

## Psycholinguistics:

### Questions and methods

Psycholinguistic methodology

## What is psycholinguistics?

- Psycholinguistics is the study of language using the methods of experimental psychology / cognitive science and neuropsychology
- It treats language as a structured system that has to be 'reverse-engineered' to reveal its structural and computational organization

Psycholinguistic methodology

## Basic questions in psycholinguistics

What is language? What are its natural components? How are those components structured, interconnected, and processed? How is language structure instantiated and processed in the brain? How does that structure develop? How does that structure support the different input and output modalities of language? What rules/principles/systematic constraints determine how language processing operates on the structure? At what level (genetic/neurological/physiological/cultural) are those constraints operating? How is that processing affected by extra-linguistic factors such as attentional and memory resources? How is it affected by neurological damage?

Psycholinguistic methodology

## Three goals of psycholinguistics

- i.) Description: Mapping out the space of all existent linguistic functions
- ii.) Explanation: Uniting these functions under a neurologically-plausible model of how language is processed in the brain
- iii.) Exploration: Buttressing and extending the resultant models to make them more comprehensive or more elegant

Psycholinguistic methodology

## Three methods of psycholinguistics

- i.) Direct measurement
- ii.) Measurement with interference
- iii.) Modeling

Psycholinguistic methodology

### i.) Direct measurement

- The simplest method is to ask subjects to perform a linguistic task under controlled conditions and measure how well they do it (in ways to be discussed shortly)
- The main complication is many explanations for performance must be balanced
  - Control between tests: Within/between subject problems
  - Control for extra-linguistic factors: fatigue, refusal to cooperate, cognitive damage, sex
  - Control of linguistic factors: stimulus length, complexity, frequency, category

Psycholinguistic methodology

## ii.) Measurement with interference

- Ask subjects to perform a linguistic task under controlled conditions, *with some controlled perturbation*, and measure how well they do it
- Possible sources of perturbation
  - Brain damage: Relate performance to site
  - Group: Different subject groups
    - Manipulate age, damage-type, diagnosis, sex
  - Task: Get subjects to do two tasks at once
    - Shadowing: repeating words while engaging in a different task

Psycholinguistic methodology

## What can be measured?

- The majority of psycholinguistic studies use one (or more) of six dependent measures:
  - a.) Reaction time
  - b.) Stimulus discrimination rates
  - c.) Amount of facilitation/interference
  - d.) Error rates
  - e.) Attentional focus
  - f.) Subjective judgments

Psycholinguistic methodology

## a.) Reaction time

- Assumption: Different processes take different times to complete
- By careful manipulation of one variable, with control of other variables, one can infer which variables may be relevant to any psycholinguistics process
  - Problems: Can be difficult to measure; changes with disease processes and age; control of variables is not always possible; sometimes generalization has to be sacrificed for control; makes some debatable assumptions about time and computation

Psycholinguistic methodology

## Lexical decision

- One of the most widely used tasks in the study of single words is lexical decision
- Subjects are shown (or played) words and nonwords, and asked to decide as quickly and accurately as possible which it is
  - Dozens of variables have been demonstrated to impact on lexical access of both words and nonwords using lexical decision experiments.
  - These include word frequency, letter and phoneme length, measures of orthographic similarity or regularity, and measures of regularity of similar words

Psycholinguistic methodology

## b.) Stimulus discrimination rates

- Ask subjects to make same/different judgments
  - This is one way of getting chronometric information without timing directly
    - For example, it has been used to show that auditory aphasics have low-level perceptual difficulties (abnormal click differentiation)
  - Confusable stimuli: confusability rates can serve as a measure of subjective similarity
    - For example, it has been used to show systematicity in how category-specific agnosics confuse certain fruits/vegetables; and in how letter-by-letter readers confuse certain letters

Psycholinguistic methodology

## False memory paradigm

- A currently-popular confusability technique is the false memory paradigm
- How subjects related words, then ask them if they have seen other related words
  - For example: bed, pillow, night, tired, dark [+ fillers]
    - Subjects will say they saw 'sleep' amazingly often
      - What does this tell us?
  - Also used for measuring sensitivity to phonological & orthographic similarity
  - Many clever variations are possible and have been used

Psycholinguistic methodology

### c.) Amount of facilitation/interference

- A form of interference (and facilitation) task
- Priming: exposure to one stimulus facilitates another
  - Both form (hog -> dog) and meaning (cat -> dog) usually primes
- Negative priming: interference of one with another
  - i.e. Stroop task: color names interfere with color naming

GREEN      RED  
- What does this tell us?

Psycholinguistic methodology

### d.) Error rates

- Errors can occur in a systematic way, so the number of errors made can be a dependent measure
  - As in false memory experiments
- Often measured with aphasic patients, where RTs may be too variable for conclusive results, and with infants where RTs are not possible
  - Changes in error rates over development may be of interest
  - Can be studied in word corpora

Psycholinguistic methodology

### e.) Attentional focus

- Looking time: in babies or using eye-trackers
  - Can quantify likelihood of fixation on a word; fixation duration; time spent to examining a word; how often (and when) a subject needs to glance back in reading; how long after a word begins a subject can fixate on a referent + more

Psycholinguistic methodology

### f.) Subjective judgments

- Plausibility judgments can be used to infer subject's sensitivity to syntactical manipulations
- Subjective familiarity judgments have found systematic variation in how subjects rate the 'wordness' of nonwords
- May be easily combined with RT measures
  - e.g. Subjects are also slower to reject high familiarity NWs in LD task

Psycholinguistic methodology

### iii.) Modeling

Models serve one of two main roles:

1. as mnemonic devices to organize complex data sets
  2. as explanatory devices, relating data from one domain to one which is better understood, more general, or more amenable to study
- The problem of under-determination
  - Main benefit may be as existence proofs: models provide lower bounds on what is necessary for any linguistic function

Psycholinguistic methodology