

Cognitive Psychology

PSYC230

Lecture # 4

Attention REVIEW

Selective attention
Divided attention
Attentional capacity
Automaticity & attention

1. Attention is a limited resource
2. Attention has both top-down (selective) and bottom-up (automatic) components
3. Task similarity affects our ability to divide attention between multiple tasks
4. Task familiarity (practice) affects our ability to divide attention between multiple tasks (due to task proceduralisation & automaticity)

Today

Automatic processing
Attentional conspicuity
Preconscious processing

Controlled processing
Focussed attention
Signal detection theory

Theories of attention
Filters & attenuators

What sort of things attract attention?

Our names
Novel (unusual) events
Sudden onset events
Peripheral motion
Feature singletons

Some things capture attention automatically (no effort, no intention, fast)

Like yelling *FIRE* in a theatre

Visual search

Feature singleton -- target “pops out”

Very little attentional capacity required

Feature search – search in parallel

No Display Size Effect -- # distractors doesn't matter

When target differs from distractors by a conjunction of features (e.g. shape *and* color)

Conjunction search : examine each element serially

Harder -- more attentional capacity required

Display Size Effect – response times increases with number of distractors

Attentional conspicuity

The ability of a stimulus to attract attention

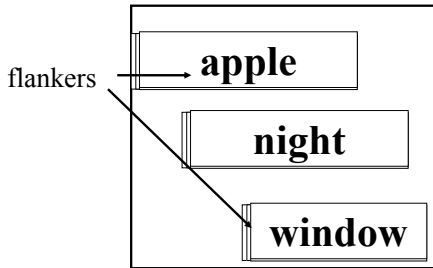
Novelty usually attracts our attention, with experience its novelty wears off (roadside hoardings & adverts)

Other things become important through experience (our names)

But even if it doesn't attract attention, it may still be processed

Non-targets are processed even if not selected by attention

The Flanker effect



Reading RTs are faster if flankers are related to target word

Evidence that some processing was occurring very rapidly, without awareness, *automatically*

Preconscious processing

The Priming Effect

(Anthony Marcel, 1983)

1. Very brief visual presentation of a word followed by a “visual mask”
2. Categorisation task -- present a word to be categorised

“Is it a plant or a body part?”

palm

priming word

boop

visual mask

Is *wrist* a body part?

or

Is *wrist* a plant?

categorisation task

The priming word sped up participants’ reaction times, even though they weren’t aware of seeing it

If the participants *can* consciously process the priming word

palm

priming word, no visual mask

Is *wrist* a body part?

*Answered **slower** if palm interpreted as a plant*

Is *pine* a plant?

*Answered **faster** if palm interpreted as a plant*

Preconscious processing

This led some advertisers to try

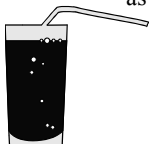
Subliminal Messages

Advertisers inserted very brief subliminal messages into movies

You are THIRSTY

Buy a CANDY BAR

Complex messages were not as effective as simple ones



Automatic Processing

Attentional conspicuity & Preconscious processing

Applications

Advertising

Novel ads to grab your attention

Product placement

Signs, labels, & warnings

Road signs

Doors (push or pull?)

Alarms

Controlled Processing

What do we use Attention for?

Focus your attention on important information
(to process it further)

How do you focus on what's important?

Direct your attention to where you think the
signal (target) will be, and ignore all of the noise
(distractors) in the background
feature search or conjunctive search

Controlled Processing

Sperling & Melcher (1978)

Flashed arrays of 16 letters

On some trials, participants told to allocate 90% of
their attention to the inside set of letters

On other trials, participants told to allocate 90% of
their attention to the outside set of letters

On remaining trials, participants told to allocate
their attention equally to all letters

J	B	X	D
Y	A	E	S
N	P	W	V
Q	M	R	T

Controlled Processing

Sperling & Melcher (1978)

Results

80% correct recall inside when told to attend
to the inside set

80% correct recall outside when told to attend
to the outside set

50-60% correct recall when told to attend
to both sets equally

But trying not to think about something may
actually make it harder to keep out of attention

Controlled Processing

Ironic Processes

Being told to ignore something makes it
harder to ignore

Quickly say the first word that comes into
your mind when you see words below

Controlled Processing

Ironic Processes

Being told to ignore something makes it
harder to ignore

How do ironic effects work?

