

The Empowerment through Science & Technology Initiative (ESTI)

OUR GOAL IS TO PROVIDE YOU WITH ACCURATE
INFORMATION ON SCIENCE, TECHNOLOGY, AND
HEALTH.

Get In Touch

Are you interested in learning how to use your technology?

At ESTI, we're hoping to start online workshops on how to use specific technologies and get the most out of your products. If this is something you'd be interested please fill out this survey (https://cutt.ly/ESTI_survey)!

Participate in a study about how COVID-19 and the public health crisis impacts out behavior. Please visit this site (www.colelab.org/covid.html) for more information, and check out this infographic (https://cutt.ly/study_info) on how to sign up.

The Cole Neurocognition Lab
Center for Molecular & Behavioral Neuroscience
Rutgers University-Newark
197 University Avenue Newark, NJ
P: 973-353-2706
E: brain.research@newark.rutgers.edu
Facebook: <http://www.facebook.com/estirutgers/>

In this issue

MYTH BUSTERS:
OUR BRAINS SHUT DOWN
WHEN WE SLEEP

NEURO NEWS:
LINKS BETWEEN MENTAL
DISORDERS

THIS MONTH IN SCIENCE:
ARTIFICIAL INTELLIGENCE
MAKING A
BREAKTHROUGH IN
GENETICS

HEALTH:
COVID-19 AND DELIRIUM

MYTH BUSTERS

WHAT DOES OUR BRAIN DO WHEN WE SLEEP?

by the Empowerment through Science & Technology Initiative (ESTI)

Our brains **don't** shut off when we sleep. They're just as active when we're asleep!

WHY DO WE NEED SLEEP?

A healthy amount of sleep is important for brain plasticity, which is the brain's ability to adapt to different inputs. Without a healthy amount of sleep, we won't be able to process what we've learned for the day and we'd have a difficult time remembering things for the future.

Our brains repeatedly go through 2 cycles: non-rapid-eye movement (non-REM) and rapid-eye movement sleep. With each cycle, your body spends less time in deep sleep, and more time in REM sleep. Typically, a person goes through these 2 cycles four or five times throughout the night.

1 NON-REM SLEEP

The first part of the sleep cycle is non-REM sleep, which contains four stages:

- 1 The first stage is between waking and falling asleep. Right now, your body is adjusting into sleep
- 2 The second stage is light sleeping. Your heart rate and breathing begin to regulate, and your body temperature drops
- 3
- 4 The third and fourth stage is deep sleeping.

Previous research emphasized the importance of REM sleep for learning and memory, but new research has shown that non-REM sleep is just as important. Additionally, non-REM sleep is important for a more restful and restorative sleep.

Recent research has also shown that during non-REM sleep, our brain's cerebrospinal fluid (CSF) flushes out toxic waste from our brain. Without CSF flushing out toxic waste, there is an increase chance of developing dementia and Alzheimer's disease.

REM SLEEP 2

During REM sleep, the eyes move rapidly while the lids are closed, and brain waves are similar to when you're awake.

Your breathing rate begins to increase, and the brain sends signals to the rest of your body that leaves it temporarily paralyzed while dreaming.

YOUR BODY HAS TWO PROCESSES THAT REGULATE SLEEP

Circadian Rhythm

This is a biological clock in the brain that responds to light cues (e.g., sunlight). When it comes time to sleep, your circadian rhythm increases the production of the hormone melatonin, and, when it senses light (e.g., sunrise) it switches off production.

Sleep Drive

Like your craving for food, your body also craves sleep. Throughout the day, your body's need for sleep builds up, and, after a certain point, your body needs sleep. Unlike hunger, which you can control whether you eat or not, your body will force itself to sleep even if you're working or driving.

Sources:

1. Myth vs fact: Do our brains 'shut down' while we sleep? (2020, January 12). Retrieved February 24, 2021, from <https://www.bellfoundation.org.au/myth-vs-fact-do-our-brains-shut-down-while-we-sleep/>
2. The science of SLEEP: Understanding what happens when you sleep. (n.d.). Retrieved February 24, 2021, from <https://www.hopkinsmedicine.org/health/wellness-and-prevention/the-science-of-sleep-understanding-what-happens-when-you-sleep>

MYTH: Our Brains Shut Down When We Sleep

A popular myth about sleep is that our brains shut down. However, this is not true. Our brains are just as active while we're asleep. Our brains repeat through two cycles throughout the night: (1) non-rapid-eye movement (non-REM) sleep and (2) rapid-eye movement (REM) sleep.

During non-REM sleep, the body begins to get ready for sleep and goes into deep sleep. Recent research has shown that non-REM sleep is just as important as REM sleep, not only for learning and memory but also for a more restful and restorative sleep.

