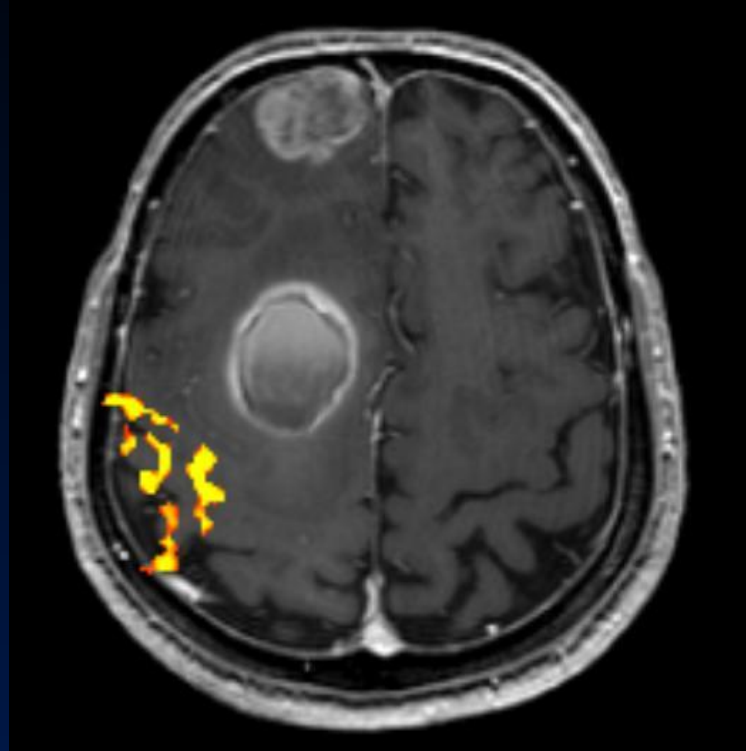


Functional MRI



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In this PowerPoint we will discuss:

- The Functional MRI concept
- The fMRI Examination



The Brain is made of

Switches



Wires



Motors



The Switch aka the Neuron

- Neurons are highly metabolic structures and have great oxygen demands.
- The neuron's metabolic activity can be visualized in a few ways with imaging.
 - PET
 - Perfusion Imaging
 - Functional MRI (fMRI)
 - Magnetoencephalography (MEG)



FMRI

- When we start thinking, the neuron uses more oxygen and demands more blood.
- FMRI is based on the difference in signal caused by the local increase in blood flow.
- The MRI scanner can measure this signal difference and create an image.



What to expect

- Most fMRI exams have 3 parts.
 1. Anatomic imaging – you remain still
 2. Motor Evaluation – you move according to the instructions given by the technologist.
 3. Language Evaluation – you remain still, but think about the words and letters on the screen according to the instructions.



The fMRI Examination

- You will see a large LCD monitor through a system of mirrors while you are in the magnet.
- Instructions and tasks will be displayed on this screen.
- If you wear prescription glasses, please know your prescription (we have MRI safe lenses), or wear contacts.

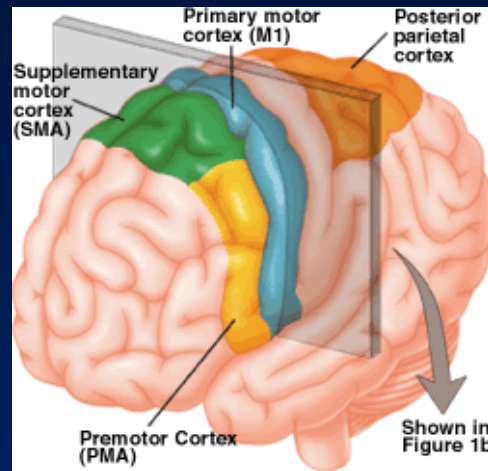


LCD in the Magnet Room



Motor Evaluation

- Each task is designed to isolate muscle groups.
 - Most commonly we use
 - Finger tapping
 - Toe tapping
- The tasks are used to show the motor cortex (Blue area).



Finger Tapping

Finger Tapping Instruction Screen

Finger Tapping

When you see:



Rest

When you see:



Tap your fingers

Keep your eyes open the whole time.

Keep the rest of your body still.



