DOWNLOAD PDF PROCESSING STRUCTURES FOR PERCEPTION AND ACTION

Chapter 1 : Commonalities between Perception and Cognition

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Differentiate the processes of sensation and perception. Explain the basic principles of sensation and perception. Describe the function of each of our senses. Outline the anatomy of the sense organs and their projections to the nervous system. Apply knowledge of sensation and perception to real world examples. Explain the consequences of multimodal perception. After passing through a vibrantly colored, pleasantly scented, temperate rainforest, I arrived at a cliff overlooking the Pacific Ocean. I grabbed the cold metal railing near the edge and looked out at the sea. Below me, I could see a pod of sea lions swimming in the deep blue water. All around me I could smell the salt from the sea and the scent of wet, fallen leaves. Our senses combine to create our perceptions of the world. It is probably best to start with one very important distinction that can often be confusing: The physical process during which our sensory organsâ€"those involved with hearing and taste, for exampleâ€"respond to external stimuli is called sensation. Sensation happens when you eat noodles or feel the wind on your face or hear a car horn honking in the distance. During sensation, our sense organs are engaging in transduction , the conversion of one form of energy into another. Physical energy such as light or a sound wave is converted into a form of energy the brain can understand: After our brain receives the electrical signals, we make sense of all this stimulation and begin to appreciate the complex world around us. This psychological processâ€"making sense of the stimuliâ€"is called perception. It is during this process that you are able to identify a gas leak in your home or a song that reminds you of a specific afternoon spent with friends. Regardless of whether we are talking about sight or taste or any of the individual senses, there are a number of basic principles that influence the way our sense organs work. The first of these influences is our ability to detect an external stimulus. Each sense organâ€"our eyes or tongue, for instanceâ€"requires a minimal amount of stimulation in order to detect a stimulus. The way we measure absolute thresholds is by using a method called signal detection. This process involves presenting stimuli of varying intensities to a research participant in order to determine the level at which he or she can reliably detect stimulation in a given sense. During one type of hearing test, for example, a person listens to increasingly louder tones starting from silence in an effort to determine the threshold at which he or she begins to hear see Additional Resources for a video demonstration of a high-frequency ringtone that can only be heard by young people. Correctly indicating that a sound was heard is called a hit; failing to do so is called a miss. Through these and other studies, we have been able to gain an understanding of just how remarkable our senses are. For example, the human eye is capable of detecting candlelight from 30 miles away in the dark. We are also capable of hearing the ticking of a watch in a quiet environment from 20 feet away. A similar principle to the absolute threshold discussed above underlies our ability to detect the difference between two stimuli of different intensities. The differential threshold , or just noticeable difference JND , for each sense has been studied using similar methods to signal detection. Have your friend hold the lightest object 1 lb. Then, replace this object with the next heaviest and ask him or her to tell you which one weighs more. Reliably, your friend will say the second object every single time. However, it is not so easy when the difference is a smaller percentage of the overall weight. It will be much harder for your friend to reliably tell the difference between 10 and 11 lbs. Crossing into the world of perception, it is clear that our experience influences how our brain processes things. However, during the time you first eat something or hear a band, you process those stimuli using bottom-up processing. This is when we build up to perception from the individual pieces. This is called top-down processing. The best way to illustrate these two concepts is with our ability to read. Read the following quote out loud: An example of stimuli processing. Notice anything odd while you were reading the text in the triangle? In other words, your past experience has changed the way you perceive the writing in the triangle! A beginning readerâ€”one who is using a bottom-up approach by carefully attending to each pieceâ€”would be less likely to make this error. When a stimulus is constant and unchanging, we experience sensory adaptation. During this process we become less sensitive to that stimulus. A great example of this occurs when we leave the radio on in our car after we park it at home for the night. When we listen to the radio on the way home from work the volume seems reasonable. However, the next morning when we start the car, we might be startled by how loud the radio is. What happened is that we adapted to the constant stimulus of the radio volume over the course of the previous day. This required us to continue to turn up the volume of the radio to combat the constantly decreasing sensitivity. However, after a number of hours away from that constant stimulus, the volume that was once reasonable is entirely too loud. We are no longer adapted to that stimulus! Now that we have introduced some basic sensory principles, let us take on each one of our fascinating senses individually. Vision How vision works Vision is a tricky matter. When we see a pizza, a feather, or a hammer, we are actually seeing light bounce off that object and into our eye. Light enters the eye through the pupil, a tiny opening behind the cornea. The pupil regulates the amount of light entering the eye by contracting getting smaller in bright light and dilating getting larger in dimmer light. Once past the pupil, light passes through the lens, which focuses an image on a thin layer of cells in the back of the eye, called the retina. Because we have two eyes in different locations, the image focused on each retina is from a slightly different angle binocular disparity , providing us with our perception of 3D space binocular vision. You can appreciate this by holding a pen in your hand, extending your arm in front of your face, and looking at the pen while closing each eye in turn. Pay attention to the apparent position of the pen relative to objects in the background. Depending on which eye is open, the pen appears to jump back and forth! This is how video game manufacturers create the perception of 3D without special glasses; two slightly different images are presented on top of one another. Diagram of the human eye. Notice the Retina, labeled here: The retina contains two main kinds of photoreceptors: Rods are primarily responsible for our ability to see in dim light conditions, such as during the night. Cones, on the other hand, provide us with the ability to see color and fine detail when the light is brighter. Rods and cones differ in their distribution across the retina, with the highest concentration of cones found in the fovea the central region of focus , and rods dominating the periphery see Figure 2. Next, the electrical signal is sent through a layer of cells in the retina, eventually traveling down the optic nerve. Information is then sent to a variety of different areas of the cortex for more complex processing. Some of these cortical regions are fairly specializedâ€”for example, for processing faces fusiform face area and body parts extrastriate body area. Damage to these areas of the cortex can potentially result in a specific kind of agnosia , whereby a person loses the ability to perceive visual stimuli. A great example of this is illustrated in the writing of famous neurologist Dr. Oliver Sacks; he experienced prosopagnosia, the inability to recognize faces. Dark and light adaptation Humans have the ability to adapt to changes in light conditions. As mentioned before, rods are primarily involved in our ability to see in dim light. They are the photoreceptors responsible for allowing us to see in a dark room. You might notice that this night vision ability takes around 10 minutes to turn on, a process called dark adaptation. This is because our rods become bleached in normal light conditions and require time to recover. We experience the opposite effect when we leave a dark movie theatre and head out into the afternoon sun. During light adaptation , a large number of rods and cones are bleached at once, causing us to be blinded for a few seconds. Light adaptation happens almost instantly compared with dark adaptation. Interestingly, some people think pirates wore a patch over one eye in order to keep it adapted to the dark while the other was adapted to the light. Color vision Figure 3. Stare at the center of the Canadian flag for fifteen seconds. Then, shift your eyes away to a white wall or blank piece of paper. You should see an "after image" in a different color scheme. Our cones allow us to see details in normal light conditions, as well as color. We have cones that respond preferentially, not exclusively, for red, green and blue Svaetichin, This trichromatic theory is not new; it dates back to the early 19th century Young, ; Von Helmholtz, This theory, however, does not explain the odd effect that occurs when we look at a white wall after staring at a picture for around 30 seconds. According to the trichromatic theory of color vision, you should see white when you do that. Is that what you experienced? This is where the opponent-process theory comes in Hering, This theory states that our cones send information to retinal ganglion cells that respond to pairs of colors red-green, blue-yellow, black-white.

