Prāts un domāšana kognitīvo zinātņu perspektīvā

1. lekcija. Prāta zobrati

Edmunds Vanags

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LU **OPEN** MINDED

Saturs

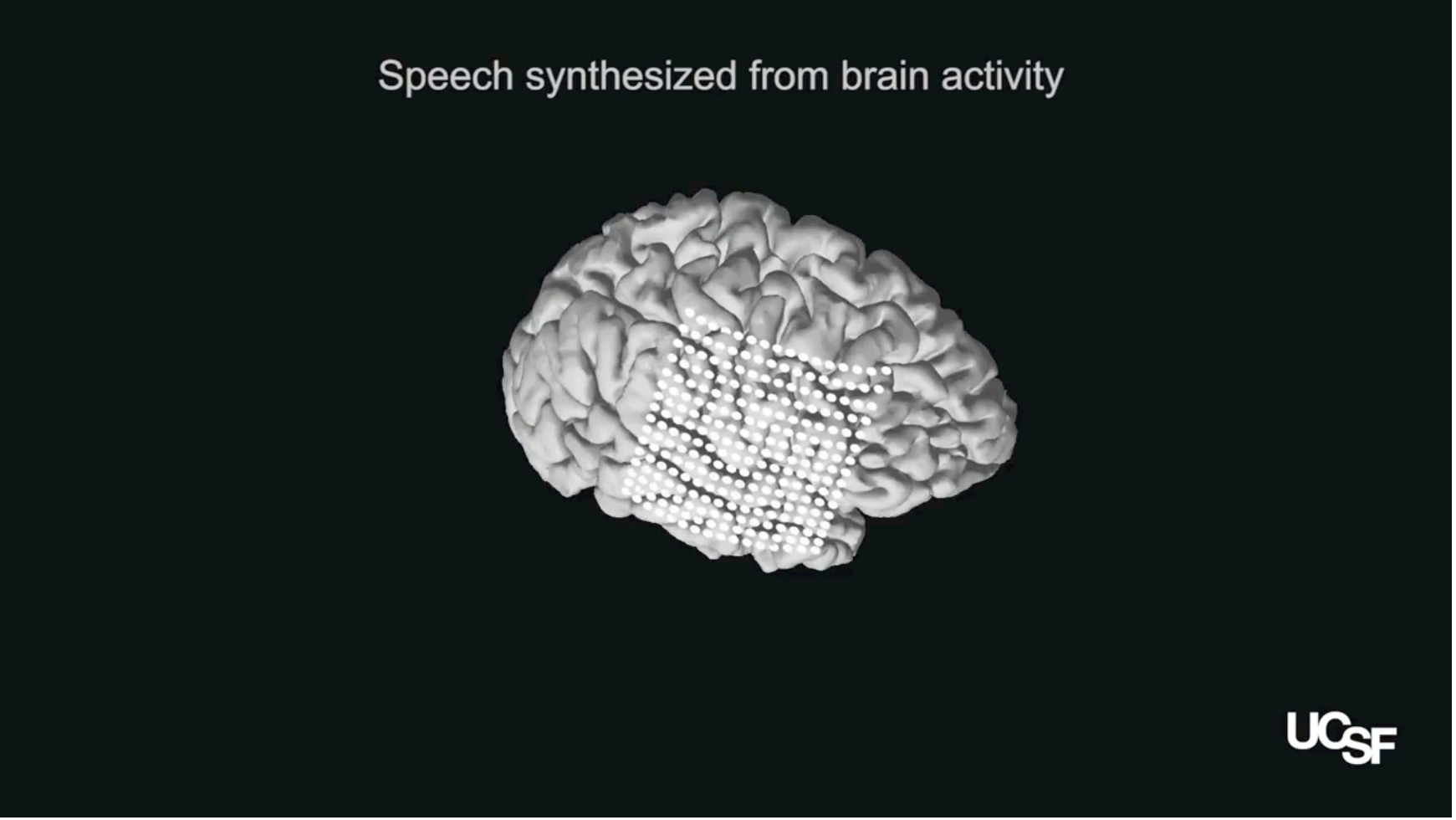
- Kas ir domāšana jeb kognitīvie procesi
- Uzmanība, atmiņa, uztvere un citi kognitīvie ”zobrati”
- Kāpēc esam neuzmanīgi un atceramies to, kas nebija?
- Cik daudz varam padomāt jeb prāta robežas
- Mūzika, šahs un ”prāta trenēšana”

MĪTI → FAKTI → JAUTĀJUMI

Neural Encoding and Decoding with Deep Learning for Dynamic Natural Vision

https://academic.oup.com/cercor/article/28/12/4136/4560155

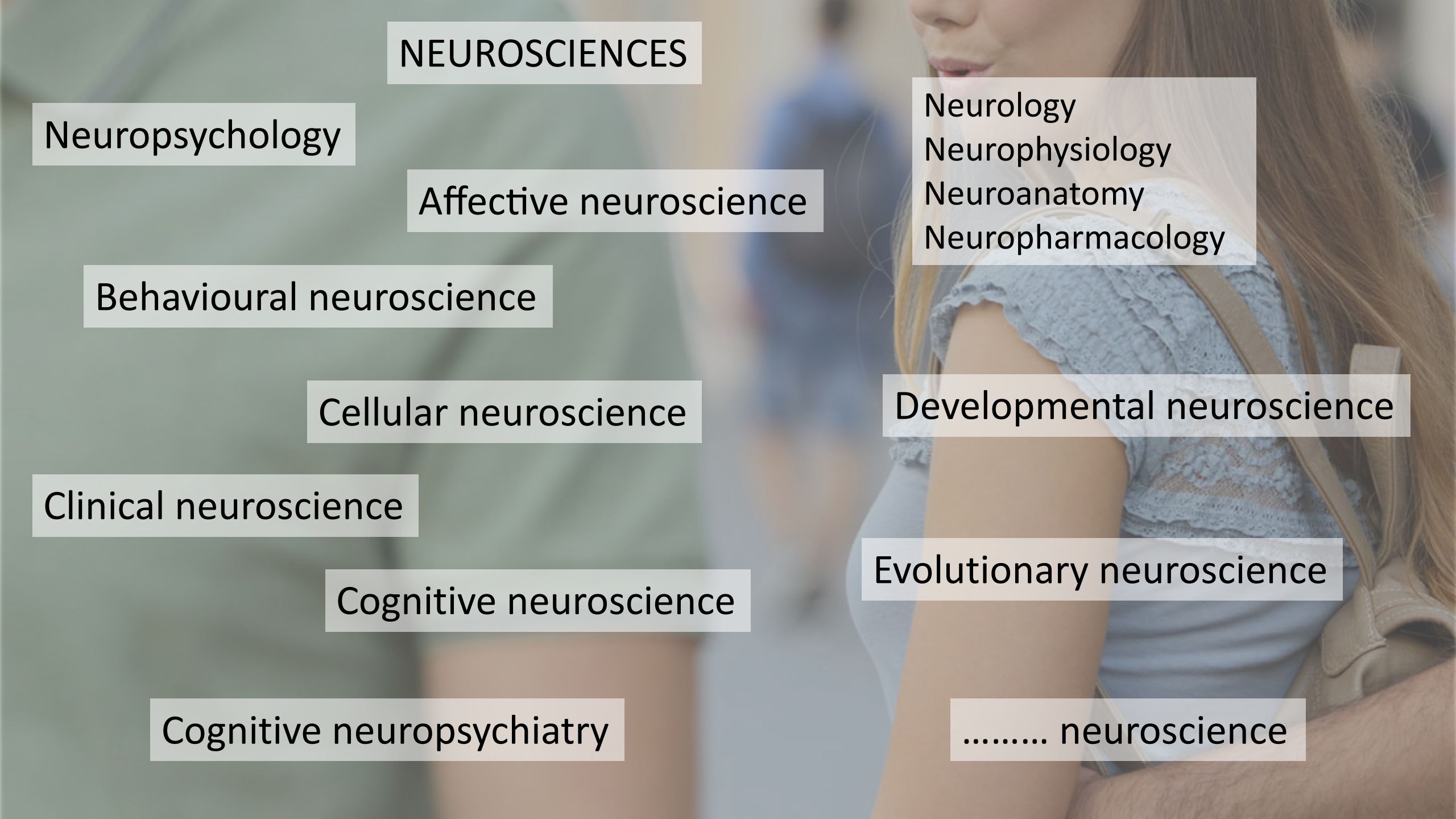
Wen, Shi, Zhang, Lu, Cao, Liu, 2018



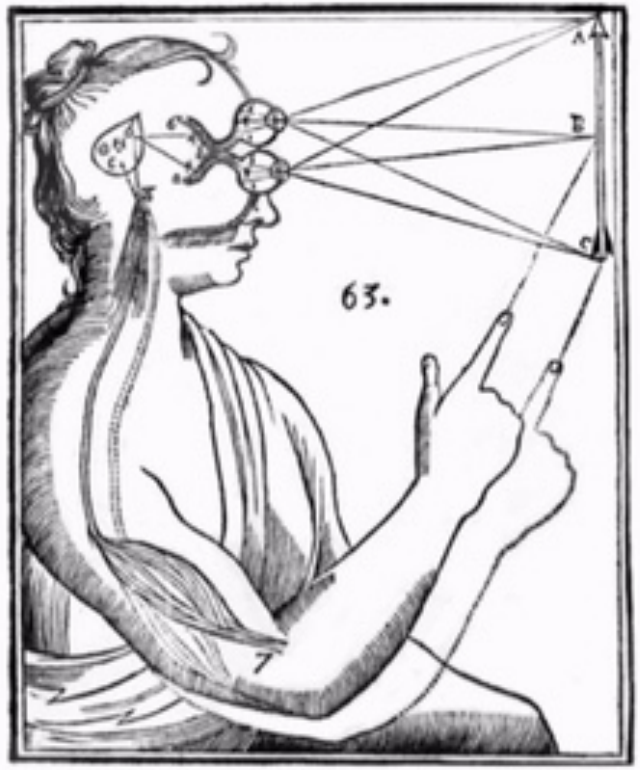
Virtual prosthetic voice, a system that decodes the brain's vocal intentions and translates them into mostly understandable speech, with no need to move a muscle, even those in the mouth.

https://www.nature.com/articles/s41586-019-1119-1

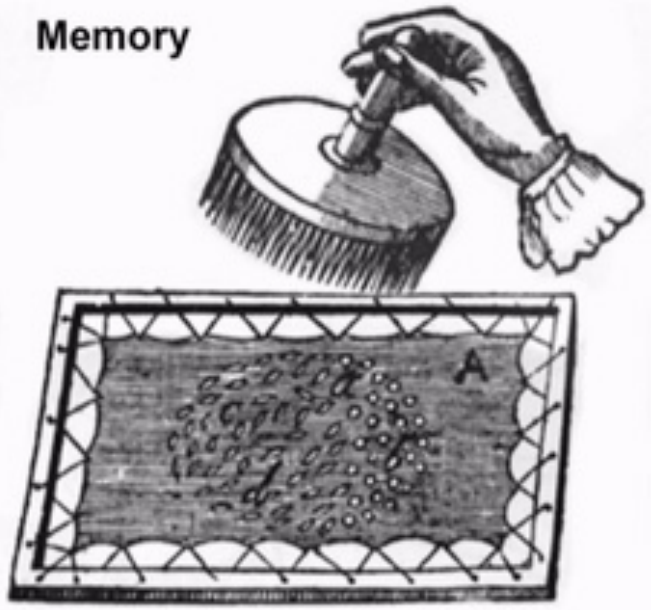
Anumanchipalli, Chartier & Chang, 2019


NEUROSCIENCES
Neuropsychology
Affective neuroscience
Behavioural neuroscience
Cellular neuroscience
Clinical neuroscience
Cognitive neuroscience
Cognitive neuropsychiatry
Neurology
Neurophysiology
Neuroanatomy
Neuropharmacology
Developmental neuroscience
Evolutionary neuroscience
…… neuroscience

