

Attention and Consciousness

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Attention!

Matlin & Farmer (2016) Definition:

A concentration of mental activity that allows you to take in a limited portion of the vast stream of information available from both your sensory world and your memory.

Multiple Meanings of Attention

- Alertness or arousal
- Orienting reflex or response
- Spotlight attention and search
- Selective attention
- Mental resources / conscious processing
- Supervisory attentional system

Two General Definitions of Attention

- Attention as a mental **process**:
The mental process of concentrating effort on a stimulus or a mental event.
- Attention as a limited mental **resource**:
The limited mental energy or resource that powers the cognitive system.

Attention

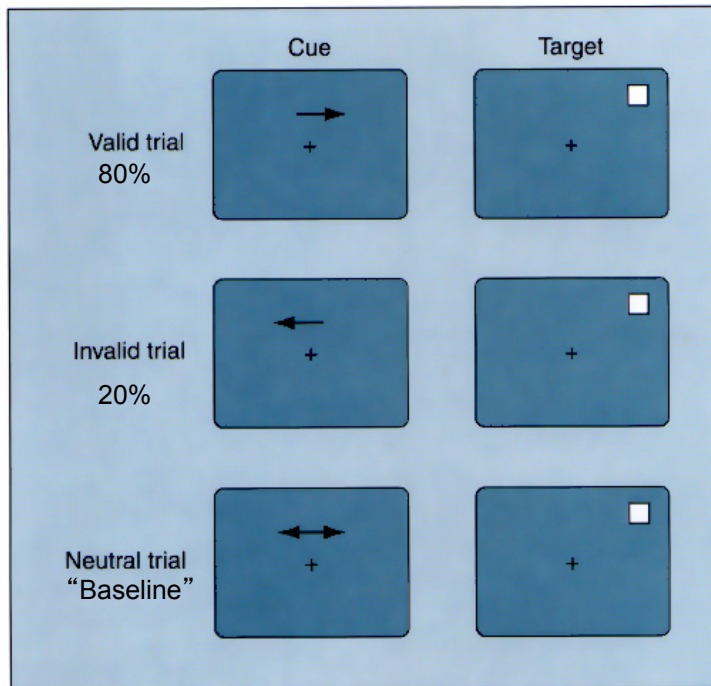
- Multiple coordinated systems and processes working together
- Top-down and bottom-up

Orienting Visual Attention

- The basic process of getting sensory information into the cognitive system
- Orienting can be *involuntary* or *voluntary*
 - **Reflexive orienting:** The redirection of attention toward an unexpected stimulus (flash of light, loud noise). This is data driven.
 - **Cued orienting:** anticipation of an impending stimulus or event. Deliberate direction of attention to a spatial location. This is internally controlled and facilitates the processing of the subsequent stimulus.

Posner's Spatial Cuing Task

(Posner, Snyder, & Davidson, 1980)



- Look always at fixation cross (no eye movements)
- Keypress L or R when target is detected
- Neutral RT - Valid RT = **facilitation effect**
- Invalid RT - Neutral RT = **cost**
- Linked to expectation, therefore is cognitive and **top-down**

Divided attention



Attention as a Mental Resource

- Kahneman (1973)
- Attention is mental effort-- the mental resource that fuels cognitive activity.
- Attention is limited-- only so much of the fuel can be devoted to mental tasks.
- Also called “controlled” attention.
- Contrast to automatic processes.

