Making Neuroscience Fun

A Brain Awareness Program for All Ages

Brain Health: It's SPECtacular

What to do TODAY
Grade 3 (A Physical Health Story)

This story describes sleep, what it is, how it changes over time and most importantly, why you do not act out your dreams.

- There are actually different stages of sleep that do different things.
- People have different sleep needs based on their age. Babies sleep up from 14-17 hours a day (and there are only 24 hours in a day!), while older people, like your grandparents, may only sleep between 6-8 hours a day.
- We have 2 kinds of dreams, the ones that are more realistic and occur during SWS (slow wave sleep) and the ones that are more bizarre and occur during REM (rapid eye movement). Your brain has a way to protect you from acting out your dreams that occur during REM sleep.

- For this presentation, you need to have the "Sleep Basics" Story Video and you will need to have downloaded the REM video - https://www.youtube.com/watch?v=ORo-nbJ-F18. The Story Video lasts ~27 minutes. You will do a REM activity 10-15 minutes and there is lots to discuss – so watch your time.

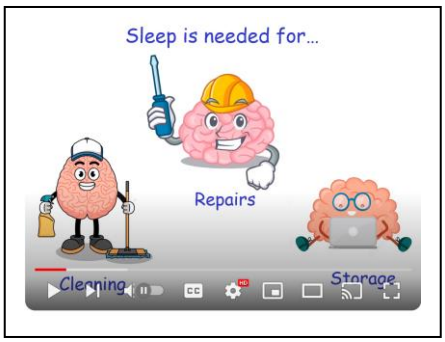
- Start the Story Video and stop after the title page.

This story is about Physical Health – which includes moving our bodies, eating, and SLEEPING.

Today, we will describe what sleep is and why it is important to your Physical Health and your Brain Health.

We will also talk about how sleeping behaviors change during the course of our lifetime AND, most importantly, we will talk about what dreams are all about.

- Continue the Story Video and stop after this screen.

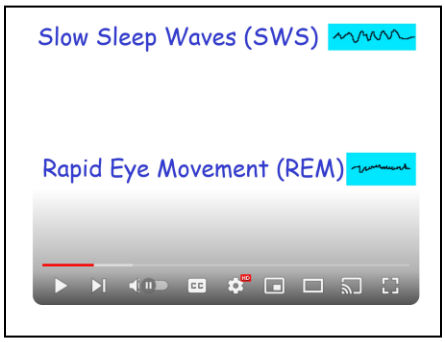


We all know that during the day our brain is REALLY busy, because our brain helps us do EVERYTHING that we do.

What are some of the things that you do during the day??? (After every response…SAY…YUP…you need your brain to do that!!!)

So, while animals are sleeping the brain is busy fixing, cleaning and storing information that from ALL the work that it did during the day.

- Continue playing the video and stop after the following slide after the definition of the EEG activity of both SWS and REM .



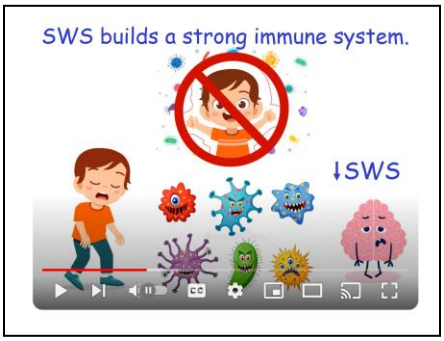
We can look at your brain activity while you are awake or sleeping by putting electrodes on top of your head that record neurons “talking to each other”.

Remind the students that in SLOW WAVE SLEEP (SWS for short) the “bumps” or waves are high and slow. During RAPID EYE MOVEMENT (REM for short) the bumps or waves are low and fast.

Ask the students to raise their hands if they can see the difference. (See if someone wants to explain what they see.)

You can explain that in SWS, many neurons in the brain rest and fire together slowly, making those big, slow waves. In REM sleep, neurons are busy and fire quickly, but not all at once, so the waves are smaller and faster.

- Continue playing the video and stop after the following slide. Discuss things that happen when we sleep.

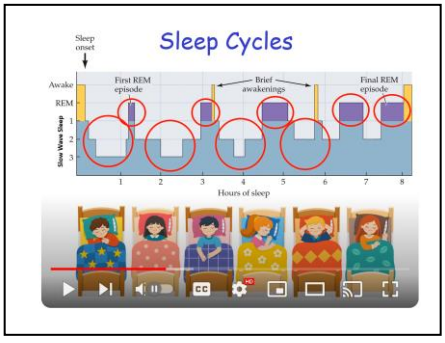


So, during sleep can you remember some of the things that the brain does? (Get some responses)

- your brain and your body grow and repairs itself
- your brain cleans out all the waste materials made during the day
- your brain stores information you learned during the day
- your immune system gets stronger…especially during SWS

Your brain is REALLY busy when you are sleeping.

