

1. Organizačná sila percepčného systému - geštaltistické zákony.

Gestalt theory first arose in 1890 as a reaction to atomism (parts could be put back together to make wholes - nature of things is absolute and not dependent on context)

Gestalt t. - mind perceives wholes out of incomplete elements = more than the sum of parts

- context was very important in perception

not the individual tones but the relation between them makes up a melody – same melody in A or C ... still recognized

Form-forming capability (*Gestalt* means "shape" or "figure")

Applications in computer science - UI design

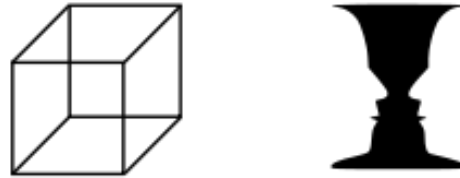
The key principles of Gestalt systems are emergence, reification, multistability and invariance.

Emergence



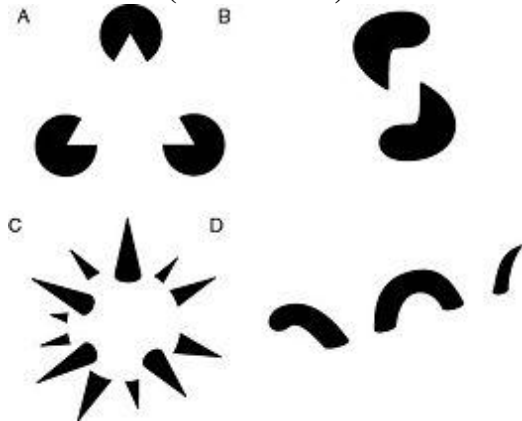
dog is not recognized by first identifying its parts but all at once

Multistability



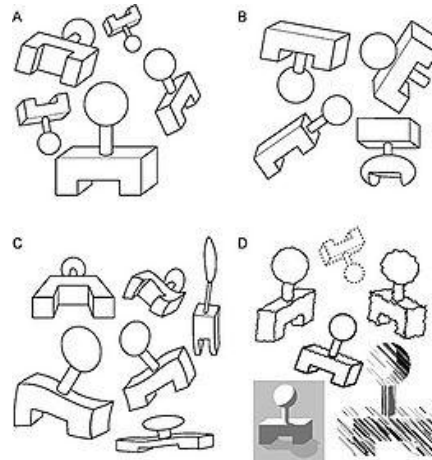
= ambiguous perceptual experiences - Necker cube, and in Rubin's Figure (tiež Escher)

Reification (zhmotnenie)



=constructive or generative aspect of perception - percept contains more explicit spatial information than the sensory stimulus on which it is based.

Invariance



= simple geometrical objects are recognized independent of rotation, translation, and scale

Ďalšie Gestalt zákony: Figure and Ground



Similar elements (figure) are contrasted with dissimilar elements (ground) to give the impression of a whole
lighthouse (figure) / blue lines (ground)

Escher -> played around with figure and ground in interesting ways

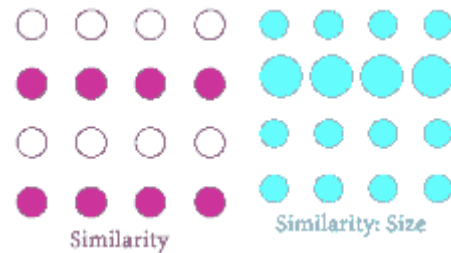


A breakdown of figure and ground in camouflage



Similarity, Proximity or Contiguity, Continuity

The principle of **similarity** states that things which share visual characteristics such as shape, size, color, texture, value or orientation will be seen as belonging together.



The principle of **proximity** or contiguity states that things which are closer together will be seen as belonging together. Looking at the picture to the right, since the horizontal rows of circles are closer together than the vertical columns, we perceive two vertical lines. Since the first two columns and the last two columns have less space between them than the center two columns, we perceive two groups of two columns.



The principle of **continuity** predicts the preference for continuous figures. We perceive the figure as two crossed lines instead of 4 lines meeting at the center.



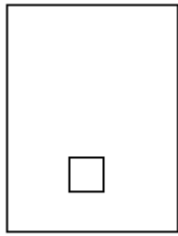
Closure, Area, Symmetry

The principle of **closure** - our minds react to patterns that are familiar

- it's speculated that it is a survival instinct (form of a predator behind a tree)



The principle of **area** states that the smaller of two overlapping figures is perceived as figure while the larger is regarded as ground. We perceive the smaller square to be a shape on top of the other figure, as opposed to a hole in the larger shape.



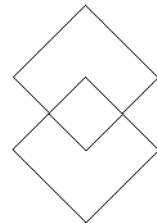
Area

We can reverse this perception by using shading to get our message across, as seen below. On a white background, this looks like a box with a hole in it.



The principle of **symmetry** describes the instance where the whole of a figure is perceived rather than the individual parts which make up the figure.

- two overlapping diamonds rather than three objects

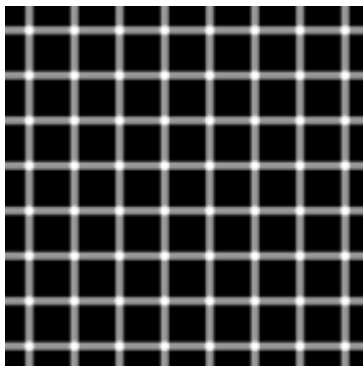


Symmetry

2. Optické ilúzie a konštantnosť vnímania veľkosti, tvaru a jasnosti.

Physiological illusions

- afterimages
- excessive stimulation of a specific type - brightness, tilt, color, movement
- Hermann grid illusion and Mach bands – explained with lateral inhibition in retina or microsaccades



Cognitive illusions

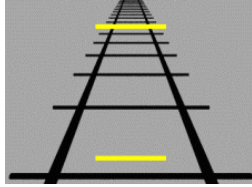
arise by interaction with assumptions about the world, leading to "unconscious inferences"

1. Ambiguous illusions

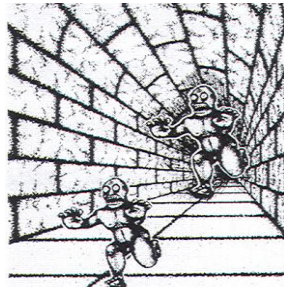
- Necker cube, Rubin vase, svokra/nevesta, kačica/zajac, eskimo/indián

2. Distorting illusions

- distortion of size, length, or curvature
 - i. Café wall illusion, Müller-Lyer illusion

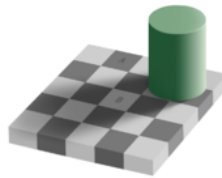


ii. Ponzo Illusion



iii.

