Why do experiments?

- Introspection doesn't tell you how language works
Why do experiments?

- Introspection doesn't tell you how language works
- Processing is subconscious
Why do experiments?

- Introspection doesn't tell you how language works
- Processing is subconscious
- Processing is really fast
Experimental Vocabulary

- Subjects Participants
Experimental Vocabulary

- Subjects Participants
- Task
Experimental Vocabulary

- Subjects Participants
- Task
- Variables (What is the effect of X on Y?)
  - Independent (X) What you manipulate
  - Dependent (Y) What you measure
Experimental Vocabulary

- Hypothesis
  - I think X will affect Y in a certain way
Experimental Vocabulary

- Hypothesis
  - I think X will affect Y in a certain way
- Stimulus
  - What people see or hear during test
Experimental Vocabulary

- Hypothesis
  - I think X will affect Y in a certain way
- Stimulus
  - What people see or hear during test
- Response
  - How they respond to stimulus
Experimental Vocabulary

- Distractor
  - Test item you don't care about, but include to keep purpose of real test items hidden
Experimental Vocabulary

• List effects
  – order of items may influence
  – randomize them
Syllabification

- **Question:** What factors influence where syllables are divided?
  - What is the effect of X on Y?
  - What is the effect of morpheme boundary
    - rent+ing, out+age (vs. pontoon, attack)
      - types of boundaries
        » compound: playmate
        » transparent: prewar
        » opaque: zealous (vs. zeal, pronunciation difference)
Syllabification

- Question: What factors influence where syllables are divided?
  - What is the effect of X on Y?
  - What is the effect of morpheme boundary
    - blink+ing, out+age (vs. monkey, attack)
  - What is the effect of written geminates?
    - rabbit versus habit
Syllabification

• Question: What factors influence where syllables are divided?
  – What is the effect of consonant legality?
    • No word ends in -pr, so a syllable can't either?
    • approve > *appr.ove, a.pprove
Syllabification

• Question: What factors influence where syllables are divided?
  – What is the effect of consonant legality?
    • No word ends in -pr, so a syllable can't either?
    • approve > *appr.ove, a.pprove
  – Effect of vowel legality
    • Words don't end in lax vowels, how about syllables?
      – lax: finish > *fi.nish, fin.ish
      – tense: phoenix > phoe.nix or phoen.ix
Syllabification

• How do you test it?
  – slash insertion
    • is habit ha / bit or hab / it?
Syllabification

• How do you test it?
  – slash insertion
    • is *habit* ha / bit or hab / it?
  – Problem: spelling doesn't reflect pronunciation
    • castle, cupboard
Syllabification

• How do you test it?
  – slash insertion
    • is habit ha / bit or hab / it?
  – Problem: spelling doesn't reflect pronunciation
    • castle, cupboard
Syllabification

- **Solution: show quasi-phonetic representation:**
  - victim
    - VI / KTUHM
    - VIK / TUHM
    - VIKT / UHM
Syllabification

- Experiment
  - 4990 words
  - Online experiment
  - How many words can people do?
Syllabification

• Experiment
  – 4990 words
  – Online experiment
  – How many words can people do?
  – What about other dialects of English?
Syllabification

• Experiment
  – 4990 words
  – Online experiment
  – How many words can people do?
  – What about other dialects of English?
  – What about non-native speakers?
Syllabification

- Experiment
  - 4990 words
  - Online experiment
  - How many words can people do?
  - What about other dialects of English?
  - What about non-native speakers?
  - Could people sabotage the experiment?
Olive Garden: Could people give any answer just to get put in raffle?

• Pop versus Soda. Look under state for “other” responses
What influences .C (vs. C.) syllabification?

<table>
<thead>
<tr>
<th>Logodds</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of medial consonant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(p = 5.69e-219)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstruent (attack)</td>
<td>1.12</td>
<td>37389</td>
</tr>
<tr>
<td>Nasal (anode)</td>
<td>0.35</td>
<td>7122</td>
</tr>
<tr>
<td>Lateral (alloy)</td>
<td>-0.03</td>
<td>5582</td>
</tr>
<tr>
<td>Rhotic (arrow)</td>
<td>-1.45</td>
<td>5087</td>
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<tr>
<td><strong>Legality of first vowel</strong></td>
<td></td>
<td></td>
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<tr>
<td>(p = 2.04e-137)</td>
<td></td>
<td></td>
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<tr>
<td>Legal (follow)</td>
<td>0.60</td>
<td>30572</td>
</tr>
<tr>
<td>Illegal (fallow)</td>
<td>-0.60</td>
<td>24608</td>
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</table>
## Syllabification

What influences .C (vs. C.) syllabification?

