

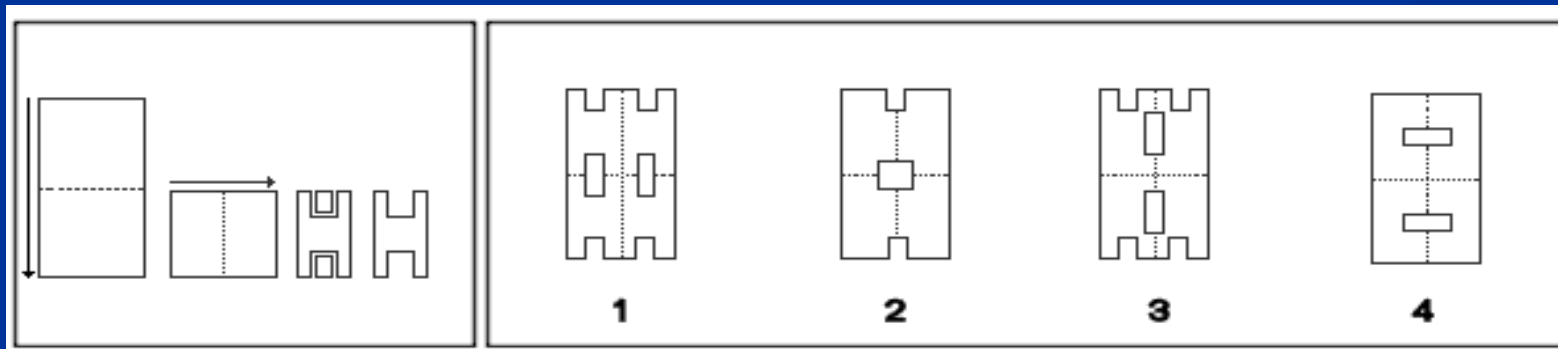
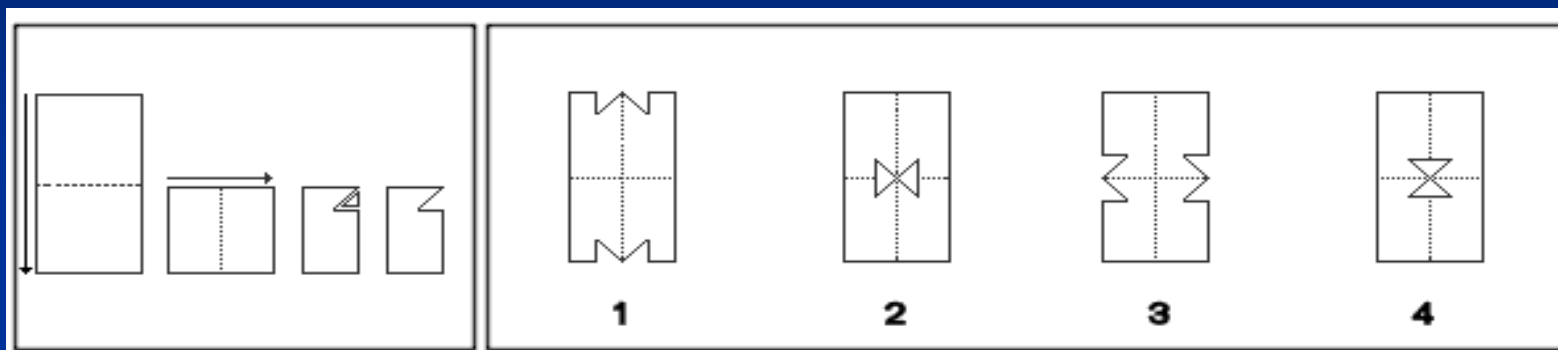
Skrivnost "Mozartovega efekta"

Katarina Habe in Norbert Jaušovec
Filozofska fakulteta Maribor

55

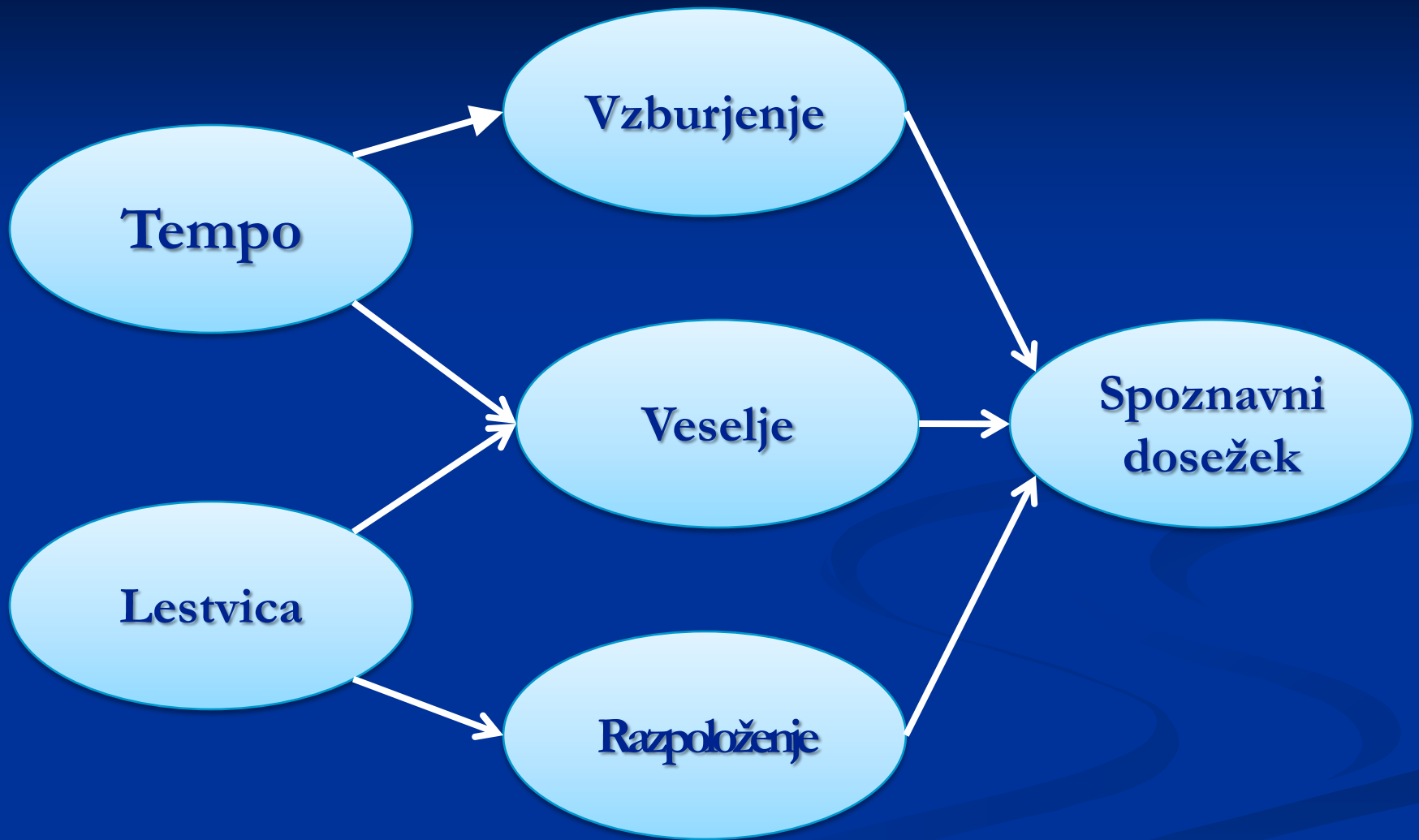
The image shows a musical score for piano, measures 55 to 60. The score is written for two staves, treble and bass clef, in G major (one sharp). The key signature is G major. The time signature is not explicitly shown but appears to be 4/4. The music features a complex rhythmic pattern with many sixteenth notes. Fingerings are indicated by numbers 1-3. There are also some dynamic markings like 'f' and 'p'. The score is divided into two systems by a bar line. The first system contains measures 55-58, and the second system contains measures 59-60. The notation includes various note values, rests, and articulation marks.