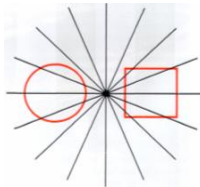
- distortion of brightness



i.

- distortion of shape

- i. Shepard illusion - two tables



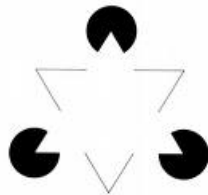
ii. Orbinson illusion

3. Paradox illusions

- Penrose triangle, impossible staircases (Escher's paintings)

4. Fictional illusions

- perception of objects that are genuinely not there
- also those induced by schizophrenia or a hallucinogen



Kanisza triangle

•

3. Binokulárne a monokulárne vnímanie hĺbky.

Depth perception ability to perceive the world in three dimensions

Monocular cues require the input from just one eye

- **Motion parallax** – when an observer moves, the apparent relative motion of several stationary objects against a background gives hints about their relative distance
 - some animals that lack binocular vision employ parallax more explicitly (e.g. some types of birds)
- **Kinetic depth perception** - as objects in motion become smaller, they appear to recede into the distance; getting larger seems to be coming closer
 - calculate time to crash distance
- **Perspective** - parallel lines converging at infinity allows us to reconstruct the relative distance of two parts of an object, or of landscape features
- **Relative size** - if TWO objects are known to be the same size (e.g., two trees), relative size cues inform about the relative depth of the two objects.
- **Familiar size** - previous knowledge of the objects size determines the absolute depth of the object
- **Aerial perspective** - Due to light scattering by the atmosphere, objects that are a great distance away have lower luminance contrast and lower color saturation (distance fog).
- **Accommodation** - oculomotor cue
- **Occlusion** (interposition) - blocking the sight – info about relative distance
- **Texture gradient** - a gravel road - gravel near you can be clearly seen, as your vision shifts towards the distant road the texture cannot be clearly differentiated.

Binocular cues require input from both eyes

- **Stereopsis** or retinal(binocular) disparity – requires frontal placement of eyes
 - different projection of objects onto each retina
- **Convergence** - a binocular oculomotor cue

only convergence, accommodation and familiar size provide absolute distance information

Evolution

Herbivores - eyes on the sides of the head (no stereopsis), providing a panoramic, almost 360°, view of the horizon (to notice the approach of predators)

Predators - both eyes looking forwards, allowing binocular depth perception

It is typically felt that Depth perception must be learned in infancy using an unconscious inference.

4. Hlavné teórie percepcie (teória priamej percepcie, exemplárová a prototypová teória, teória geonov, atď').

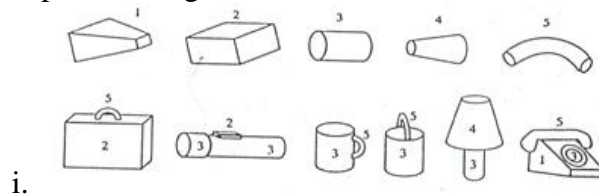
Two major classes:

1. **Bottom-up:** perception builds up hierarchically from a set of primitive "features" to our internal representations.
 - a. *Direct perception* - perception is a direct result of stimulus energy affecting receptor cells. No higher cognitive processes or internal representations are necessary
 - b. *Template/Exemplar theory* - we store examples of all the objects we have seen as exemplars or templates. We compare a perceived object to this set of exemplars until we find a match.
 - i. weakness - imperfect matches, cannot account for the flexibility of pattern recognition system



- c. *Prototype theory* - instead of storing many exemplars or rigid templates, we store a prototype, which is kind of like the average of an object, abstraction of common characteristics
- d. *Feature theory* - perception starts with the identification of basic features that are put together into more complex objects, which are put together into more complex objects, etc. until we identify an object.

(Neural basis – V1 cortex – neurons responsive to vertical/horizontal lines...)
- e. *Structural description theory* – 3D version of feature theory - simple geometric shapes, called geons, are the basic features.



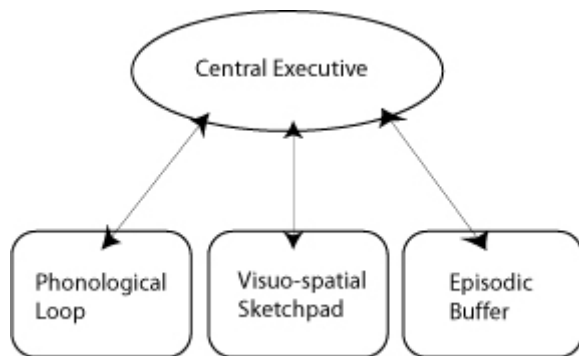
2. **Top-down:** perception starts with a set of primitives, but our perceptual experience is influenced by higher-level processes, such as knowledge and context.
 - Word Superiority Effect - people are more accurate in recognizing a letter in the context of a word than they are when a letter is presented in isolation, or when a letter is presented within a nonword ("WXRQ") – experiments using tachistoscope
 - THE CAT
 - Constructive Perception (Jerome Bruner) - during perception we quickly form and test various hypotheses regarding percepts based on what we sense, know, infer and expect

5. Baddeleyho model pracovnej pamäti verzus Atkinson-Shiffrinov trojzložkový model pamäti.

Baddeley's concept of working memory

Working memory is

- an active, multi-component system
- proposed as an alternative to short term memory
- can be used to explain a large amount of findings from work on short-term and working memory
- has a central control system – *central executive* - supervisory system and controls the flow of information from and to its slave systems and potentially several subsystems (slave systems) - short-term storage systems with limited capacity dedicated to a content domain – verbal (*phonological loop*) and visuo-spatial (*sketchpad*)
- In 2000 Baddeley added a third slave system to his model; the *episodic buffer*



Evidence - dual-task paradigms - performance of two simultaneous tasks requiring the use of two separate perceptual domains (i.e. a visual and a verbal task) is nearly as efficient as performance of the tasks individually. In contrast, when a person tries to carry out two tasks simultaneously that use the same perceptual domain, performance is less efficient than when performing the tasks individually.

