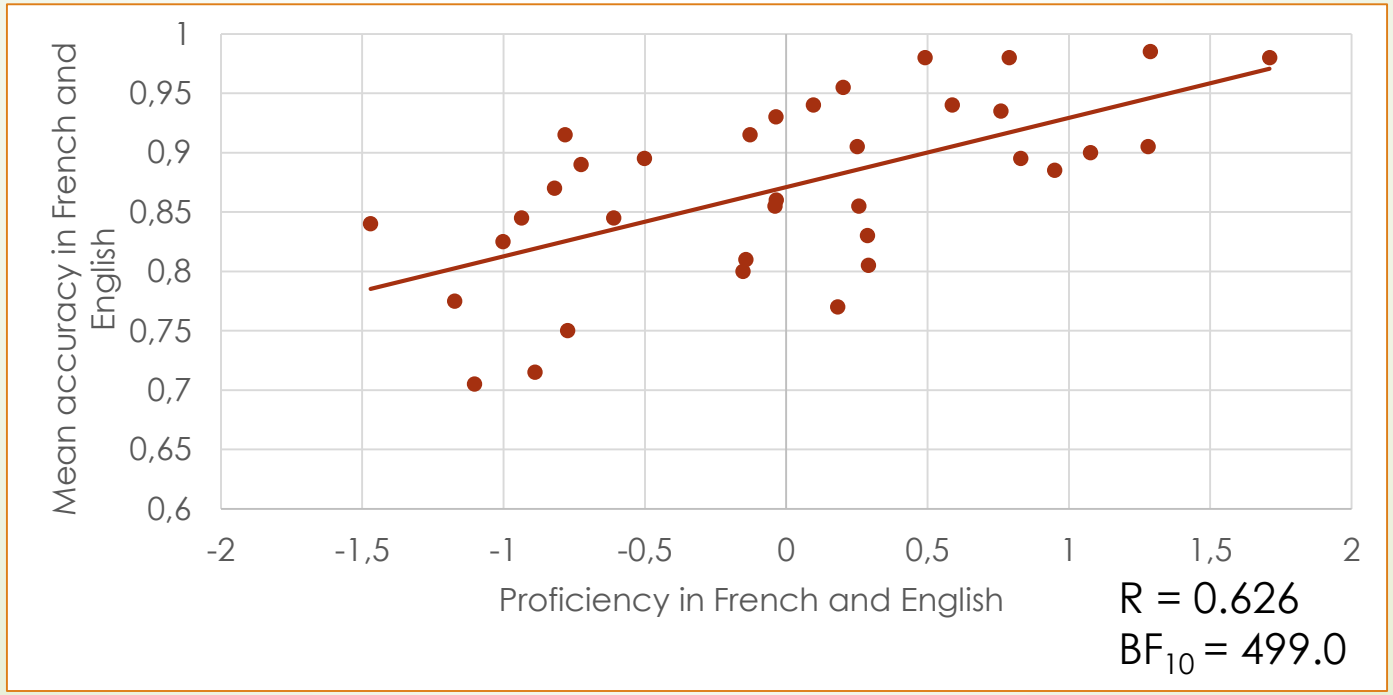
Study 2: Results

Interaction Language * Condition



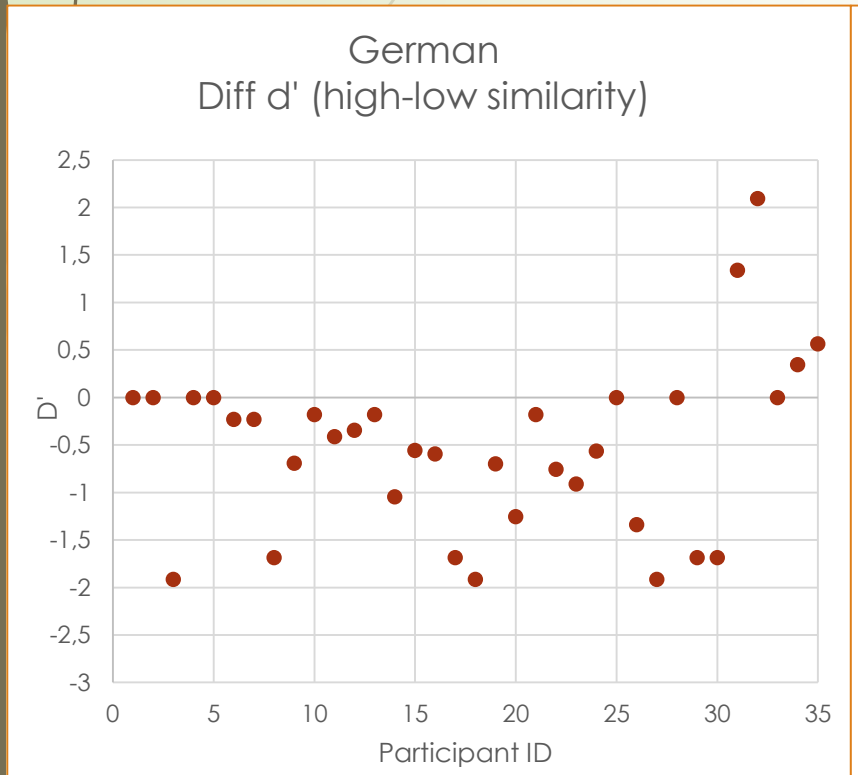
Study 2: Results

Correlation between L2 and L3 mean