Poslušanje Mozartove sonate K. 448 povzroči, da posamezniki bolje rešujejo spodnje probleme:

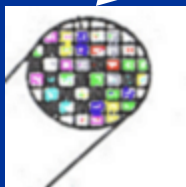
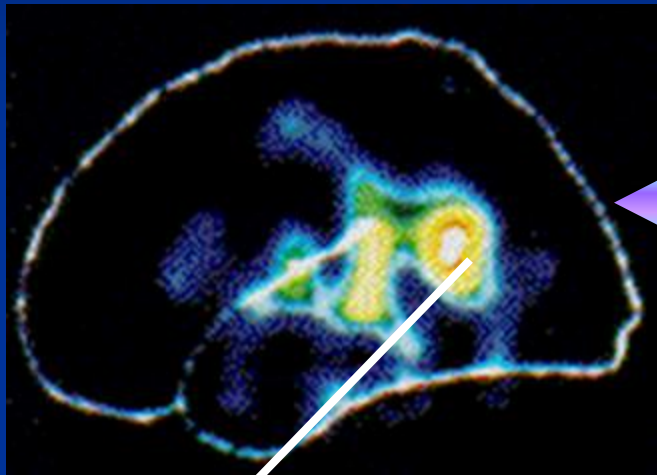


Zakaj?

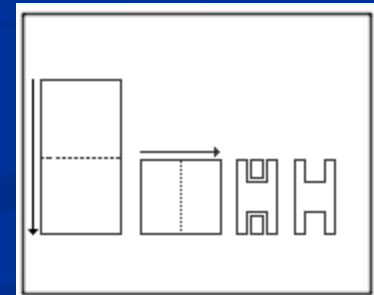
Razlaga razpoloženje-vzburjenje



Razlaga transfera



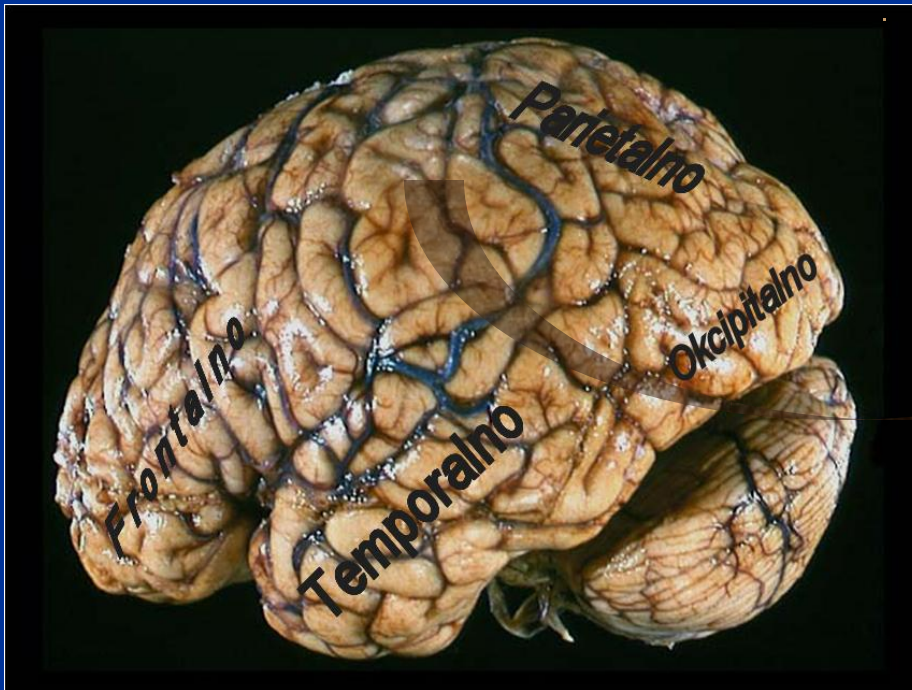
Vzorec neuralne aktivacije, ki spodbudi reševanje prostorsko časovnih nalog



