Age effects in L2 grammar processing as revealed by ERPs and how (not) to study them

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INTRODUCTION
What is the effect of Age of Acquisition (AoA) on grammar processing in a second language (L2)?
- Hypothesis 1: Older learners perform better than younger learners.
- Hypothesis 2: Older learners show more syntactic processing than younger learners.

This study: effect of AoA on brain response (ERP) to grammatical violations

METHOD
- Subjects: Slavic advanced learners of German, AoAs 7–36 years
- Materials: auditorially presented German sentences with correct and incorrect agreement of:
  - grammatical gender, e.g., das *der August (biological)/"the person"
  - non-finite verbs, e.g., hat die Rose geblüht?/"has the rose bloomed?"
- Analysis: generalized additive mixed-effects regression model with fitted effects as indication of native-like processing

RESULTS
Traditional ANOVA approach (group split)
- Shows late learners' lack of sensitivity to gender violations:
- Non-finite verb agreement:
  - Agreement: Shows a P/600 effect for all AoAs, although slightly decreasing in size over AoA
  - Effect of incorrectness: Incorrect Incorrect
  - Effect of AoA (n.s.):
  - Difference between incorrect and correct: Shows a continuous decrease of the size of the P600 across AoA, with latest learners instead showing a negativity

RESULTS (cont.)
- Generalized additive modeling (GAM) approach: AoA as a continuous variable and non-linear pattern over entire time range
- Gender agreement:
  - Correct Incorrect
  - Difference between incorrect and correct

RESULTS (cont.)
- Non-finite verb agreement:
  - Correct Incorrect
  - Difference between incorrect and correct

CONCLUSIONS
- AoA leads to differences in processing strategy for gender, but not for non-finite verb agreement
- Gradual decline: against CP and in favor of more general cognitive developmental factors and competition from L1
- Uncovering these differences requires a statistical approach that takes into account the full range of non-linear response patterns and continuous predictors

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