<table>
<thead>
<tr>
<th>Type of morphological boundary by boundary placement</th>
<th>Weight</th>
<th>Frequency</th>
<th>Significance</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound boundary before consonant</td>
<td>1.88</td>
<td>935</td>
<td>94</td>
<td>(play+mate)</td>
</tr>
<tr>
<td>Transparent boundary before consonant</td>
<td>1.32</td>
<td>1949</td>
<td>95</td>
<td>(pre+war)</td>
</tr>
<tr>
<td>Opaque boundary before consonant</td>
<td>0.84</td>
<td>135</td>
<td>90</td>
<td>(zeal+ous)</td>
</tr>
<tr>
<td>Morphologically simple</td>
<td>0.05</td>
<td>43024</td>
<td>75</td>
<td>(aloof)</td>
</tr>
<tr>
<td>Opaque boundary after consonant</td>
<td>-0.30</td>
<td>1355</td>
<td>69</td>
<td>(foot+age)</td>
</tr>
<tr>
<td>Transparent boundary after consonant</td>
<td>-0.77</td>
<td>7111</td>
<td>63</td>
<td>(fill+ing)</td>
</tr>
<tr>
<td>Compound boundary after consonant</td>
<td>-3.03</td>
<td>671</td>
<td>26</td>
<td>(with+out)</td>
</tr>
</tbody>
</table>
## Syllabification

What influences C (vs. C.) syllabification?

### Stress

(p = 2.31e-57)

<table>
<thead>
<tr>
<th></th>
<th>(attach)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Final</td>
<td></td>
<td>0.51</td>
<td>12314</td>
</tr>
<tr>
<td>Initial</td>
<td>(attic)</td>
<td>-0.51</td>
<td>42866</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>87</th>
<th>70</th>
</tr>
</thead>
</table>
Syllabification

• Other ways to elicit syllabification?
  – verbally
  – first part, second part
Syllabification

- Other ways to elicit syllabification?
  - verbally
  - first part, second part
  - What color is “g”? (count errors)
    - segment segment
Syllabification

- Other ways to elicit syllabification?
  - verbally
  - first part, second part
  - What color is “g”? (count errors)
    - segment segment
  - Will syllables prime?
    - In French pal primes pal.mier better than pa.lace
    - pa primes pa.lace better than pal.mier
Meaning or word memory?

- Subjects heard
  - Bob sent Jim a letter
- Later asked if this is what they heard:
  - Bob sent Jim a letter. Yes
  - Bob sent a letter to Jim. Yes 50%
  - Bob sent a package to Jim. No
Confounding Variables

- Things that influence experiment that mess up results
Confounding Variables

- Things that influence experiment that mess up results
  - Hypothesis: polymorphemic words take longer to process than monomorphemic words
    - industrialize vs. cabbage
    - postmodernist vs. alligator
Confounding Variables

- Things that influence experiment that mess up results
  - Hypothesis: polymorphemic words take longer to process than monomorphemic words
    - industrialize vs. cabbage
    - postmodernist vs. alligator
  - confound: word frequency and word length
Confounding Variables

- Things that influence experiment that mess up results
  - Hypothesis: People learn Spanish better with method A than B
    - one class taught with method A and one with method B
    - A class meets at 8:00 MWF and B at 4:00 MWF
Confounding Variables

- Things that influence experiment that mess up results

- Hypothesis: People learn Spanish better with method A than B
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  - A class meets at 8:00 MWF and B at 4:00 MWF
  - A class has 90% females and B has 30%
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    - A class is taught by experimenter who developed method A and B is taught by starving part-timer
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    - A class meets at 8:00 MWF and B at 4:00 MWF
    - A class has 90% females and B has 30%
    - A class is taught by experimenter who developed method A and B is taught by starving part-timer
    - Students in A told they are piloting a new method
Confounding Variables

- **Hawthorne Effect**
  - Production rates in factory
    - As lighting increased so did production
Confounding Variables

- Hawthorne Effect
  - Production rates in factory
    - As lighting increased so did production
    - Later, as lighting was reduced, production increased
Confounding Variables

- **Hawthorne Effect**
  - Production rates in factory
    - As lighting increased so did production
    - Later, as lighting was reduced, production increased
    - Lighting was not the reason, the fact they knew they were being studied was
When we name a picture, initially many semantically related names (lemmas) become activated, and selecting the correct name requires a competition between the different candidates.
Semantic Blocking

- It's harder to name pictures of items from same semantic field (semantically homogenous) than from different semantic fields (semantically homogenous)
Semantic Blocking