Chapter 2 : Sensation and Perception | Noba

PROCESSING STRUCTURES FOR PERCEPTION AND ACTION FINAL REPORT OF THE SONDERFORSCHUNGSBEREICH KYBERNETIK SONDERFORSCHUNGSBEREICHE 5 semantics verbal.

Saul McLeod , published In order to receive information from the environment we are equipped with sense organs e. Each sense organ is part of a sensory system which receives sensory inputs and transmits sensory information to the brain. A particular problem for psychologists is to explain the process by which the physical energy received by sense organs forms the basis of perceptual experience. Sensory inputs are somehow converted into perceptions of desks and computers, flowers and buildings, cars and planes; into sights, sounds, smells, taste and touch experiences. A major theoretical issue on which psychologists are divided is the extent to which perception relies directly on the information present in the stimulus. Psychologists distinguish between two types of processes in perception: Bottom-up processing is also known as data-driven processing, because perception begins with the stimulus itself. Processing is carried out in one direction from the retina to the visual cortex, with each successive stage in the visual pathway carrying out ever more complex analysis of the input. Top-down processing refers to the use of contextual information in pattern recognition. For example, understanding difficult handwriting is easier when reading complete sentences than when reading single and isolated words. This is because the meaning of the surrounding words provide a context to aid understanding. Gregory and Top Down Processing Theory Psychologist Richard Gregory argued that perception is a constructive process which relies on top-down processing. Stimulus information from our environment is frequently ambiguous so to interpret it, we require higher cognitive information either from past experiences or stored knowledge in order to makes inferences about what we perceive. For Gregory perception is a hypothesis, which is based on prior knowledge. In this way we are actively constructing our perception of reality based on our environment and stored information. Therefore, the brain has to guess what a person sees based on past experiences. We actively construct our perception of reality. Richard Gregory proposed that perception involves a lot of hypothesis testing to make sense of the information presented to the sense organs. Our perceptions of the world are hypotheses based on past experiences and stored information. Sensory receptors receive information from the environment, which is then combined with previously stored information about the world which we have built up as a result of experience. The formation of incorrect hypotheses will lead to errors of perception e. Such a mask is generally seen as normal, even when one knows and feels the real mask. An assumption based on past experience. Perceptions can be ambiguous The Necker cube is a good example of this. It becomes unstable and a single physical pattern can produce two perceptions. Gregory argued that this object appears to flip between orientations because the brain develops two equally plausible hypotheses and is unable to decide between them. When the perception changes though there is no change of the sensory input, the change of appearance cannot be due to bottom-up processing. It must be set downwards by the prevailing perceptual hypothesis of what is near and what is far. Perception allows behavior to be generally appropriate to non-sensed object characteristics For example, we respond to certain objects as though they are doors even though we can only see a long narrow rectangle as the door is ajar. What we have seen so far would seem to confirm that indeed we do interpret the information that we receive, in other words, perception is a top down process. In some cases it would seem the answer is yes. For example, look at the figure below: This probably looks like a random arrangement of black shapes. In fact there is a hidden face in there, can you see it? The face is looking straight ahead and is in the top half of the picture in the center. Now can you see it? The figure is strongly lit from the side and has long hair and a beard. Once the face is discovered, very rapid perceptual learning takes place and the ambiguous picture now obviously contains a face each time we look at it. We have learned to perceive the stimulus in a different way. Although in some cases, as in the ambiguous face picture, there is a direct relationship between modifying hypotheses and perception, in other cases this is not so evident. For example, illusions persist even when we have full knowledge of them e. The current hypothesis testing theories cannot explain this lack of a relationship between learning and perception. Relying on individual constructs for making sense of the world makes perception a very individual and chancy process. The constructivist approach stresses the role of knowledge in perception and therefore is against the nativist approach to perceptual development. However, a substantial body of evidence has been accrued favoring the nativist approach, for example: Constructivists like Gregory frequently use the example of size constancy to support their explanations. That is, we correctly perceive the size of an object even though the retinal image of an object shrinks as the object recedes. They propose that sensory evidence from other sources must be available for us to be able to do this. However, in the real world, retinal images are rarely seen in isolation as is possible in the laboratory. There is a rich array of sensory information including other objects, background, the distant horizon and movement. This rich source of sensory information is important to the second approach to explaining perception that we will examine, namely the direct approach to perception as proposed by Gibson. This is crucial because Gregory accepts that misperceptions are the exception rather than the norm. Illusions may be interesting phenomena, but they might not be that informative about the debate. This suggests that perception is necessary for survival â€” without perception we would live in a very dangerous environment. Our ancestors would have needed perception to escape from harmful predators, suggesting perception is evolutionary. James Gibson argues that perception is direct, and not subject to hypotheses testing as Gregory proposed. There is enough information in our environment to make sense of the world in a direct way. There is no need for processing interpretation as the information we receive about size, shape and distance etc. Gibson argued that perception is a bottom-up process, which means that sensory information is analyzed in one direction: Light rays reflect off of surfaces and converge into the cornea of your eye. Because of movement and different intensities of light shining in different directions it is an ever changing source of sensory information. Therefore, if you move, the structure of the optic array changes. According to Gibson, we have the mechanisms to interpret this unstable sensory input, meaning we experience a stable and meaningful view of the world. Changes in the flow of the optic array contain important information about what type of movement is taking place. The flow of the optic array will either move from or towards a particular point. If the flow appears to be coming from the point, it means you are moving towards it. If the optic array is moving towards the point you are moving away from it. Invariant Features the optic array contains invariant information that remains constant as the observer moves. They supply us with crucial information. Two good examples of invariants are texture and linear perspective. Another invariant is the horizon-ratio relation. The ratio above and below the horizon is constant for objects of the same size standing on the same ground. Affordances Are, in short, cues in the environment that aid perception. Important cues in the environment include: The patterns of light that reach the eye from the environment. The grain of texture gets smaller as the object recedes. Gives the impression of surfaces receding into the distance. When an object moves further away from the eye the image gets smaller. Objects with smaller images are seen as more distant. If the image of one object blocks the image of another, the first object is seen as closer. A large number of applications can be applied in terms of his theory e. His theory is reductionist as it seeks to explain perception solely in terms of the environment. There is strong evidence to show that the brain and long term memory can influence perception. However, his theory cannot explain why perceptions are sometimes inaccurate, e. He claimed the illusions used in experimental work constituted extremely artificial perceptual situations unlikely to be encountered in the real world, however this dismissal cannot realistically be applied to all illusions. For example if you stare for some time at a waterfall and then transfer your gaze to a stationary object, the object appears to move in the opposite direction. Bottom-up or Top-down Processing? Neither direct nor constructivist theories of perception seem capable of explaining all perception all of the time. Research by Tulving et al manipulated both the clarity of the stimulus input and the impact of the perceptual context in a word identification task. As clarity of the stimulus through exposure duration and the amount of context increased, so did the likelihood of correct identification. However, as the exposure duration increased, so the impact of context was reduced, suggesting that if stimulus information is high, then the need to use other sources of information is reduced. Science, , The Senses Considered as Perceptual Systems. A Theory of Direct Visual Perception. The Psychology of Knowing. Concepts and Mechanisms of Perception. Infant Behavior and Development, 13 1 , How to reference this article:

Chapter 3 : Action-based Theories of Perception (Stanford Encyclopedia of Philosophy)

The action-based theories of perception, reviewed in this entry, challenge the Input-Output Picture. They maintain that perception can also depend in a noninstrumental or constitutive way on action (or, more generally, on capacities for object-directed motor control).

This is an open-access article distributed under the terms of the Creative Commons Attribution Non Commercial License , which permits use, distribution, and reproduction in other forums, provided the original authors and source are credited. This article has been cited by other articles in PMC. Abstract Perception and cognition are highly interrelated. Given the influence that these systems exert on one another, it is important to explain how perceptual representations and cognitive representations interact. In this paper, I analyze the similarities between visual perceptual representations and cognitive representations in terms of their structural properties and content. Specifically, I argue that the spatial structure underlying visual object representation displays systematicity â€" a property that is considered to be characteristic of propositional cognitive representations. Furthermore, I argue that if systematicity is taken to be a criterion to distinguish between conceptual and non-conceptual representations, then visual representations, that display systematicity, might count as an early type of conceptual representations. Showing these analogies between visual perception and cognition is an important step toward understanding the interface between the two systems. The ideas here presented might also set the stage for new empirical studies that directly compare binding and other relational operations in visual perception and higher cognition. Perceptual information guides our decisions and actions, and shapes our beliefs. At the same time our knowledge influences the way we perceive the world Brewer and Lambert, To the extent that perception and cognition seem to share information, it seems there is no sharp division between the realm of cognitive abilities and that of perceptual abilities. An example is visual perception. Visual processing is composed of different stages Marr, Roughly, at early stages of the visual system, processes like segregation of figure from background, border detection, and the detection of basic features e. This information reaches intermediate stages, where it is combined into a temporary representation of an object. At later stages, the temporary object representation is matched with previous object shapes stored in long-term visual memory to achieve visual object identification and recognition. While early visual processes are largely automatic and independent of cognitive factors, late visual stages are more influenced by our knowledge Raftopoulos, this issue. Examples of cognitive influence on how we perceive the world â€" that modulates late vision â€" are visual search and attention Treisman, Knowing the color or shape of an object helps a person to quickly identify that particular object in a cluttered visual scene Wolfe and Horowitz, Phenomena like visual search highlight the fact that visual perception at later stages depends on both sensory and cognitive factors. Late vision is at what philosophers call the personal level: This is apparently not the case for early visual stages, which occur at a subpersonal level, without a person being aware of the information being processed at that stage. Intermediate stages, on the other hand, are probably accessible at a personal level. The degree of representational awareness occurring at this stage is commonly identified with phenomenal consciousness Lamme, ; Raftopoulos and Mueller, It is a matter of debate to what extent intermediate stages of visual processing are influenced by our knowledge i. Some authors argue that those stages are purely visual Raftopoulos and Mueller, and that the transition between pure perception to cognition occurs only at later visual stages, when temporary object representations are matched for recognition and identification. In this paper, I will not propose an argument for whether early and intermediate stages of visual perception are cognitively penetrable. However, I would like to stress that some of the common properties between visual perception and cognition that I will consider already occur at intermediate stages, thus, casting doubt on the claim that mid-level vision is purely perceptual. Cognitive information influences perceptual processes, but, at the same time, cognitive processes depend on perceptual information Goldstone and Barsalou, Recent work in philosophy brought new vigor to the hypothesis originally proposed by British