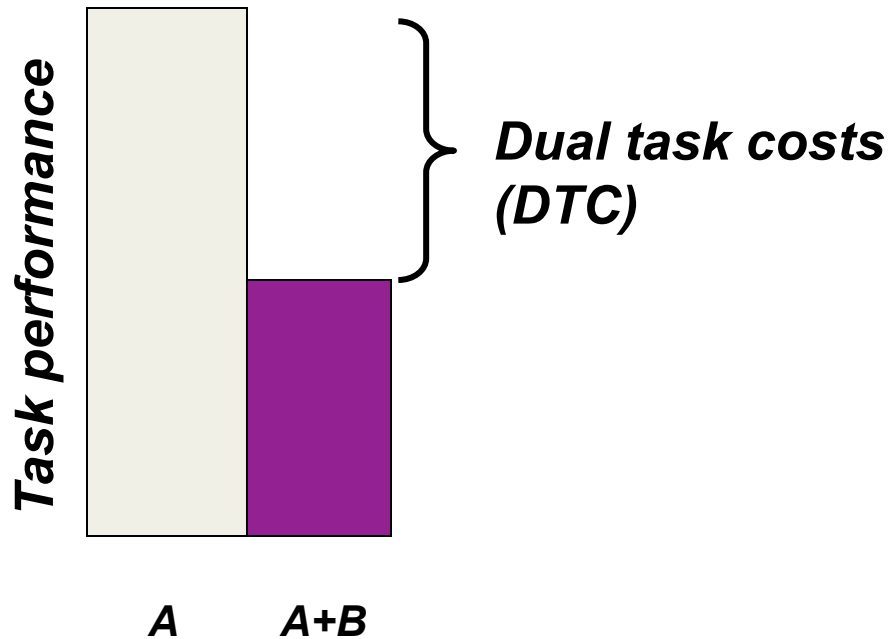
Dual-task Methodology

Measures

Task A

Task B

Tasks A+B



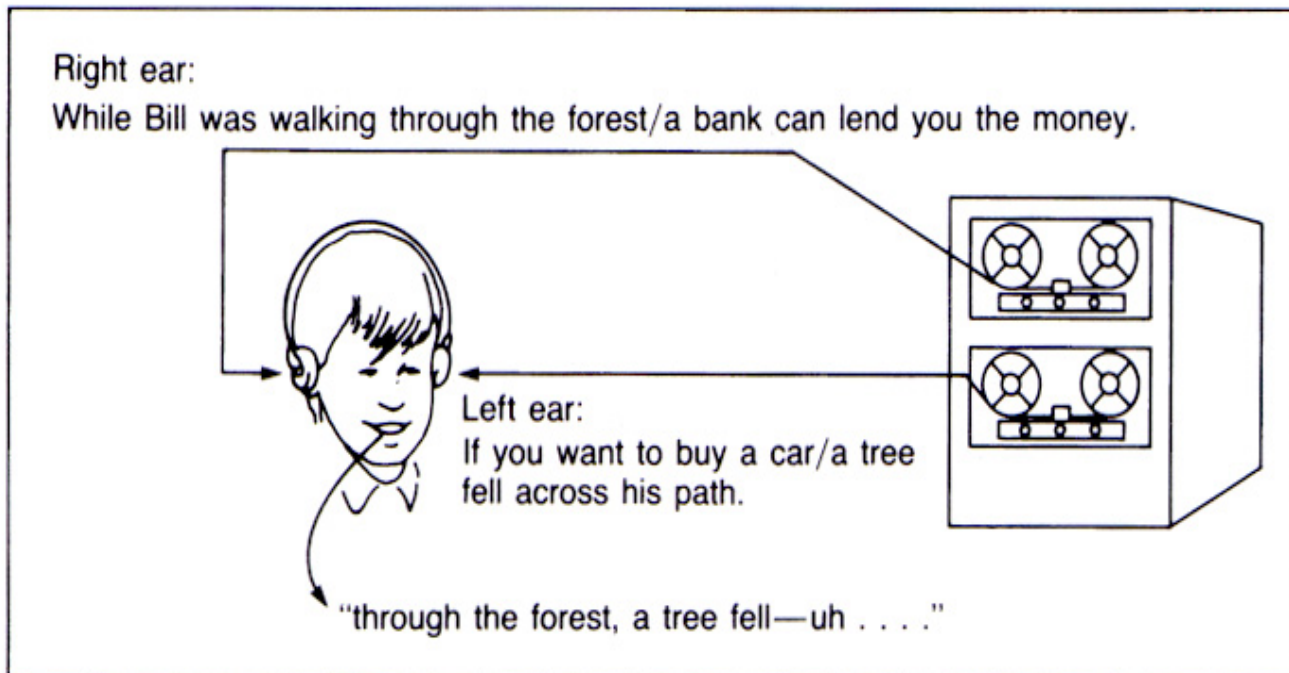
Controlled, Voluntary Attention

- A deliberate, voluntary allocation of mental effort or concentration.
- **Selective attention:**
The ability to attend to one source of information while ignoring other ongoing messages around us.