During REM sleep, the eyes move rapidly underneath the eyelids and brain waves are similar to when you're awake. Additionally, the brain sends signals to temporarily paralyze the body during sleep and dreaming.

As time goes on, your body will spend less time in deep sleep and more time in REM sleep. Typically, a person will go through these two cycles between four and five times a night.

Links Between Mental Disorders

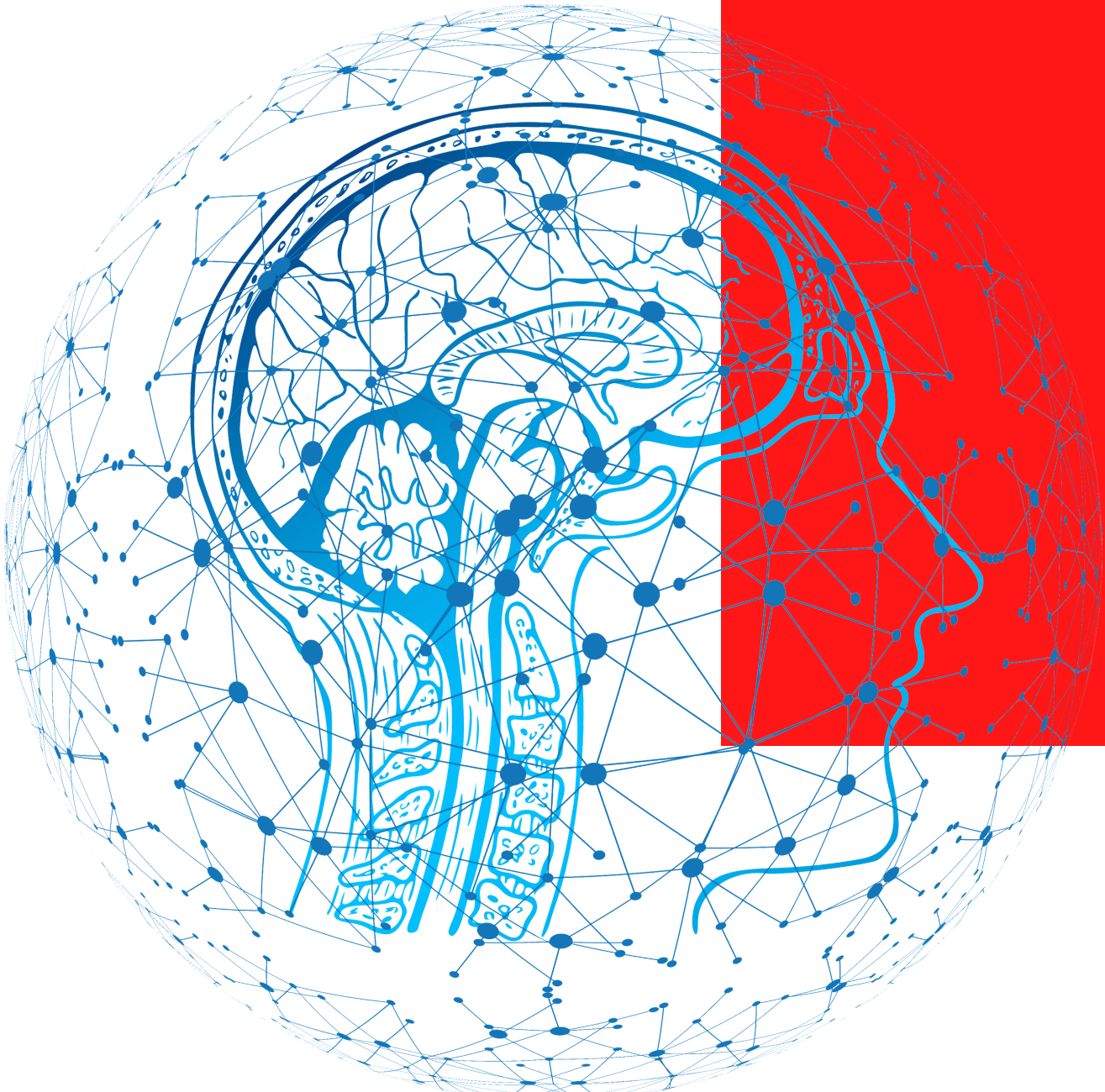
For years, psychologists and psychiatrists have diagnosed patients with various mental disorders based on specific symptoms. However, recent research has shown that people who have a mental disorder most likely have more than just one. This means that mental disorders can no longer be categorized, but thought of as a spectrum.

