Roster:
Please put a checkmark next to your name or add your name.

Course Evaluations

Please pick up a copy of today’s handouts.

L.T.M. Contents, The case of H.M., Illusions, and Counterfactual Thinking

October 12, 2012
The Contents of Memory and the case of H.M.

Compare & contrast three types of information in LTM: (a) semantic, (b) episodic, and (c) procedural

The Case Study of H.M.

The relative likelihood of forming a false memory for each type of information: semantic, episodic, and procedural

Illusions & Counterfactual Thinking
Other information:

1. Comparative effects of three PTSD treatments: Exposure therapy, EMDR & relaxation training
2. Mindfulness Intervention for Child Abuse Survivors
3. Attentional Processes and Meditation
4. Executive Control and the Experience of Regret
5. Unlucky victims or lucky survivors: Counterfactual thinking by families exposed to the tsunami disaster
6. Working memory in monolingual and bilingual children
Last week ended with the following slide...
The End.

...of forgetting
The Contents of Memory and the case of H.M.
Pathways of Remembering

STM

LTM

Sensory Memory

Mark Rafter (1-25-2011)
The Contents of Memory

Sensory Memory

STM

LTM

Veridical Information

Phonological, Visuo-Spatial, Episodic Information

Semantic, Episodic, Procedural Information
# Three Types of Information in STM:

<table>
<thead>
<tr>
<th>Information Type</th>
<th>Example</th>
<th>Brain Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phonological Loop</strong></td>
<td>The names of items. Processes a limited # of sounds per sec. (1-10 for 10-sec.)</td>
<td>Left Hemisphere Cortex frontal-temporal lobe emphasis</td>
</tr>
<tr>
<td><strong>Episodic Buffer</strong></td>
<td>Personal experiences time-place-items-activity-person - integrates sounds (names) and sights -</td>
<td>Cerebral Cortex temporal-parietal-occipital lobe emphasis and amygdala-hippocampus interaction</td>
</tr>
<tr>
<td><strong>Visuo-Spatial Sketchpad</strong></td>
<td>Visual &amp; Spatial Information identify, relate &amp; navigate</td>
<td>Right Hemisphere Cortex parietal-occipital lobe emphasis</td>
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### Three Types of Information in LTM:

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<th>Example</th>
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<tr>
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<td>Language, names &amp; dates, rules &amp; facts SCHEMA</td>
<td>Cerebral Cortex temporal lobe emphasis</td>
</tr>
<tr>
<td><strong>Episodic</strong></td>
<td>Personal experiences time-place-person &amp; sensory memory SCRIPT</td>
<td>Cerebral Cortex parietal lobe emphasis</td>
</tr>
<tr>
<td><strong>Procedural</strong></td>
<td>Conditioned behavior and behavioral habit patterns</td>
<td>In the cerebellum</td>
</tr>
</tbody>
</table>
Brain Structures & Functions

- Frontal lobe
- Parietal lobe
- Reading comprehension area
- Occipital lobe
- Sensory speech area of Wernicke
- Temporal lobe
- Motor speech area of Broca
- Cerebellum
- Pons
- Medulla oblongata
The Case of H.M.
Inside the Brain

The amnesic patient known as H.M. had most of his hippocampus and adjacent tissues in the medial temporal lobe removed, from both hemispheres of his brain.

Part of the brain that had been removed.

- PREFRONTAL CORTEX
- AMYGDALA
- HIPPOCAMPUS

Front view

Side view

View from below
### Three Types of Information in LTM:

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Surgical removal of H.M.’s hippocampus to alleviate seizures:

**H.M.’s Performance on the Star Test:**

<table>
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<th>Trial #</th>
<th># of Errors</th>
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Surgical removal of H.M.’s hippocampus to alleviate seizures:

H.M.’s

Performance on the Star Test:

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<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
</tr>
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</table>
The hippocampus is crucial for the storage of semantic and episodic information in long-term memory in the cerebral cortex.

The hippocampus is not crucial for the storage of procedural information in long-term memory in the cerebellum.
The possibility of false memories...

My experience of the universe is a mix of memory... and imagination.

...and this is my reality.
Each of us creates our reality based on how we perceive the energy in the universe.
## False Memories

<table>
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<th>STM</th>
<th>Possible</th>
</tr>
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<tbody>
<tr>
<td><strong>Phonological Loop</strong></td>
<td>Possible (acoustic confusion)</td>
</tr>
<tr>
<td><strong>Visuo-spatial Sketchpad</strong></td>
<td>Possible (the event vs. the attended image vs. imagination)</td>
</tr>
<tr>
<td><strong>Episodic Buffer</strong></td>
<td>Possible (both of the above + emotion)</td>
</tr>
</tbody>
</table>
# False Memories

<table>
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<tr>
<th>LTM</th>
<th>Semantic</th>
<th>Episodic</th>
<th>Procedural</th>
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<tbody>
<tr>
<td></td>
<td>Possible (association confusion - needle)</td>
<td>Possible (interference and imagination)</td>
<td>Possible (generalization of a simple conditioned response)</td>
</tr>
</tbody>
</table>
Cognitions + Emotions + Overt Behavior

- Each of these may influence the other two.
- False memories are as powerful an influence as real memories.
The End.