Selective Attention

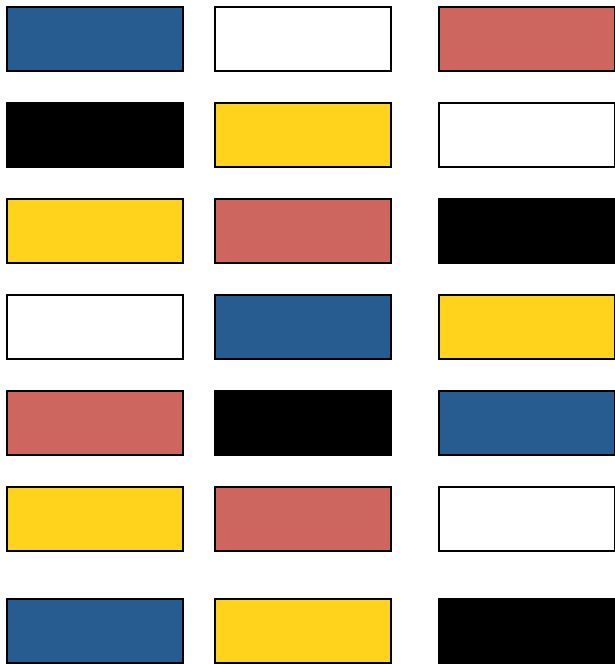
- Dichotic listening
- Stroop task
- Visual search