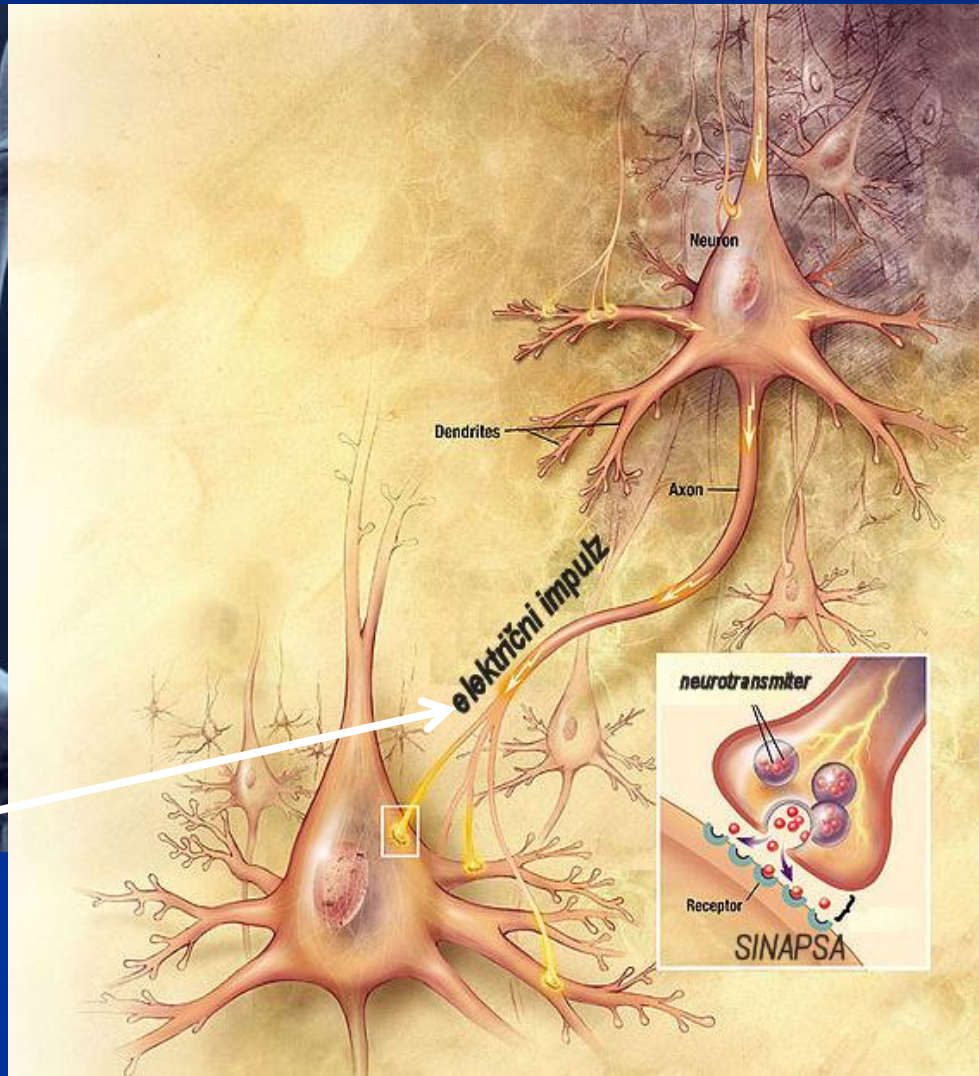
Nekaj podatkov:

- 1130 cc ženske; 1260 cc moški;
- Teža 1.5 kg, porabi 20% kisika;
- Dve hemisferi, 50 Brodmanovih arealov; modularni kolumni s premerom 20-50 μm – minikolumen in makrokolumen s premerom 0.5-3 mm.
- Kolumni vsebujejo 10^3 do 10^4 nevronov.
- V korteksu je okoli 10^{10} neuronov z okoli 10^{14} sinapsami.

- Če bi stanja neokorteksa ponazorili v binarni obliki (0/1), potem je na nivoju Brodmanovih arealov 10^{32} stanj in na nivoju makrokolumnov kar 10^{3162} stanj – dokaj kompleksno..... Število elektronov, ki jih lahko stisnemo v nam znano vesolje je 10^{120} .