Central executive

- binding information from a number of sources into coherent episodes
- coordination of the slave systems
- shifting between tasks or retrieval strategies
- selective attention and inhibition

Phonological loop

- consists of two parts: a short-term phonological store with auditory memory traces that are subject to rapid decay and an articulatory rehearsal component that can revive the memory traces
- auditory verbal information enters automatically the phonological store
- visually presented language can be transformed into phonological code by silent articulation
- necessary for acquisition of vocabulary, particularly in the early childhood years, also for learning a second language.

evidence for the phonological loop:

word length effect – long words are harder to remember - affects sub-vocal rehearsal process

irrelevant speech – uses the limited capacity of phonological store

effect of phonological similarity - words that sound similar are more difficult to remember than words that sound different

effect of articulatory suppression - memory for verbal material is impaired when people are asked to say something irrelevant aloud - affects sub-vocal rehearsal process

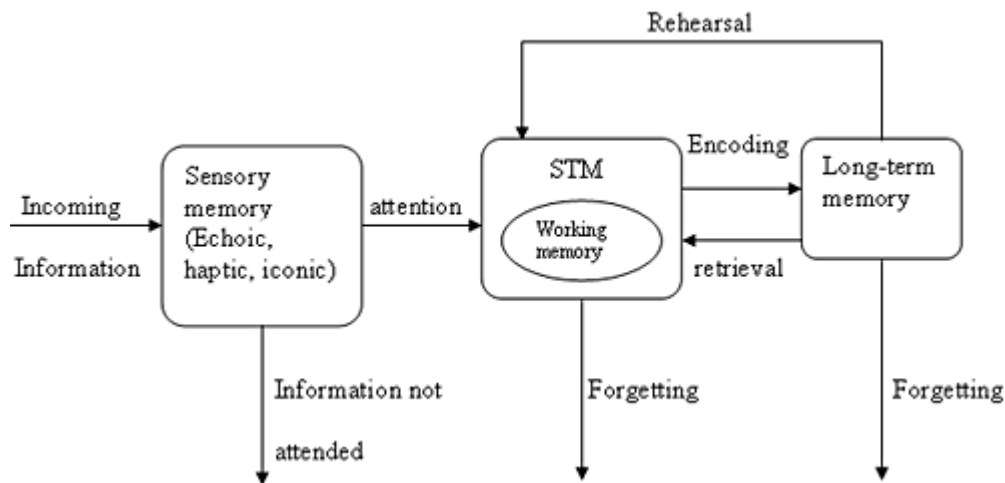
Visuospatial sketchpad

- holds information about what we see (remembering shapes and colours, or the location or speed of objects in space)
- involved in planning of spatial movements
- represented within the right hemisphere of the brain
- can be divided into separate visual, spatial and possibly kinaesthetic (movement) components
 - o visual cache - stores information about form and color
 - o inner scribe - deals with spatial and movement information

Episodic buffer

- connecting information across domains to form integrated units of visual, spatial, and verbal information with time sequencing (or chronological ordering)
- for example memory of a story or a movie scene
- probably has links to long-term memory and semantical meaning

Atkinson-Shiffrin memory model



- proposed in 1968

1. Sensory memory (SM)
2. Short-term memory (STM)
3. Long-term memory (LTM)

Sensory memory

- sense organs have a limited ability to store unprocessed information for less than 1sec
- iconic memory (250ms, capacity – up to 12 items), echoic memory (2-3 seconds to enable processing)
- experimentally demonstrated by Sperling (1960) using a tachistoscope.

Short-term memory

- Peterson & Peterson (1959) - STM lasts between 15 and 30 seconds unless rehearsed
- Miller (1956) - capacity of around 7 ± 2 'chunks' of information
- appears to mostly encode memory acoustically, but can also retain visuospatial images
- however in many cases STM can be semantic

Long-term memory

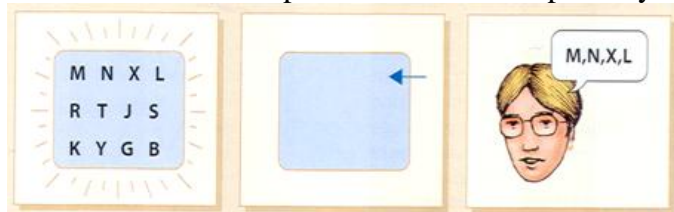
- LTM provides the lasting retention of information , from minutes to a lifetime
- almost limitless capacity
- encoded mainly in terms of meaning (semantic memory), but also retains procedural skills and imagery
- memory can be transported directly from sensory memory to LTM if it receives instant attention, e.g. witnessing a fire in your house
- if information in the LTM is not rehearsed it can be forgotten through trace decay

6. Meranie senzorickej, krátkodobej a dlhodobej pamäti.

senzoricka

Sperling (1960) Iconic Memory Research

- Whole report procedure
 - Flash a matrix of letters for 50 milliseconds
 - Identify as many letters as possible
 - Participants typically remembered 4 letters
- Partial Report Procedure
 - Flash a matrix of letters for 50 milliseconds
 - Participants are told to report bottom row
 - Participants were able to report any row requested



krátkodoba

Millerove experimenty – rad cisel, zapamatanych 7 ± 2

Tab. 5.1 Druhy úloh užívaných pri mērení pamēti

Některé paměťové úkoly jsou zaměřeny na reprodukci, jiné na znovupoznání explicitních vzpomínek na deklarativní poznatky. Jiné úkoly jsou zaměřeny na implicitní paměť a paměť pro procedurální poznatky.

