#4103

The Influence of Bilingualism on Statistical Word Learning

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Introduction

Bilinguals are often thought to be better at **learning novel words** than monolinguals.

The results of our **ongoing meta-analysis** are in line with an overall bilingual advantage (g = -0.18; 95 % CI -0.32 to -0.04, I^2 = 26.92 %), though results vary widely, with some studies indicating a general benefit and others showing advantages only in specific conditions.

In particular with statistical word learning, **contrasting results** were found:

- A **general bilingual** advantage (Aguasvivas et al., 2024; Escudero et al., 2016),
- A **specific bilingual** advantage (Poepsel & Weiss, 2016; Crespo et al., 2023),
- A **monolingual** advantage (Crespo & Kaushanskaya, 2021),
- No difference at all (Benitez et al., 2016; Li & Benitez, 2023).

However, the studies **varied** in population (types of bilinguals, age), stimuli, and exact learning paradigm (type and number of mappings), and most of them had few participants.

Mutual exclusivity bias

Show me the DAX

Definition: the tendency to assume that an object can have only one linguistic label (e.g., Markman and Wachtel, 1988).
Previous research has shown that **bilingual** children **relax** their use of the mutual exclusivity bias (e.g., Kalashnikova et al., 2015).

These findings suggest that bilinguals should outperform monolinguals when complex mappings are to be learned, consistent with a **specific bilingual advantage** (Poepsel & Weiss, 2016).

Current Experiment

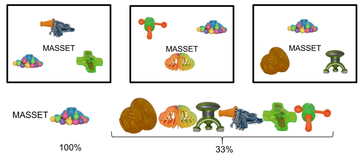
Participants

- **100** English **Monolinguals**
- **100** English-German **Bilinguals**

Using the optional stopping practice, we stopped at 200 (our maximum) usable participants (Rouder, 2014).

Procedure

Paradigm: Cross-Situational Statistical Learning (CSSL)



If a **word** and its **meaning** have above baseline probability of co-occurring, this information can be used across situations to learn the correct mappings.

Participants had to select an object on each trial.

Accuracy

Goal

The current study aims to clarify whether one's language group (monolingualism vs bilingualism) impacts statistical word learning.

There are different types of mappings:

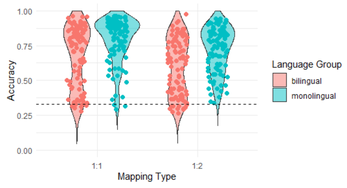
- Simple (**1:1**) mapping:
  1 word mapping onto 1 object
- Complex (**1:2**) mapping:
  1 word mapping onto 2 objects
  (c.f., interlingual homographs/false friends)

Hypotheses:

- **H1**: It will be **harder** to acquire **1:2 than 1:1** mappings.
- **H2**: **Bilinguals** will outperform monolinguals only in **1:2** but not **1:1** mappings (Poepsel & Weis, 2016).
  Consistent with a **specific bilingual advantage**.

Results: Accuracy

Participants in general learnt words quite well (M = .71, SD = .46) and scored significantly above chance (chance level = .333, $t(199) = 27.22$, $p < .001$).



Bilinguals (M = .65, SD = .48; $t(99) = 15.09$, $p < .001$) and **Monolinguals** (M = .76, SD = .44; $t(99) = 27.17$, $p < .001$) were able to learn better than chance level.

H1:

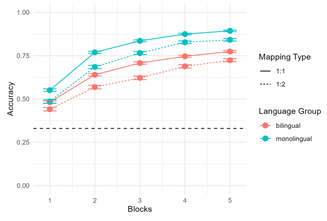
We **found** a main effect of:

- **Block**

(β = 0.44, SE = 0.02, z = 23.57, BF > 1000)

- **Mapping type**

(β = 0.50, SE = 0.09, z = 5.82, BF >1000)
As predicted, participants were generally better at learning 1:1 than 1:2 mappings.