Dichotic listening: Treisman's (1960) study



Stroop Task

Name the colours

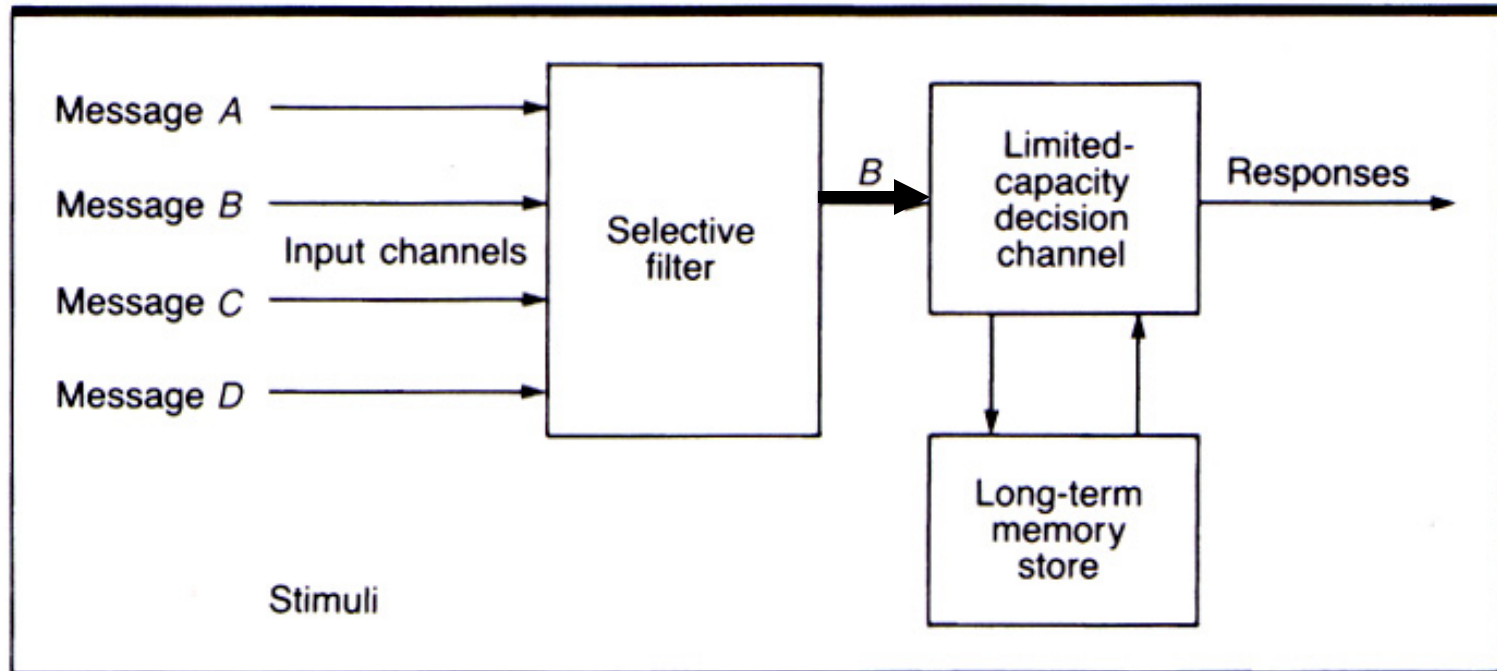


White	Blue	Green
Yellow	Red	White
Green	Yellow	Red
Red	Green	Blue
Blue	Red	Green
Yellow	Green	White
Red	White	Red
Blue	Red	Green

Theories of Attention

- Early Theories of Attention
 - Bottleneck theories
 - narrow passageway
 - information either passes through bottleneck or is lost
 - too simple; underestimate flexibility
 - information not lost at just one phase of the attention process

Broadbent's Filter Theory



Treisman's Visual Search Task

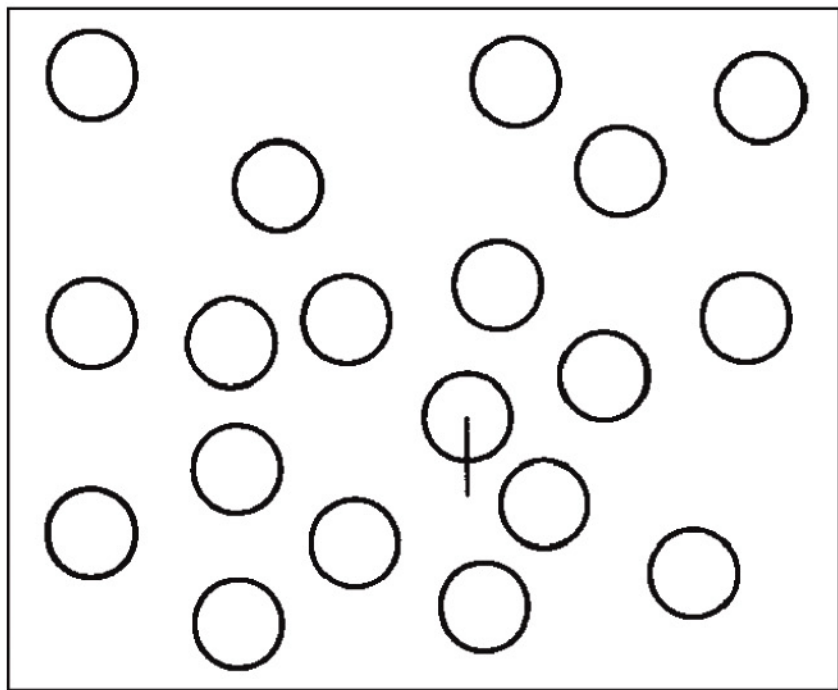


See array of distractors, with the target present in 50% of trials
Subject: respond Y if target present in display, or N if not