In a study, which looked at data from about 5.9 million Danish citizens, it was found that many mental disorders, such as depression and anxiety, overlap each other. At a genetic level, research has shown that the same genes are found for multiple distinct disorders. This led the US National Institute of Mental Health, in 2011, to request for more research to be done on the biological basis of mental disorders, with more focus on genetics and neuroanatomy.

Neuro News

Sources:

1. Marshall, M. (2020, May 05). The hidden links between mental disorders. Retrieved February 24, 2021, from <https://www.nature.com/articles/d41586-020-00922-8>





This Month in Science

Sources:

1. Nature news. (n.d.). Retrieved February 25, 2021, from <https://www.nature.com/scitable/topicpage/protein-structure-14122136/#:~:text=The%20linear%20sequence%20of%20amino,acids%20have%20nonpolar%20side%20chains.>
2. John Moult's Group homepage. (n.d.). Retrieved February 25, 2021, from <http://moult.ibbr.umd.edu/>
3. Home - Prediction Center. (n.d.). Retrieved February 25, 2021, from <https://predictioncenter.org/>
4. What if solving One problem could UNLOCK solutions to thousands more? (n.d.). Retrieved February 25, 2021, from <https://deepmind.com/>
5. Cryogenic electron microscopy. (2021, February 24). Retrieved February 25, 2021, from https://en.wikipedia.org/wiki/Cryogenic_electron_microscopy
6. Callaway, E. (2020, November 30). 'It will Change EVERYTHING': DeepMind's AI makes gigantic leap in solving protein structures. Retrieved February 25, 2021, from <https://www.nature.com/articles/d41586-020-03348-4>
7. Metz, C. (2020, November 30). London A.I. lab Claims breakthrough that could accelerate drug discovery. Retrieved February 25, 2021, from https://www.nytimes.com/2020/11/30/technology/deepmind-ai-protein-folding.html?campaign_id=34&emc=edit_sc_20201201&instance_id=24602&nl=science-times&i_id=119507377&segment_id=45757&te=1&user_id=c99f690585ed5298071f9a5b77a2e614

Artificial Intelligence Making a Breakthrough in Genetics

For more than 50 years, scientists have been working on finding an accurate method to predict protein structures[1]. Proteins are responsible for what happens inside of cells, essentially, they are the building blocks of life. A protein's structure is what determines its function. Therefore, being able to predict a protein's structure can lead to breakthroughs for various genetic diseases such as Alzheimer's and cystic fibrosis.

In order to speed up the process, John Moult[2] and other scientists created the Critical Assessment of Structure Prediction (CASP)[3], a global competition where teams of scientists measure and compare efforts in solving this problem of predicting protein structures. This year, DeepMind[4], an artificial intelligence lab owned by the same parent company of Google, was able to accurately predict a protein structure that was previously predicted using cryo-electron microscopy (cryo-EM)[5].

DeepMind's program that has potentially solved this problem, AlphaFold, gives hope to many scientists in understanding protein structure and the potential drugs that could be created in order to combat genetic diseases and future viruses and bacteria.

COVID-19 & Delirium

The COVID-19 pandemic has continued to cause many long-term health issues in many people, especially older adults. One symptom that continues to surface is delirium[1], which disproportionately affects older adults. This is when someone experiences abrupt disorientation (e.g, can't recall names, address, etc.).

In April 2020, a study[2] was conducted in France that revealed that 65% of severe cases of COVID-19 also experienced delirium. Even though the underlying cause of delirium is still not understood, there is a potential link between delirium and dementia. Therefore, experiencing even a single episode of delirium can possibly lead to dementia later on.

Additionally, a paper[3] published in November showed that 28% of older adults who were being treated for COVID-19 in an emergency department experienced episode(s) of delirium. However, more long-term studies must be conducted in order to understand the long-term effects of delirium in patients who were diagnosed with COVID-19.

Health

Sources:

1. Delirium. (2020, September 01). Retrieved February 25, 2021, from <https://www.mayoclinic.org/diseases-conditions/delirium/symptoms-causes/syc-20371386>
2. S. R. Kadire and Others, & F. P. Polack and Others. (2020, June 25). Neurologic features in severe sars-cov-2 infection: *Nejm*. Retrieved February 25, 2021, from https://www.nejm.org/doi/10.1056/NEJMc2008597?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acr.ossref.org&rfr_dat=cr_pub%2B%2Bpubmed
3. Maura Kennedy, M. (2020, November 19). Delirium in older patients With Covid-19 presenting to the emergency department. Retrieved February 25, 2021, from <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2773106>
4. Arnold, C. (2020, December 02). Could covid delirium bring on dementia? Retrieved February 25, 2021, from <https://www.nature.com/articles/d41586-020-03360-8>