H2:

We did **not** find an **interaction** of mapping type and language group (β = -0.13, SE = 0.07, z = -1.83, BF = 0.93), with the BF indicating that results are inconclusive.
Instead the main effect of **language group** had a BF greater than 3 (β = -0.66, SE = 0.14, z = -4.77, BF = 9559.11).
Against our predictions, **Monolinguals** learned words overall better than **Bilinguals** regardless of the mapping type.

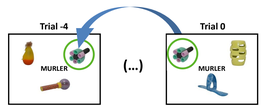
Trial-by-trial Analyses

Definition

In these so-called trial-by-trial analyses, **accuracy on a current trial** is predicted by characteristics or behaviors on **previous trials** with the same word or objects.

In particular we will explore if learning can be **predicted by**:

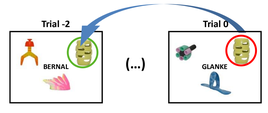
- **Last-target accuracy**



Participants are more likely to be correct on a current trial (Trial 0) if they were **also correct** the last time they encountered the same word (Trial -4).

- **Last-competitor accuracy**

Participants are more likely to be correct on a current trial (Trial 0) if they had selected the **correct referents** for the **competitor** objects the last time they were the target object (Trial -2).

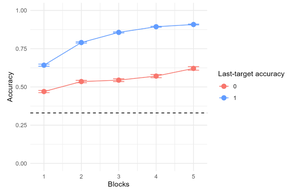


Last-competitor accuracy can be seen as a measure of the **mutual exclusivity bias**.

Hypotheses:

- **H3**: Accuracy on the current trial will be higher if participants were also accurate on the preceding trial with the same word.
  (e.g., Roembke & McMurray, 2016)
- **H4**: The use of the mutual exclusivity bias will be lower for **bilinguals** than **monolinguals.**
- **H5**: The use of the mutual exclusivity bias will be lower for **1:2** than **1:1** mappings.

Results: Trial-by-trial Analyses



H3:

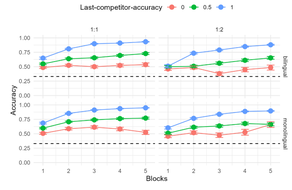
We found a **BF greater than 3** for the interaction of **last-target accuracy** and **target-count** (β = 0.24, SE = 0.03, z = 7.34, BF > 1000).

H4:

We found **inconclusive** results for the interaction of **last-competitor accuracy** and **language group** (β = 0.05, SE = 0.07, z = 0.74, BF = 1.00).

H5:

We also found an **inconclusive** result for the interaction of **last-competitor accuracy** and **mapping type** (β = 0.15, SE = 0.08, z = 2.03, BF = 1.51).



Discussion

We were able to confirm that **1:1** mappings are **easier** to learn than **1:2**.

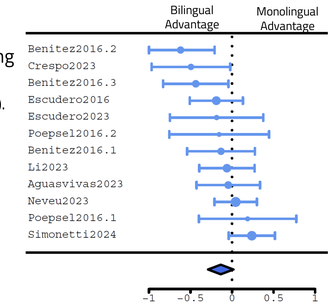
However, we could **not** confirm the **specific bilingual advantage** found by Poepsel and Weiss (2016).

→Our results are instead in line with a **general monolingual advantage**.

Other word learning studies that found a **monolingual** word learning advantage found it in **babies or children** (e.g., Rocha-Hidalgo et al., 2021).

Only **one** other **statistical** word **learning** study found a general monolingual advantage (Crespo & Kaushanskaya, 2021).

Adding our result to our meta-analysis, the bilingual advantage **ceased to be significant**.



Trial-by-trial analyses highlighted that a relaxation of the mutual exclusivity bias was not encountered neither by bilinguals nor with 1:2 mappings.

Conclusion:

We can conclude that (if existing) bilingual cognitive advantages are highly **population-, task- and setting-specific**.

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