Outline of Psychology of Attention
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Note: To look up references, see the Consciousness Bibliography, listing 10,000 books and articles, with full journal and author names, available in text and PDF file formats at http://www.outline-of-knowledge.info/Consciousness_Bibliography/index.html.

SOCI>Psychology>Cognition>Attention

attention

People can observe scenes and then concentrate on organisms, self, objects, features, times, or locations {attention}|. Attention is on whole-object center, not just to initial cue or feature. Attention can focus on objects of different sizes and at different distances, so size and distance do not matter. Attending reduces noticing other organisms, objects, features, times, and locations. Attention filters, amplifies, or suppresses data.

processes

To guide attention, mind uses hypotheses about scene or object to test if distinctive properties are at distinctive locations. General search method does not guide attention. Attention uses image spatial coordinates to move to locations. Body, head, eyes, and attention window move to focus on stimulus location. Minds shift visual attention to new object before saccadic eye movement [Culham et al., 1998] [Posner and Gilbert, 1999] [Umiltà and Moscovitch, 1994].

processes: selection

Attention can affect early information processing {early selection} and not cause later perception. Attention can affect responses, memory, or high-level information processing and not prevent later perception {late selection}. Attentional load studies indicate that attention affects early selection.

processes: figure

Attention selects figure from ground.

purposes

Attention to object allows quicker reaction, smaller stimulation, more accuracy, and better recall.

properties: attention to painting

In perspective painting, observer attention typically moves along eye-level line.

properties: distance

Attention does not decrease or increase perceived distance.

properties: EEG

Attention to object, to recognize it or use it, causes 40-Hz EEG oscillation.

properties: extinction

If stimulus is present in one visual field, it can prevent attention to later stimulus in other visual field, especially if the stimuli have similar positions.

properties: information

Minds track object parts with highest information and strongest features, which are often along outer contour.

properties: intensity

Attention does not increase stimulus intensity.

properties: time

Attention can turn off but only for short time.

causes: texture discrimination

Texture discrimination precedes attention and looks for visual-field texton-kind and density changes, in parallel. If elongated blobs are the same because blob terminators total same number, texture is the same. If texton changes, mind calls attention processes.

causes: pain

Pain causes attention to object and causes motivation and response to push object farther away and/or stop pain. Attention, anxiety, and prior experience influence pain. Pain makes other goals seem unimportant.

causes: pleasure

Pleasure causes attention to object.

factors: classifying

The categorizing process begins before attention and continues independently after attention.

factors: consciousness

Animals with consciousness can attend to something only if they are aware of it already. Attention can be faster than consciousness. Attention can distract before consciousness. Consciousness can be selective attention. Brain regions for attention, shape, planning, and goals are for sensory consciousness [Chalmers, 2000] [Ffytche, 2000] [Kanwisher, 2001] [Lumer, 2000] [Lumer et al., 1998].

factors: dreaming

In dreams, attention easily distracts, and people cannot consciously attend.

factors: emotion

Attention is before emotions associated with events.

factors: hypnosis

Hypnosis typically restricts attention to small field.

factors: learning

Rewards and punishments determine attention to features and objects, so learning affects attention.

factors: meditation

Concentrative meditation pays attention to one object or event, such as breathing or mantra.

factors: memory

Memories are weak if attention is weak. More attention strengthens declarative memory encoding, because more conscious processing makes more cues for retrieval. Animals with consciousness must pay attention to remember declarative facts. Animals with no consciousness can orient but cannot attend or use declarative memory. Making iconic memory requires attention. Attention to sensory memory causes automatic entry into verbal short-term memory. Attention is part of working memory, or working memory holds attended conscious content, and vice versa.

factors: near-death experience

Near-death experiences have focused attention.

factors: perception

Attention precedes perception and so is apperceptive.

factors: recognition

Recognizing object requires attention.

factors: sensation

Attention requires sensation and does not require awareness.

factors: sleep

Little sleep causes attention loss.

factors: will

Animals with consciousness must pay attention to take voluntary action. Animals with no consciousness can orient but cannot attend or perform voluntary actions.

effects

Attention can enhance all processing related to object attended.

effects: association

Attention to two object features associates their features. Attention can associate two features by placing them in same spatial location [Treisman and Gelade, 1980].

effects: orientation followup

The orienting response precedes slower process that gathers information about time, place, and person to recognize object {orientation followup}.

effects: orientation response

Response to new stimulus directs attention to spatial location {orientation response, attention}, probably before consciousness starts.

