SENSURVEILEDNING

Emnekode og navn:	Semester / År / Eksamenstype:
PSY3111	Høst 2020 – hjemmeeksamen, 4 timer

Oppgave:

Står under eksamenskrav

Relevant pensumlitteratur:

Eksamenskrav:

Bokmål: Studenten skal jobbe individuelt og besvare 3 av de følgende 5 oppgavene:
English. The student should work individually and answer 3 of the following 5 tasks:

Oppgave/ Task 1

Bokmål

Under læring virker erfaringer og minner å nedfelles som endringer i synaptiske strukturer. Hvordan tror man dette skjer og hvor stabilt ser det ut til å være?

English

During learning, experience and memories seem to be imprinted in synaptic structures. Explain how this process is thought to occur and how stable it appears to be.

Sensurveiledning: The question is open, which gives some degree of freedom for answers, however, the syllabus deals with memory processes in the hippocampus and the answer should reflect that. The response should include that the encoding of new memories is probably synonymous with the initiation of protein synthesis and structural changes of synapses. The NMDA receptor should be included, indicated as a triggering factor, and that the influx of calcium triggers a cascade that changes with protein synthesis. A very good answer names each essential link in this cascade, as well as the interaction between CREB-1 and CREB-2. Using LTP as an example is good, but not required. It is a plus if the student mentions different types of initiation (associative / non-associative), and distinguishes the early phase from late phase. A very good answer also includes the theory of synaptic labeling (tagging), that the final protein synthesis takes place in the synapses where the cascade started. It is a plus if the student discusses the possible roll of gamma oscillations. Related to stability, the response should address the concept of reconsolidation and how recent studies indicate that it is possible to unlearn fear memories under special conditions.

Oppgave/Task 2

Bokmål

Gi en kort beskrivelse av den første delen av det menneskelige olfaktoriske systemet, inkludert de olfaktoriske sensoriske nevronene og deres projeksjonsmønster i olfaktorisk pære. Med dette

grunnlaget, forklar først arrangementet av luktreseptorer i periferien og hvordan disse reseptortypene er relatert til glomeruli i olfaktorisk pære. Diskuter deretter hvorfor luktesystemet har et så stort antall forskjellige luktreseptortyper.

English
Briefly describe the initial part of the human olfactory system, including the olfactory sensory neurons and their projection pattern into the olfactory bulb. With that basis, first, explain the arrangement of odor receptors in the periphery and how these receptor types are related to the glomeruli in the olfactory bulb., Then, discuss why the olfactory system has such a huge number of different odor receptor types?

Sensurveiledning: The student should describe the olfactory epithelium located dorsally in the nasal cavity and its sensory olfactory neurons. The structure of the sensory neuron is a bipolar neuron with a dendrite that points out towards the world and an axon that projects directly into the brain. The student may mention that these axons form the brain nerve number 1, the olfactory nerve. At the end of the dendrite there are a handful of finger-like structures, cilia. In the large surface of the cell-membrane of these cilia, the olfactory receptors are located. The student should explain that the large number of different receptor types in the olfactory system is related to the nature of the odor stimulus. These stimuli consist of chemical molecules (usually organic and often volatile) each of which have their own structure. Thus, olfactory stimuli differ significantly from physical stimuli such as sound and light that can be characterized in the form of one parameter (wavelength). The student should further explain that the different types of odor receptors are arranged so that each neuron expresses only one type. However, these neurons are distributed within the olfactory epithelium without any kind of spatial organization. Furthermore, the student should describe how the axons of the sensory neurons project into the brain's primary olfactory center, the olfactory lobe. Here the axon terminals make contact with second-order neurons in spherical structures called glomeruli. The student should explain that all sensory neurons that express the same type of receptor project to one and the same glomerulus. In this way, each glomerulus represents one type of receptor. This organization has been characterized as the molecular logic of smell.

Oppgave/Task 3
Bokmål
Hva er de grunnleggende systemene som danner episodisk minne? (Du trenger ikke å definere hver av dem.) Gjør rede for hvordan de samhandler med hverandre ved å referere til de tre slags koordineringer (generell koordinering, spesifikk koordinering og romlig koordinering). Diskuter hvorfor Rubins modell gir bedre forklaringer enn tradisjonelle teoretiske modeller inspirert av datametaforen.

English
What are the basic systems forming episodic memory? (You do not have to define each of them.) Explain how they interact with each other by referring to the three types of coordination (general coordination, specific coordination and spatial coordination). Discuss why Rubin's model provides better explanations than traditional theoretical models inspired by the computer metaphor.

Sensorveiledning: The events that are recalled as episodic memories are typically multimodal (involving vision, hearing, smell, taste, touch, and body sense or kinesthesis); they vary in spatial, temporal, emotional, and narrative content and context; and they have personal relevance. The relative complexity of real-life situations suggests that studies of episodic memory require additional theoretical and methodological considerations that are not needed in the typical laboratory study. The basic systems involved in the formation of

multimodal episodic memories are: Vision, Spatial Imagery, Olfaction, Emotion, Language, Narrative, Explicit Memory and Search and Retrieval, and Motor output. Episodic memory can be understood only if the properties of basic cognitive, behavioral, and neural systems are understood individually and in combination.