accuracy and L2 and L3 proficiency

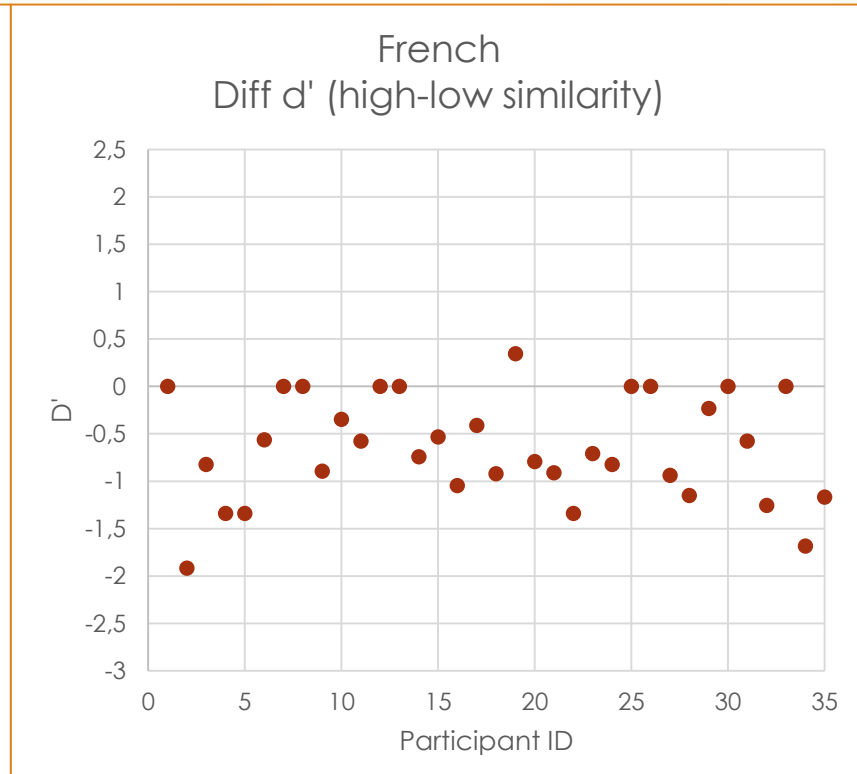


Study 2: Results

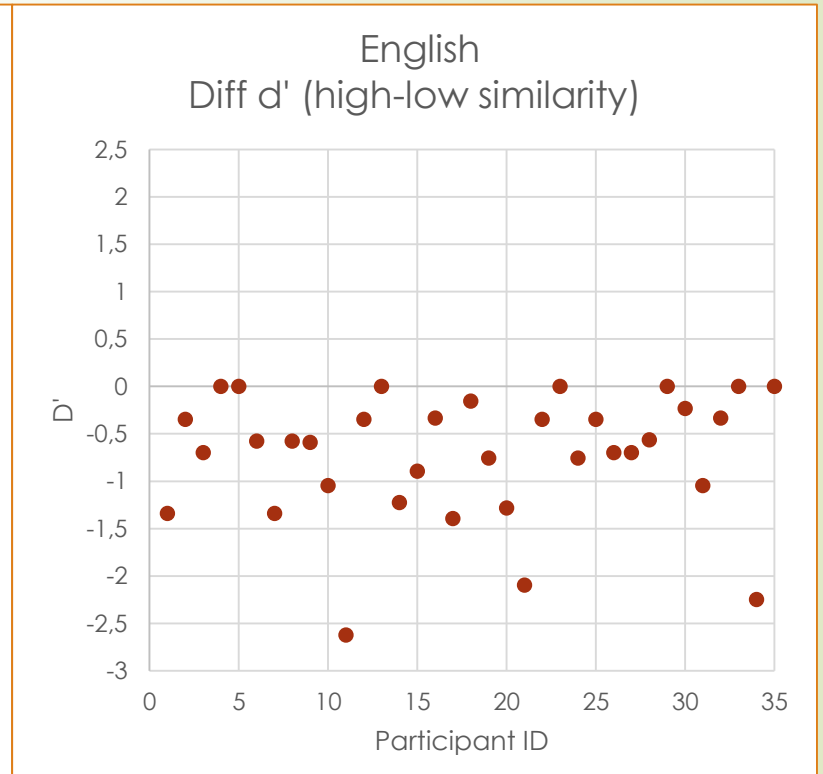
Interindividual variability and precision scores



