

Are you participating in a magnetic resonance imaging (MRI) session? MRI is an important tool in today's medicine and may be used for clinical and research purposes. MRI techniques allow us to take detailed images of our body. Do you want to know more about how MRI works? Then follow our MR superheroes and their adventure into the exciting world of MRI and become an MR superhero yourself...

MR SUPERHEROES

Kian
Age: 8 years
Likes: climbing, music and cats
Reason for MRI: surgery migraines and assessment
Superhero-Idol: The Arrow

Noelle
Age: 8 years (Cousin sister of Kian)
Likes: drawing, reading, swimming and all animals
Reason for MRI: participating in a research study
Superhero-Idol: Wonder Woman

Finn
Age: 4 years (Younger brother to Noelle & Kian)
Likes: drawing, singing, cartoons
Reason for MRI: joining his older Superhero-Idol, Thor

How does an MRI work?

The human body consists mostly of water (~65%). This is a water molecule. Molecules represent the smallest unit of any substance and are themselves made up of atoms. The water molecule is made up of two hydrogen atoms and one oxygen atom.

Each hydrogen atom has a positively charged proton in its center.

The proton spins like a tiny magnetic circle around its axis.

Within an ordinary room, protons are oriented randomly, meaning that the axis around which the protons spin point to different directions. In an MRI room a constant magnetic field exists aligning the spins of all protons.

Short radio frequency pulses are applied to flip all the protons out of their comfy state. But they want to move back to align their axis to the comfy constant magnetic field.

While moving back to their original position, still turning around their own axis, they send out energy. Imagine it a bit like a signal from a light tower. That energy can be measured and for different body tissues this signal is different.

Using all this information we can reconstruct the type of tissue at any given coordinate in space that is scanned. This knowledge allows us to create images of parts of the body that are not visible from the outside.

An MRI is therefore like a big camera we can use to take pictures of different parts of our body. But, for the pictures to get perfect you have to remember a few tricks. In fact, if you master these tricks, they become your super powers which anyone needs in order to become an MR superhero!

There are three superpowers an MR superhero has to master...

KABOOM!

MR SUPERHERO
There are three superpowers an MR superhero has to master...

The Anti-Magnetism Power

When you enter an MRI room there is a constant magnetic field. It is strongest at the center of the MRI scanner. All magnetic elements are attracted by it. Therefore, it is super important to remove all metal before entering an MRI room.

The Freezing Power

Similar to pictures taken by a regular camera, our pictures are best, when patients or research participants stay super still, almost like frozen. It takes a couple of minutes to obtain images covering the whole brain. If you move your head during this time, the images may become incomplete or blurry. We take many, many images after each other in order to have one good three dimensional image in the end.

The Shielding Power

BRRRRRREEEP BRRRRRREEEP

An MRI works through magnets and radio waves and is therefore considered harmless, even when repeated multiple times. This is pretty cool. However, it can get loud inside an MRI scanner. For that reason, you will get ear plugs or headphones when getting an MRI. Your final superpower is the ability to shield all the noise created by the MR scanner.

Response Tools
You may get headphones to protect your ears but also for listening to music, sounds or stories and instructions given by the operator of the MRI. You may get special MR-buttons when playing a game. If you feel uncomfortable, an emergency button will be at hand to immediately stop a scan.

button boxes
headphones
emergency button

To summarize, an MRI works by using magnets and radio waves. Our knowledge of what happens when we apply radio frequencies to different tissue classes helps us to create an image of any part of our body non-invasively. This means the body is not harmed by an MRI, we simply found a cool way of looking through it.

There are only a few things that are very important to remember and for you these can become your MR superpowers. These superpowers are (1) remembering to remove all metals before entering an MRI room, (2) staying super still when we take your images, so they do not become blurry, (3) shielding all the noise and only focusing on the task at hand. Sometimes, you may be asked to watch a video and sometimes you are asked to play a game. For that you may get a lot of different response tools. In either case, if you master your three superpowers, you will be awarded with an amazing image. And you have effectively become an MR superhero!