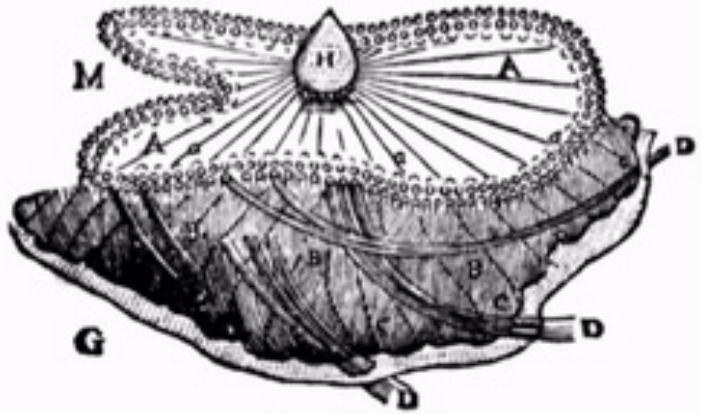
Vision and action



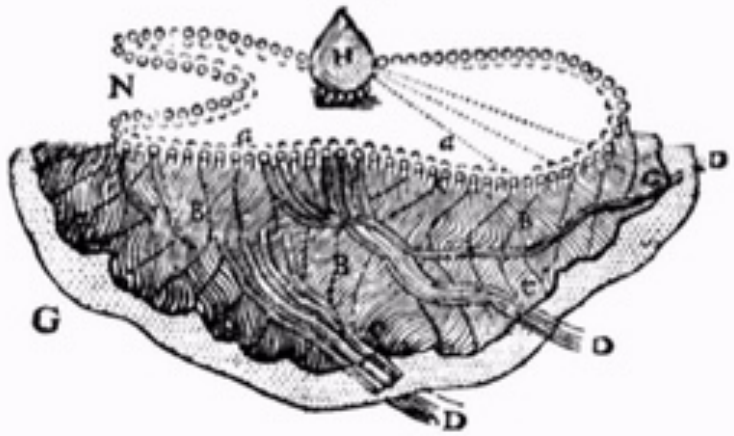
Memory

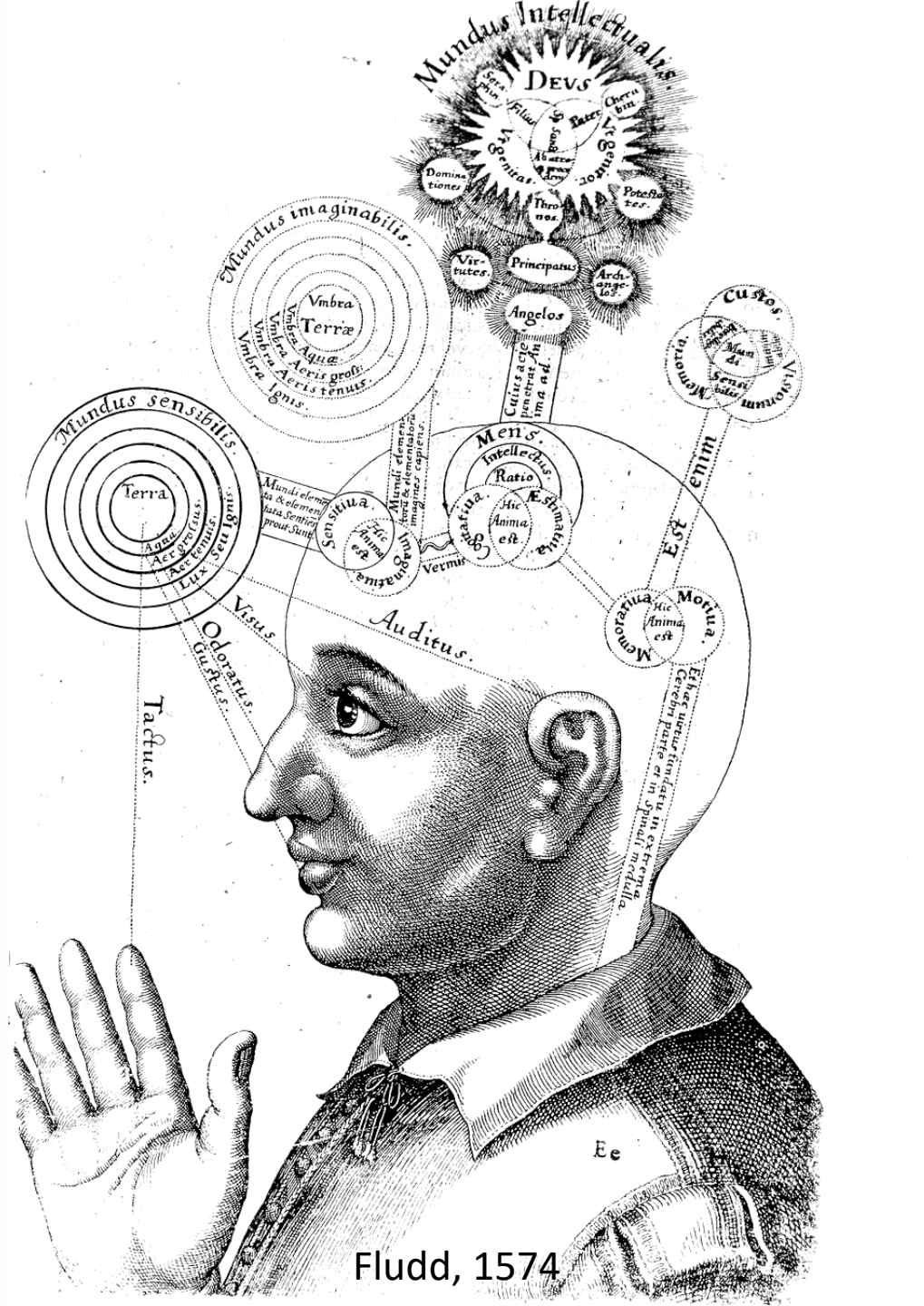


Wakefulness



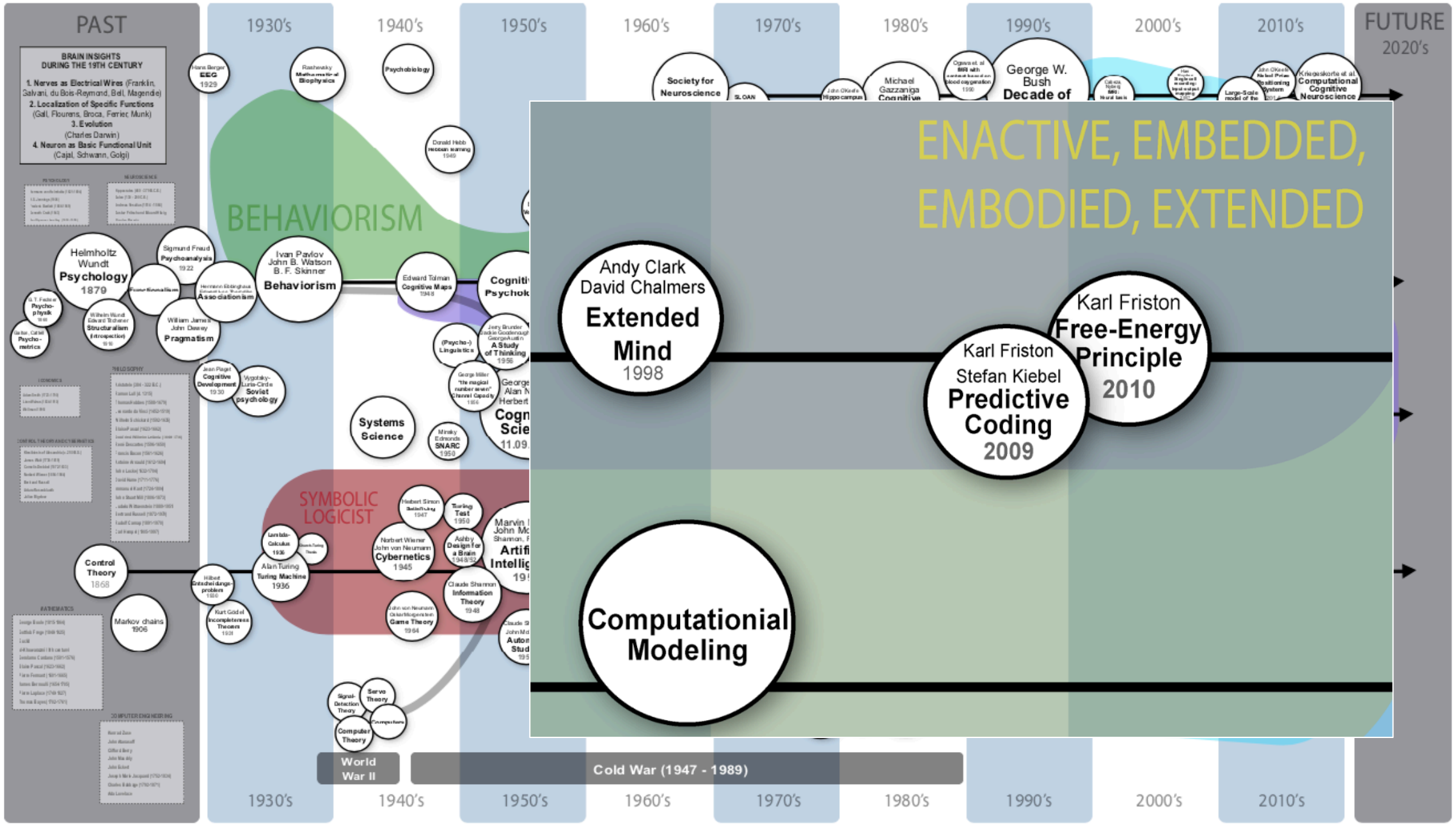
Sleep



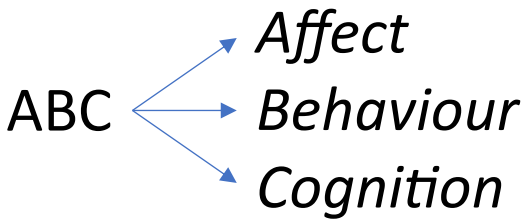


Fludd, 1574

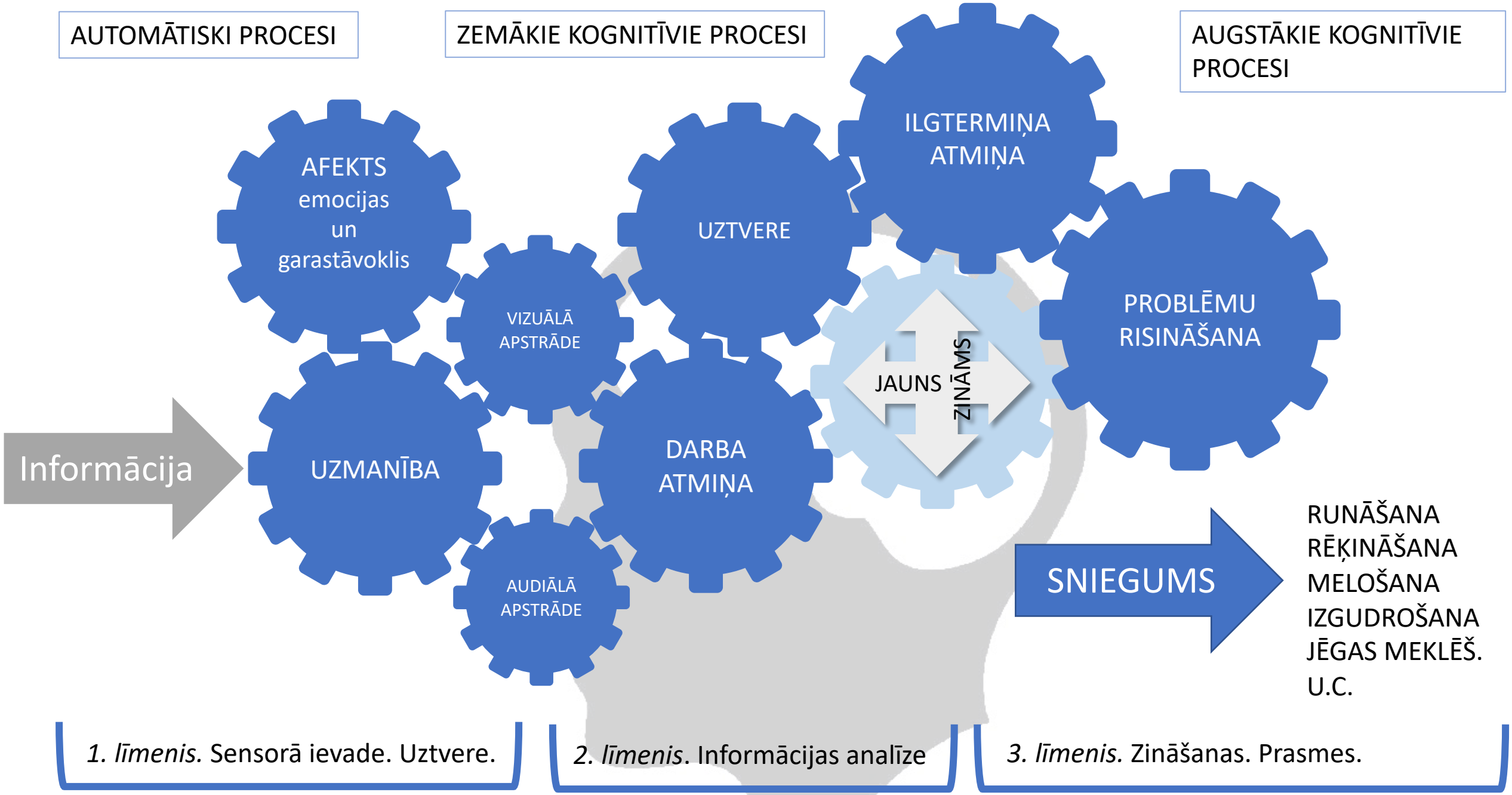
HISTORICAL MAP OF (THE) COGNITIVE SCIENCE(S): AN ATTEMPT

