Attention and Consciousness

- Divided Attention
- Selective Attention
- Theories of Attention
- Cognitive Neuroscience of Attention
- Consciousness

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Attention

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Definitions of Attention

- Concentration of mental resources
- Allocation of mental resources

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Divided Attention

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Reinitz & Colleagues (1974)

Full Attention Condition

Divided Attention Condition

No instruction about dots

Subjects count the dots

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Proportion of "Old" Responses for Each of Two Study Conditions and Three Test Conditions (Reinitz & Colleagues, 1994).

	Study Condition	
Test Condition	Full Attention	Divided Attention
Old Faces	.81	.48
New Faces	.09	.17
Conjunction Faces	.48	.42

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Divided Attention & Practice

- Hirst, et. al. 1980
- Spelke, 1976

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Divided Attention Demonstration

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Start reading this passage but as I dictate individual words, write down each word on your piece of paper

- Our intuition tells us that attention increases the processing of visual information, but vision still proceeds to some extent without the benefit of attention. For example, suppose you had walked past a painting in a museum but your friend told you that it was her favorite, so you went back and inspected it more closely. You would likely say that you had *seen* the painting when you first passed it, but had not noticed many of the details until you had directed attention to it. This observation indicates that attention enables deeper or more complex visual perception, but that some perceptual processes operate independently of attention. These processes allow you to know that it's a painting on a wall, and not a mirror or a window. Research reviewed by Mack in "Inattentional Blind- ness: Looking Without Seeing" suggests that our intuition is not quite right, and that visual perception is more dependent on attention than we would guess. It appears that we do not see objects to which we don't attend. But the interesting twist is that this generalization holds true only for conscious perception. Visible objects can and do affect behavior, although we may not be aware of how they influence us.

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Words Dictated for Divided Attention Demonstration

Upset	Indulge
Hotel	Pencil
Judge	Problem
Employment	Key
Map	Terrible

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Hirst, et al. (1980) Results

- Initially students had lots of trouble combining the two tasks: reading speed decreased; handwriting illegible;
- 6 weeks later: Could read as quickly while taking dictation as while they were only reading. But weren't attending to the dictated words much – remembered only 35 out of thousands
- After extensive training became extremely accomplished at both tasks: read normally & answered comprehension Qs; dictation of words & classification task; memory for words, etc.

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Can we always divide our attention with practice?

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Cell Phones & Driving – Research Questions

1. Is it safe to drive while talking on a cell phone?
2. What are the chances of an accident while driving and talking on a cell phone?
3. Some states have passed legislation prohibiting hand-held but not hands-free cell phones. Does this make any sense?
4. Compare driving while talking to someone in the car versus driving while talking on a cell phone?
5. Does practice make a difference? Explain?
6. Compare driving under the influence to driving while talking on a cell phone driving
7. Solutions to the problem

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Selective Attention

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Selective Attention

- Dichotic Listening Task
- Stroop Effect
- Visual Search

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Dichotic Listening Task

- Shadowing
- Irrelevant Channel
- Cocktail Party Effect - Morray (1959)
- Treisman (1960)

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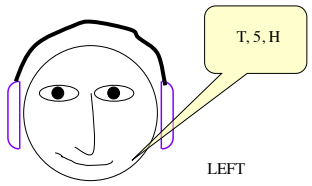
Dichotic Listening Task



RIGHT	LEFT
S	T
3	5
G	H

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What do subjects report hearing in the Unattended Channel?

- Very little
- They notice if the voice changes gender (e.g. male to female)
- Don't notice if the language changes from English to French or German
- Notice only low-level physical changes
- Generally don't notice changes in higher level, meaningful (semantic) info

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Cocktail Party Effect

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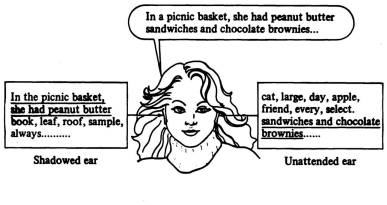
Treisman's Shadowing Study

An Illustration of Treisman's (1960) Shadowing Study.