Druh úlohy	Popis toho, co úlohy vyžadují	Příklad
Úlohy oslovující explicitní paměť	Musíte vědomě reprodukovat specifickou informaci.	Kdo napsal <i>Hamleta</i> ?
Úlohy oslovující deklarativní znalost	Musíte reprodukovat fakta.	Jaké je vaše křestní jméno?
Úlohy vyžadující reprodukci	Musíte z paměti reprodukovat fakt, slovo nebo nějakou jinou položku.	Řešení doplňovacích testů vyžaduje, abyste z paměti reprodukovali nějakou položku, např.: „Pojem označující osobu trpící těžkou paměťovou poruchou je _____?“
Testy zaměřené na sériovou reprodukci	Úkolem je opakovat jednotlivé položky ze seznamu přesně v pořadí, v němž jste je četli nebo slyšeli.	Jestliže jste viděli číslce 2–8–7–1–6–4, pak se očekává, že je vyjmenujete přesně v tomto pořadí.
Testy zaměřené na volnou reprodukci	Úkolem je zopakovat položky ze seznamu v libovolném pořadí.	Jestliže vám byla prezentována slova „pes, tužka, čas, vlasy, opice, restaurant“, dostanete plný počet bodů i v případě, že budete opakovat „opice, restaurant, pes, tužka, čas, vlasy“.
Testy zaměřené na reprodukci na základě návodů	Nejprve se naučíte seznam slovních dvojic. Poté je vám prezentován jeden člen dvojice a vašim úkolem je reprodukovat druhý člen dvojice.	Předpokládejme, že vám byly předloženy následující dvojice slov: „čas–město, mlha–domov, vypínač–papír, kredit–den, pěst–mrak, počet–větev“. Později bude uveden podnět „vypínač“ a očekává se, že odpovíte „papír“, apod.
Úlohy zaměřené na znovupoznání	Úkolem je volit nebo jiným způsobem identifikovat položku, která vám již byla prezentována.	Testy užívající úlohy s výběrem odpovědi (multiple-choice) nebo úlohy dichotomické (výrok platí, nebo neplatí). Příklad: „Lidé s mimořádnou pamětí se nazývají: a) amnestici, b) sémantici, c) mnemonici, d) retrográdníci.“
Úlohy oslovující implicitní paměť	Úkolem je vyvolat z paměti informaci, aniž byste si byli vědomi, že tak činíte.	Implicitní paměť oslovuje doplňování slov. Prezentuje se část slova, např. jeho první tři písmena, a úlohou je toto slovo doplnit na první celek, který přijde na mysl. Předpokládejme např., že úkolem je vytvořit celé slovo tím, že doplníte následujících sedm písmen: imp _____. Protože jste právě viděli slovo <i>implicitní</i> , doplníte správná písmena s vyšší pravděpodobností než člověk, který toto slovo bezprostředně neviděl.
Úkoly oslovující procedurální paměť	Spíše než fakta si musíte zapamatovat naučené dovednosti a automatizované druhy chování.	Žádá-li se na vás, abyste ukázali dovednosti („jak“), můžete dostat příležitost procvičovat skládání skládky nebo čtení zrcadlově psaného textu. Poté se bude zjišťovat, zda si pamatujete, jak se tyto dovednosti užívají. V jiném případě můžete být požádáni, abyste předvedli, jak jste zvládli, nebo co si pamatujete z jednotlivých pohybových dovedností (např. jízdu na kole nebo bruslení).

7. Pamäťové procesy: kódovanie, vybavovanie, zabúdanie.

Encoding Processes

- Creating an acoustic code
 - Conradov experiment – šesť písmen prezentovaných vizuálne, jedno za 0,75 s - najčastejšie chyby u písmen, ktoré sa zvukovo podobajú. Napríklad P sa často pletie s B, V s F a pod.

- Creating a semantic code
 - in LTM - Grossman & Eagle (1970) - word recognition test - 9 of the distractors were semantically related to words on list / 9 of the distractors were not - false alarms for each type: 1.83 of synonyms, but only 1.05 of unrelated
- Creating a visual code
 - Letter matching task A-a, A-A, A-M
 - Faster in (a-a) than in (A-a)

Transfer from STM to LTM

- Consolidation - integrating new information into stored information
- REM Theory
 - more REM sessions following study sessions -> more consolidation that occurs
 - disruption of consolidation is studied in amnesiacs

Metamemory

- Knowing how your memory works, being able to assess your own memory
- Young children lack metamemory skills

Retrieval

Retrieval from Short-Term Memory

- Saul Sternberg (1966)
 - Parallel processing
 - Simultaneous handling of multiple operations
 - Response times should be the same, regardless of the size of the set of items, because all comparisons would be done at once
 - Serial processing
 - Operations being done one after another
 - It should take longer to retrieve four digits than to retrieve two digits
 - Exhaustive (vyčerpávajúce) serial processing – the participant always checks the test digit against all digits in the set, even if a match were found partway through the list
 - Self-terminating (sebaukončujúce) serial processing – the participant would check the test digit against only those digits needed to make a response
- > results - response times increased linearly with set size but were the same regardless of serial position - indicates that **serial exhaustive** model seems to be right

Forgetting

- Decay theory
 - Memory is weakened with disuse
 - Reitmanovej experiment - 5 words presented visually for two seconds, then tone-detection task for fifteen seconds, recall declined by about 24% over the 15s
- Interference theory
 - Serial position effect (efekt čerstvosti, efekt primárnosti)
 - Brown-Petersonových experiment
 - 3 consonants to remember (FRL)

- 3 digit number (294) & asked to count backwards by threes (e.g., 291, 288, 285)
- after varying delays (3-18 seconds) participants were asked to recall the 3 letters - trigrams were forgotten by 18 seconds due to retroactive interference of counting backwards
- retrográdna a anterográdna interferencia:
 - Proactive: old memories interfere with recall of new information

Experimental group	Learn List A	Learn List B	Delay	Test for Memory B
Control group	No study	Learn List B	Delay	Test for Memory B

- Retroactive: new memories interfere with recall of old information

Experimental group	Learn List A	Learn List B	Delay	Test for Memory A
Control group	Learn List A	-----	Delay	Test for Memory A

What affects remembering?

BED	ARTICHOKE	Did you recall?	Explanation
CLOCK	INSOMNIA		
DREAM	REST	Bed? Clock?	Primacy Effect
NIGHT	TOSS	Snore? Pillow?	Recency Effect
TURN	NIGHT		
MATTRESS	ALARM	Night?	Spacing Effect
SNOOZE	NAP	Artichoke?	Distinctiveness
NOD	SNORE		
TIRED	PILLOW	Toss? Toss &	Clustering
NIGHT		Turn?	
		Sleep?	False Memory

... mnemonics, synesthetics

... Infantilná amnézia, Retrogradná amnézia, Anterogradná amnézia

8. Základné funkcie pozornosti - bdelosť (vigilancia) a detekcia signálov – základné experimenty (Mockworth) a metódy merania (change detection).