effects: binding

Attention can be necessary for binding. However, binding can happen for non-conscious information processing with no attention. Adjacent-object properties can bind to half-attended objects.

effects: response enhancement

Perhaps, attention to stimulus increases response of neuron that receives stimulus input.

effects: sharper tuning

Perhaps, attention to stimulus decreases stimulus range to which neuron responds.

effects: structural model

Attention selects one information channel, which has maximum serial information-flow rate.

biology: animals

All mammals have attention.

biology: excitation

Attention excites affected neurons temporarily [Chelazzi et al., 1993] [Crick and Koch, 1990] [Desimone and Duncan, 1995] [Kastner et al., 1998] [Lee et al., 1999] [Luck et al., 1997] [Miller et al., 1993] [Moran and Desimone, 1985] [Reynolds et al., 1999] [Reynolds and Desimone, 1999] [Rolls et al., 2003] [Rolls and Tovee, 1995] [Treue and Maunsell, 1996].

biology: neuron

Attention reduces neural responses in unattended cortex and increases neural responses and synchronous firing in attended cortex.

biology: development

At 6 to 7 years, ability to sustain attention increases greatly, in all cultures.

biology: drug

Drugs, such as modafinil, can provide atypical attention states [Atkinson and Shiffrin, 1968] [Atkinson et al., 1999] [Atkinson et al., 2000] [Farthing, 1992] [Hobson, 1999] [Metzner, 1971] [Spence and Spence, 1968] [Tart, 1972] [Tart, 1975].

biology: synchrony

Awake brain has synchrony, which increases with attention and preparation for motor acts.

biology: fruitfly

In fruitfly, attention affects specific neurons [Heisenberg and Wolf, 1984] [Tang and Guo, 2001] [van Swinderen and Greenspan, 2003].

brain

Attention involves anterior attention network, cingulate nucleus, frontal lobe attentional network, hypothalamus, inferotemporal region, lateral pulvinar nucleus, lateral reticular system, locus coeruleus, orbito-frontal lobe, pons, posterior parietal lobe, prefrontal lobe, reticular formation, spatial attention system, superior colliculus, tectopulvinar pathway, tegmentum, thalamus, and ventral temporal lobe.

brain: anterior cingulate

Consciousness reduces anterior-cingulate-gyrus activity {anterior cingulate, attention} [Chalmers, 2000] [Ffytche, 2000] [Kanwisher, 2001] [Lumer, 2000] [Lumer et al., 1998].

brain: frontal lobe

Consciousness increases right-frontal-lobe attention-center activity [Chalmers, 2000] [Ffytche, 2000] [Huerta et al., 1986] [Kanwisher, 2001] [Lumer, 2000] [Lumer et al., 1998] [Schall, 1997].

brain: parietal lobe

Attention affects posterior parietal lobe [Bisley and Goldberg, 2003] [Colby and Goldberg, 1999] [Gottlieb et al., 1998].

brain: PIP

PIP controls attention [Chalmers, 2000] [Ffytche, 2000] [Kanwisher, 2001] [Lumer, 2000] [Lumer et al., 1998].

brain: prefrontal cortex

Focal attention originates in prefrontal cortex and can affect thalamus or sense-cortex areas [Boff et al., 1986] [Braun, 1994] [Braun, 2003] [Braun and Julesz, 1998] [Braun and Sagi, 1990] [de Fockert et al., 2001] [Lennie, 2003] [Li et al., 2002] [Reddy et al., 2004] [Rousselet et al., 2002] [Sperling and Dosher, 1986] [Strayer and Johnston, 2001] [Tsotsos, 1990] [Ullman, 1984].

brain: V1 region

Attention affects area V1 [Brefczynski and DeYoe, 1999] [Fries et al., 2001] [Gandhi et al., 1999] [Ito and Gilbert, 1999] [Ito et al., 1995] [Kastner and Ungerleider, 2000] [Motter, 1993] [Niebur and Koch, 1994] [Niebur et al., 1993] [Niebur et al., 2002] [Noesselt et al., 2002] [O'Connor et al., 2002] [Posner and Gilbert, 1999] [Roelfsema et al., 1998] [Somers et al., 1999] [Watanabe et al., 1998].

