# Investigating language learning and morphosyntactic transfer longitudinally using artificial languages

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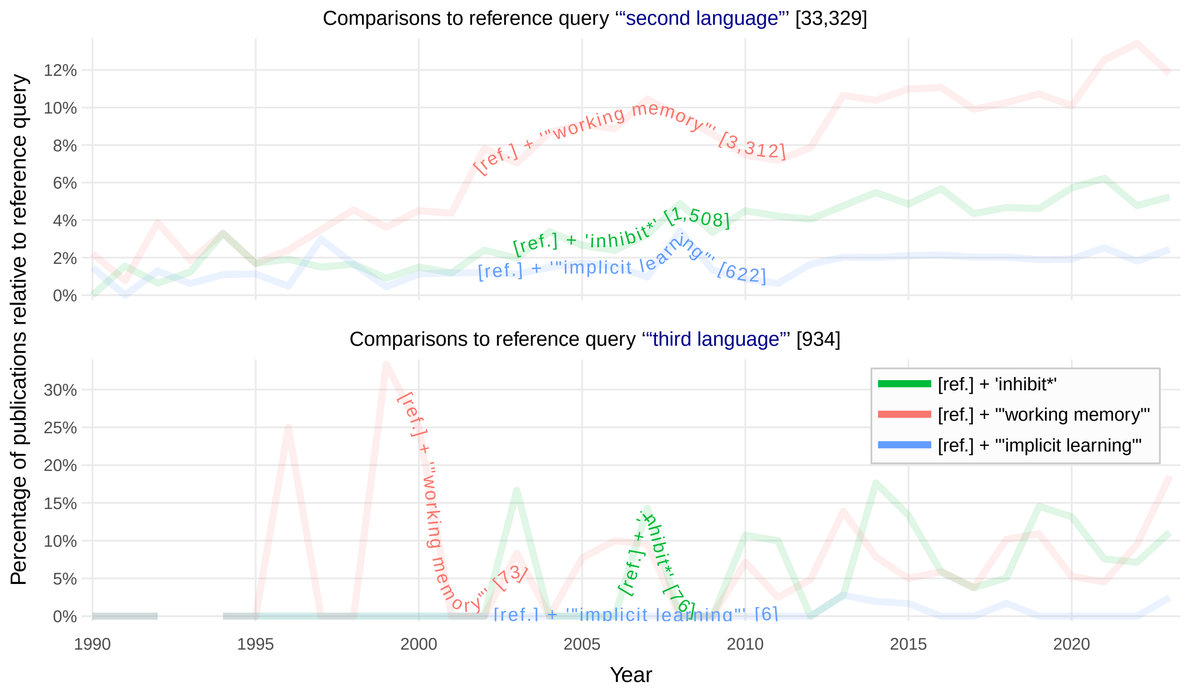
## Language learning

- More attention to executive functions (EFs) in second language (L2) [1] than in third language (L3) [2] (bibliometric analysis from https://osf.io/m7zua).
- Working memory contributes most to L2 learning [1].




- Inhibitory control linked to language-switching ability and resistance to interference from non-target languages [3].
- Implicit learning linked to acquisition of morphosyntactic features [4].
- *Current study:*
  - Role of three EFs at onset of L3 learning [1] using artificial language paradigm [5], contributing to cross-validation of EFs in multilingualism [6].
  - Longitudinal stability of EFs and resting-state EEG. Longitudinal consistency examined by associating predictive power of each EF over Session 2 performance with pre-post change of each EF.

## Morphosyntactic transfer in third language acquisition

- L3/L*n* acquisition draws on previous languages–e.g., L1 and/or L2. Use of artificial languages in research allows examination of onset of learning/acquisition without confounds such as age of acquisition, proficiency and morphological salience [7].
- Attention allocation–e.g., N200 and P300 effects–in response to grammatical violations may precede selection of a source(s) of transfer. More extensive training and practice may be needed for P600 effect [5, 8, 9].
- *Current study:* Longitudinally, transfer source selection is steered using artificial languages containing lexicons from natural languages but identical, novel morphemes. Hypotheses afforded by various models [7, 10]. E.g., full, early transfer guided by structural proximity [7] predicts Mini-Norwegian and Mini-Spanish groups will be more sensitive to gender agreement than Mini-English group [5].

