Experimental and Computational Methods in Linguistic Research

Spring 2025

Instructor: Sanghee Kim

Week 8

Agenda

- Research presentation
- Research report

- Data collection
- Other methods

Next week: Presentation!

You will give a 30-minute oral presentation on your research project proposal. In addition to presenting your research question and a summary of your methods, you should demonstrate the process of creating your materials and setting up the experiment. You should also outline your plans for analyzing and reporting the results. Be prepared to answer questions from your classmates.

Next week: Presentation!

You will give a ~~30-minute~~ oral presentation on your research project proposal. In addition to presenting your research question and a summary of your methods, ~~you should demonstrate the process of creating your materials and setting up the experiment~~. You should also outline your plans for analyzing and reporting the results. Be prepared to answer questions from your classmates.

Some of the guidelines in the syllabus are out of date, so refer to the guidelines in the following slides.

Presentation guideline

- **Time**: 20 minutes per person
  - **Presentation**: 13-14 minutes (<u>IMPORTANT!! Practice timing yourself!</u>)
  - **Q&A Session**: 5~6 minutes
- **For Presenters**: Your audience is your classmates—not me. This is their first time hearing about your research. Make your presentation accessible so everyone can follow what you're saying. Aim for clarity over complexity.
- **For Audience**: Listen critically, take notes if needed, and be prepared to ask thoughtful questions during the Q&A. Your questions help the presenter improve their work.

Presentation guideline

- **Slides should include:**
  - The phenomenon (with a key set of example)
  - Research question and hypotheses
  - Methods (be precise)
  - Analysis plan
  - Plan for reporting the results
  - Predicted results

Research report

- Based on Assignment 6…

Data collection

Subjects

- Depending on the nature of the research, one might call this person by a variety of names – a subject, an informant, a participant, a collaborator, a consultant, etc.

Data collection

- How do we recruit subjects?
  - Flyers, word of mouth, Prolific

- How do we encourage subjects to participate?

- What are the subjects' rights?

Consent

- Consent is the cornerstone of ethical research practices.
- A researcher should obtain consent for participation BEFORE the experiment begins.
- A subject has the right to withdraw from the experiment at any time.

Informed Consent for Human Sentence Processing: A cross-linguistic investigation of sentence comprehension and production (IRB ███████)

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PI: ▮▮▮▮▮▮▮▮▮▮▮. Phone: ▮▮▮▮▮ Email: ▮▮▮▮▮▮▮

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Purpose of the research:

What you will do in this research:

Time required:

Risks:

Benefits:

Compensation:

Confidentiality:

Participation and withdrawal:

Contact:

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Time required: Participation will last approximately 15 minutes.

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Compensation: You will receive $3.00.

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Social & Behavioral Sciences Institutional Review Board, University of Chicago, 1155 E. 60th street, Room 418, Chicago IL 60637. Phone: (773) 834-7835. Fax: (773) 834-8700. Email: sbs-irb@uchicago.edu.

IRB (Institutional Review Board)

- A committee that reviews research involving human participants.

- Approval from the IRB is legally and ethically required before recruiting participants.
  - Required for most university-affiliated research involving people.

- IRB reviews research proposals examining whether ethical and protects participants' rights and welfare; it may ask researchers to revise their study.

Recruitment and data collection

Participant recruitment

Hosting platforms

Prolific

- https://app.prolific.com/researcher/workspaces/6215281391e16251b4d1861e/screener-sets/find

Other behavioral methods in linguistic research

Acceptability judgment task (AJT)

- Yes/No or Likert Scale

- **Prompt**: *Please rate how natural or acceptable the following sentence sounds in English.*