Appears to be two processes at work:

Operating process – active search with attention

Monitoring process – monitors content of attention
alerting you of irrelevant information (automatic,
doesn't require attention)

When resources are low (tired or overloaded)
operating process fails and we're left with contents
of monitoring process

Controlled Processing

How long can we focus attention?

Vigilance

searching a stimulus field over a prolonged length
of time (focussed attention)

like watching a radar screen ...

(Not the same as a control task with continuous action
required -- e.g., driving a car)

Humans are not very good at vigilance
about 30 mins maximum

Controlled Processing

Why does vigilance deteriorate?

Several reasons:

Attention captured by other events
(esp. those with high attentional conspicuity)

Habituation (sensitivity to signals)

Motivation (boredom)

Controlled Processing

Signal Detection Theory

Receiver Operating Characteristic (ROC)

		Signal	
		present	absent
Receiver's decision	present	Hit	False alarm
	absent	Miss	Correct rejection

Controlled Processing

Signal Detection Theory

ROC curve

Sensitivity (d') changes through habituation

Criterion changes according to motivation

cost of a miss (or false alarm)

payoff for a hit

*Where would you set the threshold for
a pregnancy test?*

(minimise misses or false alarms?)

detecting a possible cure for cancer?

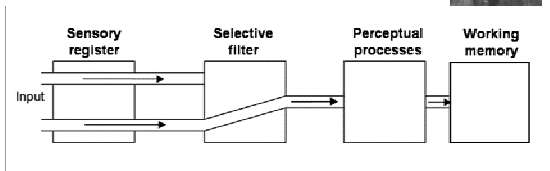
detecting an oil field?

Theories of Attention

Theories of Attention

Filter model

Donald Broadbent (1958)



Attention is a single-channel filter

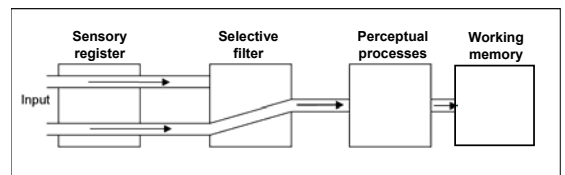
Selects inputs for working memory

Filtering based on stimulus characteristics

Content not processed until working memory

Prevents overload in working memory

Theories of Attention



*But... how did participants detect their name
in the cocktail party experiments?*

Perceptual processing

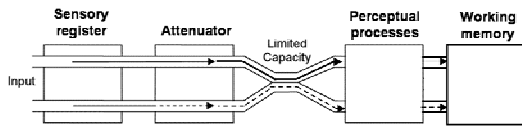
Corteen & Wood (1972) and Von Wright (1975) paired some words with electric shocks. The words caused an emotional response (measurable by GSR). Using dichotic listening method, Von

Wright found conditioned words in the ignored ear still produced GSR response, even without awareness

Theories of Attention

Attenuation model

Anne Treisman (1964)



Input is *attenuated* based on sensory characteristics.
 Followed by perceptual analysis (pattern matching)
 Then analysed for content in working memory.

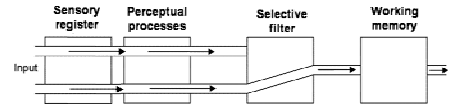
A parallel-processing model

Theories of Attention

Other approaches ...

Late Filtering Model

Deutsch & Deutsch (1963)



All inputs are analysed perceptually,
 filter is located before working memory

Flexible Filter Model

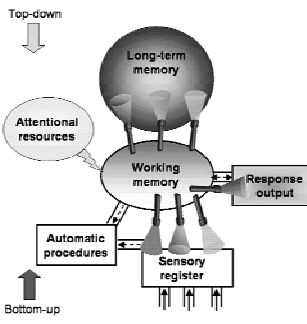
Johnston & Heinz (1978)

Filtering can occur either early or late
 in processing, earlier is less demanding

Filter early when working memory is overloaded

Theories of Attention

Other approaches ...



Resource models

A combination of automatic and controlled processes running in parallel, powered by the attentional resources available

Summary -- Attention & Consciousness

Automatic processing

Some stimuli grab our attention automatically

Preconscious processing

Some processing of incoming information occurs even before we are aware of it

Summary -- Attention & Consciousness

Controlled processing

We *can* exercise voluntary control over what we pay attention to

Sustained attention (vigilance) is affected by habituation (sensitivity) and motivation (criterion)

Theories of Attention

Early view was that attention acts like a filter

Early vs late and flexible filter models
 Gradually replaced by parallel (attenuator) and resource models

**Quiz # 1 in labs
 next week**

Questions?