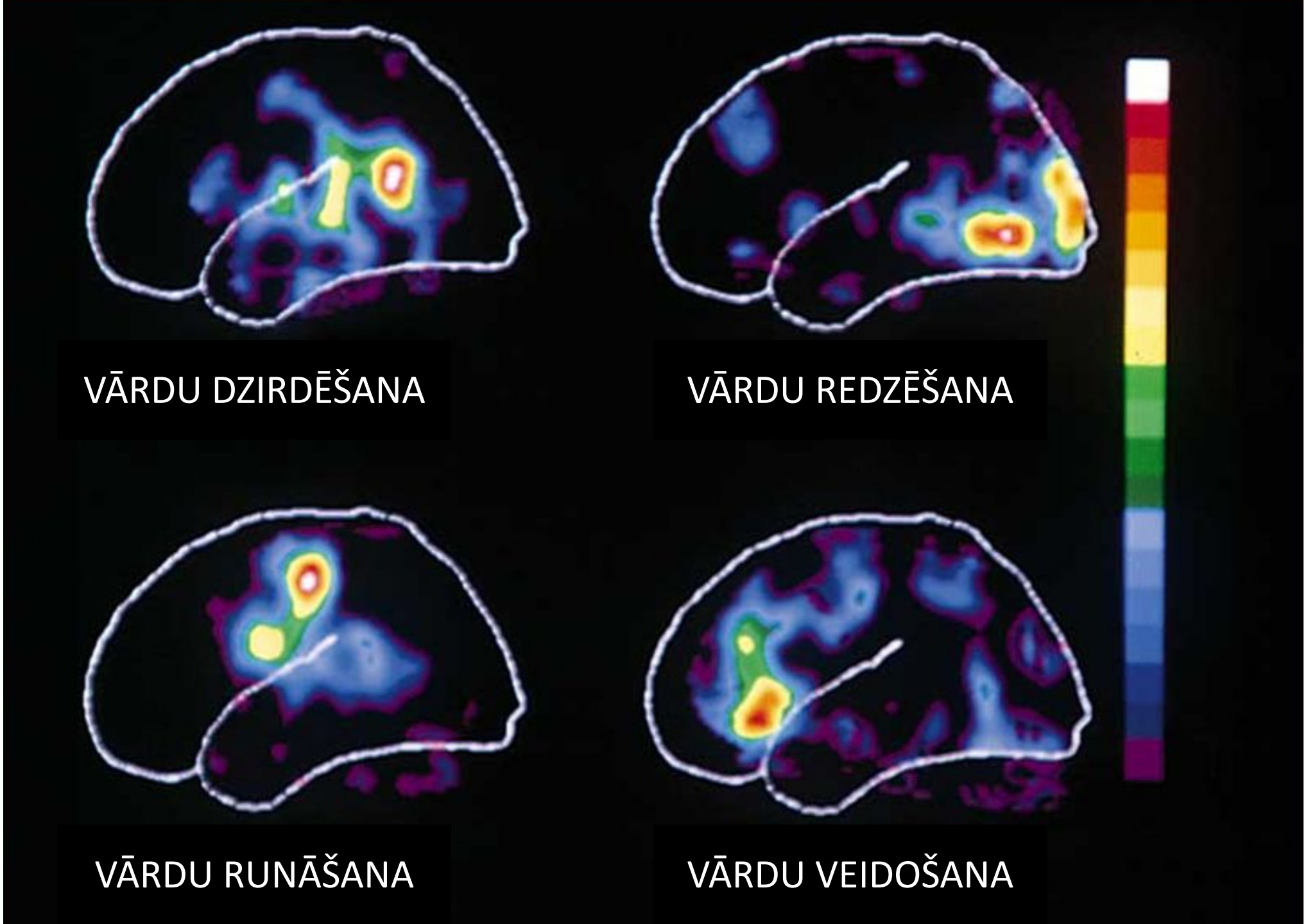


Prāta (smadzeņu) teorijas



- Cilvēku nervu sistēma ir nepieciešama, lai veidotu uztveri, domas, sajūtas, emocijas un uzvedību.
- Centrālā nervu un periferālā nervu sistēma ir anatomiski nošķirtas vienības, taču to funkcijas ir mijsakarīgas (Gazzaniga et al. 2010).
- Brīvās enerģijas un prognostiskās kognīcijas modelis, balstīts uz modernākajām atziņām pētniecībā (Barrett, 2017; Seth, Suzuki, Critchley, 2012; Sterling & Laughlin, 2015; Friston, Daunizeau, Kiebel, 2009, Friston et al., 2017).
- Prognostiskā kodēšana ir teorētiskais ietvars, kas skaidro kognitīvos procesus cilvēkiem un dzīvniekiem (Rao and Ballard, 1999; Bubic et al., 2010; Friston, 2010; 2019).


AUTOMĀTISKI PROCESI
ZEMĀKIE KOGNITĪVIE PROCESI
AUGSTĀKIE KOGNITĪVIE PROCESI
AFEKTS
emocijas
un
garastāvoklis
VIZUĀLĀ
APSTRĀDE
UZTVERE
ILGTERMIŅA
ATMIŅA
PROBLĒMU
RISINĀŠANA
Informācija
UZMANĪBA
DARBA
ATMIŅA
JAUNS
ZINĀMS
AUDIĀLĀ
APSTRĀDE
SNIEGUMS
RUNĀŠANA
RĒĶINĀŠANA
MELOŠANA
IZGUDROŠANA
JĒGAS MEKLĒŠ.
U.C.
1. līmenis. Sensorā ievade. Uztvere.
2. līmenis. Informācijas analīze
3. līmenis. Zināšanas. Prasmes.


VĀRDU DZIRDĒŠANA
VĀRDU REDZĒŠANA
VĀRDU RUNĀŠANA
VĀRDU VEIDOŠANA

Kognīcija

- Kā mēs uztveram?
- Kā mēs mācāmies/iemācāmies?
- Kā mēs atceramies?
- Kā mēs domājam?

Kognīcija

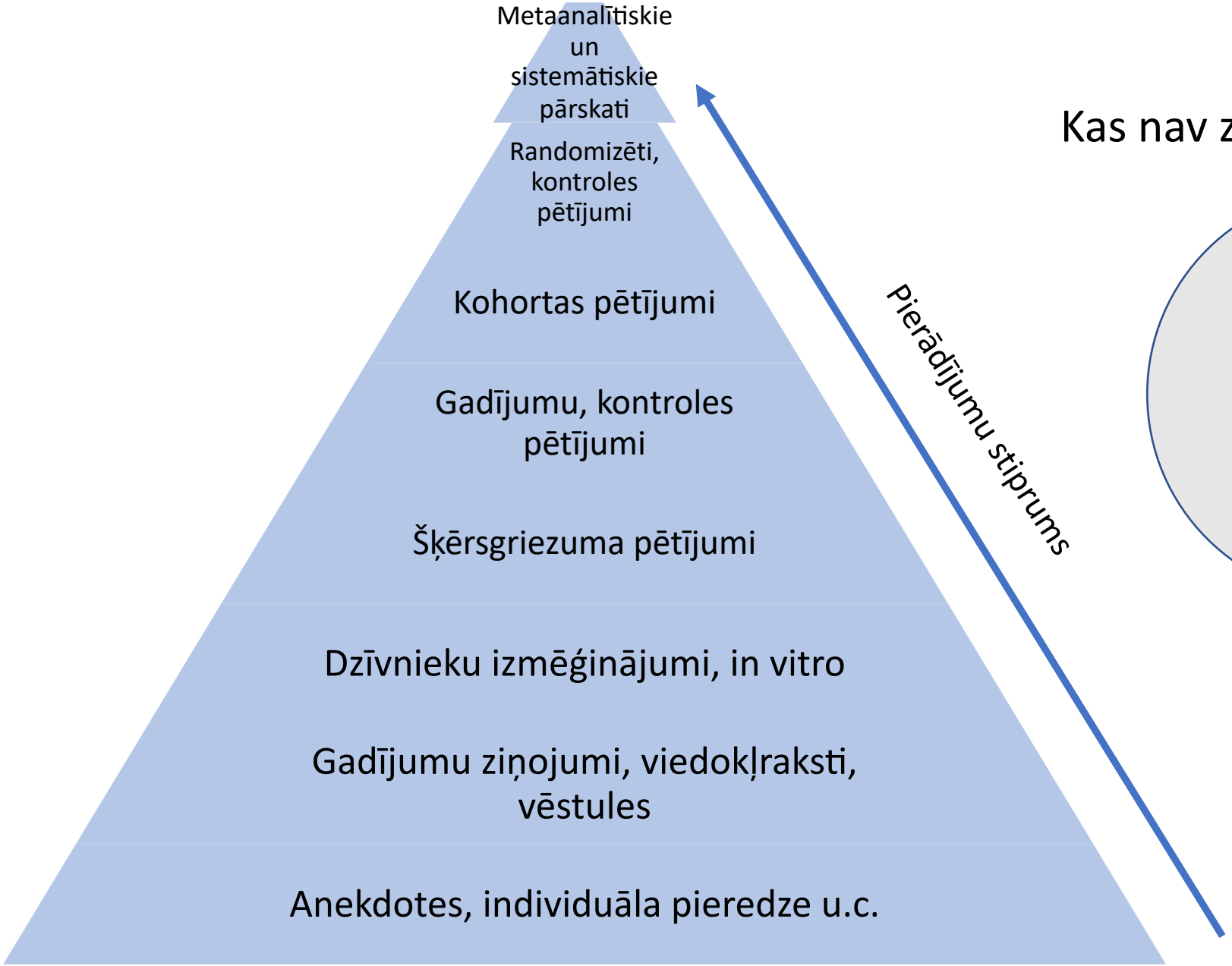
- Prāts rada un vada mentālās funkcijas – uztveri, uzmanību, atmiņu, emocijas, valodu, spriestpēju, domāšanu un lemšanu.
- Prāts ir sistēma, kas veido pasaules reprezentācijas tā, lai mēs varētu ar to palīdzību sasniegt savus mērķus (Sternberg, 2011, 2015).

Cognitio (latīņu valodā) – izzināšana, priekšstats, jēdziens

Cognitive (angļu valodā) – ar izziņu saistīts, izzināšanas-

Cognition - izziņa, izzināšanas spējas, priekšstati, kognīcija

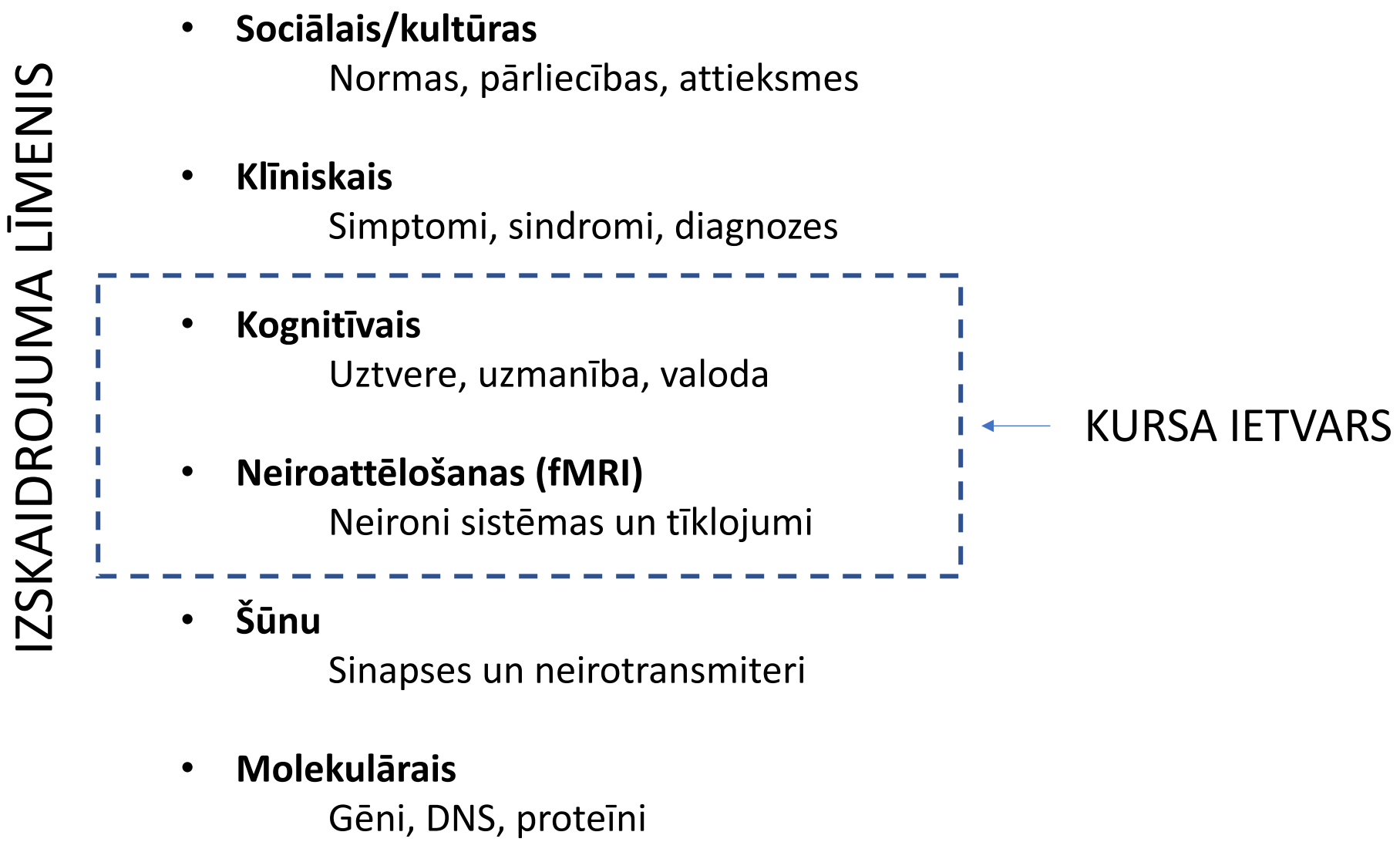
Zinātnisko pierādījumu hierarhija



Kas nav zinātniski pierādījumi

Youtube video, dzīves stāsti jeb anekdotes, sajūtas, vecāku instinkti, “mans draugs zina”, interneta ziņu portāli u.c.