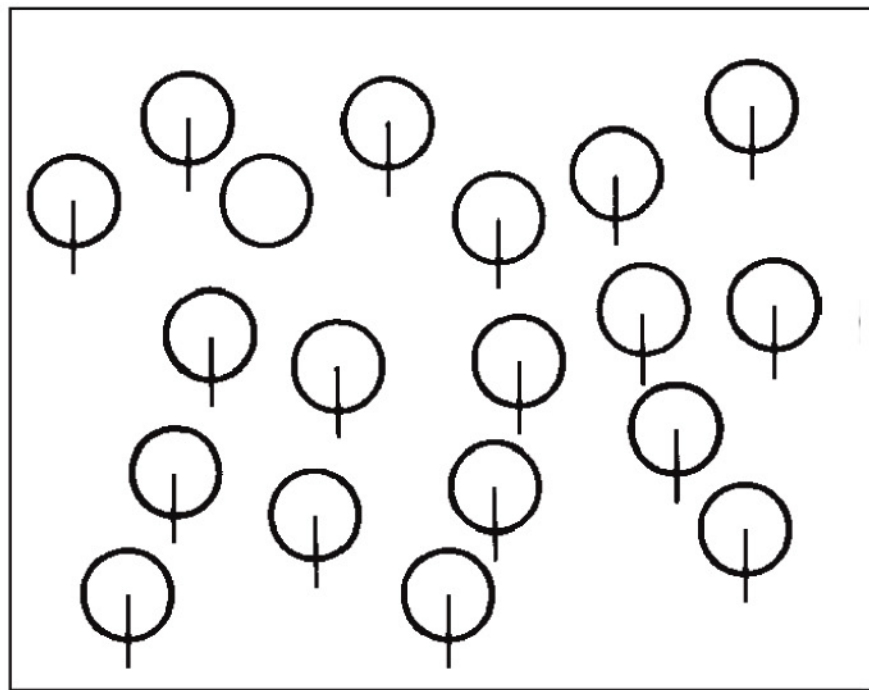
Research manipulations:
Vary target-distractor similarity:
feature overlap

Vary how many objects are in the array: **set size**

(A)



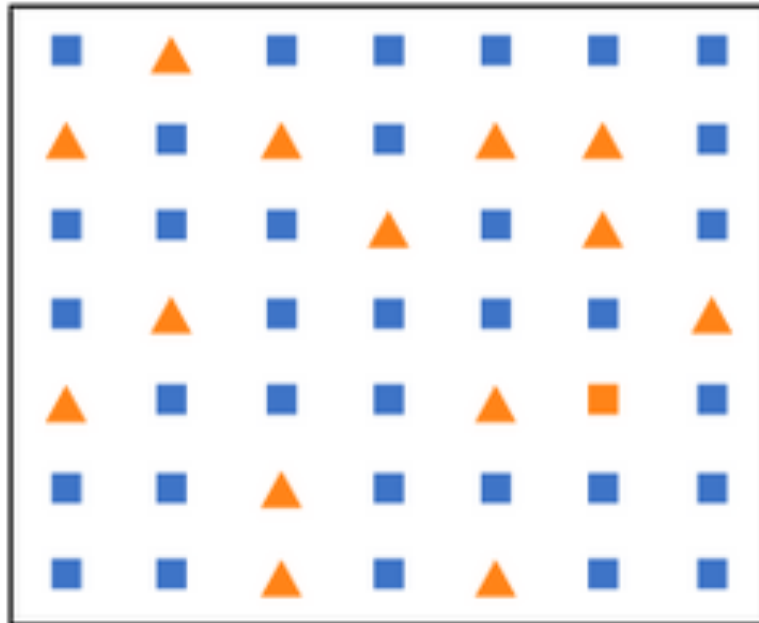
(B)



Parallel Search / Feature Search

X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	O	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X
X	X	X	X	X	X	X