Empiricists that cognition is inherently perceptual Prinz, Such theoretical proposals are supported by empirical findings from psychology. Work on concept acquisition shows that functions e. The basic hypothesis is that a concept is represented by means of a simulation at the sensory level of an experience of that to which the concept truly applies. For example, to represent the concept APPLE 1 , perceptual systems for vision, action, and touch partially produce the experience of a particular apple. Though it seems to be common ground that cognitive and perceptual representations influence each other, they are not taken to be the same kind of representations. Neurophysiological studies distinguish different functional areas for sensory and cognitive systems. Those areas process specific inputs and specialize in different kinds of information processes Zeki, ; Felleman and Van Essen, And distinct sensory areas can be treated as separate modules Barrett, that deal with their specific representational primitives. From a philosophical point of view, visual perception and cognition process information by means of representations that differ in both their structure and content Heck, ; Fodor, One of the main characteristics of cognitive states, paradigmatically of thoughts, is that they have a propositional combinatorial structure that satisfies the requirement of the Generality Constraint Evans, The Generality Constraint describes the pervasive ability of humans to entertain certain thoughts that they have never had before on the basis of having entertained the components of these new thoughts in other preceding situations. For example, from the fact that a person can think that the sky is blue and the car is gray, she can also think that the sky is gray and the car is blue, even if she has never had this thought before. The new thought depends on her conceptual ability to combine already acquired concepts in different ways. This regularity of human thinking is explained by appealing to the fact that thoughts are mental representations with a sentential combinatorial structure Fodor, Thoughts are built up by combining primitive constituents according to propositional rules. The constituent structure of thought is such that whenever a complex representation is tokened its constituents are simultaneously tokened. Failure to represent car or grayness leads to failure to represent that the car is gray. The appeal to the constituent structure of cognitive representations allows us to explain a further property of these representations: Systematicity, similar to the Generality Constraint, describes the human ability to entertain semantically related thoughts. For example, the ability to entertain a certain thought about cars is connected to the ability to entertain certain other thoughts about cars: Systematic recombinations are necessary to satisfy the Generality Constraint but not sufficient. According to the Generality Constraint, once a thinker can entertain a thought, elements of this thought could be in principle indefinitely recombined with every other appropriate concept that a person possesses. This requirement is not part of systematicity, since it leaves open whether it is in principle possible that a finite type of systematicity exists Fodor and Pylyshyn, For what concerns the analysis of the structure of visual representations, I will mostly focus on whether those representations implement a systematic structure of constituents. Acceptance of the Generality Constraint, or the weaker systematicity requirement, also affects how we characterize the content of cognitive and perceptual representations. Philosophers distinguish between two types of content: Typical cases of mental states with conceptual content are cognitive mental states, like thought, belief, desire, and so on: Perception, both personal and subpersonal, is considered a paradigmatic example of states with non-conceptual content. In other words, to have the thought that an apple is red, one has to possess the concepts involved in that thought, but to have a perceptual experience characteristic of seeing a red apple one does not need to possess the concepts involved in the specification. It has been argued that perceptual representations, specifically visual representations, do not satisfy the requirement of systematicity, and, hence, unlike cognitive representations, do not have conceptual content Heck, The argument is based on the idea that visual representations have a pictorial nature. Pictorial theories equate visual representations to images or maps. Like images or maps, visual representations are spatially characterized: Furthermore, like images or maps, visual representations have a holistic character. Unlike cognitive representations, there is no unique structured propositional representation that determines the content of a visual representation. There are many distinct possible decompositions of the same image, such that it is impossible to both identify which are its constituent parts and disentangle the role of these parts in the building up of the pictorial representation. Thus, visual representations, like maps, seemingly lack the syntactic structure of constituents typical of cognitive representations. The lack of a constituent structure entails that visual representations are not systematic. Satisfying systematicity is a necessary condition on satisfying the Generality Constraint. For the reasons above, visual representations do not seem to satisfy systematicity, and hence the Generality Constraint. Therefore, they have a content of a different kind than the content of cognitive representations: This is both an empirical and theoretical question. From the philosophical point of view, finding out the relationship between perception and cognition will be of benefit to explain phenomena as different as concept formation and acquisition, belief justification, and demonstrative thinking, each of which partly depends on perceptual information. In this paper, I will focus on commonalities between visual perception and cognition that might help explain the communication between those systems. In the first part, I will show that the spatial recombination underlying visual object recognition satisfies the requirement of systematicity. The analysis will take into account the so-called Feature Integration Theory Treisman and Gelade, ; a model that explains visual object representation by considering the spatial nature of visual representations. Although Feature Integration Theory characterizes visual representations as spatially organized, it differs from pictorial theories of visual representations, since it does not commit to the view that visual representations are holistic. In fact, visual representations can be seen as states of the visual system that can be neuronally specified, such that each part of an object representation can be spelled out by considering the different neuronal activations Treisman and Gelade, ; Goldstone and Barsalou, Each neuronal activation roughly corresponds to a part, or primitive constituent, of the representation. Thus, one can decompose an object representation into its primitive constituents and analyze whether a systematic structure of constituents is displayed by visual spatial recombinations Tacca, In the second part, I will argue against the claim that visual representations have non-conceptual content. Based on the analysis in the first part of the paper, I will propose that, if one takes systematicity to be a necessary requirement for having conceptual content, visual representations might be an early type of conceptual representations. I conclude that understanding the link between perception and cognition requires considering whether they satisfy common requirements in terms of structure and content. These similarities might be at the basis of the translation of perceptual representations into cognitive representation and elucidate the mechanism of their interaction. Primitive Visual Features and the Binding Problem Recombination in cognitive processes depends on operations on primitive constituents. A primitive constituent is an entity that corresponds to the smallest meaningful representation carrying relevant information for the processing of more complex representations. Different theories posit different types of primitive constituents Smolensky, ; Fodor, However, there is agreement that the primitive mental representations involved in thought and other cognitive processes, like belief and desire, are concepts. According to an atomistic perspective, concepts cannot be further decomposed into more primitive elements and as such they are the building blocks of thoughts Fodor, However, others have argued that concepts can be further decomposed into their perceptual components e. Those elementary constituents are taken to be symbolic perceptual representations stored at late perceptual stages that become part of cognitive recombinations. Therefore, they share with cognitive representations systematicity, compositionality, and productivity Barsalou, In the following, I will show that intermediate visual representations that contribute to object perception but are not yet stored at late visual stages also display systematicity. The hypothesis that concepts have a structure of constituents that involves perceptual representations is based on anatomical, physiological, and psychophysical evidence for the existence of distinct representations for primitive visual features. Neurobiological Zeki, ; Livingstone and Hubel, ; Felleman and Van Essen, and psychophysical studies Treisman and Gelade, report the existence in visual areas of so-called feature maps. Feature maps code for specific object features, like color, motion, and orientation. They are also topographically organized; namely, they represent a specific feature and the specific location in which the feature occurs in the visual field. Thus, any visual object we perceive is first decomposed into its primitive components and only later those components are recombined into a coherent object representation.

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Chapter 4 : Perception - Wikipedia

Processing Structures for Perception and Action: Final Report of the Sonderforschungsbereich "Kybernetik" - (Sonderforschungsbereiche) 1st Edition.