Visus domāšanas fenomenus var pētīt un skaidrot dažādos līmeņos



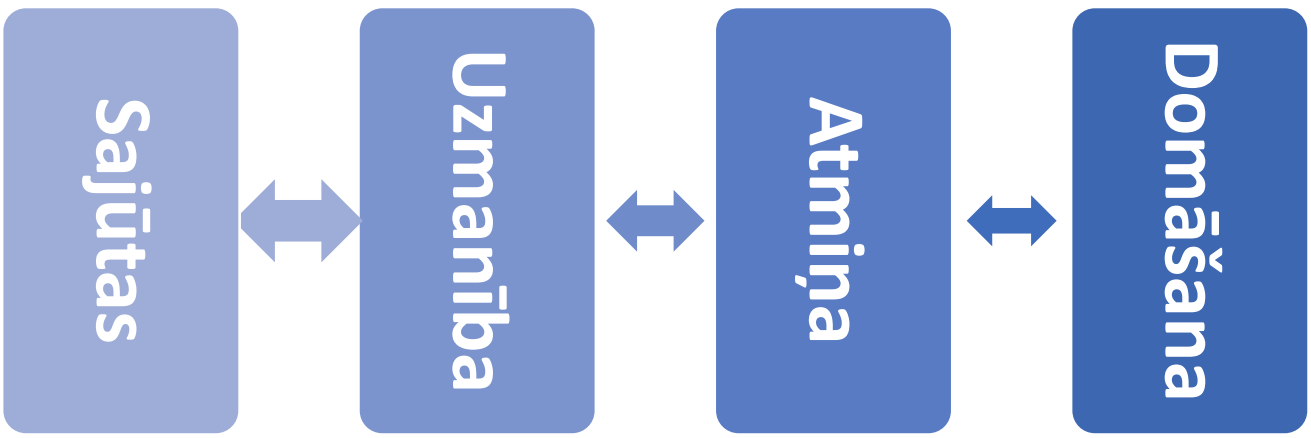
Hughdalh, 2017

UZTVERE

Uztvere

- Zināšanas nepieciešamas, lai koriģētu informāciju, kas nav patiesa.
- Smadzenes veido jēgu uztverē ienākošiem stimuliem (sajustajam).
- Sajūtas – sensorā informācija.
- Uztvere – sensorās informācijas nozīme (Sternberg, 2012).

Augšupejošie procesi jeb no apakšas uz augšu

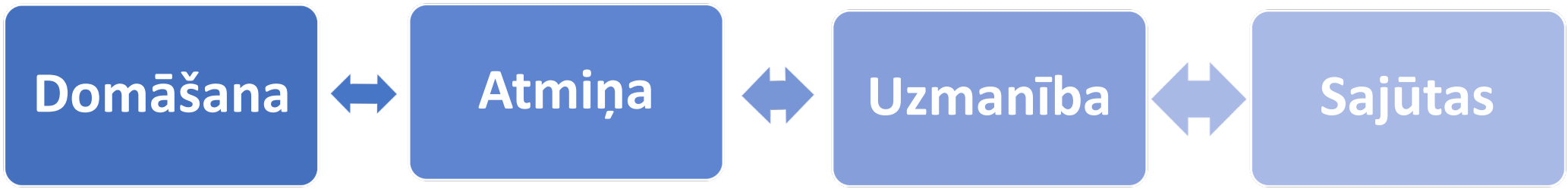


Lejupejošie prosesi jeb no augšas uz apakšu

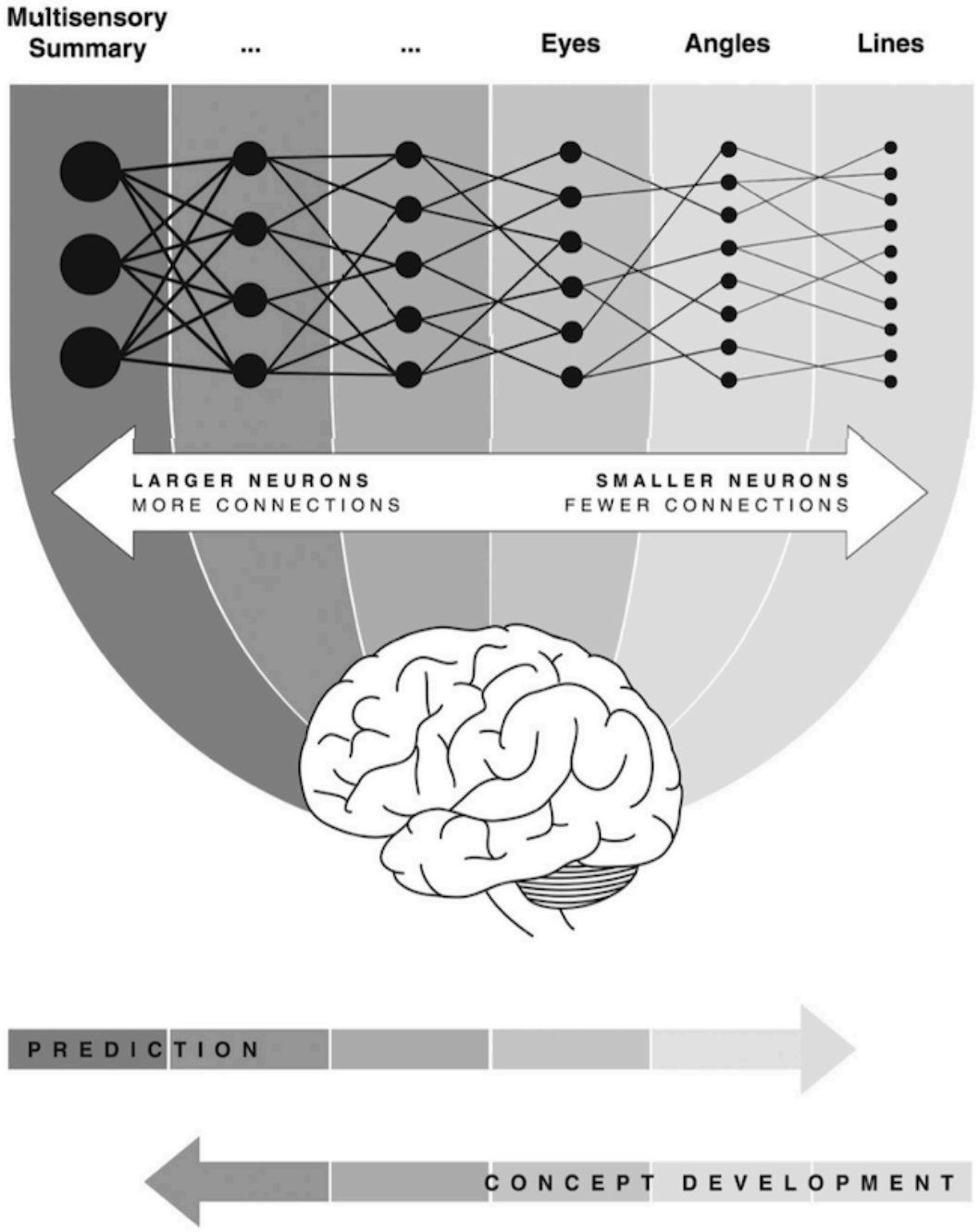
UZTVERE

UZTVERE

Uz priekšu vērstie jeb prognostiskie procesi



Uz atpakaļu vērstie jeb koriģējošie procesi



Barrett, 2017

A

ERP Face Present vs. Absent

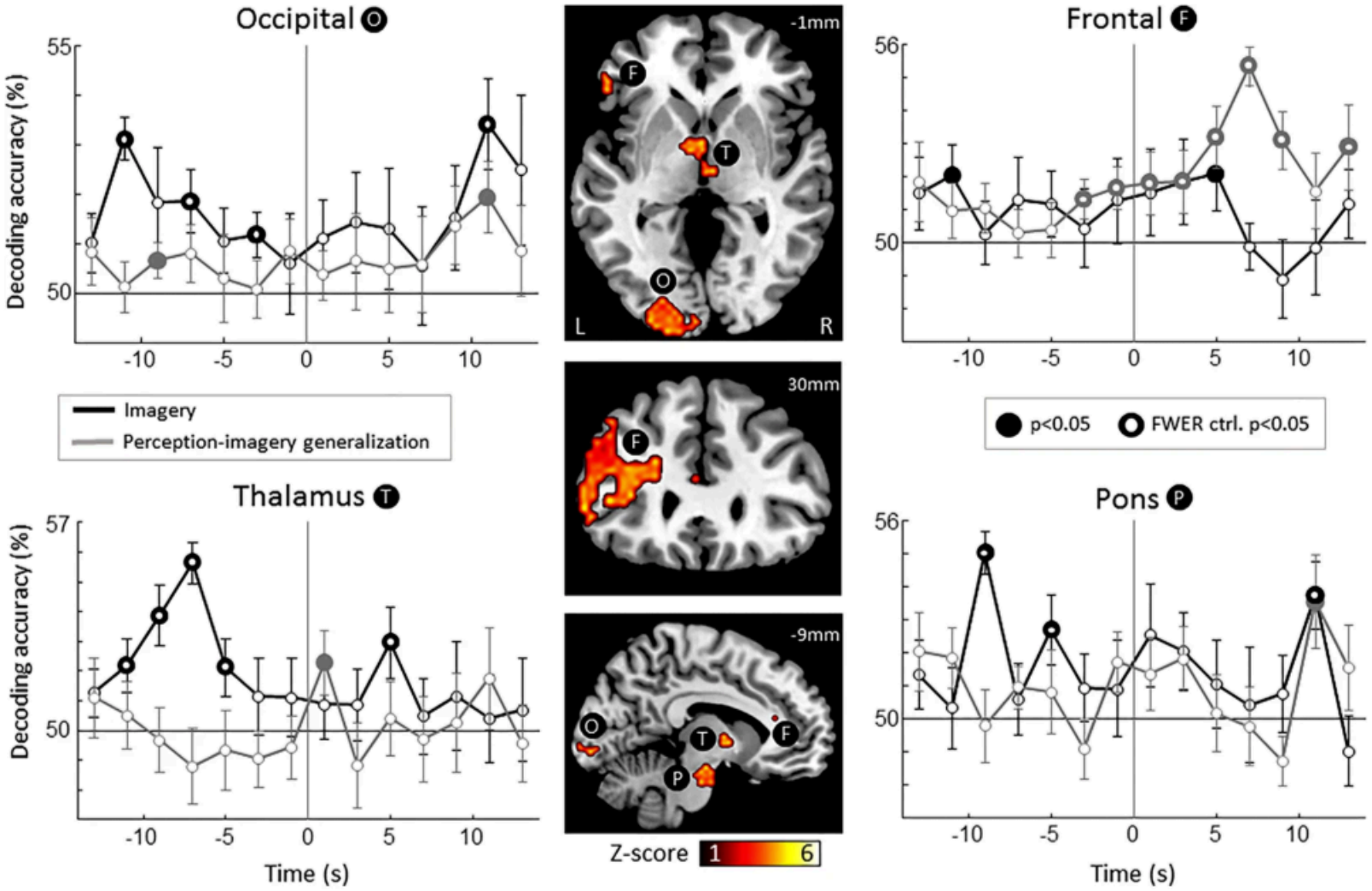
S1

1µV

-1µV

[-100 0] [0 100] [100 200] [200 300] [300 400] [400 500] [500 600] [600 700] Behaviour

From: Decoding the contents and strength of imagery before volitional engagement



Searchlight decoding of the contents of imagery. Using searchlight decoding, we investigated which regions contained

Brīvi izvēlētas atbildes var paredzēt (“ieraudzīt neirālās struktūrās”) aptuveni 11 sekundes pirms respondents to pasaka.

(Koenig-Robert & Pearson, 2019)

Prognostiskā uztvere

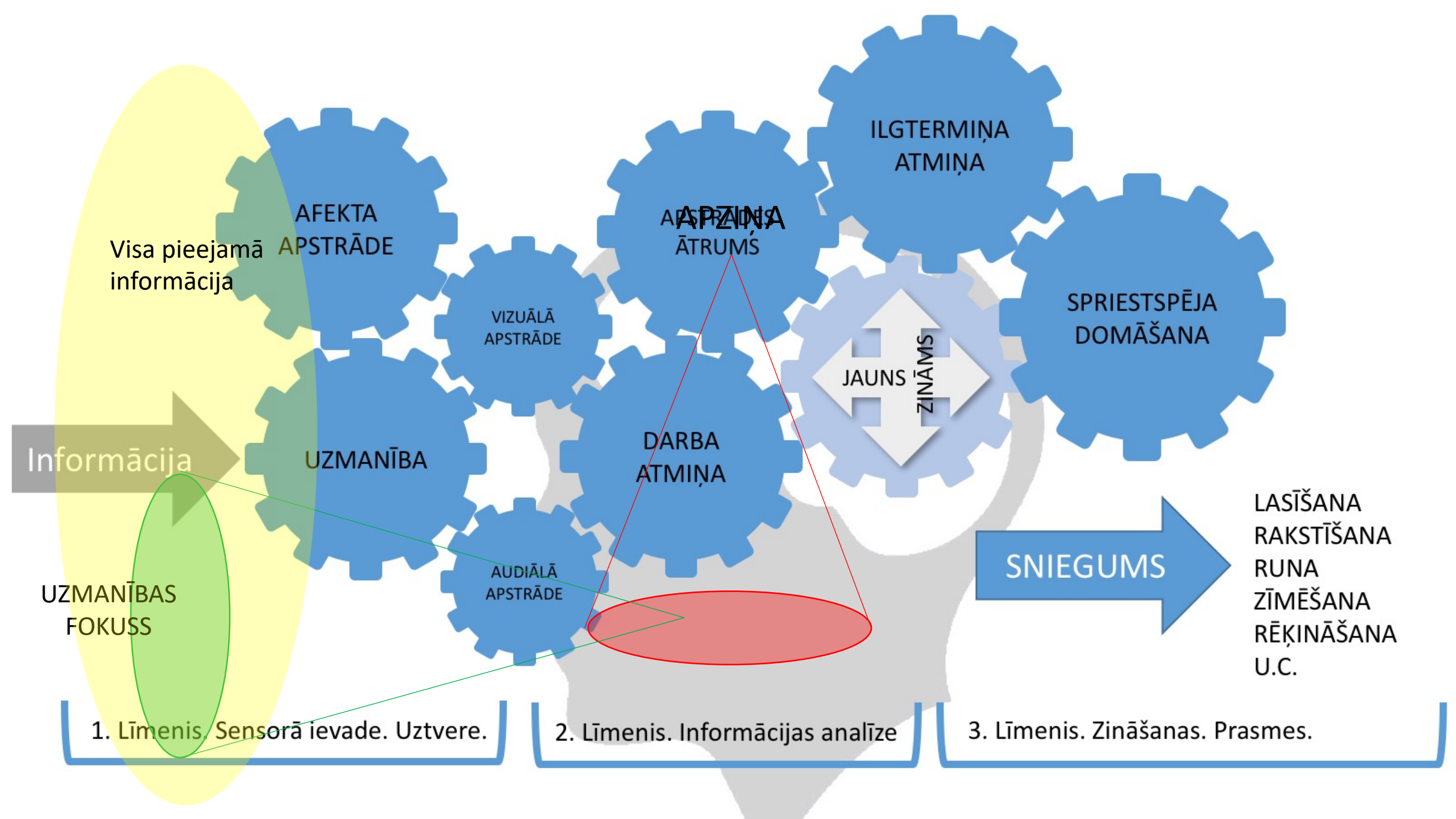
- Pretēji iepriekš izvirzītajām teorijām, no augšas-uz-apakšu pieeja jeb konstruējošā pieeja (Bruner, 1957; Gregory, 1980; Rock, 1983; von Helmholtz, 1909/1962).
- Mēs konstruējam savu izpratni par stimuliem un mūsu kognitīvie procesi ietekmē to, ko redzam.
- Pirms kaut ko ieraugām, mēs gaidām to, ko ieraudzīsim (Pafundo, Nicholas, Zhang, & Kuhlman, 2016)
- Prognostiskās kognīcijas modelis (Friston, 2019).