Aktivnost – kognicija – izmenjava informacij med neuroni



Lahko izmerimo z EEG

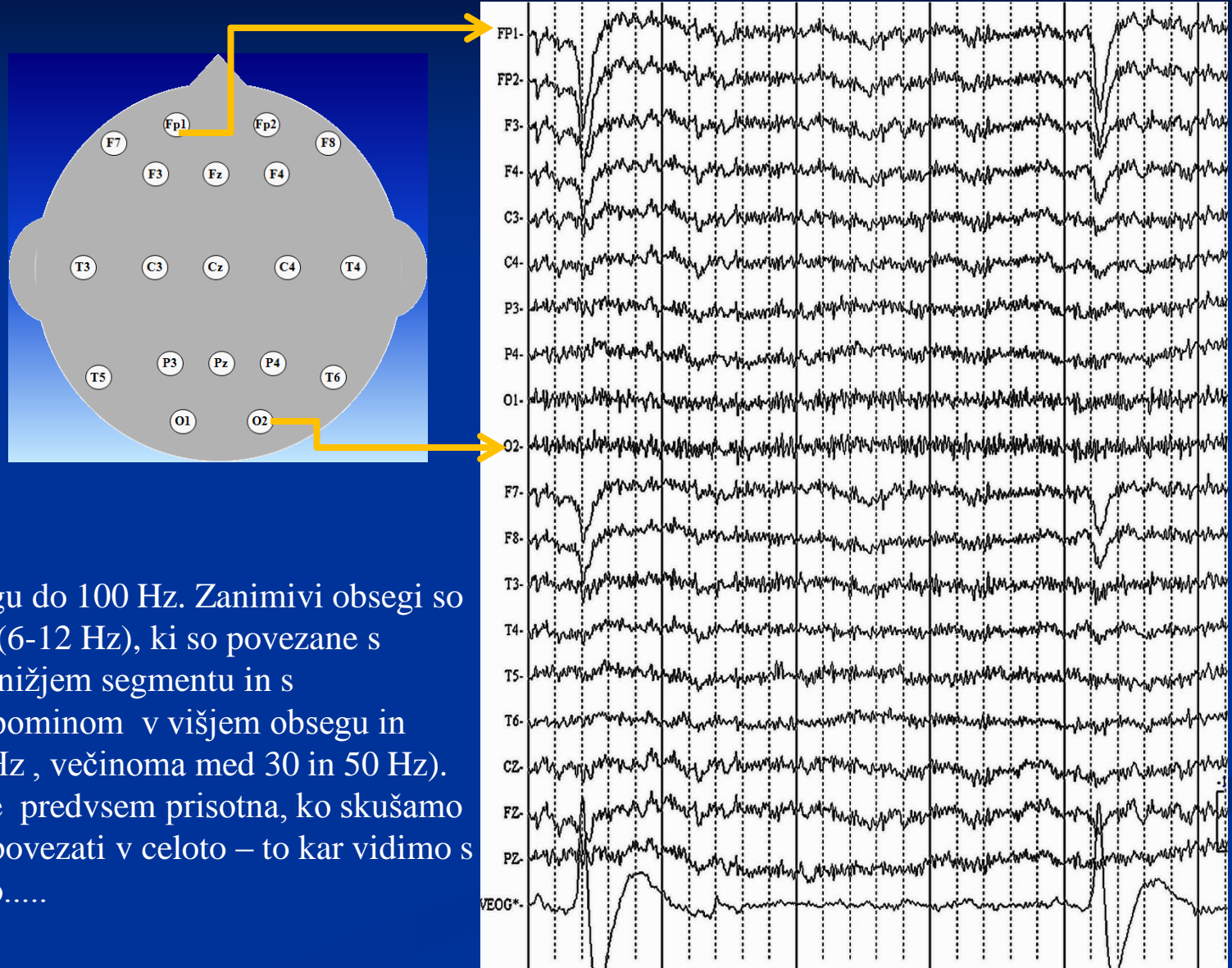
EEG - elektroencefalogram



Primer EEG snemanja
med meditacijo

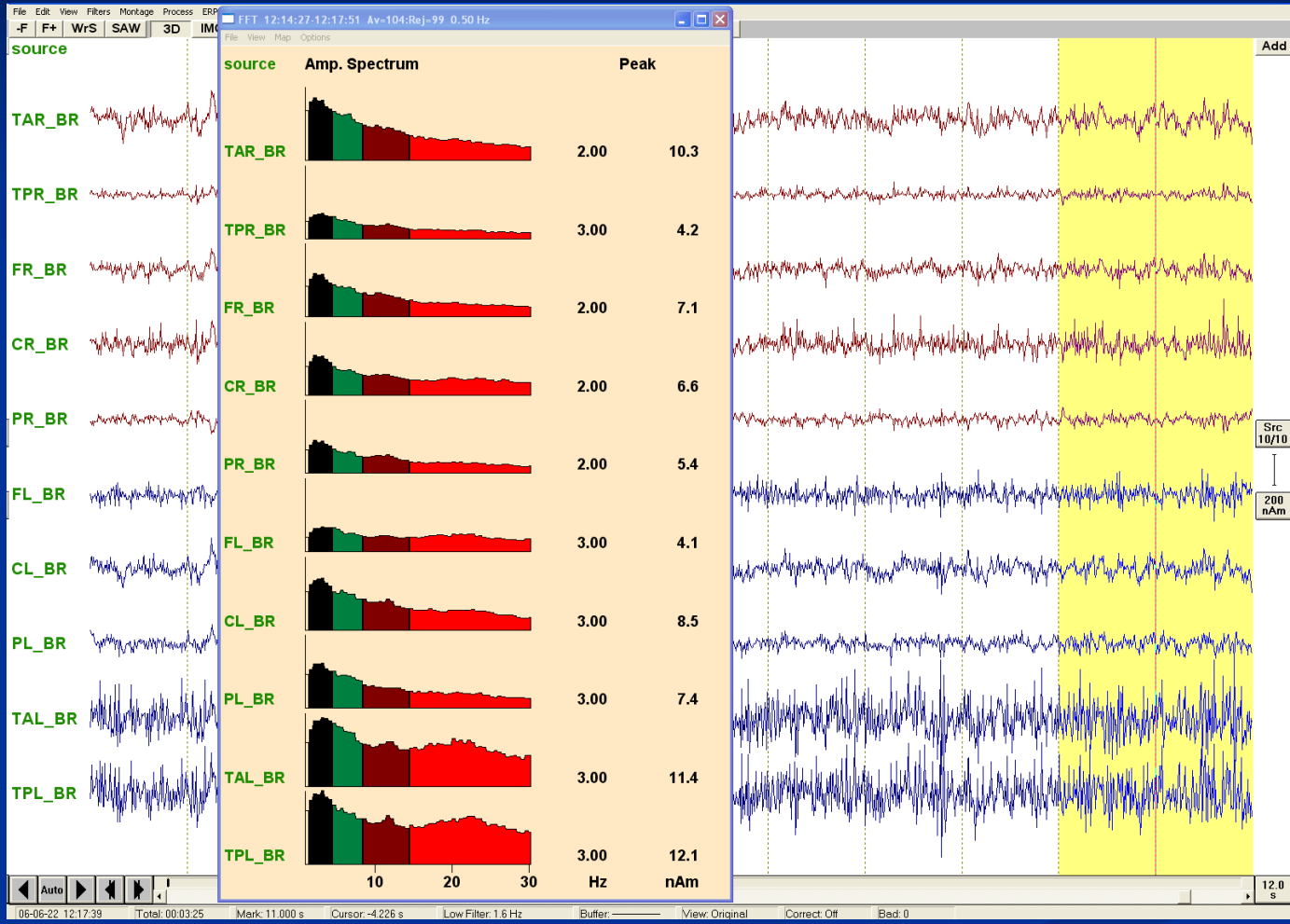


Primer 19 kanalne EEG meritve



EEG je v obsegu do 100 Hz. Zanimivi obsegi so alfa frekvence (6-12 Hz), ki so povezane s pozornostjo v nižjem segmentu in s semantičnim spominom v višjem obsegu in gama (30-100Hz, večinoma med 30 in 50 Hz). Ta frekvenca je predvsem prisotna, ko skušamo neko zaznavo povezati v celoto – to kar vidimo s tem kar slišimo.....