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Stroop Effect

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Stroop's Experiments (1935)

- Investigated selective attention of multidimensional stimuli (e.g. verbal vs color aspect of multidimensional stimulus)
- In particular, what happens when there is a conflict in selectively attending to one aspect of a stimulus vs another
- For example: reading the word 'blue' versus identifying the color of the word 'blue'.

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Experiment 1

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Read the Word.

Stop!

Green	Blue	Red	Red
Blue	Orange	Blue	Purple
Red	Red	Orange	Orange
Purple	Blue	Green	Green
Green	Green	Blue	Black

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Read the Word. Ignore the color

Stop!

Green	Blue	Red	Red
Blue	Orange	Blue	Purple
Red	Red	Orange	Orange
Purple	Blue	Green	Green
Green	Green	Blue	Black

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Experiment 2

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Name the Color of the Ink

Stop!

xxxxx	xxxxx	xxx	xxx
xxx	xxxxxx	xxxx	xxxxxx
xxx	xxx	xxxxxx	xxxxxx
xxxxxx	xxxx	xxxxx	xxxxx
xxxxx	xxxxx	xxxx	xxxxx

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Name the Color (e.g. Red say "blue")

Stop!

Green	Blue	Red	Red
Blue	Orange	Blue	Purple
Red	Red	Orange	Orange
Purple	Blue	Green	Green
Green	Green	Blue	Black

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Stroop's 3 Experiments

- Exp 1 - Selectively attend to the verbal aspect of the stimulus; ignore ink color
- Exp 2 – Selectively attend to the ink color of the stimulus; ignore verbal aspect
- Question– Why does ignoring the verbal aspect of the stimulus interfere strongly with color naming; but not the reverse?
- Exp 3 – What was Stroop's 3rd experiment?

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This is a nice version of the Stroop Experiment that you can do online:

- Try it out.
- The link is on my cognitive website and on Isidore. Or you can use my link here but you have to be on the acutal Powerpoint Slide of course (on the website & Isidore)
- https://www.psytoolkit.org/lessons/stroop.html

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Emotional Stroop Effect

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Visual Search

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Variables Influencing Search

1. The isolated-feature/combined-feature effect
2. The feature-present/feature-absent effect.
3. Movement-present object/ movement-absent object effect

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Isolated-feature vs. Combined-feature effect:
Treisman and Gelade (1980)

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Part A: Find the Blue X as fast as possible

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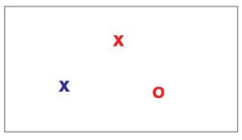
Find the Blue X



A1

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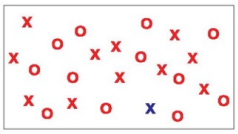
Find the Blue X



A2

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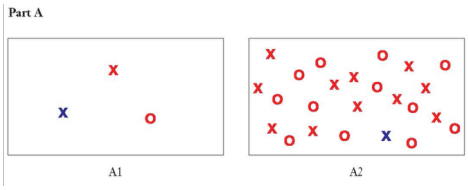
No Difference in Search Times



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Part B: Find the Blue X as fast as possible

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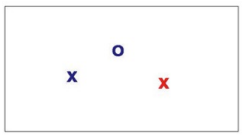
Find the Blue X



B1

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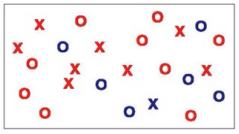
Find the Blue X



B2

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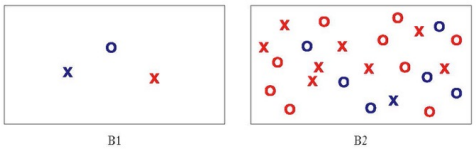
Significant Difference in Search Times

Part B



B1 B2

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Isolated-Feature/Combined-Feature Effect Summary

1. If the target differs from the irrelevant items in the display with respect to a simple feature such as color, observers quickly detect the target.

2. If the irrelevant items force you to search for a combination of features (both blue and X), visual search takes longer.