- **Sentence**: *The student who the teacher praised was very happy.*

- **Scale (Likert-style)**:
  1 = completely unnatural / unacceptable
  2 = somewhat unnatural
  3 = neutral
  4 = somewhat natural
  5 = completely natural
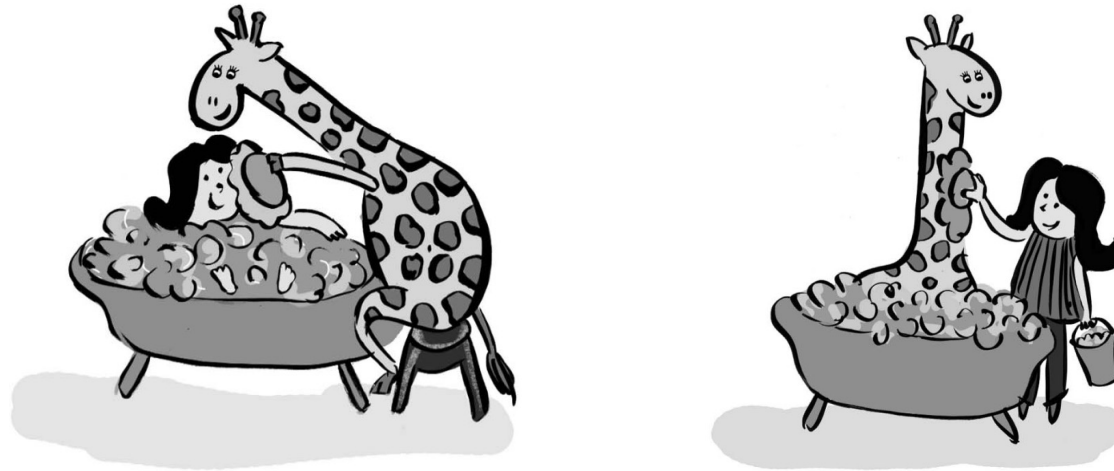
Picture matching task

- **Audio Played:** *The fish swim in a tank which is perfectly round.*

- **Task:** Participants see two pictures:

- **Picture A:** Fish in a round tank.
  Picture B: Fish in a rectangular tank.

- **Prompt:** *Click the picture that matches the sentence you heard.*

- https://farm.pcibex.net/r/QuFrkC/experiment.html

Truth Value Judgment Task (TVJT)

- Imagine there's a boy who has **two apples**, and he eats **only one** of them. [Or sometimes participants are given images of this context.]

- **Test Sentence:** *The boy ate all the apples.*

- **Prompt:** *Is this sentence true or false based on the story?*

- **Options:** True / False

Elicitation task

- **Prompt:** *Describe what is happening in this picture using a complete sentence.*

- **Expected Response:** *The {giraffe/girl} is washing the {girl/giraffe}.*

Eyetracking (Reading)

- https://www.youtube.com/watch?v=bSEWrbcrFc0 (from 0:25")

Eyetracking (visual world paradigm)

- Useful for tracking visual attention

- Where people are looking at
  = What is being processed

https://farm.pcibex.net/experiments/HzHwXM/edit

How can Language Models be used for linguistic research?

Why use model output for psycholinguistic research?

At least three reasons:

1. Test existing psycholinguistic hypotheses (specifically about predictive processing)

2. Make learnability arguments (i.e., what can be learned given some data and learning algorithm)

3. Build a cognitive model using model architecture

Testing hypotheses about predictive processing

- Ex) What we did for Assignment 6

- **Questions**: To what extent does prediction play a role in processing?

- **How LM is used**: Operationalize predictive processing with (L)LM predictability (i.e., model output) and derive predicted measures.

- **Kinds of inferences or conclusions**: If predicted and empirical measures align, hypotheses about prediction and/or linking hypotheses are correct.

Making learnability arguments

- Ex)   Give me this. / Give this to me.
        *Explain me this. / Explain this to me.

- **Questions**: What combination of data and learning algorithm is necessary/sufficient for people's linguistic preferences to emerge?

- **How LM is used**: Operationalize model performance (using model output) whether it succeeds in achieving "human-like" performance.

- **Kinds of inferences or conclusions**: What preferences can(not) emerge given the model's learning objective and the training data.

Build a cognitive model

- **Questions**: How do we construct the underlying cognitive architecture that supports human language processing?

- How LM is used: Tweaking model architecture to simulate human cognition.

- Kinds of inferences or conclusions: Systematically change aspects of model (architecture parameters, attention layers) and examine how the change leads to different performance. If improved fit, infer possible explanations.