Three types of systems for the general coordination of episodic memory: dumb, smart, and smarter. A dumb system would bind together everything that occurred at the same time into one event that could later be retrieved as a memory. Such a system would be very useful to have if one often did not know until later which events would need to be recalled, and we have this kind of memory. The dumb coordination is managed by the explicit memory system. A smart system might modulate the encoding of memories on the basis of the discrepancy between what was expected and what occurred, on the basis of surprise or interest, or on the basis of emotional arousal. The smart coordination is handled by emotion system. A smarter system might have the ability to search for some components of a memory when cued by other components while using inhibitory mechanisms to suppress dominant responses that do not fit all the criteria set by the known cues. The smarter system is organized by the search and retrieval system.

The storage metaphor is the computer hard drive, where files are recorded, searched for, and retrieved. Each memory has its own place and no changes are possible, except for deterioration. A computer has only one form of information, not a number of different basic systems. Rubin argues that the mind and brain are divided into basic systems, each of which has its own functions, processes, structures, and forms of memory, and each of which involves different parts of the brain. Using episodic memory as an example, Rubin shows that it makes theoretical and biological sense to view cognition as the interaction among basic systems, each with its own unique properties, rather than to see the mind and brain as a homogenized information processor.

Oppgave/Task 4

Bokmål:

Hva er multisensorisk persepsjon? Gjør rede for den dynamiske vektingen av fysikalske egenskaper ved stimuli og lærte assosiasjoner i løpet av multisensorisk utvikling. Hvordan henger dette sammen med subkortikal og kortikal utvikling?

English

What is multisensory perception? Discuss the dynamic weighting of physical stimuli characteristics and learned associations in the course of multisensory development. How does this fit subcortical and cortical development?

Sensorveiledning:

The student is expected to describe multisensory perception with reference to how different sensory organs cooperate to form a coherent representation of the world. A good answer may connect this to the "**assumption of unity**" which states that as information from different modalities share more (amodal) properties, the brain will more likely treat them as having a common source. A good response might also include one or more examples. A very good response would include that the assumption of unity is proposed to be based on **three principles of multisensory integration:**

(1) Spatial rule: multisensory integration is more likely or stronger when the unisensory constituents come from approximately the same location.

(2) Temporal rule: multisensory integration is more likely or stronger when the unisensory constituents arise at approximately the same time.

(3) Principle of inverse effectiveness: multisensory integration is more likely or stronger when the unisensory constituents evoke relatively weak responses when presented in isolation.

A very good response might discuss brain functions involved in multisensory perception or address how it might be understood from a Bayesian approach.

The response is expected to discuss how development across the lifespan accommodates the physical characteristics (i.e., statistics) of stimuli in the environment, and how a weighting between these stimulus characteristics and learned associations shape multisensory processing as development progresses. A strong response may bring in a Bayesian approach, and/or address the relative plasticity of learned associations.

To address the last point of the task, the response should discuss that different brain regions/circuitry and differ in their rate of maturation. This discussion should be integrated with the developmental perspective(s) above.

Oppgave/Task 5

Bokmål

Ta i betraktning følgende eksempel:

> Du har opplevd at om vinteren er en klar dag ofte kaldere enn en overskyet dag. Mens du forbereder deg på å gå ut på denne vinterdagen, ser du at himmelen er stort sett klar. Du overveier å bruke tynne eller tykke hansker.

Beskriv den Bayesiske tilnærmingen til persepsjon og anvend den for eksemplet ovenfor. Diskuter hvordan den Bayesiske tilnærmingen er relevant for å forstå læring?

English

Consider the following example:

> You have experienced that, in winter, a clear day is often colder than a cloudy day. Preparing to go out on this winter day, you see the sky is mostly clear. You deliberate whether to wear thin or thick gloves.

Describe the Bayesian approach to perception and apply it to the above example. Discuss how the Bayesian approach is relevant for understanding learning?

Sensorveiledning: The student´s response must describe the three components of Bayesian modeling: ***priors, likelihood, posterior***. The response must also describe how they work together in **probabilistic inference,** as a model for perception; in short, expectation about some property/dimension in the world (prior probability distribution) is combined with current sensory information (likelihood function) to generate something you take a percept from (posterior distribution). A good answer will have directly discussed that perception is not perfect (sensory signals are ***imprecise*** and ***ambiguous***) and how that fits with a Bayesian approach. A very good answer will also bring in **causal inference** and/or discuss perception versus decision making. A very good answer may also address a Bayesian approach in the context of brain functions (e.g., Marrs´ approach) or give explicity examples of research demonstrating a Bayesian approach to perception.

With this basis the student should use the foundation concepts related to perception and extend them more broadly to learning, by applying them (minimally, ***priors, likelihood*** and ***posterior***) to the example.

Karakterbeskrivelse:

https://innsida.ntnu.no/wiki/-/wiki/Norsk/Karakterskalaen

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