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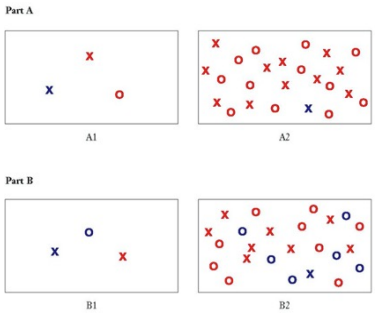
Demonstration 3.2 Revisited: Which task(s) requires focused attention?



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Feature-Present vs Feature-Absent Effect: Treisman & Souther (1985)

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Part A: Find the "circle with the line"

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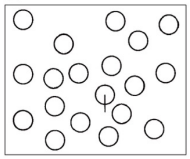
Find the Circle with the Line

(A)



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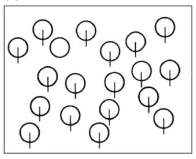
Find the Circle without the Line

(B)



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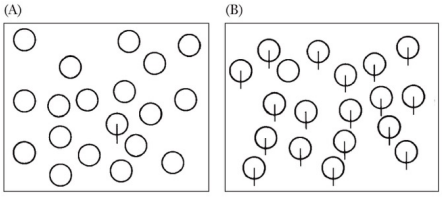
Participants faster finding the circle with a line than the circle without a line



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The Feature-Present/Feature-Absent Effect Summary

- We find the "circle with the line" faster than we find the "circle without the line"
- Generally, we can locate a feature that is present more quickly than a feature that is absent.
- Theme 3 – Cognitive processes generally handle positive information more easily than negative information

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Movement-present object/ Movement-absent object effect – Royden & Colleagues (2001)

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Movement-present object/ Movement-absent object effect – Royden & Colleagues (2001)

- People can quickly locate a moving target when it appears in a group of stationary distractors.
- In contrast, they take much longer to locate a stationary target when it appears in a group of moving distractors.
- It's easier to spot a movement-present object than a movement-absent object.

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Theories of Attention

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Theories of Attention

- Filter/Bottleneck Theories
- Resource Theories
- Feature Integration Theories (Treisman)

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Filter or Bottleneck Theories

- Early Theory – Information Processing Model
- Explains early dichotic listening task results (i.e. we notice very little in the unattended channel)
- Too simple; underestimates our flexibility – e.g. Cocktail Party Effect
- Information not lost at just at one stage of the attention process

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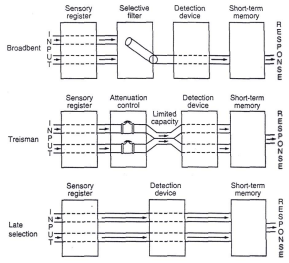
Filter Models of Attention



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Cocktail Party Effect

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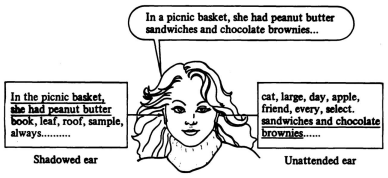
Treisman's Shadowing Study

An Illustration of Treisman's (1960) Shadowing Study.



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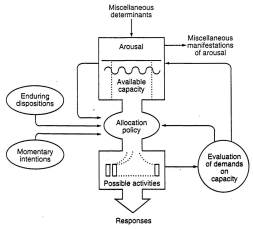
Resource (Capacity) Model of Attention



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Controlled vs Automatic Processes

Diagnostic Criteria for Automatic and Controlled Processes

Controlled	Automatic
1. The process occurs only *with* intention, with a deliberate decision.	1. The process occurs *without* intention, without a conscious decision.
2. The process is open to awareness and introspection.	2. the mental process is not open to conscious awareness or introspection.
3. The process uses conscious resources; that is, it drains the pool of conscious attentional capacity.	3. The process consumes few if any conscious resources; that is, it consumes little if any conscious attention.
4. (Informal) The process is relatively slow, taking more than a second or two for completion.	4. (Informal) The process operates very rapidly, usually within one second.

Partial Autonomy/Automaticity

A process is said to be partially autonomous if it can *begin* automatically but requires a more conscious set of operations for completion (see Zbrodoff & Logan, 1986).