...of the Contents of Memory, H.M., and False Memories
...and now...
Illusions
Illusions

(a) illusions, (b) after-images, (c) after-effects

Origin of ILLUSION
Middle English, from Anglo-French,
from Late Latin illusion-, illusio,
from Latin, action of mocking,
from illudere to mock at,
from in- + ludere to play, mock
Illusions

Illusions result from the misperception of sensory information, due to:

- Misleading cues that distort the size or orientation of the stimulus
- Opponent processes
- Bias based in prior experience
When I Grow up...

I want to be like mommy!
When I Grow up...

I want to be like mommy!
Illusions due to bias based in prior experience

I want to be like mommy!

(Here's the reply the teacher received the following day)

Dear Mrs. Jones,
I wish to clarify that I am not now, nor have I ever been, an exotic dancer.
I work at Home Depot and I told my daughter how hectic it was last week before the blizzard hit. I told her we sold out every single shovel we had, and then I found one more in the back room, and that several people were fighting over who would get it. Her picture doesn't show me dancing around a pole. It's supposed to depict me selling the last snow shovel we had at Home Depot.
From now on I will remember to check her homework more
“...fooled by form.” C.G.

When I Grow up...

I want to be like mommy!
“Imagination is more important than knowledge.”

Albert Einstein
Break.
Bottom-Up Influence
Bottom-Up Influence
Bottom-Up Influence
Bottom-Up Influence
Bottom-Up Influence
Bottom-Up Influence
The Spark Illusion
Lightness Perception and Lightness Illusions

The Koffka Ring

The Haze Illusion
Misleading cues that distort the size or orientation of the stimulus

The Thatcher Illusion
Mound/Crater Illumination
Linear Perspective
Context /Contrast Effects
The Thatcher Illusion
The Thatcher Illusion
The Thatcher Illusion
Updated Thatcher Illusion
Updated Thatcher Illusion
Updated Thatcher Illusion
Mound/Crater Illumination from our syllabus
The Moon Illusion
Linear Perspective
Parallel lines are perceived to converge in the distance.
Linear Perspective
The Ponzo Illusion
Crepuscular sun rays
Jastrow Illusion
Jastrow Illusion
Ebbinghaus Illusion - Context Effect
Ebbinghaus Illusion - Context Effect
Opponent Processes

After Images on the retina
Bias due to Prior Experience

Color Constancy

Edward H. Adelson
Opponent Processes

Motion After Effects are more central in the visual system

...on the desktop
Counterfactual Thinking
Counterfactual Thinking
...thoughts that are contrary to the facts.

A. If things are bad, then...
   “Things would be better, if only…”

B. If things are good, then...
   “Things would be worse, if only…”

Cognitions – Emotions – Overt Behavior
Counterfactual Thinking

Upward Counterfactual
If things are bad, then...
“Things would be better, if only…”

Downward Counterfactual
If things are good, then...
“Things would be worse, if only…”

Upward counterfactual thoughts are more frequent than downward counterfactual thoughts.
Counterfactual Thinking

Upward Counterfactual
“Things would be better, if only…”

*increases the sense of entitlement*

Downward Counterfactual
If things are good, then...

“Things would be worse, if only…”

*increases the sense of gratitude*
Counterfactual Thinking
The Seven Sins of Memory

<table>
<thead>
<tr>
<th></th>
<th><strong>Transience</strong>: weakening of memory over time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>Absent-mindedness</strong>: distracted attention</td>
</tr>
<tr>
<td>3</td>
<td><strong>Blocking</strong>: thwarted search for LTM memory</td>
</tr>
<tr>
<td></td>
<td>(M.R.)</td>
</tr>
<tr>
<td>4</td>
<td><strong>Misattribution</strong>: loss of source memory</td>
</tr>
<tr>
<td>5</td>
<td><strong>Suggestibility</strong>: implanted memory</td>
</tr>
<tr>
<td></td>
<td>(Loftus)</td>
</tr>
<tr>
<td>6</td>
<td><strong>Bias</strong>: revised on feeling rather than fact</td>
</tr>
<tr>
<td></td>
<td>(Attachment Type)</td>
</tr>
<tr>
<td>7</td>
<td><strong>Persistence</strong>: repeated recall of information</td>
</tr>
<tr>
<td></td>
<td>we’d prefer to forget - PTSD</td>
</tr>
<tr>
<td></td>
<td>(Donnie Moore – p. 161)</td>
</tr>
</tbody>
</table>
PTSD Treatments:
Exposure Therapy
EMDR
(eye movement desensitization and reprocessing)
Relaxation Training
Mindfulness Meditation
http://www.youtube.com/watch?v=Owolr63y4Mw&feature=related

(6:21)
Bob Newhart

The End.