Finger Tapping Video



Finger Tapping Practice

(Slides will automatically change after 5 seconds)



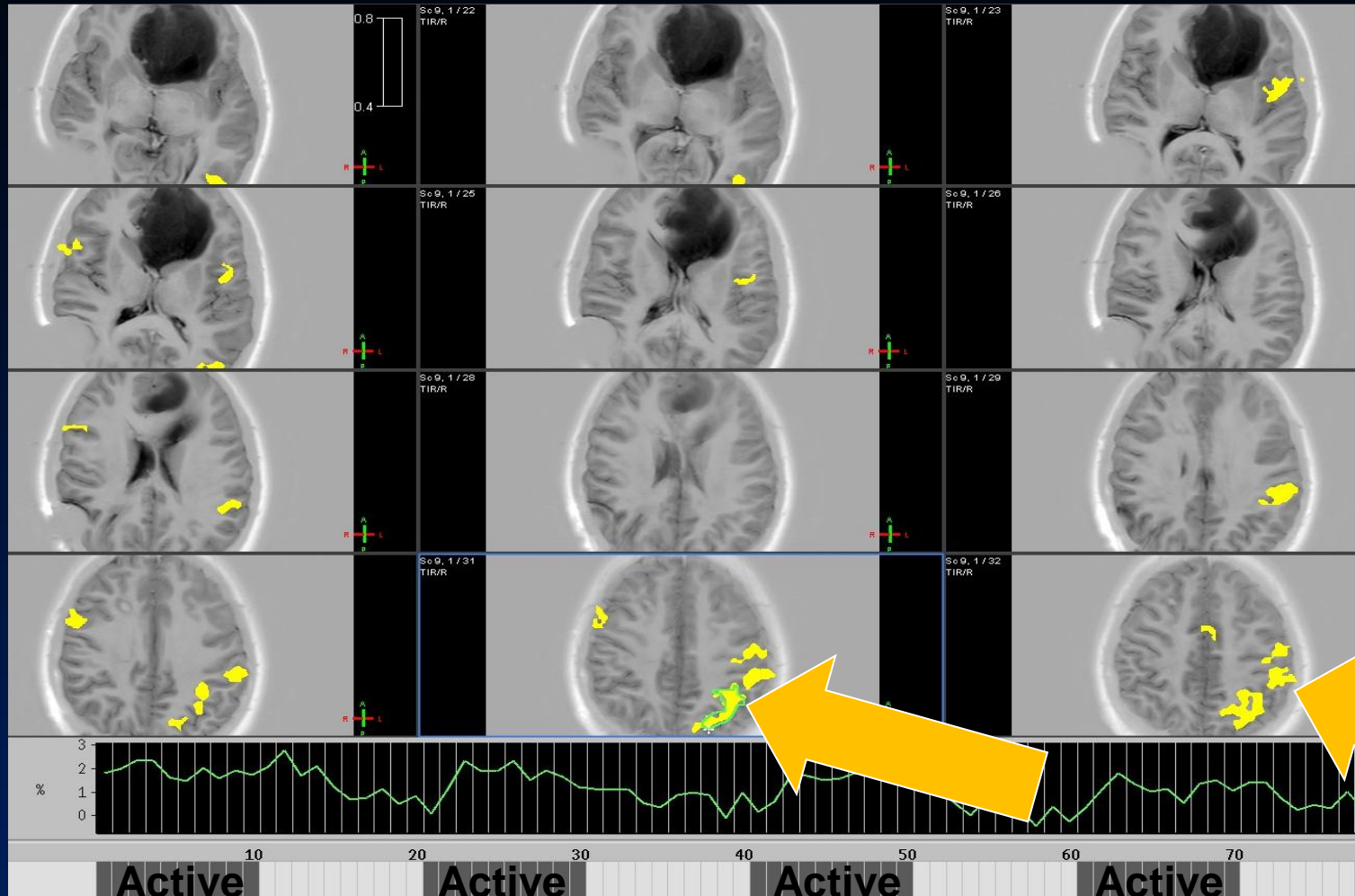






The Image Result

Yellow areas show the motor cortex.



Language Evaluation

- Language tests are designed to test two components of language.
 1. Word Generation
 2. Comprehension
- Most right handed individuals are left dominant meaning that the left half of the brain has the language areas. Some people are bilateral, and some are right sided.