Homogenous

X 8
Semantic Blocking

Heterogenous

X 8
Semantic Blocking Effect

![Graph showing the effect of semantic blocking on reaction time (RT) across presentation cycles. The graph compares 'hom' and 'het' conditions, with 'hom' showing a lower RT initially and maintaining a more stable rate of decrease compared to 'het', which shows a slower decrease and higher RT overall.]
Semantic Blocking

- Reaction time went down with repetition
- Heterogenous (cow, ladder, chair, car) was faster than homogenous (frog, cow, cat, snake) after first cycle
Semantic Blocking

- Reaction time went down with repetition
- Heterogenous (cow, ladder, chair, car) was faster than homogenous (frog, cow, cat, snake) after first cycle
- WHY?
Semantic Blocking

- On first cycle people don't notice the categories (animal, tool, furniture, vehicle, etc.)
- After first cycle all members of the category get activated when you see them back to back, and this slows you down
Semantic Blocking

- On first cycle people don't notice the categories (animal, tool, furniture, vehicle, etc.)
- After first cycle all members of the category get activated when you see them back to back, and this slows you down
- When you don't see them back to back the category isn't formed so all members don't get activated
Eye-tracking
Eye-tracking

- Where to people look when they are driving?
Eye-tracking

- Where do people focus on in an ad?
Eye-tracking

- Where do people look at other people?
Eye-tracking

- Where do people look when reading?

Dans, kön och jagprojekt

På jakt efter ungdomars kroppsspråk och den "synkretiska dansen", en sammansmältning av olika kulturers dans, har jag i mitt fältarbete under hösten rört mig på olika arenor inom skolans värld. Nordiska, afrikanska, syd- och östeuropeiska ungdomar gör sina röster hörda genom sång, musik, skrik, skratt och gestaltar känslor och uttryck med hjälp av kroppsspråk och dans.

Den individuella estetiken framträder i kläder, frisyror och symboliska tecken som förstärker ungdomarnas "jagprojekt" där också den egna stilen i kroppsförelserna spelar en betydande roll i identitetsprövningen. Upphållsrummet fungerar som offentlig arena där ungdomarna spelar upp sina performanser liknande kroppsshow...
Eye-tracking

- People look at item before the recording of the word has played completely
Eye-tracking

- Upon hearing [fo] they start moving toward fork
Eye-tracking

They don't move as fast toward candy or candle upon hearing [kæ] or [kæn] because they need more information to recognize the right word.
Eye-tracking

- Used in psycholinguistic experiments.
- Question: Are bilinguals influenced by one language when doing task in another?
Eye-tracking

- Monolingual German/English and bilingual German/English speakers did task
Eye-tracking

- Instructions
  - look at the cross in the middle of the screen
  - now look at the ________
Eye-tracking

- To English speaker: look at the dove
  - Eyes go to dove
Eye-tracking

- To German speaker: look at the *dach* (roof)
  - Eyes go to roof
Eye-tracking

- To bilingual German/English speaker: look at the *dach* (roof)
  - Eyes flit to dove
  - then to roof
  - dove/dach
Eye-tracking

- This shows that words in both languages are being activated even though the task is carried out in only one language.
Lexical Decision Task

- Press one key if you see a word and another if you see a non-word.
Lexical Decision Task

- Press one key if you see a word and another if you see a non-word.
  - Reaction time is tested
  - Allows us to see how words are related
Lexical Decision Task

- How are these words related?
  - nurse/doctor, pillar/column, tree/leaf
Lexical Decision Task

- How are these words related?
  - nurse/doctor, pillar/column, tree/leaf
- Meaning
Lexical Decision Task

• How are these words related?
  – nurse/doctor, pillar/column, tree/leaf
  – leave/leaf, burn/urn, thought/through, red/bread
Lexical Decision Task

• How are these words related?
  – nurse/doctor, pillar/column, tree/leaf
  – leave/leaf, burn/urn, thought/through, red/bread

• Sound or spelling
Lexical Decision Task

- How are these words related?
  - nurse/doctor, pillar/column, tree/leaf
  - leave/leaf, burn/urn, thought/through, red/bread
  - teach/taught, speak/speaker, goat/goats, ox/oxen
Lexical Decision Task

• How are these words related?
  – nurse/doctor, pillar/column, tree/leaf
  – leave/leaf, burn/urn, thought/through, red/bread
  – teach/taught, speak/speaker, goat/goats, ox/oxen

• Morphologically: both meaning and sound
Lexical Decision Task

- What are the morphological relationships between these words?
  - serene/serenity, proof/prove
Lexical Decision Task

- What are the morphological relationships between these words?
  - serene/serenity, proof/prove
- Irregular derivational
Lexical Decision Task

