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1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?

Can a communicative pressure result in the emergence of a writing system that is more informative than the spoken language? If so, how does this differ across two distinct mechanisms (differentiation, Experiment 1 and conservation, Experiment 2)?

Experiment 1 (differentiation)

- –communication: We expect to see the emergence of a transparent orthography. This will be reflected in a decrease in informativeness over generational time, an increase in learnability over generational time, and the majority of final-generation systems being degenerate.
- +communication: We expect to see the gradual emergence of differentiated suffix spellings. Informativeness will remain high over generational time, but the systems will transition from holistic to compositional, resulting in increasing learnability; the majority of final-generation systems will be expressive.

Experiment 2 (conservation)

- –communication: We expect the orthography to track the spoken forms as they change over time, becoming simpler with successive sound mergers and ultimately becoming fully degenerate and uninformative. Informativeness will decrease over time and the majority of final-generation systems will be degenerate. Learnability will remain high, or even increase, as the systems transition from compositional to degenerate.
- +communication: We expect the orthography to retain archaic (but informative) spelling distinctions even after these distinctions cease to exist in the spoken language. The informativeness of the orthography will remain high, even as the informativeness of the spoken system systematically decreases, and the majority of final-generation systems will be expressive. Learnability will remain high and fairly stable since the compositional systems should persist over time.

3) Describe the key dependent variable(s) specifying how they will be measured.

- Informativeness, measured as communicative cost (lower cost = higher informativeness). Average information loss (in bits) when using language L to communicate a meaning m from universe U . This is given by $1/|U| \times \sum [-\log(\Pr(m|s_m))]$ for m in U , where $\Pr(m|s_m)$ gives the probability that a listener would infer meaning m given that a speaker produced signal s for meaning m .
- Learnability, measured as transmission error (lower error = higher learnability). Mean Levenshtein edit distance between the words produced at generation i and the corresponding words produced at generation $i-1$.
- Dominant System Type. An orthographic suffix system may be classified as degenerate, redundant, or expressive based on the reference system it is most similar to, as measured by the variation of information (VI) distance metric.

4) How many and which conditions will participants be assigned to?

In each experiment, there are two conditions: –communication and +communication. In each condition, we will run ten iterated learning chains for nine generations. Each experiment has a between-subjects design with random assignment to condition, chain, and generation.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

We have not prepared a detailed statistical plan because the nature of these experiments is quite exploratory and the precise methods will need to be adapted to the particular outcomes (e.g. generational effects may be non-linear in some conditions). In general, however, our hypotheses will be evaluated with mixed-effects regression models of the following form: $dv \sim \text{generation} * \text{condition} + (1 + \text{generation} | \text{chain})$. These will be run in the Bayesian framework.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

Since the input to one participant is the direct output of another participant, the data must be monitored as it comes in to filter out non-compliant participants (i.e. so as not to invalidate the rest of the chain). It is difficult to predict a-priori what kinds of invalid output might occur, so we will make a judgment call on a case-by-case basis. All exclusions will be documented and we will err on the side of being permissive, only excluding participants whose output demonstrates a clear misunderstanding of or abuse of the task (e.g. responding with English words, entering the bare minimum to get through the task as quickly as possible, repeatedly clicking the same button on comprehension trials, extremely short response times, failure of more than one attention check, etc.). In previous similar experiments, rejections were rare (~ 2%) and entirely due to failing the audio attention checks.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

The number of subjects required (after exclusions) is fixed by the experimental design: 10 chains of 9 generations results in 90 participants in the –communication condition and 180 participants in the +communication condition for a total of 270 participants in each experiment (540 overall). We chose to run ten chains per condition because this was the maximum number achievable within our budget. Simulations of the above-mentioned linear regression model suggest that ten chains will provide sufficient power to detect a communicative-cost effect size as small as around 0.05 bits per generation (which represents a minimally interesting effect size).

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

Nothing else to pre-register.