- Continue playing the video and stop after the following slide.



Ok..so when you are asleep at night, your brain is cycling about every 60-90 minutes from SWS to REM sleep.

During the course of the night, the amount of time you spend in SWS gets smaller (point this out on the slide) and the amount of REM sleep gets longer.

Here is a question for you…If your immune system gets stronger during SWS, then what part of your sleep cycle would be doing the most to make sure you can fight off germs? (Discuss this once you get an answer.)

- Continue playing the video and stop after the following slide.

Ok…Raise your hand if you have ever been chased by a lion?

So, it is important for the zebra to learn to run when they are being chased by a lion – but, what are some of the things that YOU need to learn to stay alive? (Get some responses...how to cross a street, what to do if they hear a fire alarm, etc.)

Learning is **evolutionarily** important – so when we don't get enough sleep REM takes over…but, then the immune system suffers – so getting enough sleep is important.

- Continue playing the video and stop after the following slide. Scientist know that sleep changes with age.

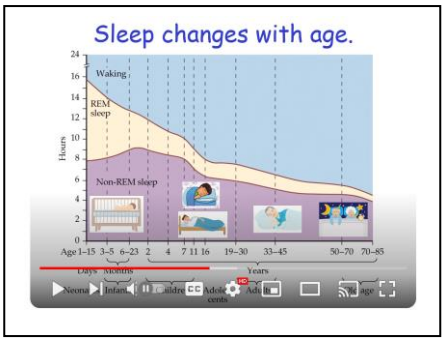
Who do you think sleeps more – babies or you?
Raise your hand if you think babies sleep more. Raise your hand if you think you sleep more.

Who do you think sleeps more – you or your parents?
Raise your hand if you think you sleep more. Raise your hand if you think your parents sleep more.

Who do you think sleeps more – you or your grandparents? Raise your hand if you think you sleep more. Raise your hand if you think your grandparents sleep more.

Let see what the science says…

- Continue playing the video and stop after the following slide. Explain the graph – hours spent sleeping, age of person and the difference between the amount of REM and SWS (label non-REM).

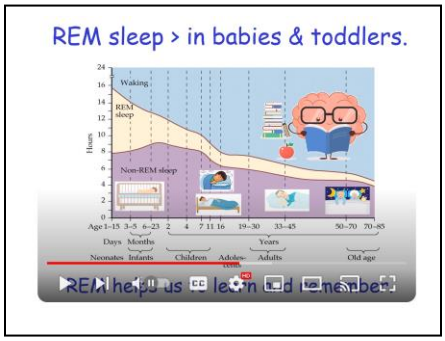


So, according to the science… (show the students how to look at the graph – hours of sleep on the vertical axis and age on the horizontal axis)

Babies sleep more than you.
You sleep more than your parents.
You sleep more than your grandparents.

Let's think about why this happens.

- Continue playing the video and stop after the following slide. Discuss the importance of both SWS & REM at different ages.



Remember… Everyone needs more SWS sleep during the night because this the brain activity that we see when we are repairing, cleaning up, and getting rid of the waste in the brain. Remember, this helps to make our immune system – which protects us – stronger.

Ask the students to explain the why babies and toddlers need more REM sleep.

Remind the students that…More REM sleep makes sense as the brains of babies and toddlers are much more immature than the other age groups and so there is more work that needs to be done in making all the connections that we make the brain ready to do all the thinking and learning that children start to do when they go to school. REM sleeps helps us to learn and remember.

So…we know when you are in SWS or REM sleep when you have electrodes on your head. BUT, did you know that you can tell if someone is in SWS or REM sleep just by looking at them.

- Explain to the students that you can actually tell when a person is in REM sleep, just by watching them sleep.

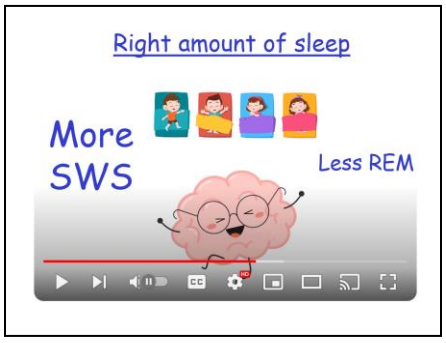
1. Tell the students you are going to play a video of a person sleeping and then you will ask them a few question.
2. Play the video (https://www.youtube.com/watch?v=ORo-nbJ-F18~1:29 minutes).
3. Ask… What did you see in the video? (Get Responses)

Remind that students that REM stands for Rapid Eye Movement.

