NUBAO NEWSLETTER

SPRING 2026

FIRST EDITION

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To learn more about NUBAO and keep up with future events, follow us on **Instagram** at **@northwesternbao**

UPCOMING EVENTS

In the summer, you can find us around Chicago at events like Sundays on State.

SUNDAYS ON STATE

BRAIN FAIR

Last fall, over 400 Chicagoans attended our 16th annual Brain Fair. We saw particularly high engagement from Pilsen, Bridgeport, Brighton Park, and Bronzeville.

A WORD FROM OUR PRES

Lisa Kim
President

Dear NUBAO Community,

It is my privilege to welcome you to the inaugural Northwestern University Brain Awareness Outreach (NUBAO) newsletter. Founded to educate and inspire the Chicago community about the brain, NUBAO spent this past year hoping to make neuroscience accessible to K–12 youth in communities where STEM resources are often limited. We hope to use this new platform not only to provide community updates but to serve as a resource for continued neuroscience education. As we look ahead, we remain deeply grateful to the volunteers and supporters who help us inspire the next generation of scientists. Thank you for growing this community with us.

- Lisa Kim

NUBAO UPDATES

Over the past few months, NUBAO has been busy working to make neuroscience engaging and accessible throughout the Chicago community. Through our efforts, we've had the opportunity to share our enthusiasm for brain science with students and educators across the city.

TEACHER'S WORKSHOP

In March, we hosted our 14th annual Teachers' Workshop, welcoming educators from 23 schools across 19 Chicago neighborhoods to learn more about neuroscience. Participants explored a variety of classroom-ready lessons and activities designed to help bring neuroscience concepts into their schools and inspire students' curiosity about the brain.

WALTER PAYTON

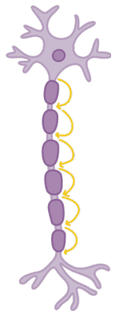
During the school year, NUBAO has continued to partner with Chicago Public Schools to spark enthusiasm for the brain. Through our local Walter Payton high school seminar series, Northwestern students and staff present neuroscience topics to a group of highly motivated students.

STEM NIGHTS

NUBAO has participated in STEM nights at local middle and elementary schools including Jovita Idar, SPC Daniel Zizumbo, Goudy, Skinner North, Garvy, and Newberry Math & Science Academy. At these nights, volunteers bring interactive demonstrations, educational materials, and our brain collection to make neuroscience both fun and approachable for younger students.

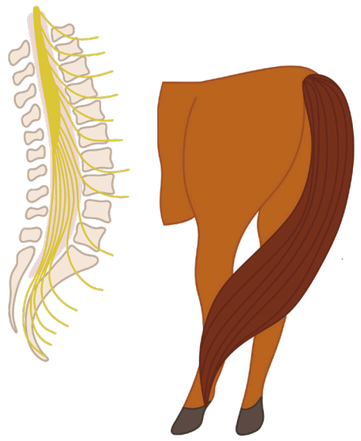
BRAIN FACTS

300 MILES PER HOUR



THIS IS HOW FAST A **NERVE SIGNAL** CAN TRAVEL

THE END OF THE SPINAL CORD IS CALLED **CAUDA EQUINA** DUE TO ITS SIMILARITY TO A **HORSE'S TAIL**



OUR BRAINS CONSIST OF **80% WATER**

60% OF THE BRAIN IS MADE OF FAT

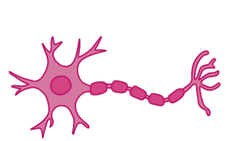
THE AVERAGE BRAIN GENERATES ABOUT **70,000** THOUGHTS A DAY

BRAIN TISSUE THE SIZE OF A **GRAIN OF SAND** CONTAINS **100,000 NEURONS**

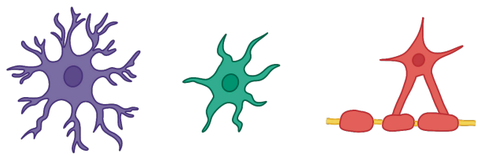
NEURONS AREN'T THE ONLY CELLS IN THE BRAIN

GLIAL CELLS PROVIDE:

- IMMUNE DEFENSE
- CHEMICAL BALANCE
- NEURON INSULATION



NEURON



MICROGLIA ASTROCYTE OLIGODENDROCYTE

GLIAL CELLS

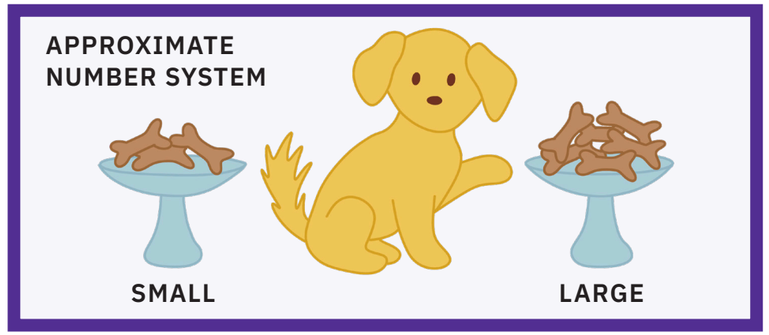
NUMBER SENSE

How do we develop number sense?