## Methods

### Participants

- **Tromsø, northern Norway:** L1 Norwegian, L2 English. Other languages curbed. Mini-Norwegian and Mini-English between groups.
- **Madrid, central Spain:** L1 Spanish, L2 English; L1 English (child heritage), L2 Spanish. Other languages curbed. Mini-Spanish and Mini-English groups in each of the previous groups (2 × 2).

*Exclusion criteria in both sites:* language disorders (due to need for fast learning of artificial grammars), attention disorders (due to findings on attention-related N200 and P300), colour blindness (due to colour-based EF task).

### Materials

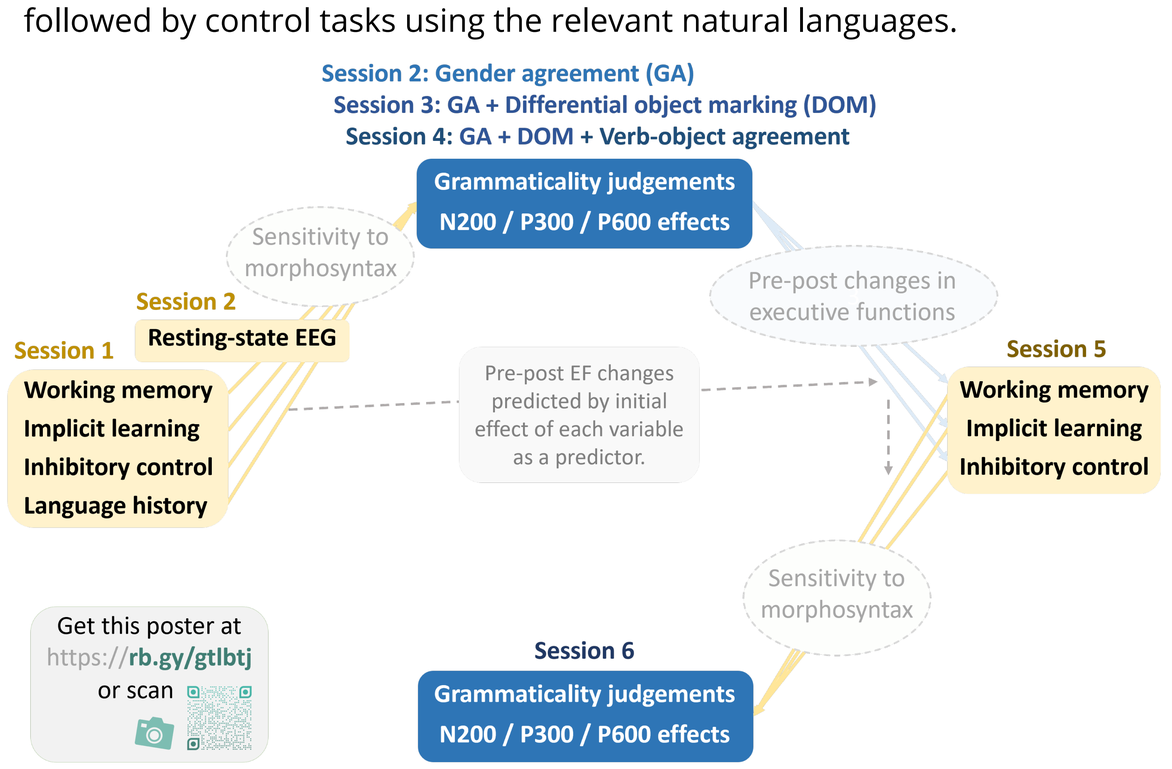
Mini-English, Mini-Norwegian and Mini-Spanish are each formed of the lexicon of the original language, and all three share the same novel morphemes for each of the following properties.

1. **gender and number agreement** between nouns and adjectives in copular sentences (natural to Norwegian and Spanish);
2. **differential object marking** (natural to Spanish);
3. **verb-object agreement** (absent from English, Norwegian and Spanish)

## Design and planned analyses

- **Session 1:** EFs and language history. Next session in a week.
- **Sessions 2, 3 and 4** (one week apart from each other):
  - Session 2 takes place around a week after Session 1, and begins with a resting-state EEG measurement (👁 & 🙈), related to attention [11];
  - in Sessions 2–4, implicit training and test in new grammatical property;


  - in Sessions 2–4, EEG experiment in which participants judge grammatical and ungrammatical sentences containing the grammatical properties presented incrementally over weeks.
- (+ one week) **Session 5:** EFs retested.
- (+ four months) **Session 6:** Repetition of EEG experiment from Session 4, followed by control tasks using the relevant natural languages.

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