Mean: -0.52
SD: 0.9



Mean: -0.65
SD: 0.56



Mean: -0.71
SD: 0.66

Study 2: Results

Precision scores (d' contrasts): Between-language correlations

	DE Diff d' (high-low similarity)	FR Diff d' (high-low similarity)
DE Diff d' (high-low similarity)	—	
FR Diff d' (high-low similarity)	-0.262	—
ENG Diff d' (high-low similarity)	-0.043	0.012
* BF_{10} > 10, ** BF_{10} > 30, *** BF_{10} > 100		

General discussion and conclusion

- Observed gradients
  - Phonological similarity
  - Language
- Correlations with L2 and L3 proficiency
- Interindividual variability
- Correlation between precision scores?

General discussion and conclusion

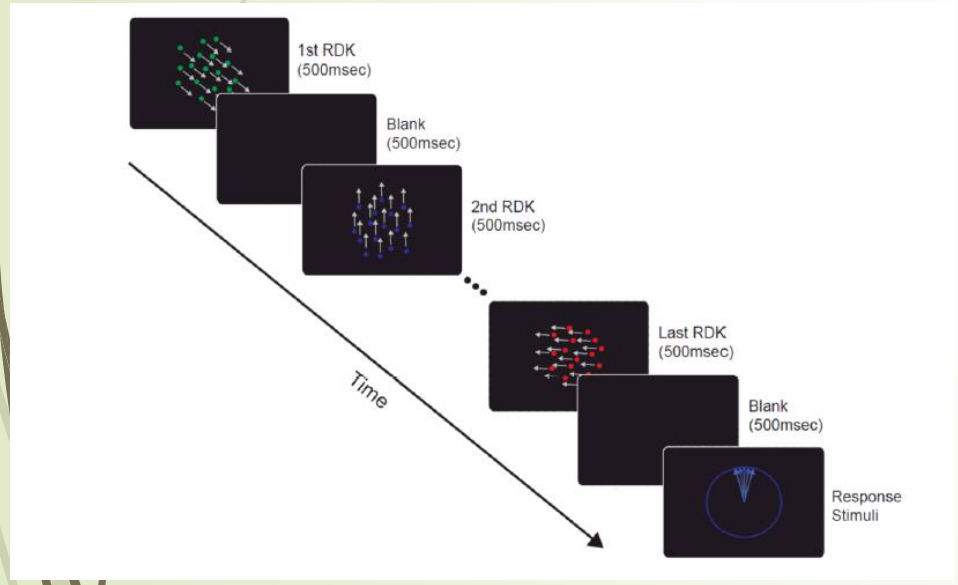
- Sensitive measure of STM performance
- Interdependence between language system and verbal STM (Baddeley et al., 1998; Cowan, 1999; Burgess & Hitch, 2006; Majerus, 2010; Majerus, 2013)

Merci für die attention!