Subjective constancy Perceptual constancy is the ability of perceptual systems to recognize the same object from widely varying sensory inputs. A coin looked at face-on makes a circular image on the retina, but when held at angle it makes an elliptical image. Without this correction process, an animal approaching from the distance would appear to gain in size. The brain compensates for this, so the speed of contact does not affect the perceived roughness. Principles of grouping Law of Closure. The human brain tends to perceive complete shapes even if those forms are incomplete. The principles of grouping or Gestalt laws of grouping are a set of principles in psychology , first proposed by Gestalt psychologists to explain how humans naturally perceive objects as organized patterns and objects. Gestalt psychologists argued that these principles exist because the mind has an innate disposition to perceive patterns in the stimulus based on certain rules. These principles are organized into six categories: The principle of proximity states that, all else being equal, perception tends to group stimuli that are close together as part of the same object, and stimuli that are far apart as two separate objects. The principle of similarity states that, all else being equal, perception lends itself to seeing stimuli that physically resemble each other as part of the same object, and stimuli that are different as part of a different object. This allows for people to distinguish between adjacent and overlapping objects based on their visual texture and resemblance. The principle of good continuation makes sense of stimuli that overlap: The principle of common fate groups stimuli together on the basis of their movement. When visual elements are seen moving in the same direction at the same rate, perception associates the movement as part of the same stimulus. This allows people to make out moving objects even when other details, such as color or outline, are obscured. The principle of good form refers to the tendency to group together forms of similar shape, pattern, color , etc. Contrast effect A common finding across many different kinds of perception is that the perceived qualities of an object can be affected by the qualities of context. If one object is extreme on some dimension, then neighboring objects are perceived as further away from that extreme. Perceptual learning With experience, organisms can learn to make finer perceptual distinctions, and learn new kinds of categorization. Wine-tasting, the reading of X-ray images and music appreciation are applications of this process in the human sphere. Specifically, these practices enable perception skills to switch from the external exteroceptive field towards a higher ability to focus on internal signals proprioception. Also, when asked to provide verticality judgments, highly self-transcendent yoga practitioners were significantly less influenced by a misleading visual context. Increasing self-transcendence may enable yoga practitioners to optimize verticality judgment tasks by relying more on internal vestibular and proprioceptive signals coming from their own body, rather than on exteroceptive, visual cues. Set psychology A perceptual set, also called perceptual expectancy or just set is a predisposition to perceive things in a certain way. Subjects who were told to expect words about animals read it as "seal", but others who were expecting boat-related words read it as "sail". They were told that either a number or a letter would flash on the screen to say whether they were going to taste an orange juice drink or an unpleasant-tasting health drink. In fact, an ambiguous figure was flashed on screen, which could either be read as the letter B or the number When the letters were associated with the pleasant task, subjects were more likely to perceive a letter B, and when letters were associated with the unpleasant task they tended to perceive a number People who are primed to think of someone as "warm" are more likely to perceive a variety of positive characteristics in them, than if the word "warm" is replaced by "cold". For example, people with an aggressive personality are quicker to correctly identify aggressive words or situations. It starts with very broad constraints and expectations for the state of the world, and as expectations are met, it makes more detailed predictions errors lead to new predictions, or learning processes. Clark says this research has various implications; not only can there be no completely "unbiased, unfiltered" perception, but this means that there is a great deal of feedback between perception and expectation perceptual experiences often shape our beliefs, but those perceptions were based on existing beliefs [40]. Indeed, predictive coding provides an account where this type of feedback assists in stabilizing our inference-making process about the physical world, such as with perceptual constancy examples. Theories[edit] Perception as direct perception[edit] Cognitive theories of perception assume there is a poverty of stimulus. This with reference to perception is the claim that sensations are, by themselves, unable to provide a unique description of the world. A different type of theory is the perceptual ecology approach of James J. His theory "assumes the existence of stable, unbounded, and permanent stimulus-information in the ambient optic array. And it supposes that the visual system can explore and detect this information. The theory is information-based, not sensation-based. Animate actions require both perception and motion, and perception and movement can be described as "two sides of the same coin, the coin is action". Gibson works from the assumption that singular entities, which he calls "invariants", already exist in the real world and that all that the perception process does is to home in upon them. A view known as constructivism held by such philosophers as Ernst von Glasersfeld regards the continual adjustment of perception and action to the external input as precisely what constitutes the "entity", which is therefore far from being invariant. The invariant does not and need not represent an actuality, and Glasersfeld describes it as extremely unlikely that what is desired or feared by an organism will never suffer change as time goes on. This social constructionist theory thus allows for a needful evolutionary adjustment. Evolutionary psychology EP and perception[edit] Many philosophers, such as Jerry Fodor, write that the purpose of perception is knowledge, but evolutionary psychologists hold that its primary purpose is to guide action. Theories of perception[edit].

Chapter 5 : Two-streams hypothesis - Wikipedia

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Dorsal stream[edit] The dorsal stream is proposed to be involved in the guidance of actions and recognizing where objects are in space. Also known as the parietal stream, the "where" stream, or the "how" stream, this pathway stretches from the primary visual cortex V1 in the occipital lobe forward into the parietal lobe. It is interconnected with the parallel ventral stream the "what" stream which runs downward from V1 into the temporal lobe. General features[edit] The dorsal stream is involved in spatial awareness and guidance of actions e. In this it has two distinct functional characteristicsâ€"it contains a detailed map of the visual field, and is also good at detecting and analyzing movements. The dorsal stream commences with purely visual functions in the occipital lobe before gradually transferring to spatial awareness at its termination in the parietal lobe. The posterior parietal cortex is essential for "the perception and interpretation of spatial relationships, accurate body image, and the learning of tasks involving coordination of the body in space". The lateral intraparietal sulcus LIP contains neurons that produce enhanced activation when attention is moved onto the stimulus or the animal saccades towards a visual stimulus, and the ventral intraparietal sulcus VIP where visual and somatosensory information are integrated. Effects of damage or lesions[edit] Damage to the posterior parietal cortex causes a number of spatial disorders including: For example, a person with this disorder may draw a clock, and then label it from 12, 1, 2, Ventral stream[edit] The ventral stream is associated with object recognition and form representation. Also described as the "what" stream, it has strong connections to the medial temporal lobe which stores long-term memories , the limbic system which controls emotions , and the dorsal stream which deals with object locations and motion. The ventral stream gets its main input from the parvocellular as opposed to magnocellular layer of the lateral geniculate nucleus of the thalamus. From there, the ventral pathway goes through V2 and V4 to areas of the inferior temporal lobe: Each visual area contains a full representation of visual space. That is, it contains neurons whose receptive fields together represent the entire visual field. Visual information enters the ventral stream through the primary visual cortex and travels through the rest of the areas in sequence. Moving along the stream from V1 to AIT, receptive fields increase their size, latency, and the complexity of their tuning. All the areas in the ventral stream are influenced by extraretinal factors in addition to the nature of the stimulus in their receptive field. These factors include attention , working memory , and stimulus salience. Thus the ventral stream does not merely provide a description of the elements in the visual worldâ€"it also plays a crucial role in judging the significance of these elements. Here the auditory objects are converted into audio-visual concepts. The primary input to this is sensory, speech in particular. So, there must be a neural mechanism that both codes and maintains instances of speech sounds, and can use these sensory traces to guide the tuning of speech gestures so that the sounds are accurately reproduced. From there the information moves to the beginning of the dorsal pathway, which is located at the boundary of the temporal and parietal lobes near the Sylvian fissure. The first step of the dorsal pathway begins in the sensorimotor interface, located in the left Sylvian parietal temporal Spt within the Sylvian fissure at the parietal-temporal boundary. The spt is important for perceiving and reproducing sounds. It is also important for the basic neuronal mechanisms for phonological short-term memory. Without the Spt, language acquisition is impaired. The information then moves onto the articulatory network, which is divided into two separate parts. The articulatory network 2 is for motor phoneme programs and is located in the left M1-vBA6. This shows that conduction aphasia must reflect not an impairment of the auditory ventral pathway but instead of the auditory dorsal pathway. Buchsbaum et al [21] found that conduction aphasia can be the result of damage, particularly lesions, to the Spt Sylvian parietal temporal. The Spt is responsible for connecting the motor and auditory systems by making auditory code accessible to the motor cortex. It appears that the motor cortex recreates high-frequency, simple words like cup in order to more quickly and efficiently access them, while low-frequency, complex words like Sylvian parietal temporal require more active, online regulation by the Spt. This explains why conduction aphasiacs have particular difficulty with low-frequency words which requires a more hands-on process for speech production. Contemporary perspectives however, informed by empirical work over the past two decades, offer a more complex account than a simple separation of function into two-streams. In this account, the dorsal stream is viewed as a semi-autonomous function that operates under guidance of executive functions which themselves are informed by ventral stream processing. Rob McIntosh and Thomas Schenk summarize this position as follows: We should view the model not as a formal hypothesis, but as a set of heuristics to guide experiment and theory. The differing informational requirements of visual recognition and action guidance still offer a compelling explanation for the broad relative specializations of dorsal and ventral streams. However, to progress the field, we may need to abandon the idea that these streams work largely independently of one other, and to address the dynamic details of how the many visual brain areas arrange themselves from task to task into novel functional networks.