ĀRĒJĀ PASAULE

SMADZENĒS

APZIŅĀ

UZMANĪBA

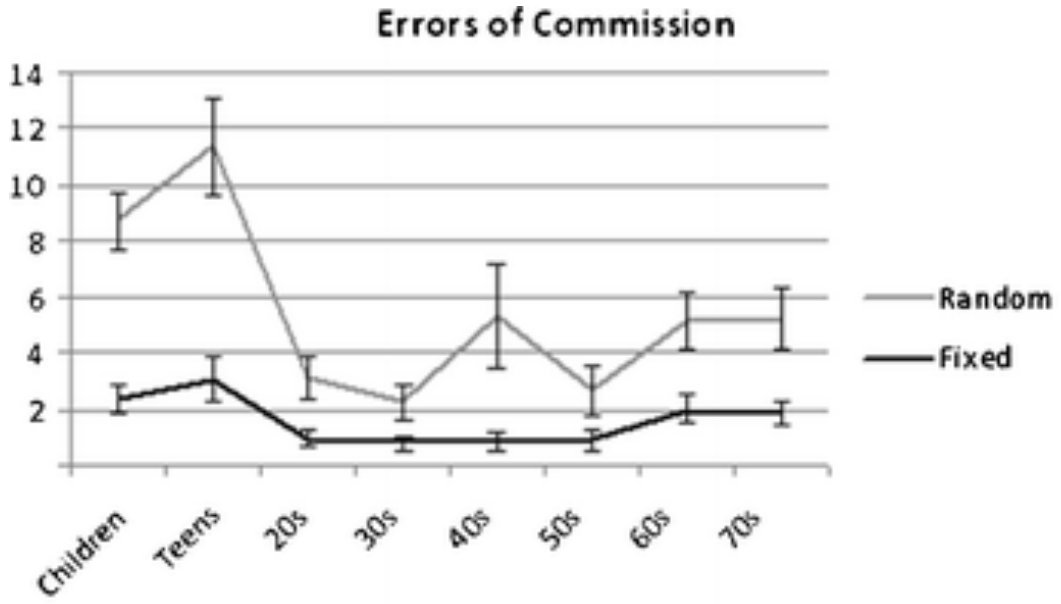

Visa pieejamā informācija
AFEKTA APSTRĀDE
VIZUĀLĀ APSTRĀDE
APSTRĀDES ĀTRUMS
ILGTERMIŅA ATMIŅA
SPRIESTSPĒJA DOMĀŠANA
JAUNS
ZINĀMS
Informācija
UZMANĪBA
DARBA ATMIŅA
AUDIĀLĀ APSTRĀDE
UZMANĪBAS FOKUSS
SNIEGUMS
LASĪŠANA
RAKSTĪŠANA
RUNA
ZĪMĒŠANA
RĒĶINĀŠANA
U.C.
1. Līmenis. Sensorā ievade. Uztvere.
2. Līmenis. Informācijas analīze
3. Līmenis. Zināšanas. Prasmes.

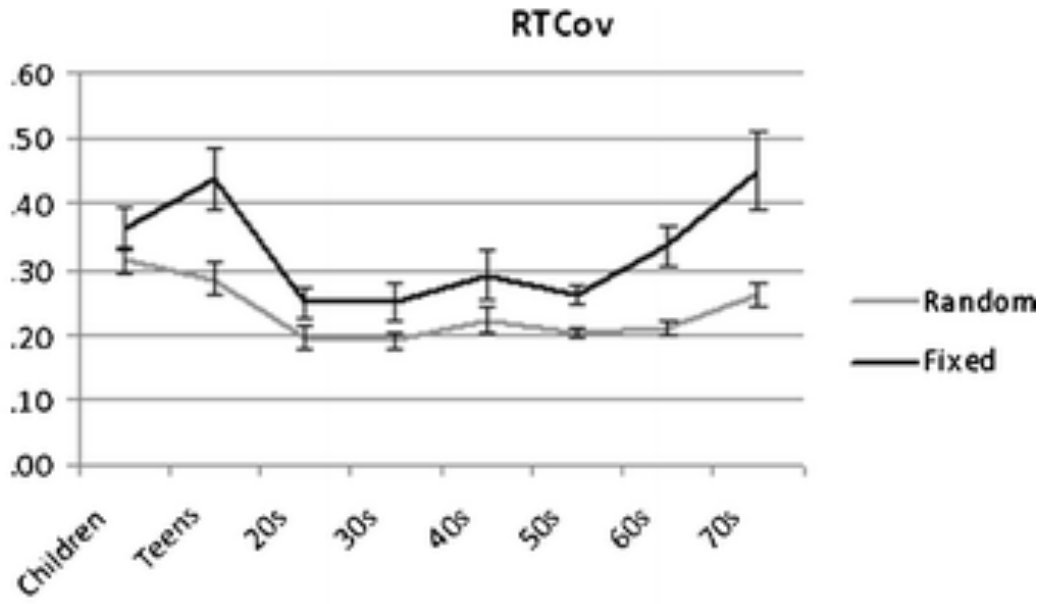
Kas ir uzmanība?

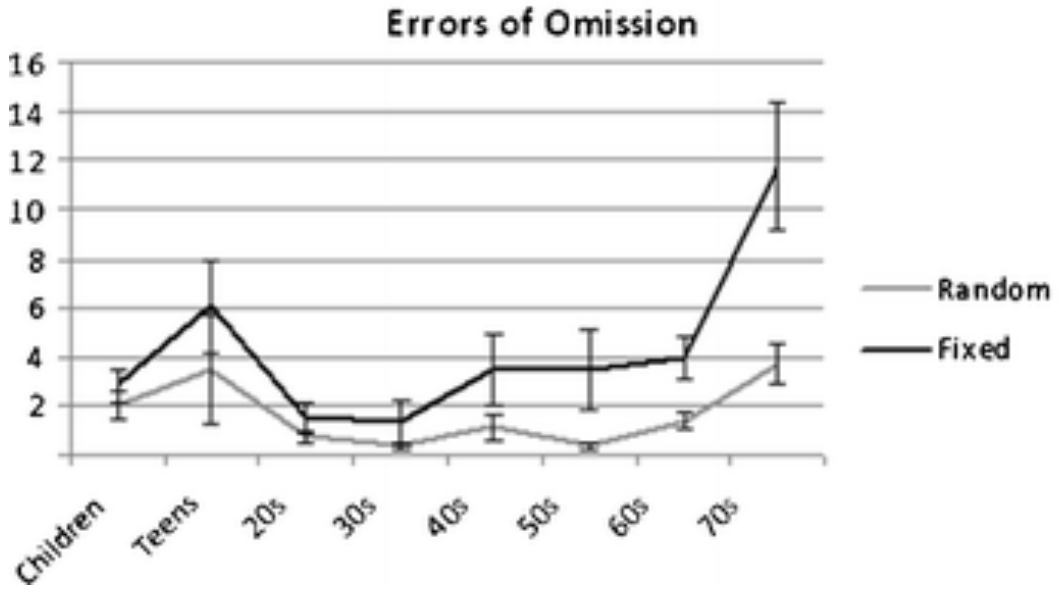
- Uzmanība ir kognitīva saite starp informācijas ierobežotu apjomu, ar ko manipulē psihe, un reāli pieejamu visu informācijas daudzumu, kas atrodas mūsu sajūtās, atmiņā un citos kognitīvajos procesos (Sternberg, 2012).
- Uzmanība nepieciešama, lai varētu mijiedarboties ar vidi un psihe varētu tai adaptēties.
- Uzmanība savieno pagātnes atmiņas ar pašreizējām jeb tagadnes sajūtām, uztveres un domu tēliem, nodrošinot pieredzes nepārtrauktību, kas ir personības identitātes pamats.
- Ar uzmanības palīdzību mēs kontrolējam un plānojam darbības, pamatojoties uz tagadnes un pagātnes informāciju.

Uzmanības funkcijas

- Modrība – gatavība sajust, pamanīt stimulu
- Meklēšana – aktīva, konkrētu stimulu meklēšana
- Selektīvā uzmanība – viena stimula ievērošana, citu ignorēšana
- Dalītā uzmanība – uzmanības resursi sadalīti vairākiem stimuliem





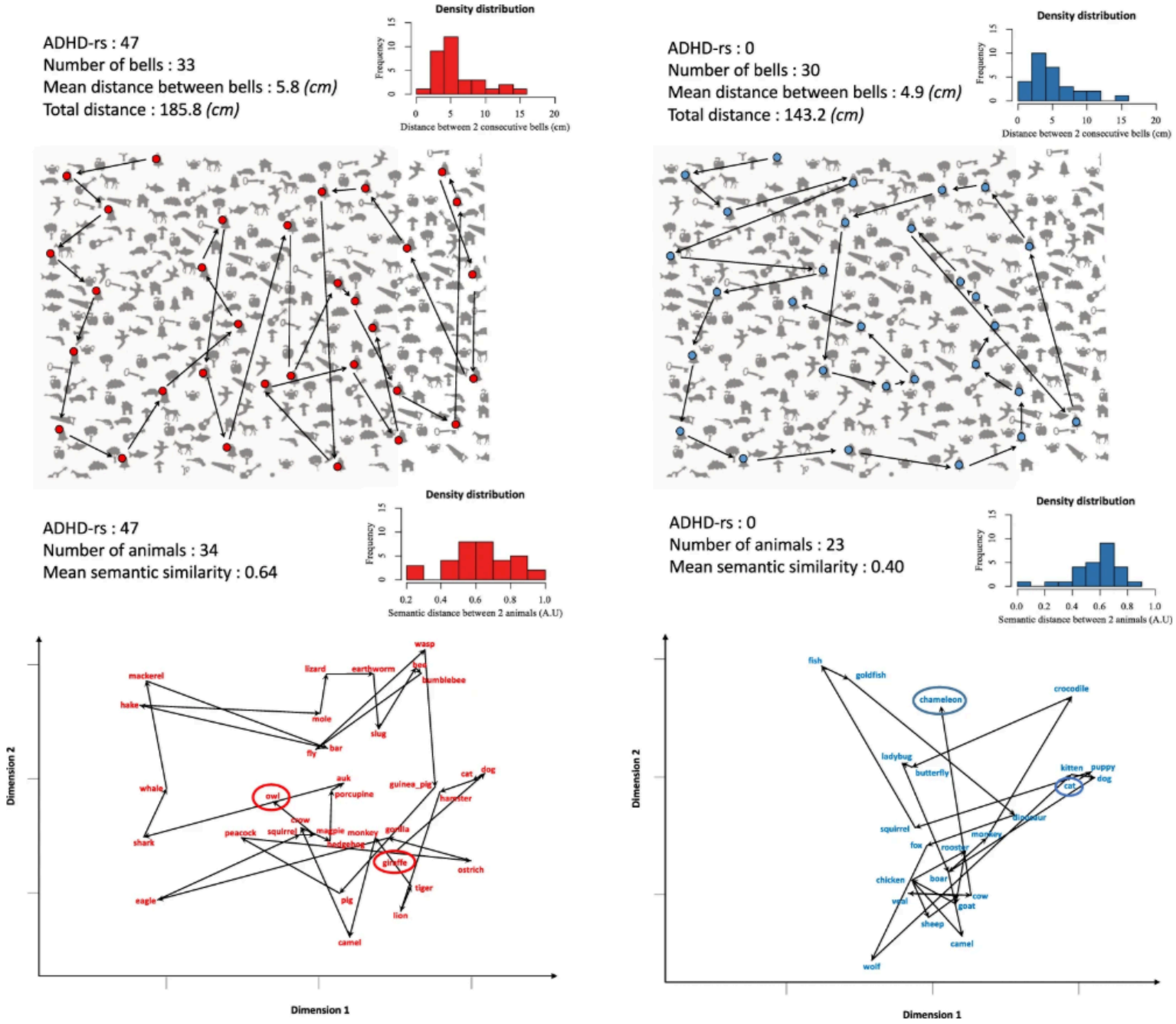


- Labākās uzmanības spējas caurmērā ir vecumā no 20 līdz 50 gadiem.
- Kļūstot vecākam, uzlabojas uzmanības efektivitātes rādītāji.
- Vecāki indivīdi attīsta metakognitīvās stratēģijas.