FFT analiza



Analiza izvora npr.: LORETA

File Edit 2D View 3D View Montage Options Help

'Edit' montage

avr com rfr a10 csd ears

Channel	Reference
TAL_BR	
TPL_BR	
FL_BR	
CL_BR	
PL_BR	
FpM_BR	
FM_BR	
CM_BR	
EO_BR	
OptM_BR	
FR_BR	
CR_BR	
PR_BR	
TAR_BR	
TPR_BR	
Fp1	F7
F7	T7
T7	P7
P7	O1
Fp1	F3
F3	C3
C3	P3
P3	O1
Fp2	F2
F2	C2
C2	P2
P2	O2
Fp2	F4
F4	C4
C4	P4
P4	O2
Fp2	F8
F8	T8
T8	P8
P8	O2

Sag

Cor

A P R L

3D




Tra

R L

set reference

The screenshot displays the LORETA software interface. On the left, the 'Edit' montage window shows a top-down view of a 10-20 electrode system with red circular electrodes connected by lines. Below it is a 'set reference' button. The top toolbar contains various icons for file operations and viewing. The central panel is a table mapping channel names to reference points. On the right, four brain views are shown: Sagittal (Sag), Coronal (Cor), 3D, and Transverse (Tra). Each view has red crosshairs indicating electrode positions. The 3D view shows a yellow head model with electrode locations. The Coronal and Transverse views are labeled with 'R' (Right) and 'L' (Left) sides.

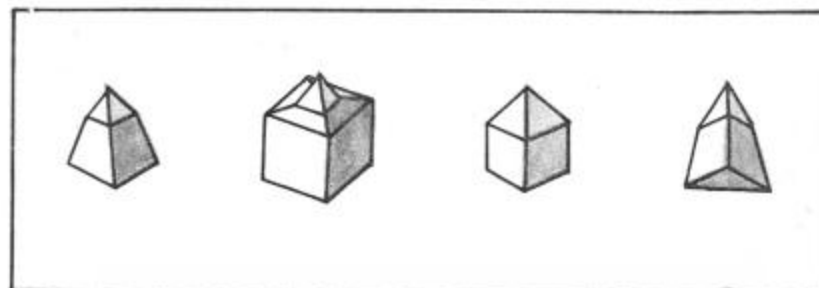
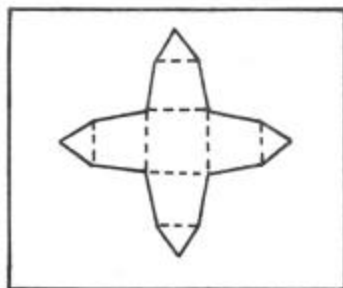
Kaj smo ugotovili ?

<i>Eksperiment 1</i>	Mozartova sonata K. 448 	Brahms Madžarski ples št. 5 	Haydnova simfonija 92 
Razpoloženje	2	1	3
Kompleksnost	2	1	3
Tempo	2	1	3

- Mozartova glasba zveča pozornost – desinhronizacija spodnji $\alpha 1$
- Mozartova glasba poveča povezovanje delov v celoto – zvečana koherentnost v γ obsegu

Eksperiment 2

Mozart



Tišina

$$3/1 = 6/?$$

2

4

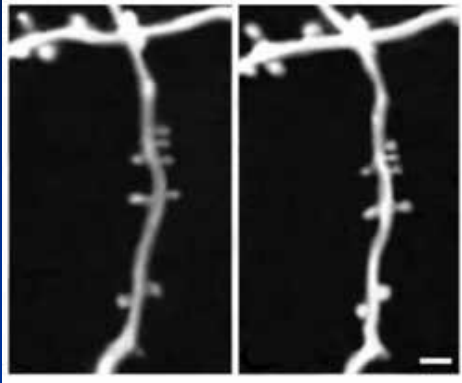
6

8

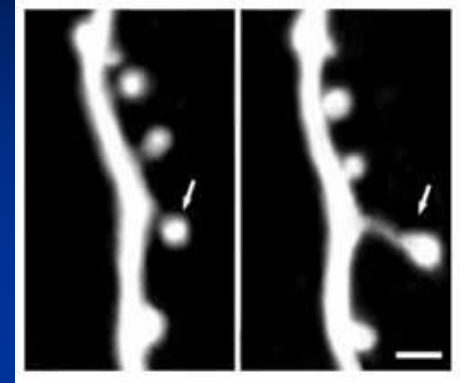
- Ugoden vpliv glasbe le na reševanje spacialnih nalog.
- Glasba poveča aktivnost v γ obsegu.
- Desinhronizacija v $\alpha 2$ obsegu prisotna samo pri reševanju računskih nalog .

Učenje in glasba

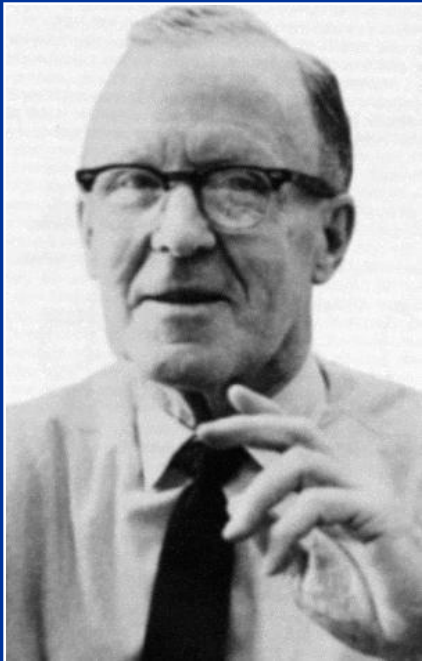
Mikroskopski posneteki neurona miši:



3 dni



1 mesec



Donald Hebb:

*Učenje kot ojačanje
sinaptične
prevodnosti*



Merljive spremembe v možganih kot odraz okoljskih vplivov

- Velikost in teža korteksa
- Neurokemija
- Velikost neuronskih celic
- Neuronska struktura
- Več sinaps
- Več neuronov