Chapter 6 : Olfaction (Smell)

The perception-action cycle is the circular flow of information from the environment to sensory structures, to motor structures, back again to the environment, to sensory structures, and so on, during the processing of goal-directed behavior.

Early Action-Based Theories Two doctrines dominate philosophical and psychological discussions of the relationship between action and space perception from the 18th to the early 20th century. The first is that the immediate objects of sight are two-dimensional manifolds of light and color, lacking perceptible extension in depth. The relevant learning process is associationist: First, Berkeley argues that visual experiences convey information about three-dimensional space only to the extent that they enable perceivers to anticipate the tactile consequences of actions directed at surrounding objects. A long line of philosophersâ€"including Condillac , Reid , Smith , Mill , , Bain , , and Dewey â€"accepted this view of the relation between sight and touch. The second respect in which action plays a prominent role in the New Theory is teleological. Sight not only derives its three-dimensional spatial significance from bodily movement, its purpose is to help us engage in such movement adaptively: It is by their information that we are principally guided in all the transactions and concerns of life. The tactual ideas associated with a rapidly looming ball in the visual field, for example, can directly motivate the subject to shift position defensively or to catch it before being struck. The third respect in which action is central to the New Theory is psychological. Like many contemporary theories of spatial vision, the Berkeleyan account thus acknowledges an important role for oculomotor factors in our perception of distance. Three sorts of objections targeted on claim b were prominent. First, it is not evident to introspection that visual experiences reliably elicit tactile and kinaesthetic images as Berkeley suggests. As Bain succinctly formulates this objection: In perceiving distance, we are not conscious of tactual feelings or locomotive reminiscences; what we see is a visible quality, and nothing more. Consider the experience of seeing a three-dimensional scene in a painting: Why does this appearance persist? Cases in which non-human neonates respond adaptively to the distal sources of visual stimulation imply that external objects are seen to be soâ€¦. They prove, at least, the possibility that the opening of the eye may be at once followed by the perception of external objects as such, or, in other words, by the perception or sensation of outness. Suppose that the novice perceiver sees a remote tree at time1 and walks in its direction until she makes contact with it at time2. Indeed, at time2 the former experience no longer exists. We cannot at one and the same moment be looking at an object five, ten, fifty yards off, and be achieving our last step towards it. Numerous studies of how subjects respond to lens-, mirror-, and prism-induced distortions of visual experience Gibson ; Harris , ; Hay et al. This point will be discussed in greater depth in Section 3 below. Our perceptions of things cannot be anything other than symbols, naturally given signs for things, which we have learned to use in order to control our motions and actions. When we have learned to read those signs in the proper manner, we are in a condition to use them to orient our actions such that they achieve their intended effect; that is to say, that new sensations arise in an expected manner Helmholtz []: Lotze and Helmholtz go further than Berkeley in maintaining that bodily movement also plays a role in the construction of the two-dimensional visual field, taken for granted by most previous accounts of vision but for exceptions, see Hatfield What sort of sensation, however, is suited to play the individuating role attributed to a local sign? Lotze appeals to kinaesthetic sensations that accompany gaze-directing movements of the eyes []: If P is the location on the retina stimulated by a distal point d and F is the fovea, then PF is the arc that must be traversed in order to align the direction of gaze with d. Importantly, Lotze allows that retinal stimulation need not trigger an overt movement of the eye. Rather, even in the absence of the corresponding saccade, stimulating point P will elicit kinaesthetic sensation p0, and this sensation will, in turn, recall from memory the rest of the series with which it is associated p1, â€¦pn. Accordingly, though there is no movement of the eye, there arises the recollection of something, greater or smaller, that must be accomplished if the stimuli at P and Q, which arouse only a weak sensation, are to arouse sensations of the highest degree of strength and clearness. In particular, he maintains that local signs are not feelings that originate in the adjustment of the ocular musculature, i. In general, to each perceptible location in the visual field there is an associated readiness or impulse of the will Willensimpuls to move eyes in the manner required in order to fixate it. Helmholtz favored a motor outflow version of the local sign doctrine for two main reasons. Recent research has shown that proprioceptive inflow from ocular muscular stretch receptors does in fact play a quantifiable role in estimating direction of gaze, but efferent outflow is normally the more heavily weighted source of information Bridgeman ; see Section 2. Second, attempting a saccade when the eyes are paralyzed or otherwise immobilized results in an apparent shift of the visual scene in the same direction Helmholtz []: This finding would make sense if efferent signals to the eye are used to determine the direction of gaze: In the next section, we trace the influence of this idea on theories in the 20th century. Sensorimotor Contingency Theories Action-based accounts of perception proliferate diversely in 20th century. In this section, we focus on the reafference theory of Richard Held and the more recent enactive approach of J. Central to both accounts is the view that perception and perceptually guided action depend on abilities to anticipate the sensory effects of bodily movements. The first is the idea that the visual system exploits efference copy, i. The second is a long line of experiments, first performed by Stratton and Helmholtz in the 19th century, on how subjects adapt to lens-, mirror-, and prism-induced modifications of visual experience. We follow up with objections to these theories and alternatives. When we execute a saccade, the image of the world projected on the retina rapidly displaces