McAvinue et al., 2012

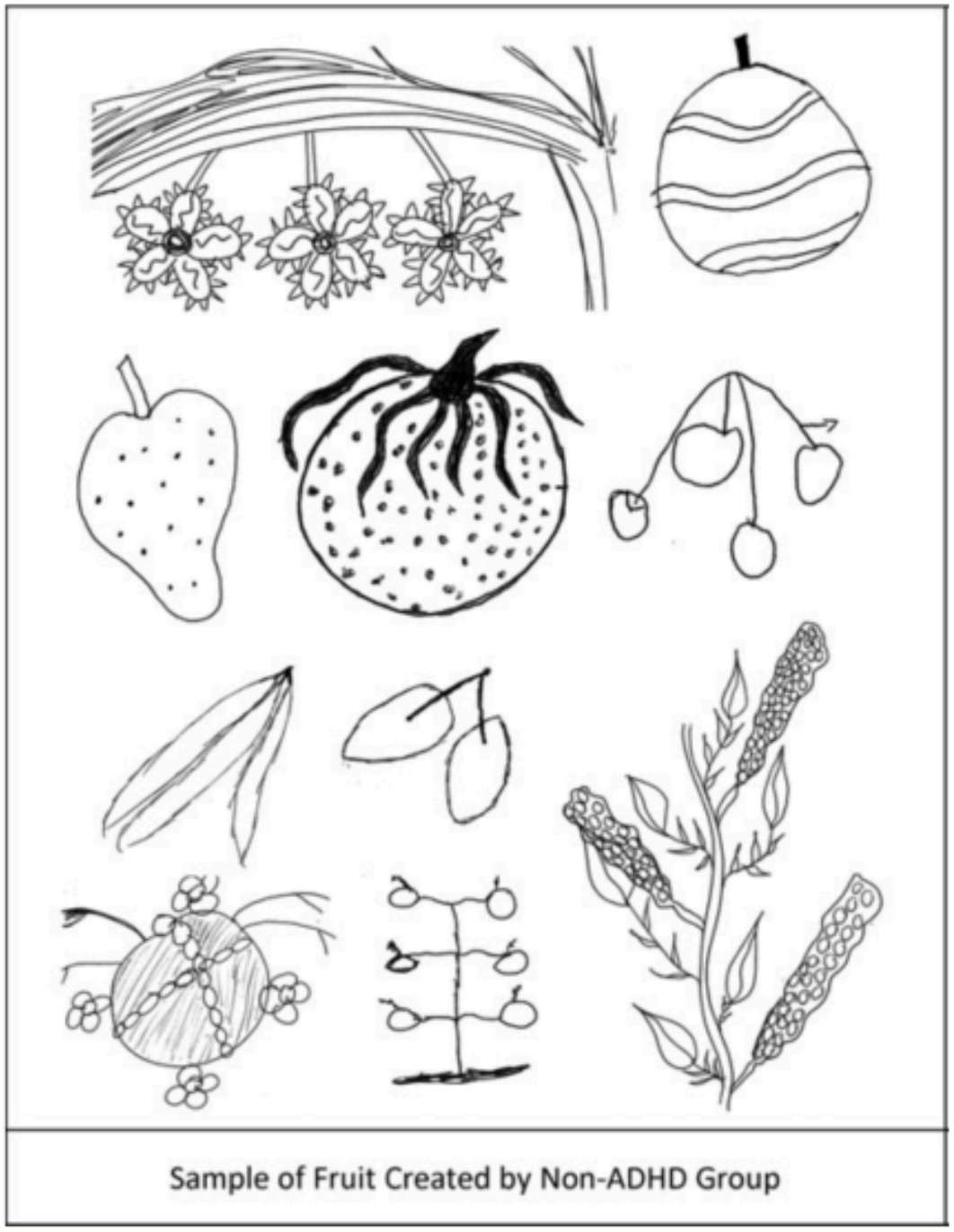

Battery Centre
Battery Centre
ALL
HAVE A
CH3
05/01/2016

From: Lower Attentional Skills predict increased exploratory foraging patterns



Vājākas uzmanības prasmes palielina netipiskas (pētošas) uzvedības darbību iespējas

Van den Driessche, Chevrier, Cleeremans, & Sackur, 2019



Sample of Fruit Created by Non-ADHD Group

White, 2018

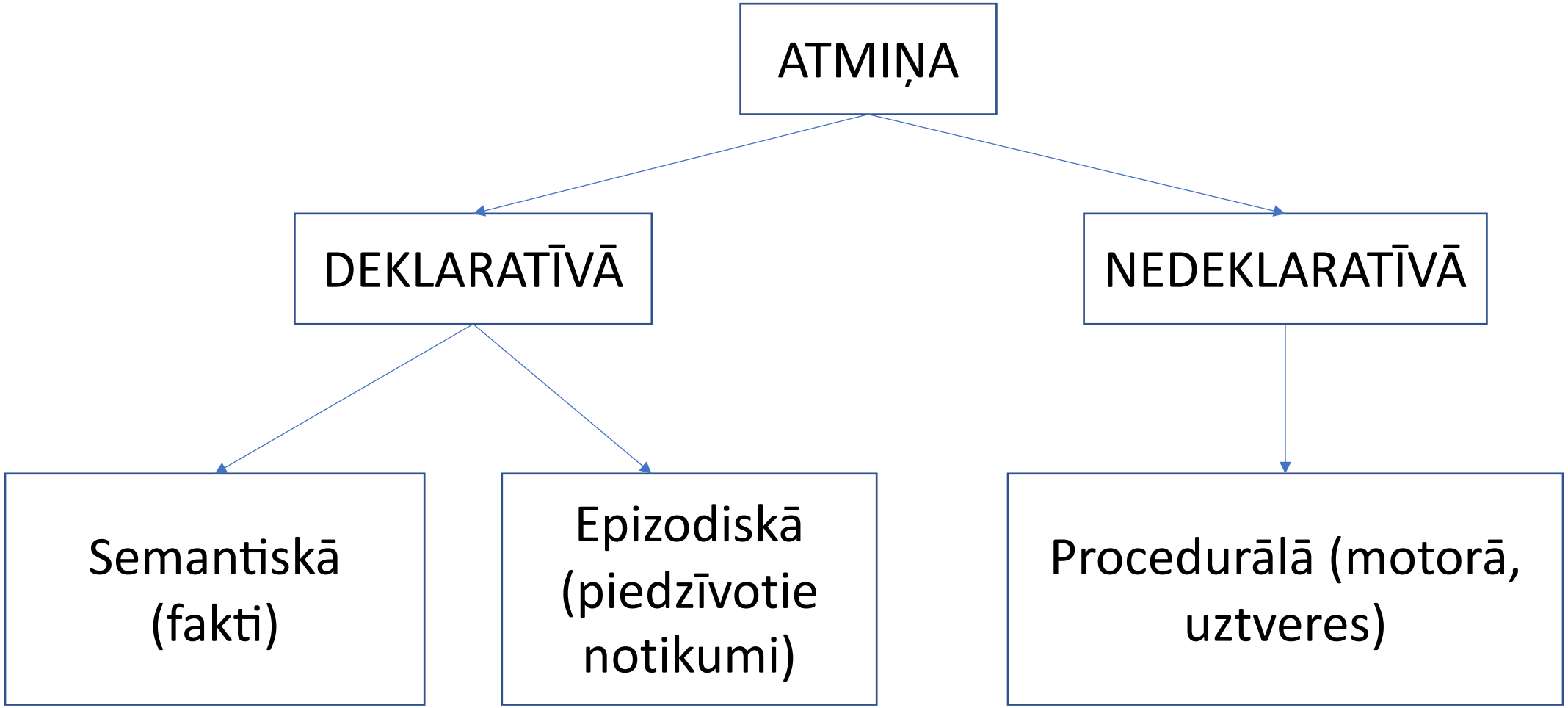
ATMIŅA

Atmiņas fenomens

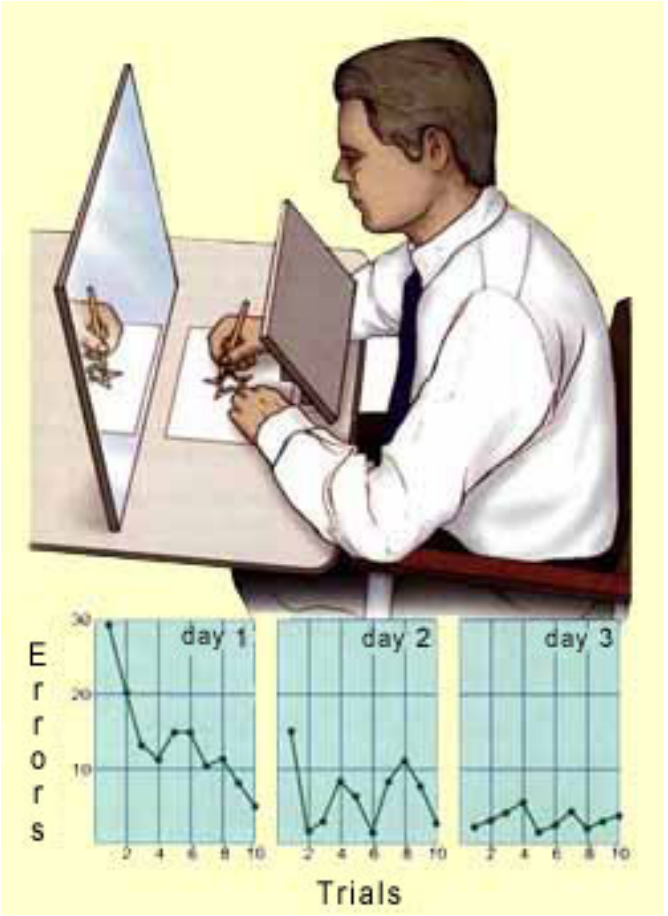
- Atmiņa ir līdzeklis, ar kuru mēs saglabājam un izmantojam iepriekšējo pieredzi, lai šo informāciju izmantotu tagadnē (Tulving, 2000b; Tulving & Craik, 2000).
- Atmiņa kā process ir dinamiski mehānismi, kas saistīti ar iepriekšējās pieredzes saglabāšanu, uzglabāšanu un izgūšanu (Bjorklund, Schneider, & Hernández Blasi, 2003; Crowder, 1976).
- Kognitīvajā psiholoģijā tiek identificētas trīs atmiņas darbības:

  - Iekodēšana – sensorās informācijas iekodēšana mentālās reprezentācijās
  - Uzglabāšana – informācija tiek glabāta atmiņā
  - Izgūšana – uzglabātā informācija tiek izgūta no atmiņas