- It is called this because your eyeballs literally go back and forth very quickly when you are in the REM sleep cycle.
- During this part of your sleep cycle, the muscles in your arms and legs get limp meaning they are not working. This is why you can lift up someone's arm while they are in REM and just drop it.

4. Have the students look at one of their fellow students.
    - Have one of the students close their eyes and move their eyes from one side to another.
    - Have the other student watch.
    - Have the students switch and then repeat.
5. Ask the following questions…
    - Was the eye movement of the student they watched and the person in the video the same?
    - If not, what was the difference? (The eye movement during REM in non-voluntary (meaning the person was not moving their eyes on purpose) while the students eye movements were voluntary).
    - Why do you think we are moving our eyes involuntarily during REM sleep? (Get responses…may be linked to what we are "seeing" in our dreams)

- Continue the Story Video and stop after the following slide.



So, it is important to get the right amount of sleep for your age. That way you are getting the right amount of SWS and REM sleep to take care of your body and your brain and make sure it is healthy.

Who remembers how much sleep children (which includes 3rd graders -8 to 9 yrs) should get? Between 8 and 10 hours of sleep.

Now, I want you to think about what time you normally go to bed and what time you normally wake up.

Count the number of hours you sleep. (Give an example…if you go to bed at 9:00 at night and wake up at 6:00 in the morning – if a clock is accessible stand in front of it and - count on fingers (if no clock, just count on your fingers)…10, 11, 12, 1, 2, 3, 4, 5, 6 = 9 hours.)

You now know that sleeping is SOOOOOO important for your brain health.

- SWS helps with the growth and repair of your body and brain and it is when your body's defense system is strengthened. REM (rapid eye movement), the brain is storing information that you need to survive.

Think about how many hours you sleep. (Remind the students that everyone is different and you may not need the 8-10 hour OR you might need more.)

If you are not getting the right amount of sleep a night for your brain, you may need to change your sleep habits. Let's see how to do that.

- Continue the Story Video and stop after this screen.

Remind the students…Good sleep habits are important…because…sleep is so important.

- Continue the Story Video and stop the video after we learn that ALL mammals dream.

OK…Raise your hand if you dream when you sleep.

Tell the students that some people do not think that they dream, because they do not remember their dreams, but so far – scientists think that all people dream.

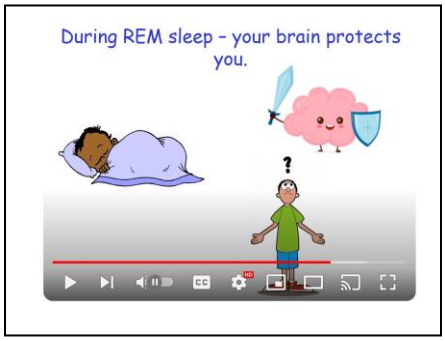
- Continue the Story Video and stop after the following slide. Discuss the difference between SWS and REM dreams. You have about 7 minutes left in the video – so you can determine how long to discuss this.

Ok…so dreams during SWS are more realistic and dreams during REM sleep are more unusual. Let's think about this…

Ask…Can someone share with me a dream they might have had or could have had? (Get some responses…or else give some examples)

Once you have some examples discuss whether the class thinks that they happened during SWS or REM sleep.

- Continue playing the video and stop after the following slide when the question “WHAT???” is raised.



So, we talked about 2 things that happen during REM sleep. The first is that your eyes move back and forth – which is why it is called Rapid Eye Movement sleep.

Does anyone remember what the 2nd thing was??? Your muscles in the rest of your body – that you can move by yourself – DON’T WORK!!! That is why if a person is in REM sleep, you can lift up their arm and drop it – and they just let it fall. Let’s see how why this might happen.

- Continue playing the video to the end OR just end the presentation.

Tell the students that you had fun talking with them today and ask them if they had fun learning.

Remind the students that we learned more about sleep – which is so important for our Physical Health.

We learned…

- while we sleep the activity in the brain cycles between Slow Wave Sleep (SWS) and Rapid Eye Movement (REM) Sleep.
- during SWS sleep our brains are busy repairing and cleaning up our brains and during REM sleep our brains store all the things we learned during the day.
- people have different sleep needs based on their age and to get the right amount of sleep that we need, we have to have good sleep habits.
- that we have 2 kinds of dreams, the ones that are more realistic and occur during SWS (slow wave sleep) and the ones that are more bizarre and occur during REM (rapid eye movement). Your brain has a way to protect you from acting out your dreams that occur during REM sleep.

Be sure to thank them for listening and the Brain Health Team of JHU students will see them soon.