attentional blink

If second stimulus is 200 ms to 500 ms after attending first stimulus, people cannot perceive second stimulus {attentional blink}. People can accurately detect a stimulus in a stimulus series with separation 100 ms, because they can use immediate memory. People can somewhat accurately detect which stimulus preceded and which was later in

stimulus series, if stimuli are less than 100 ms or more than 400 ms apart, but not 200 ms to 300 ms apart, because they cannot use immediate memory.

attentional shift

Attention can shift from object or location to another object or location {attentional shift}. Attention switches no more than twice per second. Attention shifts 50 milliseconds to 100 milliseconds after brain signal to shift attention. Attentional shift can involve eye movement {overt attentional shift} or no eye movement {covert attentional shift}. Attention shift uses dorsolateral prefrontal cortex, cingulate nucleus, frontal eye fields in area 8, area-7a posterior-parietal lobe, pulvinar nucleus, and superior colliculus.

biased competition

Attention excites a neuron set and inhibits other sets {biased competition} [Desimone and Duncan, 1995].

Broadbent filtering effect

People can prevent meaningful sounds received at unattended channel from becoming conscious {Broadbent filtering effect, attention} [Broadbent, 1958].

deception in primates

To steal food or to mate, primates distract others' attention {deception, attention} [Byrne and Whiten, 1988] [Whiten and Byrne, 1997].

inattentional blindness

While concentrating on other events or paying attention to one object, people do not necessarily see unusual events happening {inattentional blindness}, even in vision center. If attention is elsewhere, people do not necessarily see objects and events in scenes.

Even if attention is on location or object, people can still not notice, if they do not store enough object detail. People do not see unexpected objects and events [Gladwell, 2001] [Haines, 1991] [Mack and Rock, 1998] [Obrecht and Stark, 1991].

attentional load

If attentional load increases, inattentional blindness increases.

masking

Changes can have masking.

gradient

Change can be too gradual.

neglect in attention

If stimulus is in contralesional visual field, such as when right brain has lesion and stimulus is in left visual field, people cannot attend to it {neglect, attention}. Neglect can be for object or body right or left side.

orientation map

A cortical-area-6 map {orientation map} computes locations in nearby space, using body-based coordinates. Perhaps, it guides orienting responses, like tectofugal pathway.

searchlight

Mental process {searchlight of attention} {spotlight of attention} {attentional spotlight} can focus attention on objects in mental space, to find, select, and recognize scene objects. Attention probably does not move across space or time, but jumps or expands and then contracts {zooming, attention} [Bergen and Julesz, 1983] [Cave and Bichot, 1999] [Julesz, 1971] [Julesz, 1981] [Sperling and Weichselgartner, 1995] [Treisman, 1988] [Treisman, 1998] [Treisman and Gelade, 1980] [Wolfe, 1992] [Wolfe, 1998] [Wolfe, 1999].

Stroop test

Researchers can ask people to name the color used for word letters, or to name color patch near black-lettered word {Stroop test}. The word is or is not the color name. If word is different-color name, color-naming response time increases, showing that attention and perception can conflict.

time gap

Sudden consciousness, of having no memory of just-passed time {time gap}, results from low attention and failure to register event times.

SOCI>Psychology>Cognition>Attention>Forms

bottom-up attention

Consciousness of sense input has two forms, top-down and bottom-up, corresponding to the two attention stages. Quick consciousness {exogenous attention} {bottom-up attention} {saliency-based attention} is automatic, depends only on input features, and can use single neurons to detect perceptual features, as in orienting response [Braun and Julesz, 1998] [Duncan, 1998] [Duncan, 2001] [Egeth and Yantis, 1997] [Nakayama and Mackeben, 1989] [Shimojo et al., 1996] [VanRullen and Koch, 2003] [Watanabe and Rodieck, 1989].

top-down attention

Sense-input consciousness can be top-down or bottom-up, corresponding to attention stages [Bülthoff, 2002] [Hamker, 2004] [Hamker and Worcester, 2002] [Hardcastle, 2003] [Kentridge et al., 1999] [Lamme, 2003] [Lee et al., 1999] [Naccache et al., 2002] [Osaka, 2003] [Posner et al., 1980] [Reddy et al., 2002] [Rolls and Deco, 2002] [VanRullen and Koch, 2003] [Wen et al., 1997].

Long-term consciousness {top-down attention} {endogenous attention} {task-dependent attention} {volitional-controlled attention} {focal attention} is through will, has tasks, and uses focusing, short-term memory, and cortical and thalamic sense centers. Example is orientation sense. Focal attention uses locations, features, and objects.