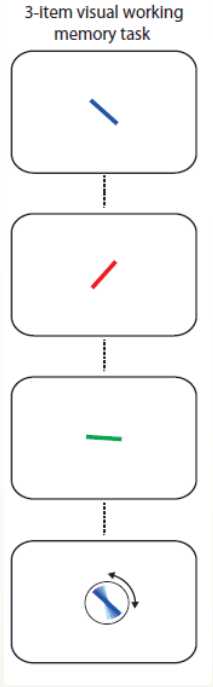
Backslides

Introduction

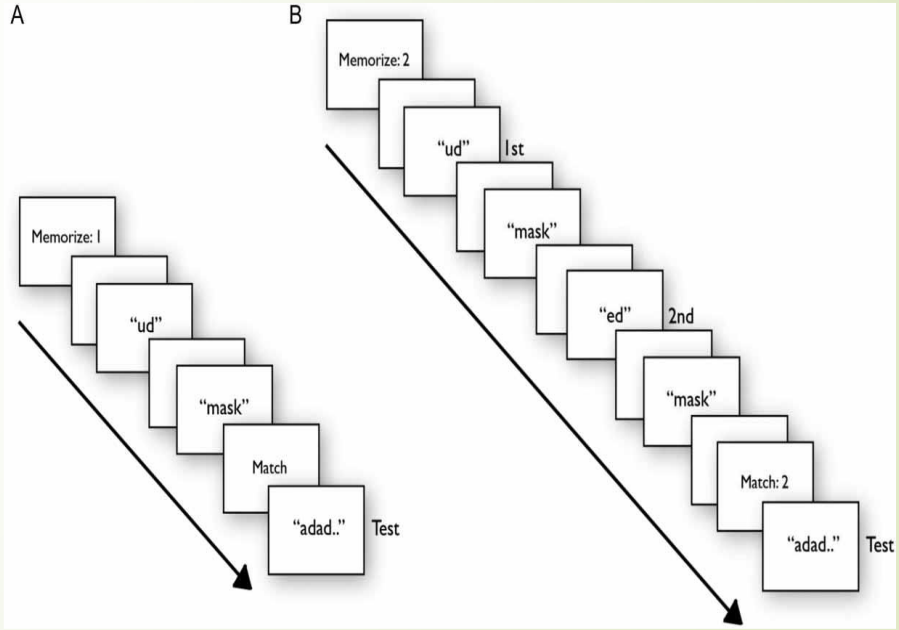
Some studies already conducted



Zokaei et al., 2011



Burnett Heyes et al., 2012



Joseph et al., 2015

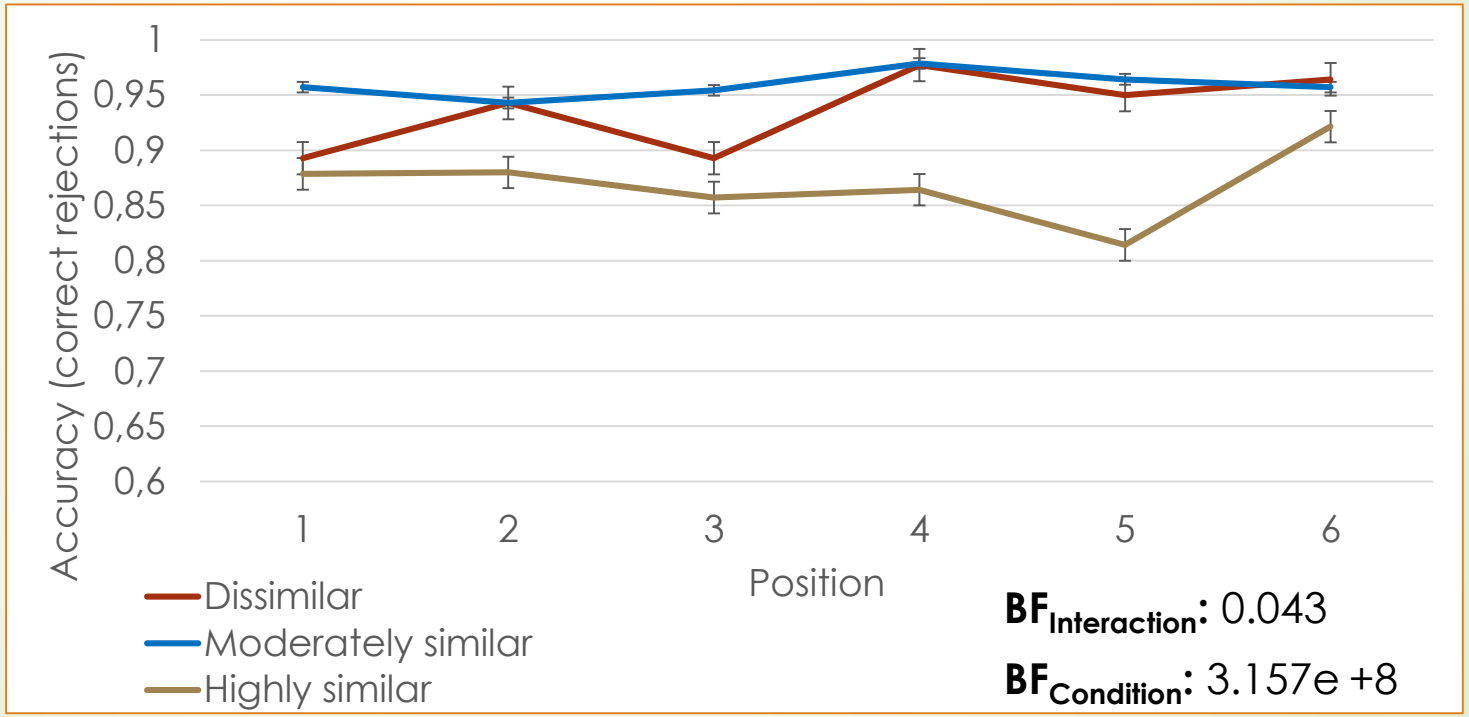
Introduction

Main results

- Load effect (Zokaei et al., 2011; Joseph et al., 2015; Clark et al., 2018)
- Recency effect (Zokaei et al., 201; Burnett Heyes et al., 2012; Joseph et al., 2015)