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Treisman's Shadowing Study

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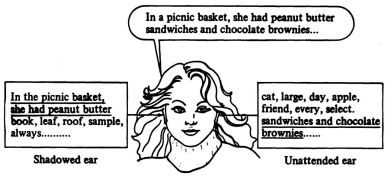

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Feature-Integration Theory

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Feature Integration Theory – Basic Elements

Distributed Attention	Focused Attention
1. Registers features automatically	1. Slower serial processing
2. Parallel processing	2. Identifies one object at a time
3. Identifies features simultaneously	3. Complex objects
4. Lower-level processing	4. Identifies which features belong together

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Feature–Integration Theory: Research

- Isolated features (distributed attention)
- Combined features (focused attention)
- Compare Demonstration A with Demonstration B

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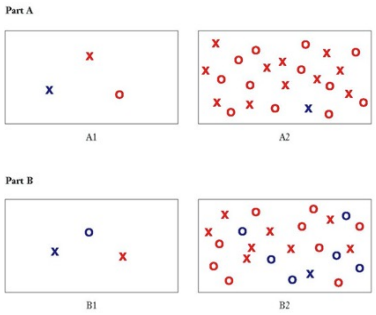
Demonstration 3.2 Revisited: Which task(s) requires focused attention?



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Feature-Integration Theory

- Distributed attention operates in a parallel fashion and relatively automatically; the target seemed to "pop out" in Demonstration 3.2A.
- People need more time to find the target when there are a large number of distractors in a focused-attention task (Demonstration 3.2B).

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Feature-Integration Theory Research – Illusory Conjunctions

- Features processed independently (distributed attention)
- Features combined (focused attention)
- Sometimes our attentional system is overloaded or we're distracted
- Errors in combining of features
- Incorrect or illusory conjunctions (e.g. 'L' mis-identified as a 'T')
- Binding problem
- Role of top-down processing

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Cognitive Neuroscience of Attention

- The Orienting Attention Network
- The Executive Attention Network

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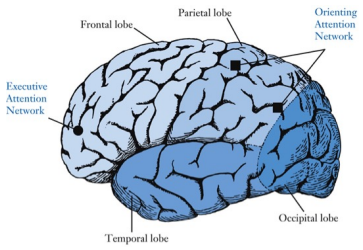

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Orienting Attention Network

- Develops during first year of life
- Selects information from the sensory input
- Guides visual search
- Parietal Lobe
- PET scans show increased blood flow in parietal cortex when people perform visual searches or pay attention to spatial locations.
- Effects of Brain Lesions
  - Unilateral Spatial Neglect

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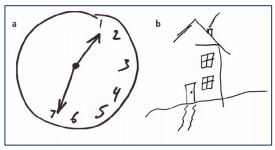
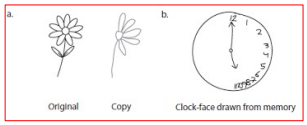
Unilateral Spatial Neglect Patients' Drawings





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Executive Attention Network

- Prefrontal cortex
- Inhibits automatic responses to stimuli
- Stroop Task
- Top-down control of attention
- Develops about age 3
- Aging Effects

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Consciousness

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Consciousness

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

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Consciousness – Access to our Thoughts

- We have access to some thought processes but limited or no access to many of our thought processes.
- Nisbett & Wilson (1977)
  - Little direct access to our thought processes
  - Product vs Process
  - Verbal reports

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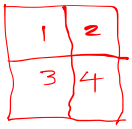
Blindsight



- Vision without awareness
- Damage to visual cortex – cortical blindness
- People can sometimes still report visual attributes of stimuli they report they cannot 'see' (i.e. no conscious awareness of the object)

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Possible Explanations of Blindsight

- Some retinal information travels to other locations of the cerebral cortex, outside the visual cortex
- Some characteristics of the visual stimulus may be identified by information registered in other cortical locations.
- Primary visual cortex is necessary for conscious awareness of visual information.
- Perception of stimulus (without conscious awareness) may be possible.

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