Atmiņas sistēmu taksonomija



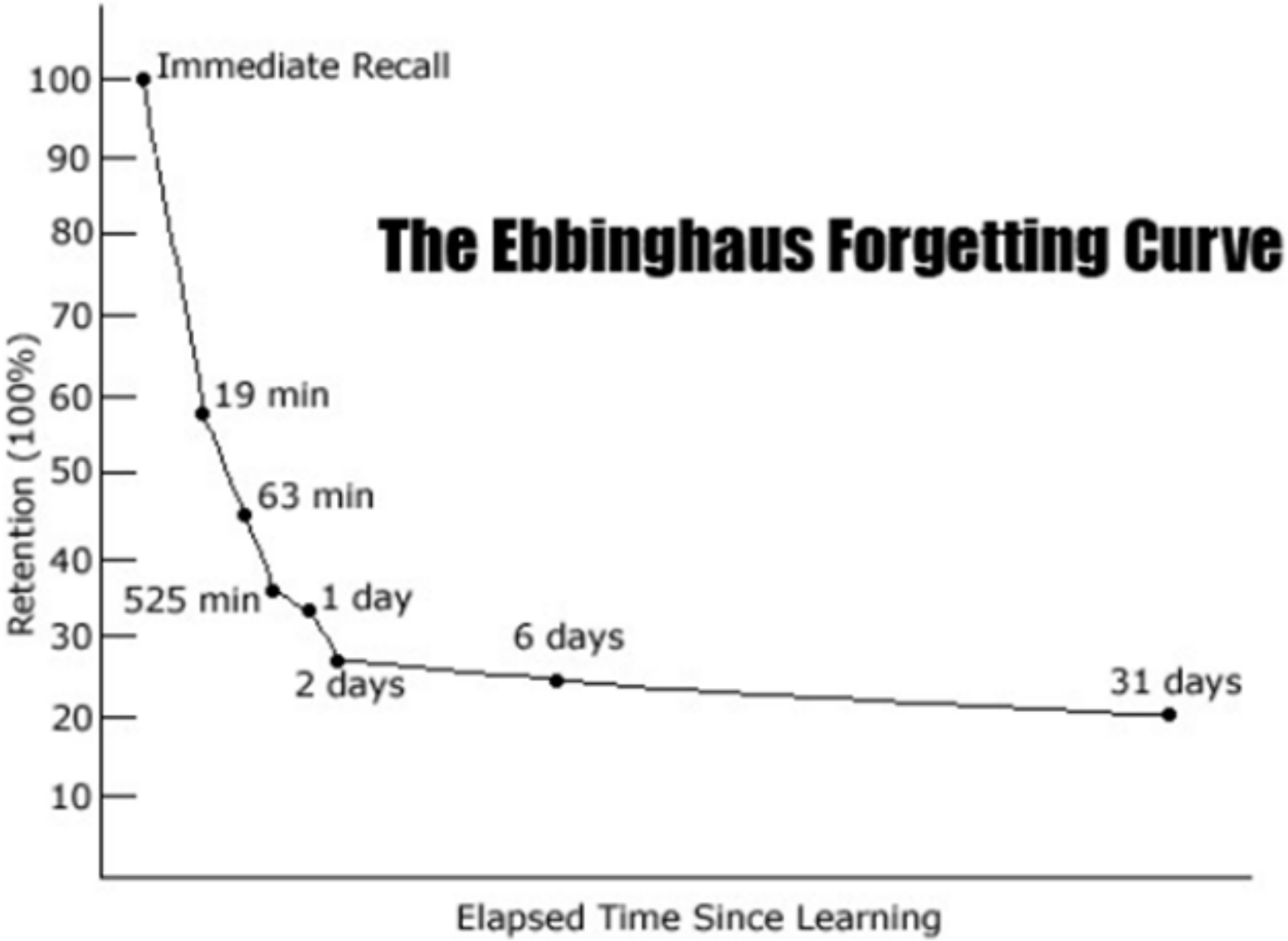
Deklaratīvā vs. procedurālā atmiņa



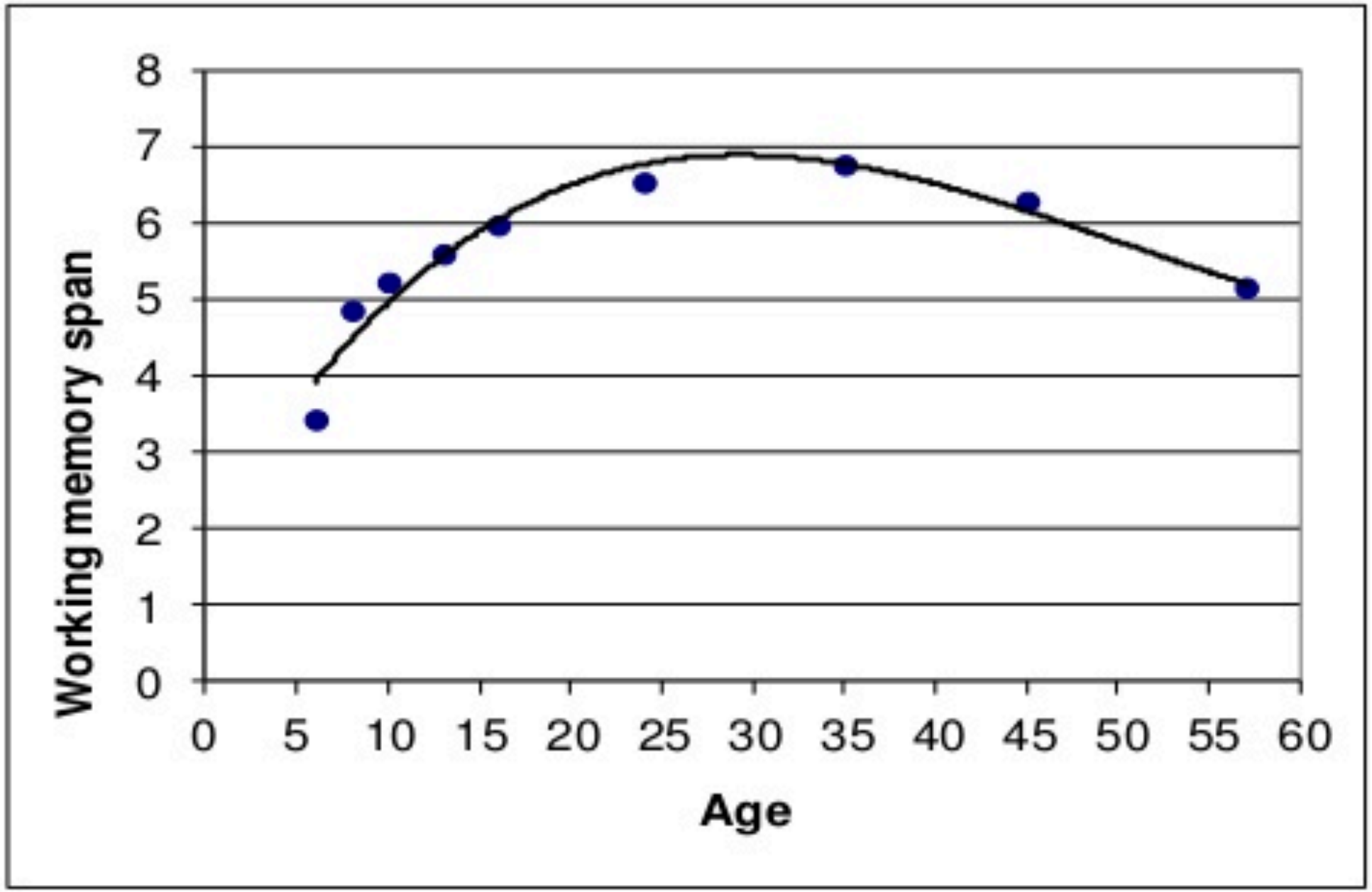
- Henry Gustav Molaison
- http://www.psychologywizard.net/scoville--milner-ao1-ao3.html

Atmiņu **konstruēšana** nevis rekonstruēšana

- Atmiņa ir konstruktīva un iepriekšēja pieredze ietekmē, kā mēs atceramies lietas un ko tieši mēs atceramies (Davis & Loftus, 2007; Grant & Ceci, 2000; Sutton, 2003).
- Viltus atmiņas ir izmainītas vai pilnīgi no jauna izveidotas atmiņas, kas neatbilst cilvēka sākotnēji uztvertajai informācijai (*Loftus*, 2003).
- Liecinieki, pakļauti noteiktu metožu ietekmei, var noticēt, piemēram, tam, ka sarkanā gaisma bija zaļa vai ka laupītājam bija ūsas, kuru patiesībā nebija (Loftus, Pickrell, 1995).



Hermann Ebbinghaus

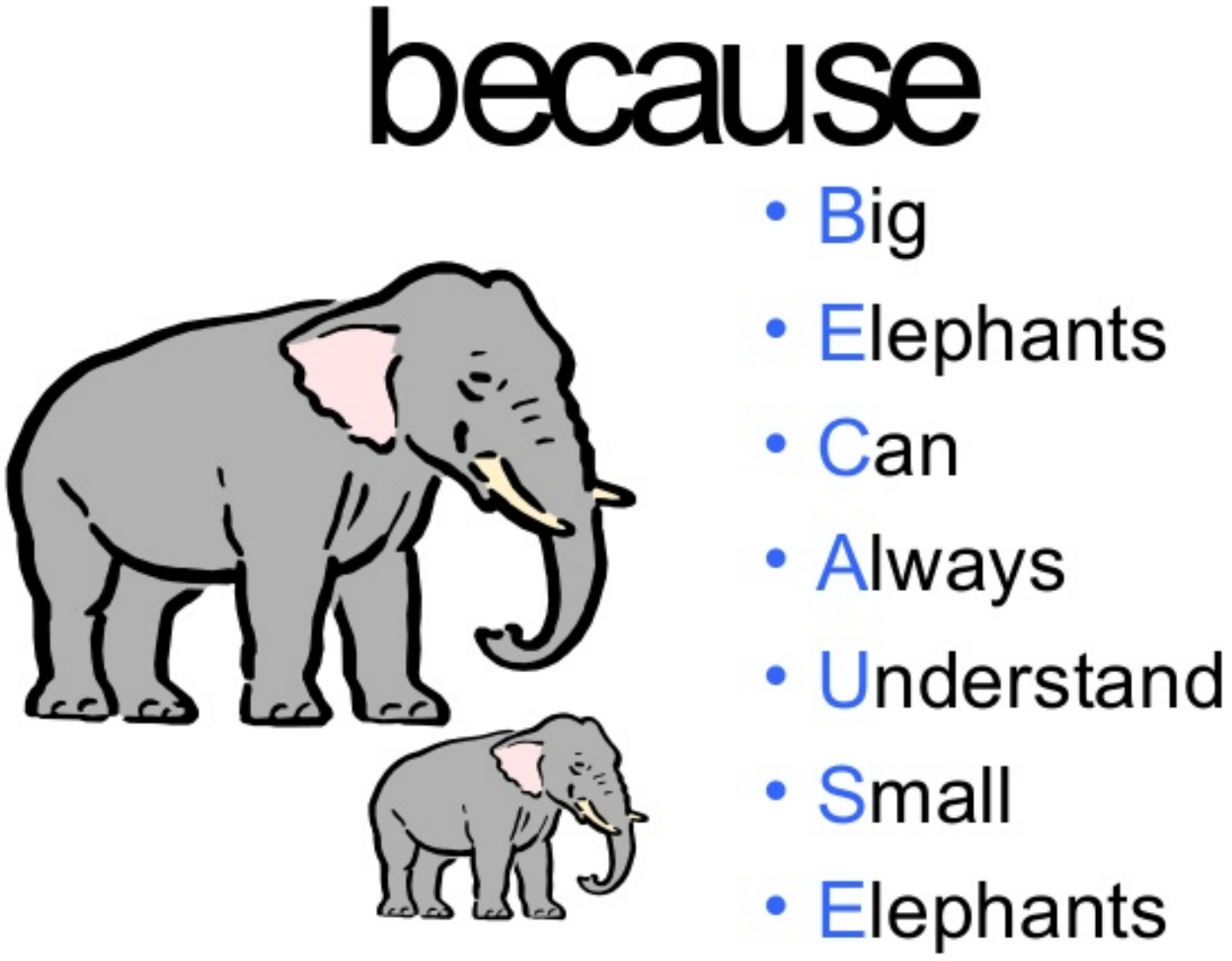


Darba atmiņas ietilpība dzīves garumā

Holmes, 2012

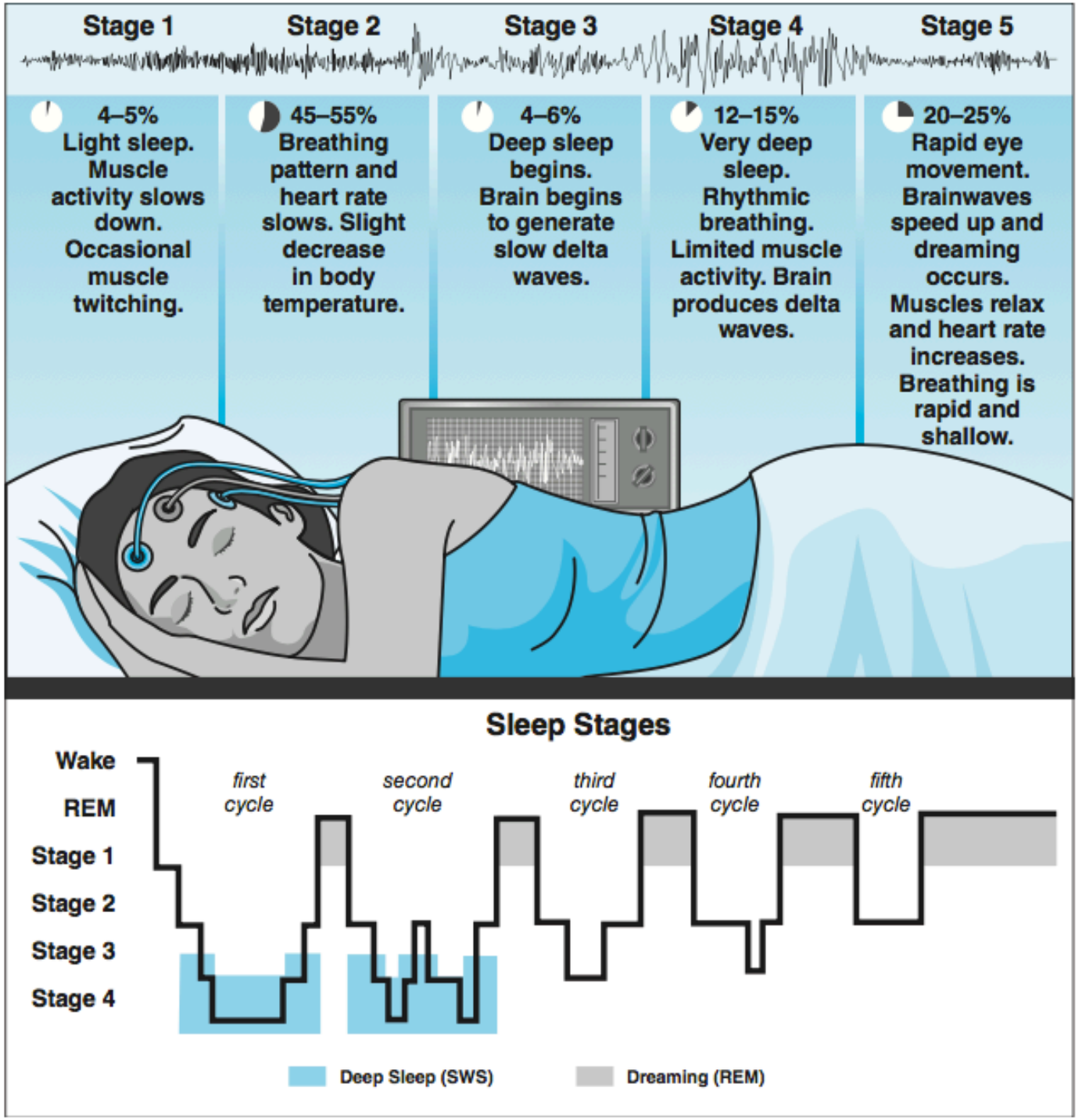
Mnemonika

- Mnemonika ir paņēmienu kopa, kas atvieglina informācijas iegaumēšanu, reproducēšanu, tās strukturizēšanu.