Attention to sense input causes subjective feeling of emptying the head of other thoughts and feelings.

SOCI>Psychology>Cognition>Attention>Properties

attention span

Stimulus can be held in memory without loss up to one second {attention span}|. Attention changes every few seconds.

attentional load

If number of objects increases {attentional load}, perceptual-task difficulty increases. If attentional load increases, inattentional blindness and change blindness increase.

covert attention scanning

While looking at location or object, people can attend to another object or place {covert attention scanning} [Rizzolatti et al., 1994].

electrodermal response

When organisms respond to environment changes, unconscious skin responses {electrodermal response} {electrodermal activity} can happen with orienting response (OR) or to defensive response (DR). Electrical skin activity changes skin potential {endosomatic response} and skin electrical resistance or conductance {exosomatic response}.

biology

Sympathetic nervous system controls electrodermal activity.

Bulbar reticular formation stimulation inhibits electrodermal response. Amygdala removal inhibits skin conductance.

factors: sweat

Sweat affects exosomatic responses.

factors: schizophrenia

Schizophrenia patients can have no or large electrodermal response.

preattentive processing

Before people attend to stimulus or time or space location, they mentally prepare {preattentive processing}.

selective attention

People can pay attention to different stimulus parts {selective attention} [Broadbent, 1958].

SOCI>Psychology>Cognition>Attention>Theories

attentional capacity model
Perhaps, attention has one channel, with strength {attentional capacity model}. Attentional strength correlates with general intelligence and ability to block proactive interference. Attention tries to block interference and distractions. Attention tracks goals, activates data, and calls parallel subsystems.

coherence field
Perhaps, attention binds related features to produce temporarily integrated scene {coherence field} {virtual representation} [Rensink, 2000].

feature integration theory
Perhaps, attention and visual search first process basic visual features preattentively and automatically and then use attention to associate features with objects and find higher level properties {feature integration theory}. Attention integrates or selects basic features such as color and orientation [Chun and Wolfe, 1996] [Driver and Baylis, 1998] [Duncan, 1984] [Jolicoeur et al., 1986] [Kanwisher and Driver, 1997] [Rock and Gutman, 1981] [Wolfe, 1994] [Wolfe, 1999].

filter theory
Perhaps, mind transforms information flowing through one information channel, which filters information at low rate to select high-priority information {filter theory}. Filtering can affect sense input, emotion, language, color, and response. People can control information channel to block or weaken incoming messages or to interpret information differently. For example, people can keep meaningful sounds received at unattended channel from becoming conscious {Broadbent filtering effect, filter theory} [Broadbent, 1958].

guided search theory
Perhaps, attention and visual search process basic visual features preattentively and automatically and then use that information to control attention processes {guided search theory, attention}.

preattentive task
Perhaps, image features compete in decision and attention processes as mind finds, selects, and recognizes object in image {preattentive task} {pop-out task}.

pre-motor theory
Perhaps, same neurons that tell eyes to move toward location are for attention to location {pre-motor theory}. Attention changes depend on plans to move eyes to new directions [Kustov and Robinson, 1996] [Rizzolatti et al., 1994] [Sheliga et al., 1994].

saliency map
Perhaps, attention uses map {saliency map} with neurons that detect differences [Itti et al., 1998] [Itti and Koch, 2000] [Itti and Koch, 2001] [Koch and Ullman, 1985] [Treisman and Gelade, 1980] [Walther et al., 2002] [Wolfe, 1994] [Wolfe, 1999].

supervisory attentional system
People can make attention metarepresentations {supervisory attentional system} [Shallice, 1988].

SOCI>Psychology>History>Attention

John Carl Flugel [Flugel, John Carl]
psychologist/psychoanalyst
Britain
1928
Practice, Fatigue and Oscillation [1928]
He lived 1884 to 1955 and studied attention.

Anne Treisman [Treisman, Anne]

psychologist
USA
1980 to 1996
Feature integration theory of attention [1980: with G. Gelade]; Perception of features and objects [1993]; Binding problem [1996]
She invented an attention theory {feature integration theory, Treisman}. Mind first processes basic visual features preattentively and automatically and then uses attention to associate features with objects and find higher-level properties.

Tim Shallice [Shallice, Tim]
psychologist
USA
1988
From Neuropsychology to Mental Structure [1988]
He studied supervisory attentional system. He invented model with functional models, contention scheduler, supervisory system, language system, and episodic memory [Shallice, 1988].