- What are the morphological relationships between these words?
  - go/went, sing/sang, am/is, good/best
Lexical Decision Task

- What are the morphological relationships between these words?
  - go/went, sing/sang, am/is, good/best
- Inflectional irregular
Lexical Decision Task

- What are the morphological relationships between these words?
  - teach/teacher, friend/friendly
- Regular derivational
Lexical Decision Task

- What are the morphological relationships between these words?
  - sing/sings, walk/walked, goat/goats
Lexical Decision Task

● What are the morphological relationships between these words?
  – sing/sings, walk/walked, goat/goats
● Regular inflectional
Lexical Decision Task

- We use the LDT to see how regular/irregular, derivational/inflectional morphology differs
Lexical Decision Task

- LDT vocabulary
  - prime: word that appear before test word whose influence on test word we want to test
Lexical Decision Task

- LDT vocabulary
  - prime: word that appear before test word whose influence on test word we want to test
  - target: the word that appears after the prime whose reaction time we measure. We want to know how it is influenced by the prime
Lexical Decision Task

- LDT vocabulary
  - facilitatory priming: faster reaction time due to prime's influence
  - inhibitory priming: slower reaction time due to prime's influence
Lexical Decision Task

- **LDT vocabulary**
  - facilitatory priming: faster reaction time due to prime's influence
  - inhibitory priming: slower reaction time due to prime's influence
  - lag: how much time or how many test items appear between prime and target
Lexical Decision Task

- **LDT vocabulary**
  - facilitatory priming: faster reaction time due to prime's influence
  - inhibitory priming: slower reaction time due to prime's influence
  - lag: how much time or how many test items appear between prime and target
  - cross modal priming: hearing prime and seeing target or vice versa
Lexical Decision Task

- Possible items in LDT
  - tubes
  - govern
  - jubbing
  - bribe
  - leckom
  - tubes
  - trade
  - flup
  - government
  - kepter
  - allowing
  - leckom
  - tribe
  - flupper
  - swap
  - rejoint
  - allow
Lexical Decision Task

- **Types of priming**
  - tubes
  - govern
  - jubbing
  - bribe
  - leckom
  - tubes (real word repetition: tubes)
  - trade
  - flup
  - government (morphological priming: govern)
  - kepter
  - allowing
  - leckom (nonce word repetition: leckom)
  - tribe (orthographic priming: bribe)
  - flupper (morphological nonce priming: flup)
  - swap (semantic priming: trade)
  - rejont
  - allow
Lexical Decision Task

- Is it just spelling/sound that causes priming effect (not meaning)?
  - Keep spelling/sound relationship identical
  - Vary semantic relationship
Lexical Decision Task

- Is it just spelling/sound that causes priming effect (not meaning)?
  - Keep spelling/sound relationship identical
  - Vary semantic relationship
    - high semantic: create/creation
    - low semantic: create/creature
Lexical Decision Task

- Is it just spelling/sound that causes priming effect (not meaning)?
  - Keep spelling/sound relationship identical
  - Vary semantic relationship
    - high semantic: create/creation
    - low semantic: create/creature
  - If they both prime equally what does that say?
  - If high primes more than low what does that say?
Lexical Decision Task

- If morphology is meaning and sound is it actually different from meaning and sound or separate?
Lexical Decision Task

- If morphology is meaning and spelling/sound is it actually different from meaning and sound or separate?
  - Words equal on spelling
  - Words vary on morphology and semantics
Lexical Decision Task

If morphology is meaning and spelling/sound is it actually different from meaning and sound or separate?

- Words equal on spelling
- Words vary on morphology and semantics
  - high semantic, same morpheme
    - adapter/adaptable
  - low semantic, historical morpheme
    - part/apartment
  - high semantic, no common morpheme
    - scream/screech
Lexical Decision Task

• 1 high semantic, same morpheme
  – adapter/adaptable
• 2 low semantic, historical morpheme
  – part/apartment
• 3 high semantic, no common morpheme
  – scream/screech

• Which primes better?
Lexical Decision Task

- 1 high semantic, same morpheme
  - adapter/adaptable
- 2 low semantic, historical morpheme
  - part/apartment
- 3 high semantic, no common morpheme
  - scream/screech

Which primes better?
Lexical Decision Task

- 1 high semantic, same morpheme
  - adapter/adaptable
- 2 low semantic, historical morpheme
  - part/apartment
- 3 high semantic, no common morpheme
  - scream/screech

Which primes better?
- 1 and 2 prime better than 3 so morphemes are separate from spelling/sound and meaning
Is speech processed differently than music?

- Speech to song illusion
- Phantom words