in the direction of rotation, yet the directions of perceived objects appear constant. Such perceptual stability is crucial for ordinary visuomotor interaction with surrounding the environment. As Bruce Bridgeman writes, Perceiving a stable visual world establishes the platform on which all other visual function rests, making possible judgments about the positions and motions of the self and of other objects. First, which sources of information are used to determine whether the observer-relative position of an object has changed between fixations? Second, how are relevant sources of information used by the visual system to achieve this function? Signals that predictably come when nothing occurs in the environment are necessarily a result of its own activity, i. All signals that come when no commands are given are exafferences and signify changes in the environment or in the state of the organism caused by external forces. It is only this difference to which there are compensatory reflexes; only this difference determines, for example during a moving glance at movable objects, the actually perceived direction of visual objects. It is only when the displacement of the retinal image differs from the displacement predicted on the basis of the efference copy, i. The relevant upshot is that VDC has an essential motoric component: First, there is evidence that proprioceptive signals from the extraocular muscles make a non-trivial contribution to estimates of eye position, although the gain of efference copy is approximately 2. Second, in the autokinetic effect, a fixed luminous dot appears to wander when the field of view is dark and thus completely unstructured. This finding is inconsistent with theories according to which retinotopic location and efference copy are the sole determinants of eye-relative direction. Efference copy theories, however, as Bridgeman observes, do not allow the possibility that parts of the image can move relative to one anotherâ€”the visual world is conceived as a monolithic object. The observation would seem to eliminate all efference copy and related theories in a single stroke. According to this theory, visual attention shifts to the saccade target and a small number of other objects in its vicinity perhaps four or fewer before eye movement is initiated. Although little visual scene information is preserved from one fixation to the next, the features of these objects as well as precise information about their presaccadic, eye-relative locations is preserved. After the eye has landed, the visual system searches for the target or one of its neighbors within a limited spatial region around the landing site. If this object is not found, however, displacement is perceived. On this approach, efference copy does not directly support VDC. Rather, the role of efference copy is to maintain an estimate of the direction of gaze, which can be integrated with incoming retinal stimulation to determine the static, observer-relative locations of perceived objects. For a recent, philosophically oriented discussion, see Wu The role of saccade efference copy on this theory is to initiate an updating of the eye-relative locations of a small number of attended or otherwise salient objects. When post-saccadic object locations are sufficiently congruent with the updated map, stability is perceived. If you are now firing in response to an item x in your receptive field, then stop firing at x. Such putative updating responses are strongest in parietal cortex and at higher levels in visual processing V3A and hV4 and weakest at lower levels V1 and V2. First, information about movement parameters specified by efference copy is not simply summated with reafferent stimulation. Rather, subjects are assumed to acquire knowledge of the specific sensory consequences of different bodily movements. Third, knowledge of the way reafferent stimulation depends on self-produced movement is used for purposes of sensorimotor control: We will refer to these as optical rearrangement devices or ORDs for short. The first experiment involved wearing the device for In both cases, Stratton kept a detailed diary of how his visual, imaginative, and proprioceptive experiences underwent modification as a consequence of inverted vision. In , he performed a lesser-known but equally dramatic three-day experiment, using a pair of mirrors that presented his eyes with a view of his own body from a position in space directly above his head Figure 2. The apparatus designed by Stratton Stratton saw a view of his own body from the perspective of mirror AB, worn above his head. In both experiments, Stratton reported a brief period of initial visual confusion and breakdown in visuomotor skill: Almost all movements performed under the direct guidance of sight were laborious and embarrassed. Inappropriate movements were constantly made; for instance, in order to move my hand from a place in the visual field to some other place which I had selected, the muscular contraction which would have accomplished this if the normal visual arrangement had existed, now carried my hand to an entirely different place. Objects lying at the moment outside the visual field things at the side of the observer, for example were at first mentally represented as they would have appeared in normal visionâ€¦. The actual present perception remained in this way entirely isolated and out of harmony with the larger whole made up by [imaginative] representation. Just what this might mean will be discussed below in Section 2. The initial tendency was to reach too far in the direction of lateral displacement. After a number of trials, however, reaching gradually regained its former level of accuracy. Helmholtz made two additional discoveries. First, there was an intermanual transfer effect: Second, immediately after removing the prisms from his eyes, errors were made in the opposite direction, i. This negative after-effect is now standardly used as a measure of adaptation to lateral displacement. Two questions dominated studies conducted during this period. First, what are the necessary and sufficient conditions for adaptation to occur? In particular, which sources of information do subjects use when adapting to the various perceptual and sensorimotor discrepancies caused by ORDs? Second, just what happens when subjects adapt to perceptual rearrangement? Evidence for this conclusion came from experiments in which participants wore laterally displacing prisms during both active and passive movement conditions. In the active movement condition, the subject moved her visible hand back and forth along a fixed arc in synchrony with a metronome.