Functions of Conscious Attention

- Signal Detection, Searching, Selective Attention, Divided Attention

Vigilance and Signal Detection

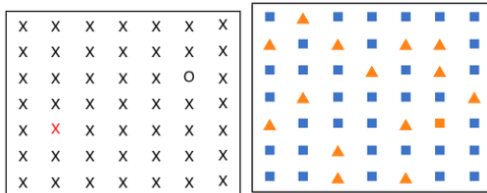
- Vigilance - ability to attend to a field of stimulation over a prolonged period, during which the person seeks to detect the appearance of a particular target stimulus
 - Mockworth, 1948
 - Participants were watching when a clock hand took a double step
 - Substantial deterioration after half an hour of observation
 - Vigilance can be increased with training

Signal Detection Theory (SDT)

		Signal	
		Present	Absent
Decision	Present	Hit	False Alarm
	Absent	Miss	Correct Rejection

Searching - Number of targets and distracters influence accuracy

- *Feature search* - targets defined by a unique visual feature, such as color, size, orientation, typically efficient, O is rapidly found among Xs
- *Conjunction search* - combination of two or more features



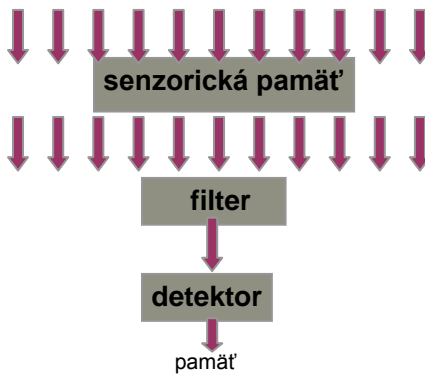
9. Výberová pozornosť a delenie pozornosti – teórie a modely, základné experimenty (Stroopov efekt, cocktail party problem).

Selective attention

- Stroop effect (1935)
 - difficulty in selectively attending to the color of the ink and trying to ignore the word that is printed with the ink of that color
 - reading is an automatic process (not readily subject to your conscious control) you find it difficult intentionally to refrain from reading and instead to concentrate on identifying the color of the ink
- Cocktail Party Problem
 - sledovanie jednej konverzácie v prítomnosti iných konverzácií.
 - Binaurálny test – dve správy do obidvoch uší naraz...
 - Dichotický test – do každého ucha ide iná správa
 - úlohou je zamerať sa, zopakovať jednu správu a odfiltrovať, ignorovať druhú
 - Čo si všimneme v ignorovanom uchu - zmenu pohlavia, tónu
 - Čo si nevšimneme v ignorovanom uchu - zmenu jazyka, témy alebo hovorcu

Broadbent filter model, 1958

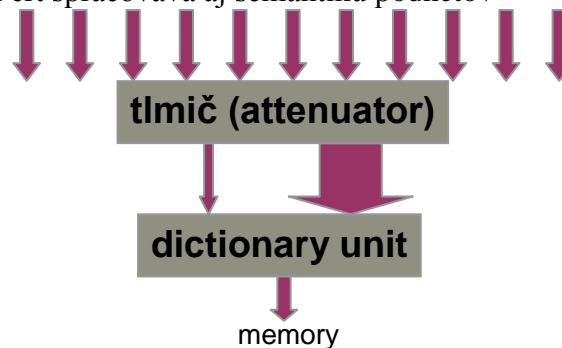
- prvý a najjednoduchší model
- early selection model - berie do úvahy len fyzikálne charakteristiky podnetu (hlasitosť, farebnosť)



- kritika – Moray - dichotickým testom ukázal, že pri vložení mena testovanej osoby do nepozorovaného monológu v 33% participant zachytí svoje meno – preto filter musí analyzovať aj iné ako fyzikálne vlastnosti vnemu

Treisman attenuation theory, 1964

- intermediate selection model
- okrem fyzikálnych črt spracováva aj sémantiku podnetov



- filter nahradil attenuator
- dictionary unit obsahuje slová, každé z nich má nastavený určitý „prah“ - najnižšiu silu signálu, pri ktorej je dané slovo zachytené, resp. je naňho zameraná pozornosť

Late selection modely

- selekcia vnemov nastáva vždy až po spracovaní významu informácie
- Donald MacKay, 1973 - dichotický experiment s dvojzmyslami
 - o „They were throwing stones at the bank“ („bank“ = breh rieky alebo banka)
 - o do druhého ucha biasing words - ak použil slová ako „rieka“, „voda“, tak participant odpovedá, že kamene boli hodené na breh rieky, ak sa použijú slová ako „peniaze“, „úspory“, tak participant bude hovoriť o banke
 - o aj podnety, na ktoré nie je zameraná pozornosť, sú spracovávané sémanticky

Neisser's Synthesis

- Two processes governing attention
 - Preattentive processes (rapid, automatic, parallel)
 - Attentive processes (controlled, occur later, serial)

Divided attention

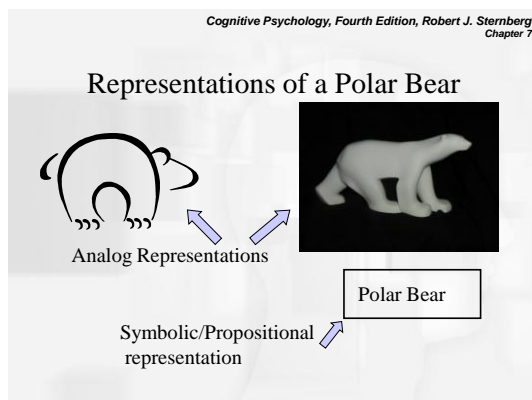
- attentional system must perform two or more discrete tasks at the same time
 - much better performance at two or more automatic tasks (driving a car and speaking) than controlled tasks (writing and comprehending read text)

10. Reprezentácia poznatkov – teória dvojitého kódovania (obrazy a symboly), hypotéza funkčnej ekvivalencie medzi vnímaním a predstavovaním (rotovanie, zoomovanie, prehľadávanie mentálnych predstáv).