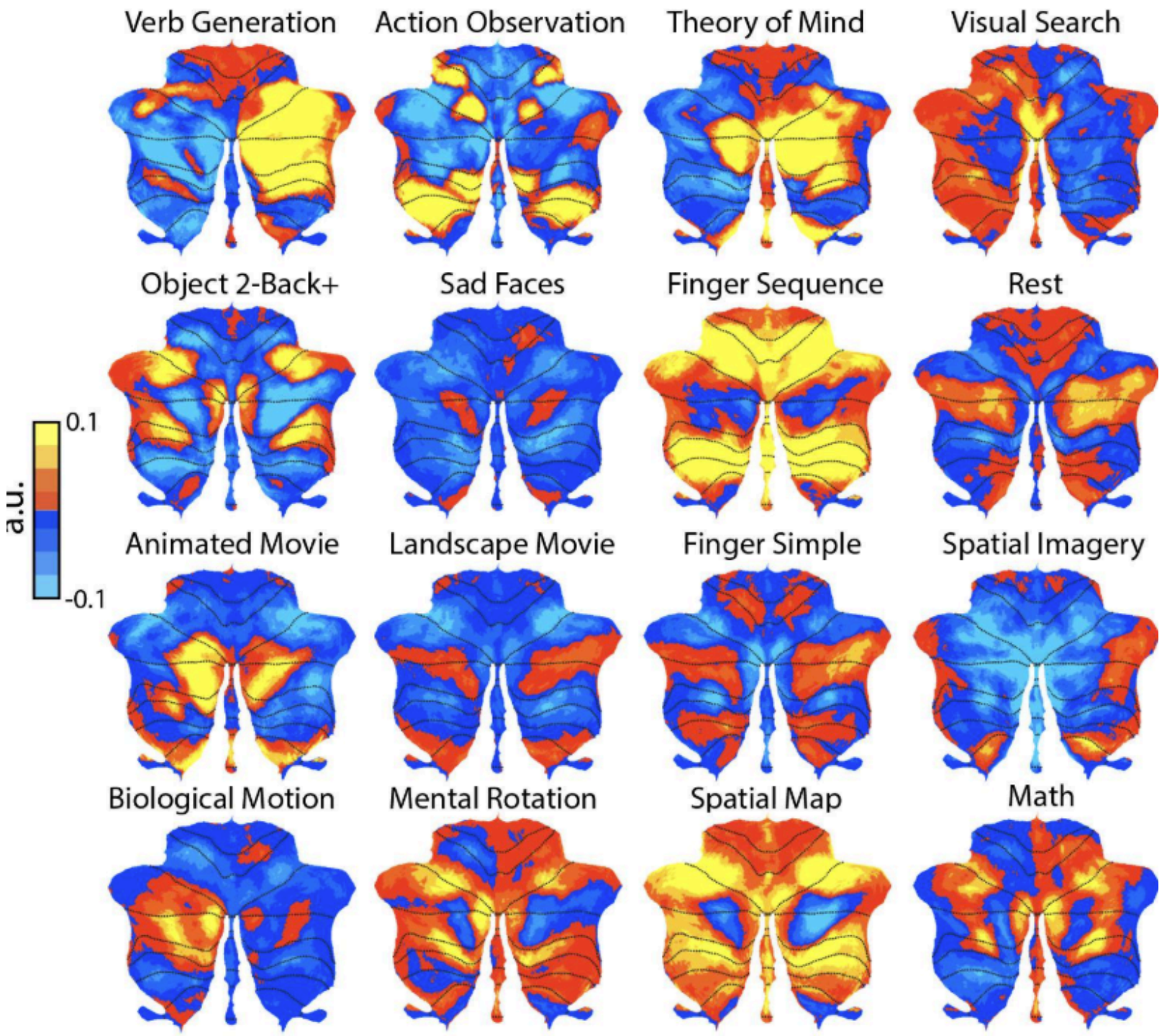
Kas palīdz ilgtermiņa iegaumēšanai?

- Reklāmas ziņojumu izvietojums laikā un telpā tiecas maksimāli nonākt mūsu ilgtermiņa atmiņā (Appleton-Knapp, 2005).
- Informācijas sadalīšana mazākās vienībās, vienmērīga atkārtošana laikā veicinās tās labāku iegaumēšanu (Sternberg, 2012).



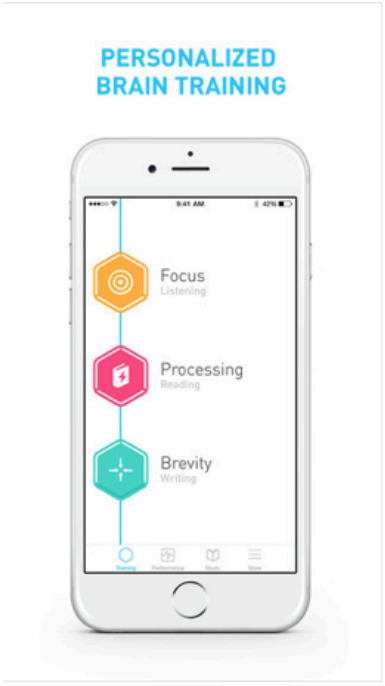
Informācijas iegaumēšana

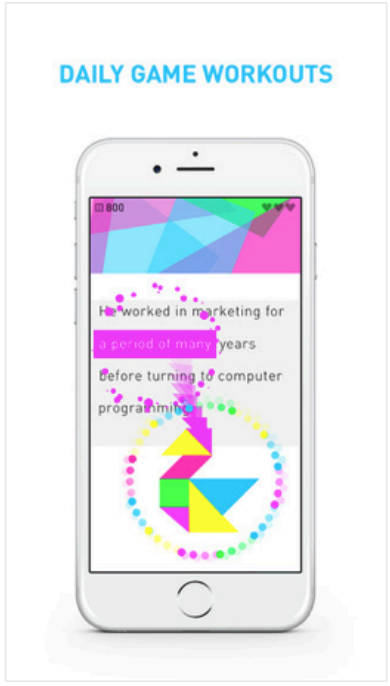
- Kategorizēšana – iepirkumu saraksts (augļi, piena produkti, dārzeņi).
- Interaktīvi attēli – savstarpēji nesaistīti vārdi (šķēres un zeķes).
- Loci metode – atmiņas pils.
- Akronīmu metode – pirmais burts veido kādu vārdu ar citiem pirmajiem burtiem.
- Atslēgas vārdu sistēma.

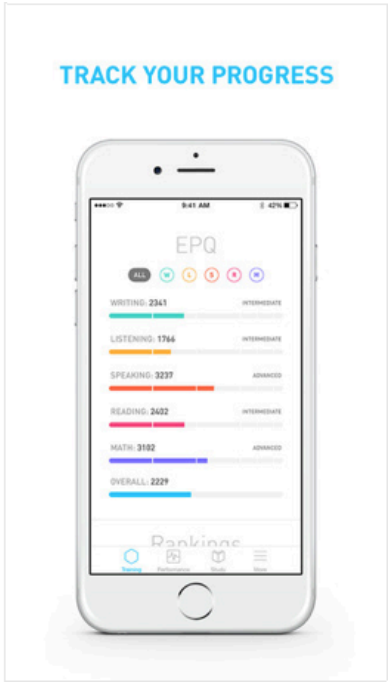


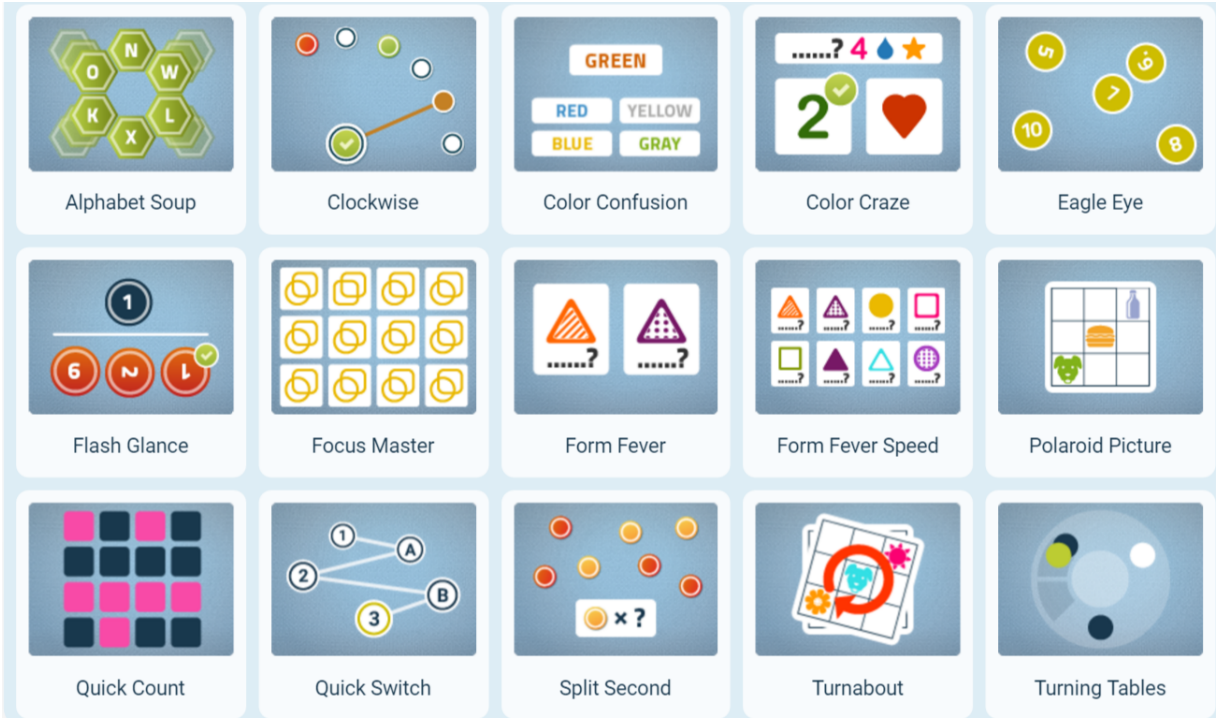
King, Hernandez-Castillo, Poldrack, Ivry, & Diedrichsen, 2018

Vai prātu var trenēt?


PERSONALIZED
BRAIN TRAINING
Focus
Listening
Processing
Reading
Brevity
Writing


DAILY GAME WORKOUTS
He worked in marketing for
a period of many years
before turning to computer
programming


TRACK YOUR PROGRESS
EPQ
Rankings


Alphabet Soup
Clockwise
GREEN
RED
YELLOW
BLUE
GRAY
Color Confusion
Color Craze
Eagle Eye
Flash Glance
Focus Master
Form Fever
Form Fever Speed
Polaroid Picture
Quick Count
Quick Switch
Split Second
Turnabout
Turning Tables

Curr Dir Psychol Sci. 2017 Dec;26(6):515-520. doi: 10.1177/0963721417712760. Epub 2017 Oct 25.

Does Far Transfer Exist? Negative Evidence From Chess, Music, and Working Memory Training.

Sala G[1], Gobet F[1].

5 metaanalīžu rezultāti

Table 1. Results of the Three Meta-Analyses of the Experimental Studies

Training	Overall	Cognitive	Academic
Chess	0.34 [0.24, 0.44]	Overall: 0.33 [0.13, 0.53]	Mathematics: 0.38 [0.23, 0.53] Literacy: 0.25 [0.13, 0.37]
Music	0.16 [0.09, 0.22]	Intelligence (fluid/full-scale): 0.35 [0.21, 0.49] Memory: 0.34 [0.20, 0.48] Phonological processing: 0.17 [0.04, 0.29] Spatial cognition: 0.14 [–0.06, 0.34]	Mathematics: 0.17 [–0.02, 0.36] Literacy: –0.07 [–0.23, 0.09]
Working memory	0.12 [0.06, 0.18]	Fluid intelligence: 0.11 [–0.02, 0.24] Cognitive control: 0.09 [–0.08, 0.26]	Mathematics: 0.20 [0.03, 0.36] Literacy: 0.11 [0.00, 0.22]

Note: Results are presented as overall differences in standard deviations between treatment and control groups. The 95% confidence intervals are shown in brackets.

Lumosity to Pay $2 Million to Settle FTC Deceptive Advertising Charges for Its "Brain Training" Program

Company Claimed Program Would Sharpen Performance in Everyday Life and Protect Against Cognitive Decline

FOR RELEASE

January 5, 2016

TAGS: Bureau of Consumer Protection | Consumer Protection | Advertising and Marketing | Health Claims | Online Advertising and Marketing

The creators and marketers of the Lumosity "brain training" program have agreed to settle Federal Trade Commission charges alleging that they deceived consumers with unfounded claims that Lumosity games can help users perform better at work and in school, and reduce or delay cognitive impairment associated with age and other serious health conditions.

As part of the settlement, Lumos Labs, the company behind Lumosity, will pay $2 million in redress and will notify subscribers of the FTC action and provide them with an easy way to cancel their auto-renewal to avoid future billing.

"Lumosity preyed on consumers' fears about age-related cognitive decline, suggesting their games could stave off memory loss, dementia, and even Alzheimer's disease," said Jessica Rich, Director of the FTC's Bureau of Consumer Protection. "But Lumosity simply did not have the science to back up its ads."

Līdzi ņemšanai

- Kognitīvie procesi ir konstruējoši, prognostiski
- Kognitīvos procesus var (un vajag) trenēt tajās nodarbēs, kurās jāuzlabo sniegums
- Kognitīvo procesu novecošana ir neizbēgama, taču to iespējams palēlināt ar veselīgu, aktīvu dzīvesveidu
- Kļūdas kognitīvos procesos ir dabiska parādība, nepieciešams attīstīt metakognīciju

Jautājumi?

Paldies par uzmanību!

edmunds.vanags@lu.lv

LU **OPEN** MINDED

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