Eksperiment 3

Pred učenjem

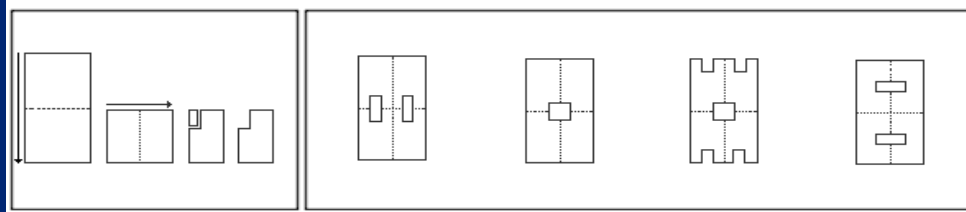
Učenje

Konsolidacija

Mozart

Vprašanje

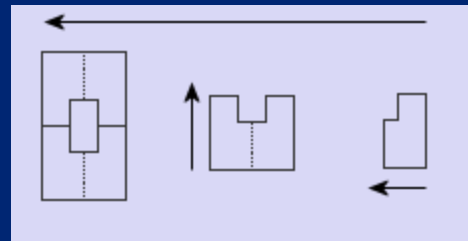
Mozart



Prikaz principa oblikovanja odgovora

Brahms

Brahms



Tišina

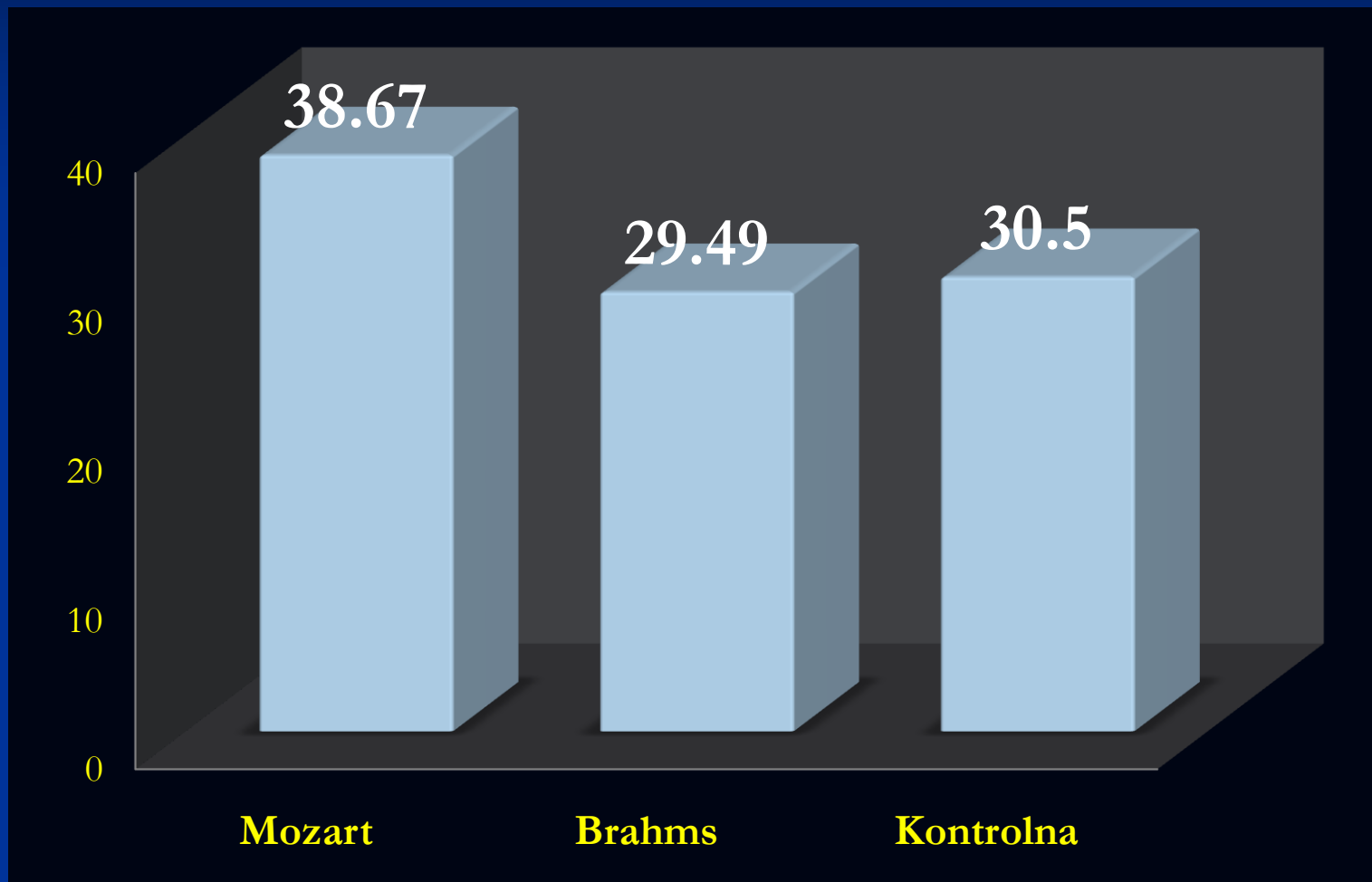
Posplošitev:

Tišina

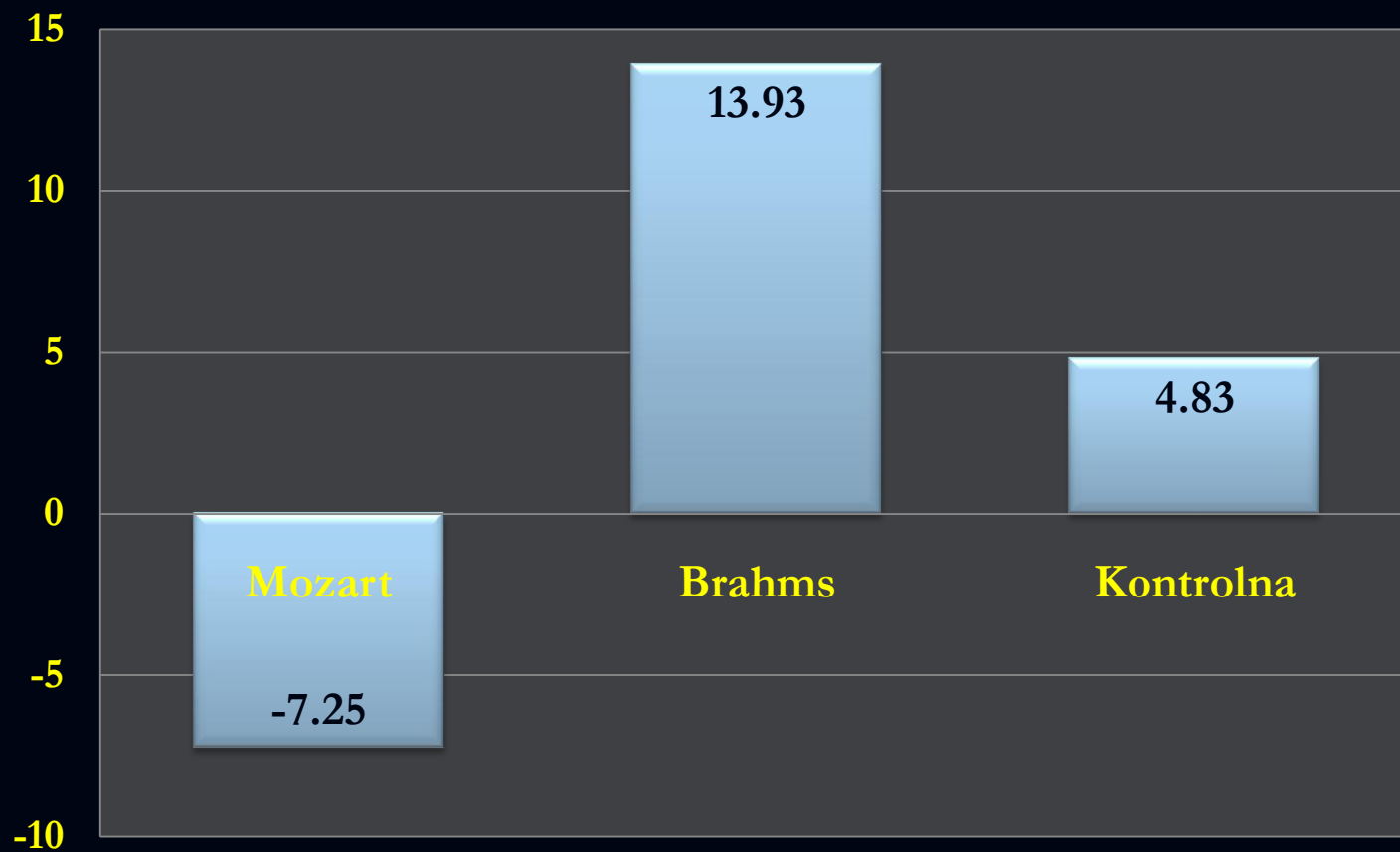
Rešujemo od konca k začetku po korakih

Rezultati:

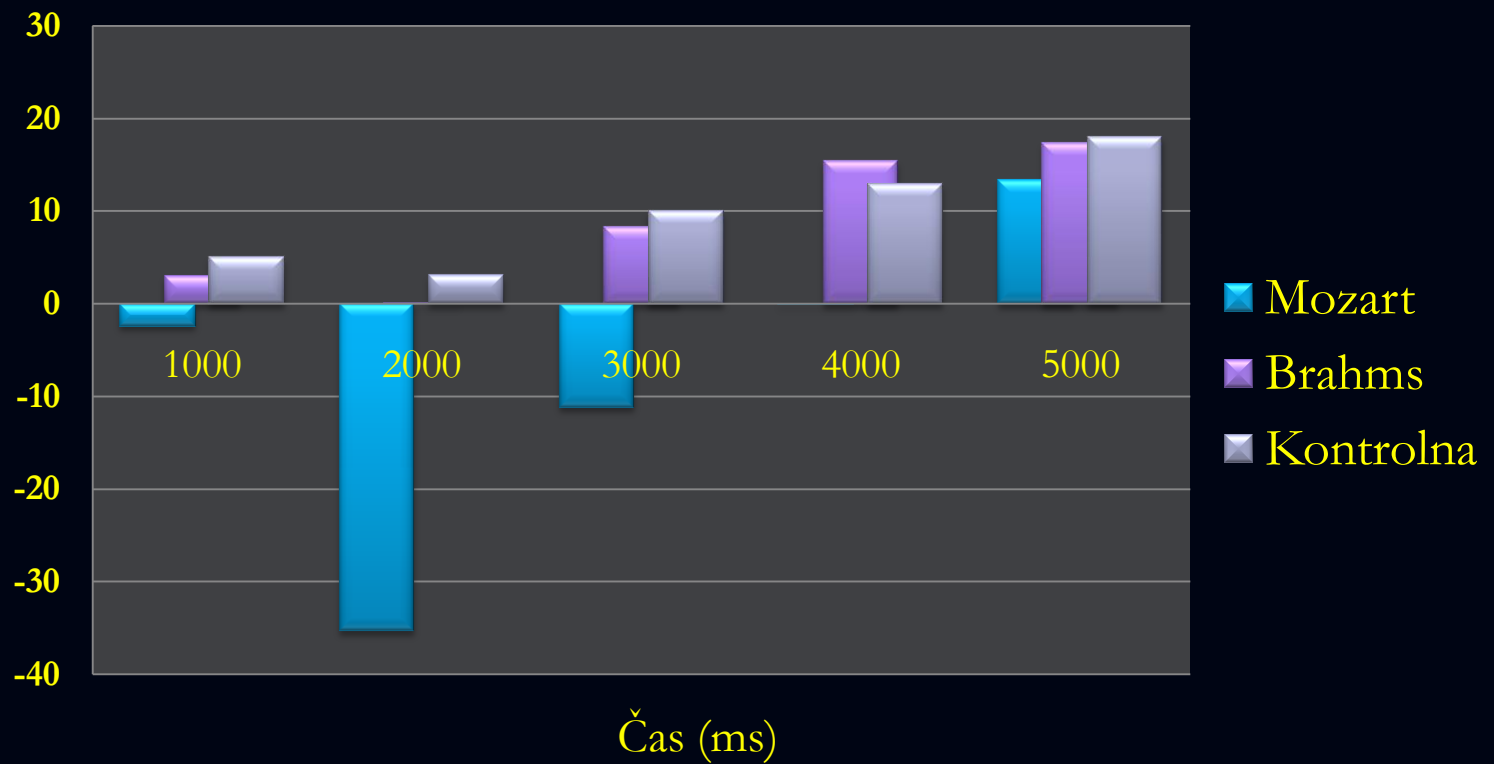
Dosežek na testu spacialne rotacije



ERD/ERS v spodnjem $\alpha 1$ obsegu



ERD/ERS v zgornjem α obsegu

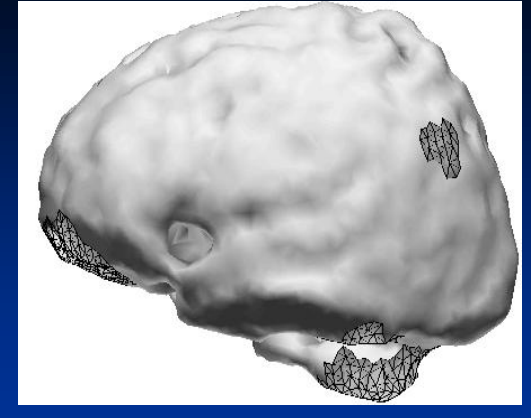
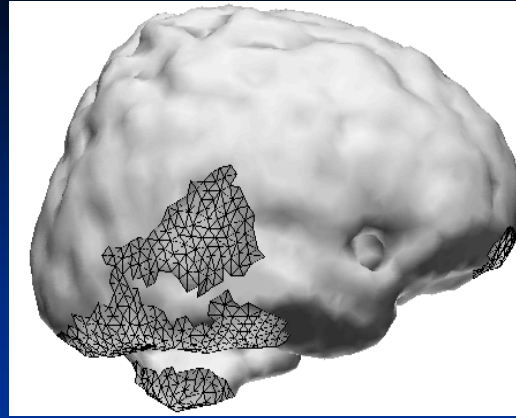
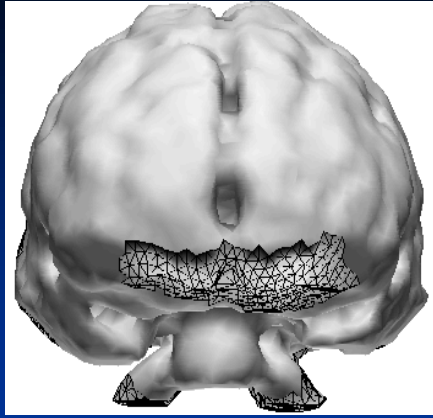


FRONTAL NO

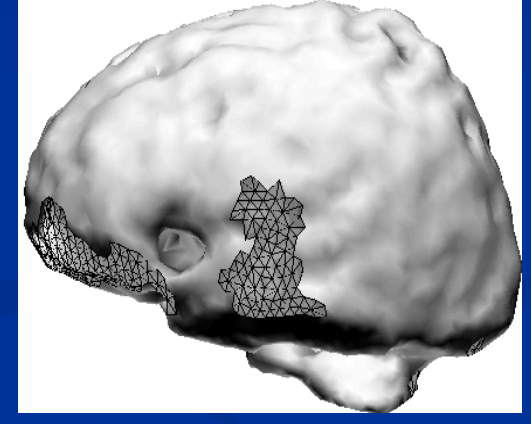
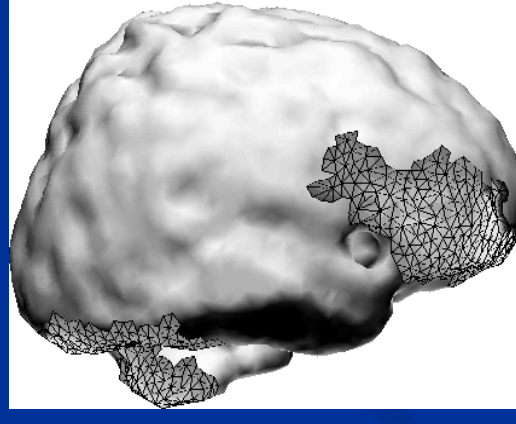
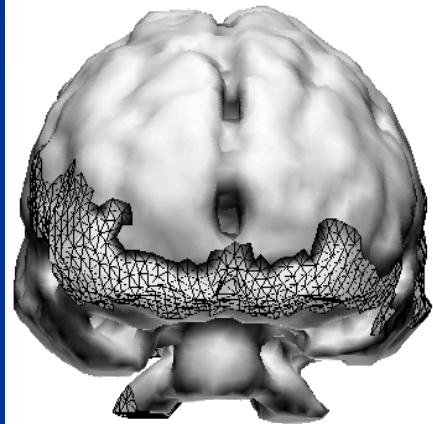
DESNO

LEVO

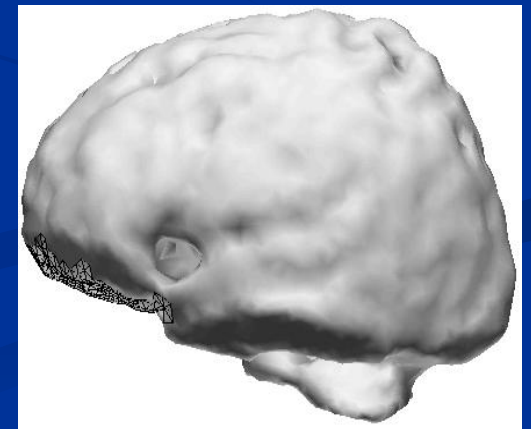
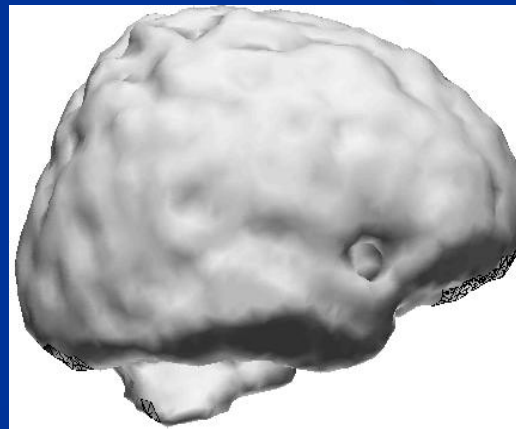
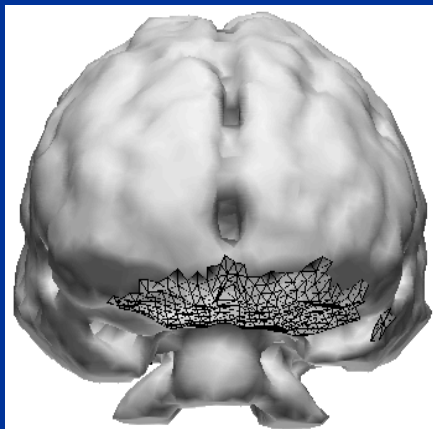
Mozart



Brahms



**Kon-
trol-
na
skupina**



KONEC