representation - hypothetical entity that represents reality, not necessarily observable

We can characterize by:

- What we represent – a polar bear
- How we represent it – different representations of a polar bear – the word “polar bear”, photograph of a polar bear, sketch of a polar bear, footprint of a polar bear

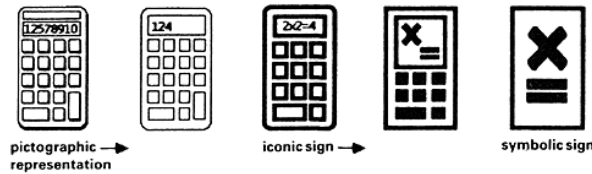


We use different kinds of representations:

- External (used in external environment - text, pictures, graphs, tables, sound and music)
- Internal (mental representations)
 - Local (representation is a single entity)
 - Indexical - the marks left by an object, representation is directly connected in some way (physically or causally) to the represented object - this link can be observed or inferred (fingerprint, wind arrow)
 - Iconic (analogous) – representation is resembling or imitating the represented object (recognizably looking, sounding, feeling, tasting or smelling like it) - being similar in possessing some of its qualities – mental image of a polar bear
 - Symbolic – representation is arbitrary or purely conventional - so that the relationship between representation and the object must be learnt (e.g. the word “polar bear”, a red traffic light, a national flag, a number)

- Distributed - somehow “spread out” over some more-than minimal extent of the resources available for representing – the object is for example represented by a set of features (white fur, 4 legs, 2 eyes, ... = a polar bear)

dimension of arbitrariness:



Mental imagery experiments

Shepard's mental rotation – matching a letter with rotated letter reaction time rises with rising angle of rotation... shows that probably we rotate a mental image in our mind

3D shape rotation – results show that we rotate faster in horizontal plane than in vertical plane

Zooming – we need more time to examine the shape of a fly's head than the shape of a rabbit's head – we need to zoom our mental image

Mental map – Kosslyn's experiments (1983) - učenie sa naspamäť objektov na mape, utvorenie mentálnej mapy, skenovanie cesty od jedného objektu na mape k druhému, meria sa reakčný čas

Časy pri predstavovaní objektov sú porovnateľné s časmi pri vnímaní objektov

11. Organizácia poznatkov v našej myslí – pojmy (definičná, exemplárová a prototypová teória), schémy, scenáre, sémantické siete.

Concepts and Categories

- intuition - we process the world using concepts as the most basic division of knowledge.

Concepts are relatively discrete ideas, such as "apple", "red", or "liberty."

The first level of organization is to collect related concepts into categories.

Categories are how related concepts get linked together, such as "fruit", "color", or "dog."

Concept identification

The obvious question to ask is how do we decide what concept a given object belongs to?

- *Feature-based categorization*: Categories are represented as lists of features, such as the concept STOP SIGN being represented as "red; octagon; at street corner" etc.
- *Prototype theory*: Categories are represented based on "typical" features. Another way to think of this as that prototypes consist more of lists of probable features. = model that best represents the class on which the category is based
- *Prototypes with exceptions*: Normal categorization still uses prototypes, but we also maintain a list of exceptions of objects that deviate too far from the prototype. A similar concept to exemplar theory.
- *The Core-prototype model*: the core contains the features that are absolutely required for category membership

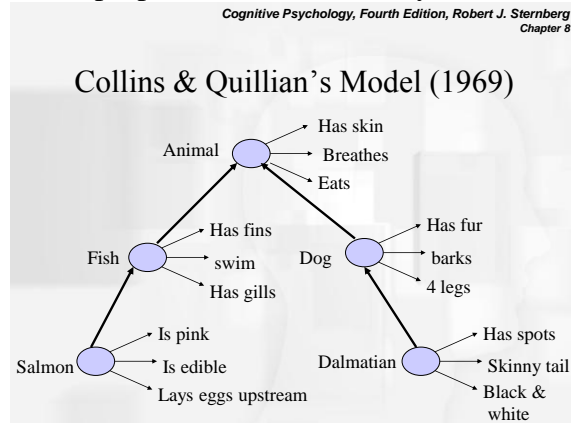
(You can think of the core as containing the necessary features, and the prototype as containing the sufficient features)

Semantic Networks

One most popular alternative put forth has been the semantic network model, which posits that concepts are stored in a hierarchy.

Each concept of the hierarchy has a set of properties associated with it.

These properties are inherited by all the concepts attached below it in the network.



Feature Space models

Each class of features, such as SIZE or COLOR, is a dimension in a geometric space. An object is categorized by where it falls in the space.

Basic level – zvierá / vták / slávik - Largest number of features, Used most often

- Children learn basic-level concepts sooner than other levels
- Basic-level is much more common in adult discourse than names for superordinate categories
- Different cultures tend to use the same basic-level categories, at least for living things

How are concepts related to each other?

These ideas have also been discussed earlier, but there are two main ways that people envision concepts being related: schemas and scripts.

Schemas: To review, schemas are high level knowledge constructs that tie together multiple concepts into a larger structure, encapsulating the relationships among concepts.

Scripts: Knowledge structures that represent how we interact with the environment in various situations.

12. Základné vlastnosti jazyka (arbitrárna symbolickosť, generatívnosť, dynamickosť, štruktúrovanosť na mnohých úrovniach).

- Language vs. Communication
- Six properties that are distinctive of language
 - Communicative

- Language permits us to communicate with one or more people who share our language
- Arbitrarily symbolic
 - Language creates an arbitrary relationship between a symbol and its referent: an idea, a process, a relationship, or a description
 - Arbitrary relationship - lack of any reason for choosing a particular symbol to refer to a particular thing
- Regularly structured
 - Language has a structure; only particularly patterned arrangements of symbols have meaning, and different arrangements yield different meanings
- Structured at multiple levels
 - The structure of language can be analyzed at more than one level (e.g., in sounds, in meaning units, in words, in phrases)
- Generative, productive
 - Within the limits of a linguistic structure, language users can produce novel utterances, and the possibilities for creating new utterances are virtually limitless
- Dynamic
 - Languages constantly evolve and change

- **Levels of analysis of language**

1 Phonology – system of speech sounds

- Phoneme – the smallest unit of speech sound that can be used to distinguish one utterance in a given language from another
- Different languages use different numbers and combinations of phonemes
- Phonemics – the study of the particular phonemes of a language
- Phonetics – the study of to produce or combine speech sounds