Serial Search / Conjunction Search



Treisman's Feature Integration Theory

Distributed attention

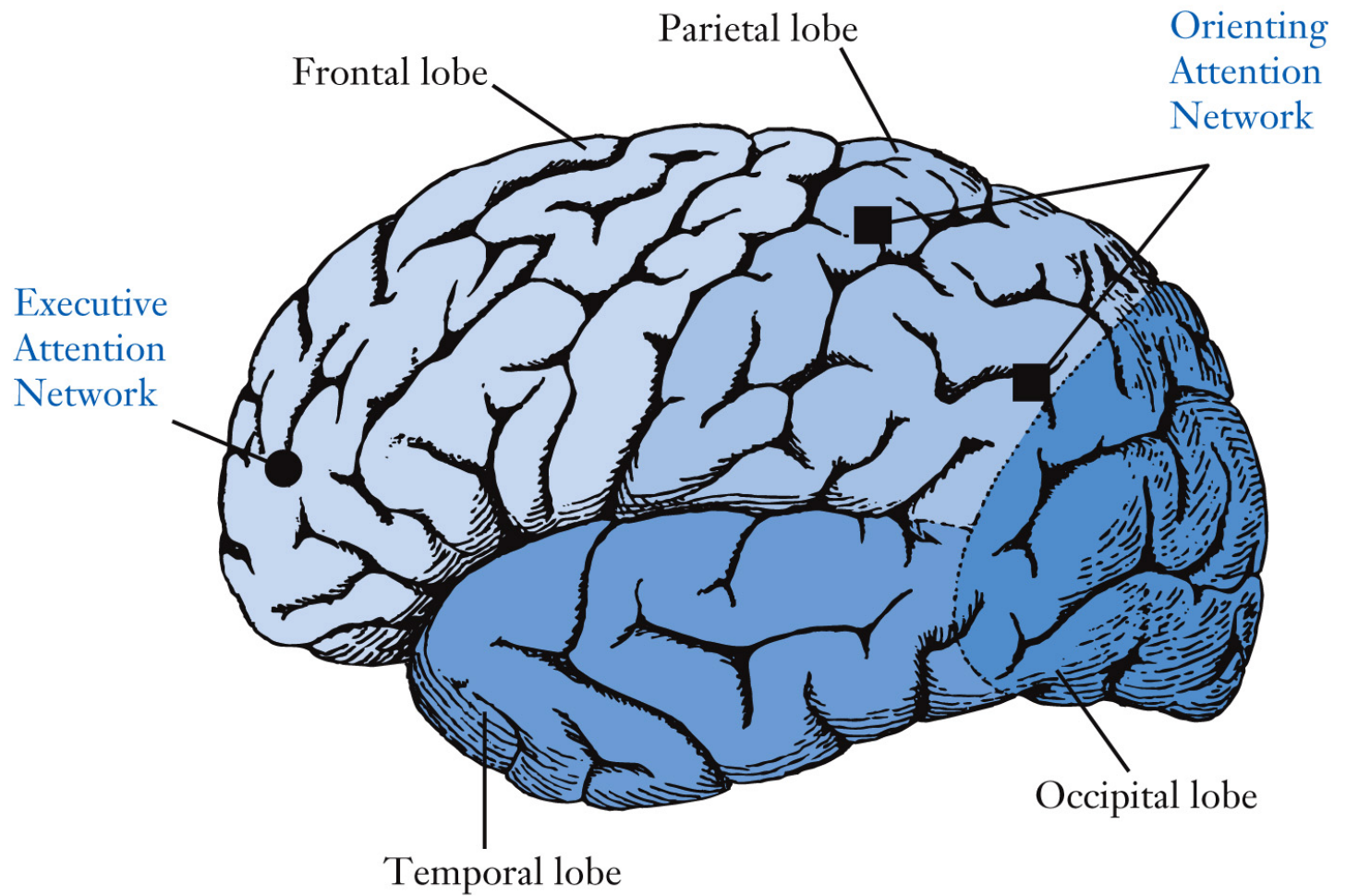
- Can process large amounts of information in parallel
- Pop-out effect
- Size of visual array does not affect search performance

Focused attention

- Serial search involving conjunction of multiple features
- No pop-out
- Search is slowed as a function of array size

Neuroscience of Attention

- **The Orienting Attention Network**
 - selecting information from sensory input
 - visual search
 - parietal lobe
 - brain lesions
 - unilateral spatial neglect
 - <https://www.youtube.com/watch?v=ymKvS0XsM4w>



Neuroscience of Attention

- **The Executive Attention Network**
 - used when task features conflict
 - Stroop task
 - inhibiting automatic responses to stimuli
 - prefrontal cortex
 - top-down control of attention

Consciousness

- Consciousness—the awareness people have about the outside world and about their perceptions, images, thoughts, memories, and feelings
- Related to attention, but not identical
- Generally associated with controlled, focused attention that is not automatic

Consciousness

– Three Interrelated Issues

1. Our inability to bring certain thoughts into consciousness
2. Our inability to let certain thoughts escape from consciousness
3. Blindsight???

Consciousness

- **Thought Suppression**

- Thought suppression—the attempt to eliminate thoughts, ideas, and images related to an undesirable stimulus
- Do not think about a white bear!
- Ironic effects of mental control

Consciousness

- **Thought Suppression**
 - Similar effect found for:
 - pain suppression
 - concentration
 - avoiding movement
 - trying to fall asleep

Consciousness

- Research on consciousness demonstrates that "how things seem" is not necessarily "how things are."