PSYC 363
Cognitive Psychology
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Part II - Attention
MUSINGS ON ATTENTION

- In a busy world filled with sounds, how do we select what to listen to?
- How do we find meaningful information within a complex scene?
- What role does attention play in putting together visual patterns as recognizable objects?
- How do we coordinate parallel activities like driving a car and holding a conversation?
What Is Attention?

- Tradeoff: Focusing vs. Monitoring

- What happens to the information we attend to?
- Better yet, what happens to the information we do not attend to?

William James: “Everyone knows what attention is”
Theories Of Attention

- Bottleneck Theories
  - Sensory limitations
  - Broadbent’s early filter model
Broadbent’s Filter Model (1958)

- Input channels
- Senses e.g. eye, ear
- Short Term Memory Store
- FILTER
  - Selection on the basis of physical characteristics only.
- Selected input for attention.
AUDITORY ATTENTION
Dichotic Listening Task

Ignored inputs:
The horses galloped across the field...

Attended inputs:
President Lincoln often read by the light of the fire...

Shadowing:
President Lincoln often read by the light of the fire...
Early Selection Theories of Attention

- Cherry (1953)
  - Shadow male voice, right ear
  - Left ear: Male, Female, Reversed Speech, Tone
    - What was remembered? What was not?

**Figure 3.1:** A typical shadowing task. Different messages are presented to the left and right ears, and the subject attempts to “shadow” one ear. (From Lindsay & Norman, 1977.)
Control: Same numbers in each ear (93% acc.)
Experimental: Different numbers in each ear (65% acc.)
  ** Always reported all of one ear, then all of the other.
  Report in Order: ½ sec between pairs (20% acc.)
  2 sec between pairs (50% acc.)
Expansion Of Broadbent’s Model

- Switching the flap
- Mixed vs. Same Modalities
- Mowbray
  - Applied this idea to other material: stories
  - Recall both
Late Selection Theories Of Attention

- Moray
  - Shadowing experiment
    - LEFT: Message
    - RIGHT: Six words, repeated
  - Does some information get through?
    - Your name?

- Cocktail Party Phenomenon (Yes Dear effect)
Dichotic Listening

Gray & Wedderburn (1959)

- Instructed to shadow meaningful message

- dogs six fleas
- eight scratch two
Theories Of Attention

- Instructions: Shadow one ear only.

- LEFT CHANNEL (EAR):
  IN THE PICNIC BASKET
  SHE HAD PEANUT BUTTER
  BOOK LEAF SAMPLE ALWAYS

- RIGHT CHANNEL (EAR):
  CAT LARGE DAY APPLE
  FRIEND POOL SANDWICHES
  AND CHOCOLATE BROWNIES
Theories Of Attention

- Treisman’s Attenuation Model
  - The unattended channel
  - What gets through?
  - Neural Evidence for Attenuation
    - 20-50 ms post-stimulus activity → presemantic (Woldorff et al., 1993)
    - PET studies (Zatorre, Mondor, & Evans, 1999)
Late-selection Theories

- Bottom-Up vs. Top-Down processing
- STM and Working Memory

MacKay
- “They were throwing stones at the bank”
- Context Word (unshadowed): river or money
- Role of Short Term Memory?
Applications

- Cherry and Kruger (1983)
  - Children with learning disabilities, ages 7-9
  - LD worse than non-LD
  - Schizophrenia
  - Unattended information?
Unified Theories Of Attention
Kahneman’s Capacity Model

What is really important?
Capacity Model

- Different and Multiple Tasks
- Kahneman’s example
- Information in the Unattended Channel?
Automatic / Controlled Processes

- Transition between the two types

- Examples

- Reading
  - Stroop Task
Stroop Task

![Stroop Task Diagram]
Stroop Task
Stroop Task

green...er no, blue?

orange

green

blue

this is easy!
Automatic / Controlled Processes

- Moray’s own performance at shadowing
- Implications
- Skill acquisition
Automatic / Controlled Processes

- Ulrich Neisser (1963)
  - Proofreaders
  - Single letters vs.
  - Groups of letters

Implications:
- Serial vs. Parallel Search
Automatic / Controlled Processes

- Hirst et al. (1980)
  + Secretary study
    - Learning to Read and take Dictation simultaneously

Figure 1. Average reading speed for blocks of five sessions in the training phase of Experiment 1.
Neely (1977)

![Graph showing response time (MSEC) vs. interval between prime and target (MSEC).](image)

- **Automatic/Fast**
- **Strategic/Controlled/Slow**

**NOTE:** Neely used ISI of 250, 400, and 700 MSEC

- **Unexpected, but related (building-door)**
- **Expected, but unrelated (building-hand)**
Automatic / Controlled Processes

What are the pros?
- Rapid Activation/Response
- Requires little to no attention to complete

What are the cons?
- Automatic response not always appropriate (Stroop)
- Slips of action
  * Reason’s diary study (Reason, 1979)
Reason’s Slips of Action

- 5 categories of slips
  - 1. Storage failures
  - 2. Test failures
  - 3. Subroutine failures
  - 4. Discrimination failures
  - 5. Program assembly failures

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>A Classification of Slips Based on Their Presumed Sources</td>
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<tr>
<td>Slips that result from errors in the formation of the intention</td>
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<tr>
<td>Errors that are not classified as slips: errors in the determination of goals, in decision making and problem solving, and other related aspects of the determination of an intention</td>
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<td>Node errors: erroneous classification of the situation</td>
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<td>Description errors: ambiguous or incomplete specification of the intention</td>
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<td>Slips that result from faulty activation of schemas</td>
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<td>Unintentional activation: when schemas not part of a current action sequence become activated for extraneous reasons, then become triggered and lead to slips</td>
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<td>Capture errors: when a sequence being performed is similar to another more frequent or better learned sequence, the latter may capture control</td>
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<td>Data-driven activation: external events cause activation of schemas</td>
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<td>Associative activation: currently active schemas activate others with which they are associated</td>
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<td>Loss of activation: when schemas that have been activated lose activation, thereby losing effectiveness to control behavior</td>
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<td>Forgetting an intention (but continuing with the action sequence)</td>
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<td>Misordering the components of an action sequence</td>
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<td>Skipping steps in an action sequence</td>
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<td>Repeating steps in an action sequence</td>
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<tr>
<td>Slips that result from faulty triggering of active schemas</td>
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<td>False triggering: a properly activated schema is triggered at an inappropriate time</td>
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<td>Spoilerisms: reversal of event components</td>
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<td>Blends: combinations of components from two competing schemas</td>
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<td>Thoughts leading to actions: triggering of schemas meant only to be thought, not to govern action</td>
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<td>Premature triggering</td>
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<td>Failure to trigger: when an active schema never gets invoked because</td>
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<td>The action was preempted by competing schemas</td>
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<td>There was insufficient activation, either as a result of forgetting or because the initial level was too low</td>
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<tr>
<td>There was a failure of the trigger condition to match, either because the triggering conditions were badly specified or the match between occurring conditions and the required conditions was never sufficiently close</td>
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Automatic / Controlled Processes

- Two Modes of control
  - Open Loop vs. Closed Loop
  - Slips of Action

- Schemas & Automaticity?
Slips Of Action
Summary

- What is attention?
- Filter Theories of attention
- Capacity Theory of attention
- Automatic and Controlled Processes
- Pitfalls of Automaticity