2 Morphology

- Morpheme – the smallest unit that denotes meaning within a particular language
- Content morphemes – the words that convey the bulk of the meaning (e.g. charge in recharge)
- Functional morphemes – the morphemes that add detail and nuance to the meaning of the content morphemes or that help the content morphemes to fit the grammatical context (e.g. re in recharge)

3 Mental Lexicon

- Mental Lexicon – the entire set of morphemes in a given language or in a given person's linguistic repertoire; contains the information about meaning, phonological form, orthographic form and syntactic properties of a particular word
- Vocabulary – the repertoire of words created by combining morphemes

4 Syntax

- The way in which users of a particular language put words together to form sentences
- It is the structure of our utterances
- A sentence comprises at least two parts
 - Noun phrase which contains at least one noun

- Verb phrase which contains at least one verb and whatever the verb acts on

- Chomsky's transformational grammar (tree 2 tree)

5 Semantics

- The study of meaning in language
- How words express meaning
- How language interacts with conceptual structure
- **Connotation** is the emotional and imaginative association surrounding a word. **Denotation** is the strict dictionary meaning of a word.

6 Discourse

- Encompasses language use at the level beyond the sentence, such as in conversation, paragraphs, stories
- Studies the interactions between the context and language

Hockett's 13 Design Features of Language

1. Vocal-Auditory Channel
2. Broadcast transmission and directional (binaural) reception
3. Rapid Fading (transitoriness)
4. Interchangeability - A person has the ability to both speak and hear the same signal.
5. Total Feedback - A speaker has the ability to hear themselves speak.
6. Specialization: Human language sounds are specialized for communication.
7. Semanticity: the idea that specific signals can be matched with a specific meaning.
8. Arbitrariness: no specific or necessary connection between the sounds and the message.
9. Discreteness: Phonemes can be placed in distinct categories which differentiate
10. Displacement: The ability to communicate about things that are currently not present.
11. Productivity: The ability to create new and unique meanings
12. Traditional Transmission: acquisition depends in part on the learning of a language.
13. Duality of patterning: phonemes make words, which in turn make sentences

While Hockett believed that all communication systems, animal and human alike, share many of these features, only human language contains all of the 13 design features. Additionally, traditional transmission, and duality of patterning are key to human language.

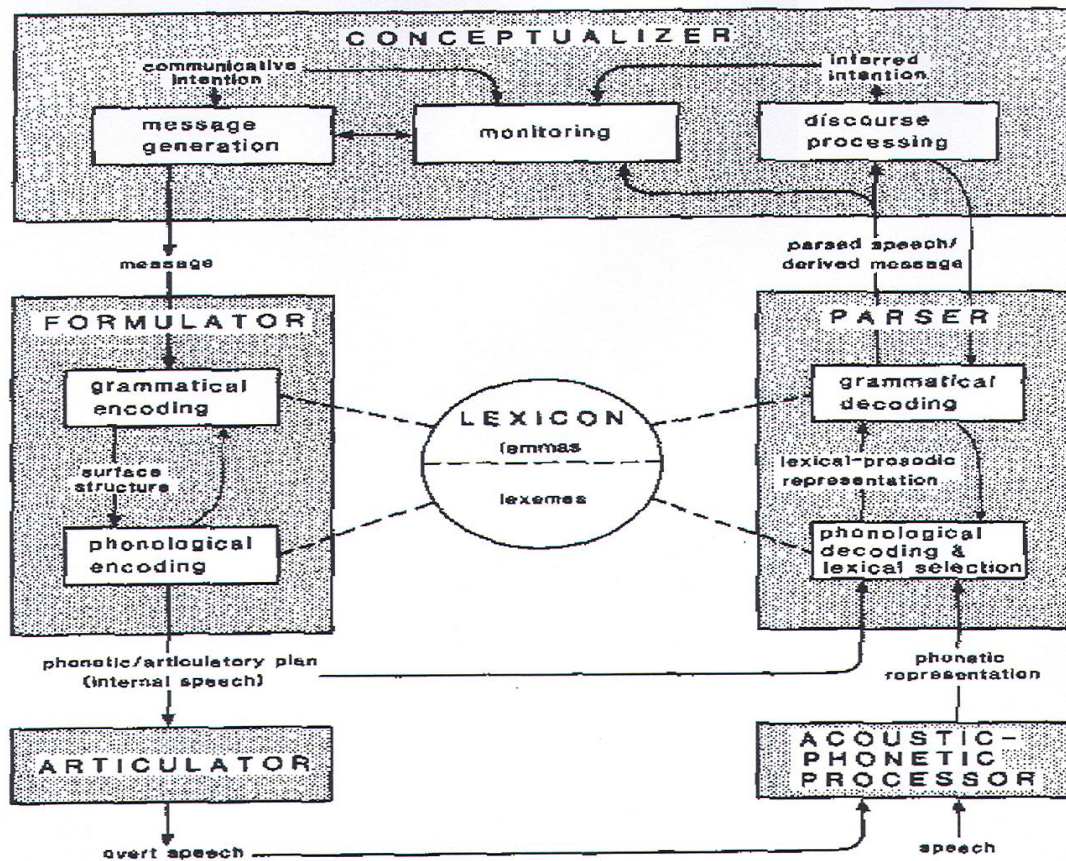
13. Tvorba reči (Leveltov model) a percepcia reči (koartikulácia, kategorická percepcia, McGurkov efekt, phoneme restoration effect).

language production - from having a concept to translating that concept into linguistic form

language perception – from linguistic form to meaning

LEVELT'S MODEL OF LANGUAGE PRODUCTION

Figure 2: Levelt's model (1993)



- modular, independent, automatic 'speaking' system. - five modules involved:
- conceptualizer** (activates intention to speak, takes into consideration discourse constraints, pragmatic factors, and the portion of the message to be realized para-linguistically (e.g., gestures) and linguistically)
- formulator** - activated by the preverbal message, lexical items (lemmas) from the **lexicon** are activated on the basis of their semantic features. Once they are active, their syntactic and morphological properties are available and the formulator encodes them into sentences. Once the lemmas are put in correct order (grammatical encoding), their phonological forms (lexemes) are retrieved and encoded (phonological encoding). The output of the formulator is phonological form. It is acoustic in nature. The phonological form is sent to two parts of the system: The **monitor** (evaluates the output – inner speech) and the **articulator** (converts acoustic signals into articulatory movements to come out as speech)

