Attention and Working Memory in Health and Disease

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Was this a failure of attention or a failure of memory?

Attention
Concentrating your processing resources on relevant information and filtering out distractions

Working Memory
Temporary storage of information and goals that are relevant for current tasks

Attention controls what we store in working memory

Working Memory controls what we attend to

Try to perceive the house

Attention & Competition
Attention & Competition

Try not to perceive the house

Attention & Competition

Try to perceive the face

Attention & Competition

Try not to perceive the face

Try to perceive the face and not the house

Attention & Competition

Try to perceive the house and not the face

Attention: The Basic Neural Circuit

Attention "turns up the volume" on one source of information

Attend Face

This indirectly increases inhibition of other sources of information

face

house
Attention doesn't have much impact in the absence of competition.

It's really hard to ignore something if there is no attended competitor. We can actually filter better when we're overloaded.

Attention is particularly difficult when we must filter out a potent distractor or overcome an automatic response.

It's easy to attend to YouTube and filter out your algebra homework.
The Stroop Task
Easy Condition: Read the Words

red blue green green blue yellow red yellow
yellow red blue yellow green blue red green

The Stroop Task
Difficult Condition: Name the Ink Colors

red blue green green blue yellow red yellow
yellow red blue yellow green blue red green

Hugdahl et al. (2015, Frontiers in Human Neuroscience)

Working Memory
Temporary storage of information and goals that are relevant for current tasks

Working memory: A temporary buffer used in the service of ongoing cognitive operations

Two Key Properties of Working Memory
• Maintains information over short periods of time
• Very limited storage capacity

https://en.wikipedia.org/wiki/Spot_the_difference

Was this panel on the left or right side of the original image?
Correlations with Cognitive Ability

Johnson et al. (2013, Neuropsychology)

Visual Working Memory Storage Capacity

Overall Cognitive Ability (MATRICS T)

\[ r^2 = .46 \] (age-adjusted)

Correlation with WASI IQ

\[ r^2 = .31 \]

Working Memory:
The Basic Neural Circuit


Set Size 3

Leonard et al. (2012, Cerebral Cortex)
Schizophrenia
1-2% lifetime prevalence
Characterized by hallucinations, delusions, disorganized thought

Degree of impairment in basic cognitive functioning is a much better predictor of long-term outcome than degree of hallucinations, delusions, and disorganized thought.

The Impaired Filtering Hypothesis

“I remember one day when I got caught in the rain. Each drop felt like an electric shock and I found it hard to move because of how intense and painful the feeling was.”

-Djinn (http://forum.schizophrenia.com/t/sensory-overload/4910)

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Unusually narrow but intense focusing of cognitive processing resources

The Hyperfocusing Hypothesis

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What Have We Learned?
Attention Boosting & Competition
Working Memory Short Duration Limited Capacity
Schizophrenia Impaired Cognition Hyperfocusing

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