Word Generation (Broca's Area) Tasks:

– Word generation:

- You will see letters. When you see a letter think of a word that starts with that letter. Do not say the word outloud. When you see a “+” symbol, stop thinking of words and relax.

– Verb Generation:

- You will see a noun. When you see a noun think of a verb that is associated with that noun. Do not say the word outloud. When you see a “+” symbol, stop thinking of words and relax.



Word Generation Practice

Get Ready. The letters come fast...

- Slides automatically advance every 3 seconds.





C



S



G

Verb Generation Instructions:

Verb Generate Task

When you see ##### just rest:
do not think at any word or sentence.

When you see a noun (an object word):
think of a verb (action word) that you can associate with it.

Examples:

<u>See</u>		<u>Think</u>
Clothes	→	Wash
Cards	→	Play
Horse	→	Ride

Think the words silently to yourself do not say them out loud.
Do not move your mouth or your lips

Try to keep still.

Verb Generation Practice

Get Ready. The letters come fast...

- Slides automatically advance every 3 seconds.



Ball



Apple



Car

Comprehension Testing

- You will see a sentence with a blank.
- Think of the word that completes the sentence.
- You will also see nonsense sentences.
- Just look at the sentences and relax.



Sentence Completion Instructions:

Sentence Completion Task

- Rest but keep your eyes open when you see a series of nonsense letters.

Example: Fkoniwe kasd iepaw akd ____dfe.

- If you see an English sentence, read it to yourself and think of a word that fits into the blank.

Example: Young cats are called _____.

- Don't speak out loud, don't move your mouth or lips.

Try to keep still.



Sentence Completion Practice

Get Ready. The sentences come fast...

- Slides automatically advance every 3 seconds.



Jkeo hifao miretyw ____.

Young dogs are called _____.

Oeiud pol ruwiea ____.

A bike has ____ wheels.

Tuoqkd aro loiea ____ pr.

The state north of
Oregon is _____.

Other Tests:

- Breath Hold Paradigm
- Visual Cortex Testing
- Object Naming Task



Breath Hold Paradigm

- During this test you will hold your breath when instructed until you are told to breath (~15 seconds).
- This will be repeated several times.
- It is important to not take in a deep breath as you hold your breath.



Visual Cortex Testing

- This test is occasionally done to localize the cortex associated with vision.



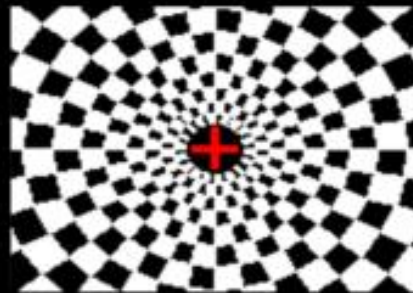
Visual Cortex Instruction Screen

Visual Task

Always look at the small '+'.
The '+' may be the only item on the screen.

Sometimes the '+' will be on top of flashing checkerboards.

Sometimes the '+' will be on top of flashing checkerboards.



Keep looking at the '+' the whole time.

Try to keep still.

Object Naming Instructions

Object Naming Task

Rest and relax when you see:



Try to relax and do nothing. Do not say to yourself the name of the object on the screen.

When you see the picture of an object like:



Think at the name of the object

Try to keep still.

FMRI

- Common Clinical Uses:
 - Presurgical planning including but not limited to:
 - Tumor Resection
 - Preradiation planning
 - Language Mapping
 - Seizure Focus resection



What to expect:

- Most commonly we perform:
 - Finger tapping in one or both hands
 - Word generation
 - Verb generation
 - Sentence Completion
 - Breath Hold paradigm
- Exams also include detailed anatomic imaging of the white matter (DTI).
- Total exam time is ~ 1.5-2 hours.
- Intravenous contrast may be used as directed by the referring physician and radiologist.



Summary

- FMRI is the most advanced technique we use to image the brain.
- Practice the tasks in this PowerPoint so you are familiar with them on test day.
- Bring your prescription for eyewear or wear contacts.
- Avoid caffeine or any form of sedatives (Valium) prior to the exam.



FMRI

- Thank you for reviewing this PowerPoint.
- The technologist will review all of this information with you prior to and during the scan.
- If you have any questions or concerns at anytime, please don't hesitate to ask!
- To Schedule an examination please call:
(503) 418 - 0990