Speech perception

Coarticulation

fonémy nevyslovujeme sekvenčne – to, ako vyslovíme jednu fonému hlásku je ovplyvnené tým, aké fonémy vyslovujeme pred a po nej
 -> nemožnosť segmentácie akustického signálu – každý úsek signálu obsahuje paralelne charakteristiky viacerých foném

-> neexistencia invariantných črt – akustické charakteristiky signálu, dôležité na to, aby sme rozpoznali „k“, sú iné, ak je „k“ nasledované „i“ (kino) a iné ak je nasledované „u“ (kus)

Whereas we can perceive as many as 50 phonemes per second in language we can perceive only about one (or less) phone per second of nonspeech sounds

One explanation – coarticulation

Phonemes are produced in a way that overlaps them in time, making one or more phonemes begin while other phonemes still are being produced

Categorical perception

We perceive speech sounds categorically, that is to say, we are more likely to notice the differences *between* categories (phonemes) than *within* categories. The perceptual space between categories is therefore warped, the centers of categories (or 'prototypes') working like magnets for in-coming speech sounds.

VOT (voice onset time) – continuum from pre-voiced [b] with negative VOT through a point

where VOT is zero, i.e. voiceless [p] to positive VOT - a strongly aspirated bilabial [p^h]

... used in experiment by Lisker and Abramson in 1970 - in this continuum of, for example, seven sounds, native English listeners will identify the first three sounds as /b/ and the last three sounds as /p/ with a clear boundary between the two categories

McGurk effect

phenomenon which demonstrates an interaction between hearing and vision in speech perception. It suggests that speech perception is multimodal, that is, that it involves information from more than one sensory modality.

This effect may be experienced when a video of one phoneme's production is dubbed onto a sound-recording of a different phoneme being spoken - a visual /ga/ combined with an audio /ba/ is often heard as /da/.

effect is very robust; that is, knowledge about it seems to have little effect on perception

<http://www.youtube.com/watch?v=aFPtc8BVdJk>

Top-down influences on speech perception

listeners are able to compensate for missing or noise-masked phonemes using their knowledge of the spoken language

= *phonemic restoration effect*

experiment - Warren (1970) replaced one phoneme of a word with a cough-like sound

- subjects restored the missing speech sound
- they were not able to identify accurately which phoneme had been disturbed

14. Úloha dedičných faktorov a úloha prostredia pri nadobúdaní jazyka (Chomského teória, kreolčina, nikaragujská posunková reč, wug test, Pinkerova hypotéza o dvoch kognitívnych podsystémoch).

Language acquisition = first language acquisition (infants' acquisition of their native language)

- Universal stages: Universal Stages
 - Cooing (first 6 months)
 - Babbling (next 6 months)
 - One-word utterances, Two-word utterances, Telegraphic speech (1-3 years)
 - Overregularization (3years)
 - Basic adult structure (4years)

Nativist theories

- hold that children are born with an innate propensity for language acquisition, and that this ability makes the task of learning a first language easier than it would otherwise be. These "hidden assumptions" allow children to quickly figure out what is and isn't possible in the grammar of their native language, and allow them to master that grammar by the age of three. Nativists view language as a fundamental part of the human genome, as the trait that makes humans human, and its acquisition as a natural part of maturation. They believe that children learning language are as natural and normal as dolphins learning to swim or songbirds learning to sing.

universal grammar / language acquisition device (Noam Chomsky) - innate, language-specific abilities that facilitate and constrain language learning - the presence of Universal Grammar in the brains of children allow them to deduce the structure of their native languages from "mere exposure".

- children (under the age of three) do not speak in fully formed sentences, instead saying things like 'want cookie' or 'my coat.' However, they do not say things like 'want my' or 'I cookie,' statements that would break the syntactic structure
- children also seem remarkably immune from error correction by adults which nativists say would not be the case if children were learning from their parents

another arguments:

- the possible existence of a **critical period for language acquisition**
- deaf population of Nicaragua - until approximately 1986, Nicaragua had neither education nor a formalized sign language for the deaf
 - As Nicaraguans attempted to rectify the situation, they discovered that children past a certain age had difficulty learning any language.
 - Additionally, the adults observed that the younger children were using gestures unknown to them to communicate with each other - [Nicaraguan Sign Language](#) with its own rules of "sign-phonology" and syntax

pidgin is a simplified language that develops as a means of communication between two or more groups that do not have a language in common, in situations such as trade.

creole is a stable language that originates seemingly as a nativized pidgin

- Hawaiian pidgin speakers - first-generation parents spoke highly-ungrammatical "pidgin English". Their children, grew up speaking a grammatically rich language - neither English nor the syntax-less pidgin of their parents
- furthermore, the language exhibited many of the underlying grammatical features of many other natural languages - language became "creolized"

wug test is an experiment in linguistics investigating the acquisition of plural and other inflectional morphemes in English-speaking children

- This is a wug. Now there is another one. There are two of them. There are two _____.

hypotéza o slovách a pravidlách (Pinker, 1999) - teória o dvoch kognitívnych podsystemoch, z ktorých jeden má na starosti lexikón a druhý tvorbu pravidiel

- pravidelné slovesá (pravidlá) a nepravidelné slovesá (pamäť) v angličtine
- dvojité disociácia
 - *agramatická afázia* (problém so syntaxou, slovná zásoba OK, podobne nepravidelne plurály bez problémov)
 - vs.
 - *anómia* (majú problém so spomenutím si na slová, gramatikou OK)

Empiricist theories

- statistical learning theories of language acquisition
- functionalist linguistics
- usage-based language acquisition
- social interactionism - Catherine Snow - adults play an important part in children's language acquisition (but empirical support over-representative of middle class American and European parent-child interactions)
- ...
- Michael Tomasello and others - language learning results from general cognitive abilities and the interaction between learners and their surrounding communities.

Emergentist theories

language acquisition is a cognitive process that emerges from the interaction of biological pressures and the environment - neither nature nor nurture alone is sufficient