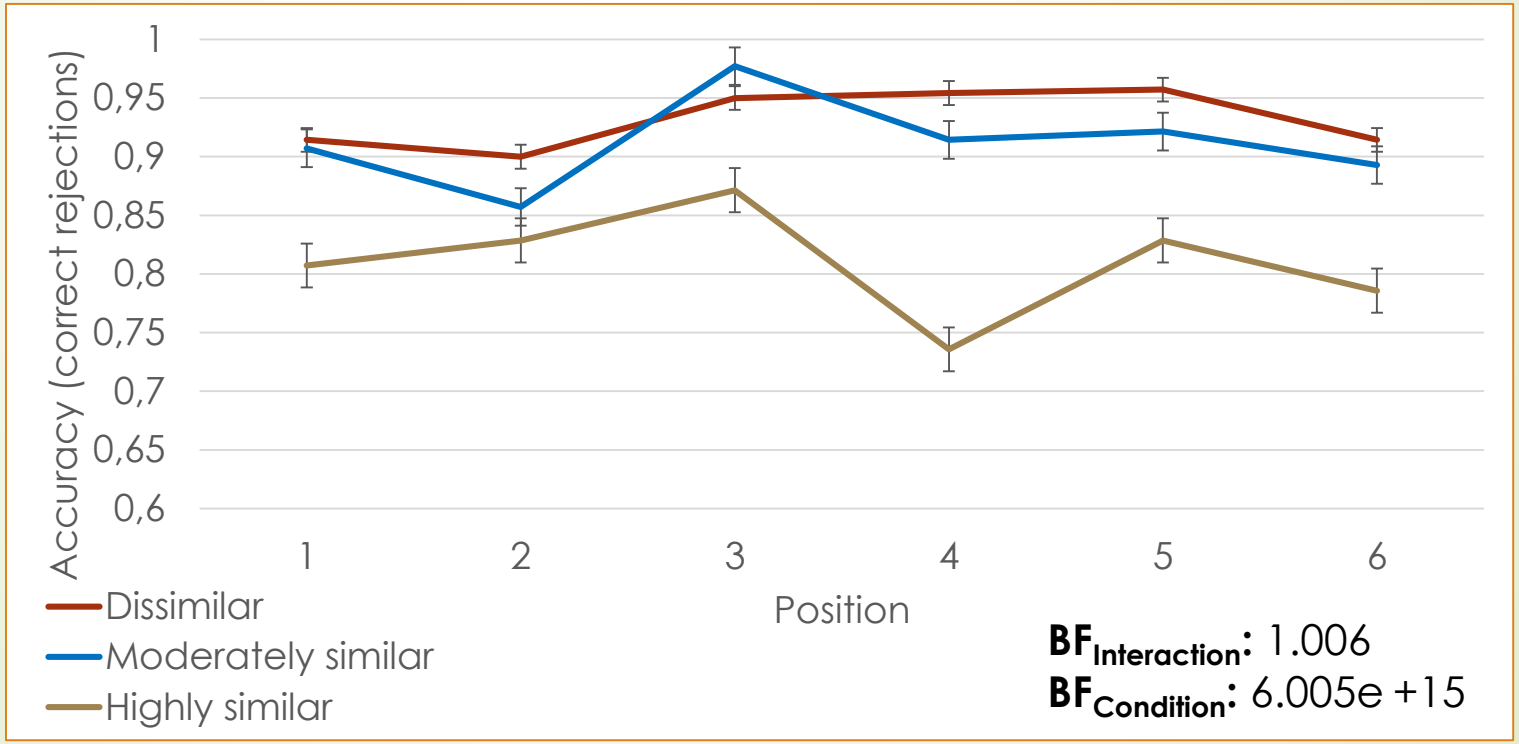
Study 2: Results

German: Interaction Condition * Position



Study 2: Results

French: Interaction Condition * Position



Study 2: Results

English: Interaction Condition * Position