Instrumental conditioning

- Learning an association from a response to a stimulus
- Response: A behavior by organism
- Stimulus: Delivered after the response to make that response more likely
  - Usually called a reinforcer
- Shaping: Reinforcing behaviors that are more and more like the desired response

Example

- Cat:
  - Response?
    - Jump in tub
  - Reinforcer?
    - Water
- Shaping?
  - Reinforce going into bathroom, then reinforce jumping on tub deck

Example

- Dad:
  - Response?
    - Turn on water
  - Reinforcer?
    - Adorable cat behavior
- US?
  - Water
- UR?
  - Drink
- CS?
  - Dad in bathroom
- CR?
  - Jump in tub

Viewed as classical conditioning
Memory

- People have different kinds of memory:
  - Sensory memory, short-term/working memory, long-term memory
- Each has different characteristics:
  - Durations, capacities, contents
- Unifying model: Stage theory

Stage theory

Visual sensory memory

- Also called iconic memory
  - Auditory sensory memory is called echoic memory
- Holds 1 item per spatial location
  - Evidence comes from masking: Presenting an item at a location masks (overwrites) the previous one at that location

Masking

<table>
<thead>
<tr>
<th>80 msec</th>
<th>120 msec</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 7</td>
<td>1 8</td>
</tr>
<tr>
<td>1 0 2</td>
<td>8 9</td>
</tr>
</tbody>
</table>

Contents and duration

- Contents are unidentified
  - You can know something was there without knowing what it was
  - You identify (encode) items one at a time
- Contents decay over time
  - Last about 1 sec
  - Contents of echoic memory last 2-3 sec
Decay

Subitizing

- We can encode the *number* of items in iconic memory, up to about 4 or 5, without counting
- For more items, we have to count
  - Or estimate, if items decay before we can count them all

Brain region

- Probably represented in the occipital lobe

Working memory (WM)

- The contents of our conscious awareness
- Has verbal and visual components
  - Often called “buffers”
  - Verbal is the more studied

Example

- You’ll see two numbers
- Multiply them in your head
- While thinking out loud

760 x 93
Verbal working memory

- Duration is a few seconds
  - Items decay, but can be maintained in an active state using rehearsal
  - Without rehearsal, an item lasts no longer than about 30 seconds
- Capacity is limited
  - Two different estimates:
    - $7 \pm 2$ chunks
    - As many items as you can rehearse in 2 seconds

Free recall procedure

- You’ll see 15 words, one at a time
  - Half a second apart
- Afterwards, write them down, in any order

Typical accuracy results

Typical accuracy results
(Glanzer & Cunitz, 1966)

Primacy and recency effects

- Primacy: Early items get more rehearsal
  - Maintenance rehearsal: say the item repeatedly
  - Elaborative rehearsal: link the item to existing knowledge
- Recency: Late items are active because you just encoded them
  - Left alone, they decay
  - So the 30-second delay eliminated recency effect

Brain regions

Verbal rehearsal involves the language areas
Implications of chunking

- The more expertise you have, the more you can remember about what you’re working on
  - Experts effectively have large working memories in their domains of expertise
  - In other domains, their working memory is no different anyone else’s