Chapter 7 : Visual Perception | Simply Psychology

Perception is the central processing of sensory stimuli into a meaningful pattern. Perception is dependent on sensation, but not all sensations are perceived. Receptors are the cells or structures that detect sensations.

Target-directed actions Fig. A Due to the non-homogeneity of the visual system, pre- and postsaccadic Q7 information of the saccade target object differ in acuity. B The two-phase model of transsaccadic feature prediction. At Phase 1, pre- and postsaccadic information of the saccade target object is associated. At Phase 2, these associations are used to predict the foveal appearance of peripheral objects peripheral object recognition and the peripheral appearance of foveal search templates visual search from Herwig and Schneider Reprinted with permission from APA. For example, there is a strong tradition in using simple key press actions which produce auditory or visual action effects in the distal environment for recent reviews see Herwig, ; Hommel, ; Nattkemper et al. While such a focus was particularly successful in demonstrating the working of internally anticipated events in action control, it should be not forgotten that a serious part of our daily actions is directed at targets within the perceptual range to the effect that these actions can be partly based on the current perceptual input. In line with this renewed interest, in the following I will thus address the question how the ideomotor approach can be applied to target-directed actions by focusing special emphasis on eye movements. Thus, seen from an ideomotor perspective, each target-directed eye movement is accompanied by a direct perceptual effect. That is, prior to a saccade, peripheral objects are only coarsely represented, whereas the same objects are represented with high acuity when foveated. We recently addressed exactly this direct perceptual effect of saccadic eye movements and proposed a feature prediction mechanism based on past experience to deal with changes accompanying saccadic eye movements Herwig and Schneider, More precisely, three questions pertaining to the ideomotor framework were investigated see Fig. First, we tested whether new action knowledge is acquired during saccadic eye movements in the form of associations of pre- and postsaccadic information of the saccade target object. Second, we asked whether predictions based on such transsaccadic associations affect perception, i. Third, we investigated whether Please cite this article in press as: Toward an integrative perspective. To test whether acquired transsaccadic associations affect perception, participants in Experiments 1 and 2 were then required to judge the spatial frequency of a peripheral saccade target object in a second test phase. The results of these two experiments demonstrated that peripheral perception is biased toward previously associated postsaccadic foveal input and that this effect is particularly associated with making saccades. Conversely, objects that previously changed frequency from high in the periphery to low in the fovea were later on judged to be lower. That is, targets were perceived as less curved for objects which previously changed from more circular in the periphery to more triangular in the fovea. Likewise, shapes were perceived as more curved for objects which previously changed from triangular to circular. To test whether acquired transsaccadic associations affect action, Herwig and Schneider further presented participants in Experiment 3 a foveal search template on each trial of the test phase and asked them to search and saccade to this target in the periphery. Importantly, the spatial frequency of the peripheral target object could physically either match or mismatch the frequency of the foveal search template. On the basis of the learning history, frequency matches and mismatches could be both, congruent and incongruent with the experience during acquisition. The results of Experiment 3 revealed that search performance was better for acquisition congruent combinations of peripheral and foveal objects which demonstrate that saccades were biased toward previously associated presaccadic peripheral input. That is, during target-directed eye movements new action knowledge linking pre- and postsaccadic information is easily acquired. This knowledge can be used for two purposes: Thus, action knowledge affects both, the perception of, as well as the action toward peripheral objects which indicates a tight linkage of perception and action. In this sense, the prediction of action effects i. Object continuity â€" the spatiotemporal stability of an object â€" has proven to be an important factor in establishing object persistence across frequently occurring interruptions of visual input in particularly saccadic eye movements. Likewise, displacements are better detected following a spatial disruption of object continuity e. To test this question, the paradigm to assess feature prediction in visual search introduced in Herwig and Schneider, was adopted and a condition with object continuity Experiment 1a was compared against conditions where we separately disrupted temporal Experiment 1b and spatial object continuity Experiment 1c during learning. More precisely, temporal object continuity was disrupted by inserting a postsaccadic blank and spatial object continuity was disrupted by a task-irrelevant shape change. Although there were overt and covert indicators for better change detection under disruption, interestingly, visual search performance revealed that neither disruption of temporal object continuity nor disruption of spatial object continuity impaired transsaccadic learning. Moreover, the independence of transsaccadic learning of object-continuity testing implies a close link between transsaccadic learning and the more general concept of actionâ€"effect learning e. As elaborated in Section 3. They address the more general question as to how participants learn that a particular action can produce a particular actionâ€"effect. As elaborated above, such goal-directed actions have been so far mainly investigated in the ideomotor approach. For example, studies addressing the relationship between attention and VWM e. In accordance with this renewed interest in goals which cannot be solely based on the current perceptual input, the second set of publications reviewed in Section 4. In line with ideomotor reasoning, such distal goals might affect eye movements in the same way as they affect other action modalities â€" that is through an anticipative mechanism. In fact, plenty of our eye movements lead to changes in sensation see Herwig and Schneider, ; Herwig et al. However, it has to be noted that we, as social beings, move our eyes not only to get information but also to supply information to our fellows. Thus, in social interaction gaze has a unique characteristic because it can cause changes in the environment or to be more precise in our counterparts e. Accordingly, we recently hypothesized that eye movements in social context should be considered as goal-directed actions Herwig and Horstmann, Converging evidence comes from a recent study by Khan et al. Here, stimuli that consistently appeared in the vicinity of the saccade target following a saccadic eye movement attracted the saccadic landing position in the course of the experiment. First, in a following test phase, saccades in response to facial expressions were initiated more quickly to the position where the expression was previously triggered. Thus, as suggested by the ideomotor approach, actions here, goal-directed eye movements can be triggered by activating effect representations through the perception of previously experienced action effects Elsner and Hommel, Second, the reported effects on attentional prioritization as well as on action priming critically depended on the action mode. Temporal and spatial visual attention for perception and action While most of the studies supporting the attention approach as a linkage principle of perception and action focused on targetdirected actions, two recent studies also addressed the attention approach in the context of goal-directed eye movements Herwig et al. These two studies focused on a particular class of saccadic eye movements, namely memory-guided saccades, which are saccades directed toward memorized locations. This experimental paradigm bears similarities to established paradigms that are frequently used to measure temporal visual attention like the attentional blink Raymond et al. It was hypothesized that, if processing information for goal-directed actions and processing information for perception are subject to a common temporal attention mechanism, as suggested by the attention approach, processing of T1 should temporarily interfere with processing of T2. Moreover, comparable to the classical attentional blink following pattern recognition we expected this interference to be pronounced for conditions in which T1 is task relevant compared to condition in which T1 is task-irrelevant. Both experiments revealed that T2 performance increased with onset asynchrony of both targets. In addition, Experiment 2, where T1 was followed by location distractors, showed a taskdependent interference effect. That is, interference was stronger and more durable under dual-task conditions when T1 needed to be processed for a memory-guided saccade. As such, the data indicate that processing information for goal-directed eye movements and processing information for perception seem to underlie a common attentional mechanism. Thus, the attentional approach also covers and accounts for linkages between perception and goal-directed actions in the domain of temporal visual attention. Finally, the study by Herwig et al. This research question was motivated by recent studies suggesting a tight interdependence of visual attention and VWM. According to the attention-based rehearsal hypothesis put forward by Edward Awh, covert shifts of attention are thought to play a functional role in the active maintenance of information in VWM Awh et al. Given that onset stimuli are known to capture spatial attention, we hypothesized that maintaining spatial information for Please cite this article in press as: From Herwig and Horstmann Second, central concepts of the attention approach including selectivity, competition and priority control also apply to goal-directed actions, i. Consequently, it is proposed that selecting information for goaldirected actions as well as for perception is performed by common visual attention mechanisms. Together, both main outcomes point to the conclusion that operations addressed in both conceptual frameworks interact with each other. This claim poses a challenge to the functional divide that often seems to exist between ideomotor and attention approaches. Pertaining to ideomotor approaches, it is thus important to develop more detailed views on the question how attentional processes affect the way common representational structures are used for perception and action. Likewise, for attention approaches, it is important to elaborate how representational structures affect the way common attentional processes are used for perception and action. As suggested by the results reviewed in Section 4. We tested this hypothesis by adopting previous research on the global effect, a well-known spatial effect of distractor stimuli on the oculomotor system, showing that visually guided saccades are typically directed to intermediate locations between a target and a simultaneously presented distractor stimulus Coren and Hoenig, ; Findlay, Comparable to the classical global effect, this attraction was only found, if the distractor was presented within a sector of 20 degrees around the target axis. In accordance with the attention approach, the results of Herwig et al. The idea to reconcile the attention and ideomotor approach originated during the great research year of the group in â€" see http: While ideomotor approaches assume that perception and action are linked by common representational structures, attentional approaches focus special emphasis on common attentional processes as a linkage principle of perception and action. To strive toward an integrative perspective, the present article followed two basic strategies. First, eye movements, as a prime candidate to bridge the gap between the ideomotor and the attention approach, were prominently featured. Second, possible relationships of the ideomotor and attention approach were investigated from two directions: In a nutshell, the reviewed studies revealed two main outcomes. First, central concepts of the ideomotor approach including the representation, acquisition and usage of action-knowledge also govern target-directed eye movements. Consequently, it is Acknowledgements References Ach, N. 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