If I offered you two different piles of chips, you would likely be able to tell me, quickly and without counting, which pile is larger. Or, if I put three cookies on the table you would instantly know that there are three cookies without having to count them out. Most of us probably never think twice about our ability to estimate quantities, as it comes so naturally to us. However, this skill, termed the Approximate Number System (ANS) by cognitive psychologists, has a rich evolutionary history and may provide a foundation for math learning and achievement.

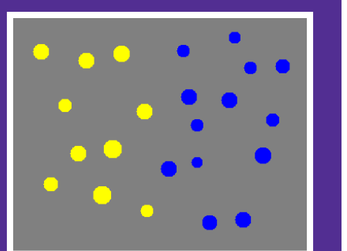
While we have fine tuned our numerical abilities to engage in algebra and calculus, humans are not the only creatures that have a sense of number. Researchers have shown that many animals are able to distinguish between more and less quantities. There is evidence that dogs, chicks, and even guppies know the difference between 1 and 9 objects or 1 and 5 objects. Animals may have evolved this ability to know where to go to maximize their food supply. A dog might choose a larger pile of treats over a smaller one. However, all animals, including humans have a harder time discriminating between groups of objects that are more similar in quantity, for example, 8 objects versus 9 objects. This trend is known as Weber's law.

We are born with ANS competencies. Infants as young as 6-months-old are able to distinguish between 10 dots and 20 dots. Shockingly, how good an infant is at discriminating between groups of dots has been shown to predict math achievement many years later. Additionally, evidence has shown that ANS competencies develop typically in individuals who are born deaf or blind.



Current brain imaging research suggests that ANS capabilities are regulated by the Intraparietal Lobule (IPL), located in the back of your head toward the top. However, this field is ever evolving, and there is recent evidence that suggests that while improving ANS abilities does not improve math abilities. Some scientists argue that ANS abilities and math abilities may not be the same process at all. Whatever the conclusion of this debate may be, our ability to discriminate between groups of objects allows us to make quick decisions and is crucial for our understanding of numbers.

TRY IT OUT

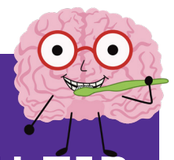


https://panamath.org/testyourself.php

REFERENCES

https://pmc.ncbi.nlm.nih.gov/articles/PMC6286047/
https://www.sciencedirect.com/topics/psychology/approximate-number-system

BRAIN HEALTH TIP



Good oral hygiene may not just be good for your teeth, it can also be good for your brain! Recent work has shown that gum disease and tooth loss are linked to shrinkage in the hippocampus, an important structure for memory in the brain! group of dedicated high schoolers.

HOLDING A HAND

How does skin-to-skin contact affect infant maturation?

My research asks the question: how does skin-to-skin contact between parents and their premature infants affect the baby's brain and body in real time? Prentice Women's Hospital cares for approximately 1,600 premature infants annually. Premature infants are born before many of their systems are fully developed, especially the autonomic nervous system, which coordinates breathing, heart rate, and brain activit

Many premature infants are cared for in the neonatal intensive care unit (NICU), and our goal is to understand how their nervous system matures, and to help accelerate this maturation. Premature infants are at higher risk for neurological complications and later developmental delays. Even small improvements in their care can make a meaningful difference. Skin-to-skin holding, also called Kangaroo Care, has been shown to improve the health of premature infants in the long-term, including more stable sleep, temperature, heart rate, breathing, and brain development. However, we still do not fully understand what changes are happening in the baby's brain and body during Kangaroo Care.

One major reason we still do not fully understand this is because measuring infant brain activity usually requires an electroencephalogram (EEG), which is a system that uses wires connected to electrodes that stick to the scalp and measure the brain's electrical activity. EEGs are commonly used in NICUs to monitor premature infants' brain activity and development and detect seizures. However, the extensive amount of wiring makes it difficult for parents to hold their babies during monitoring. This creates two important problems: very premature infants who need continuous EEG monitoring are held less frequently, and researchers have never been able to continuously study infant brain activity during skin-to-skin contact.

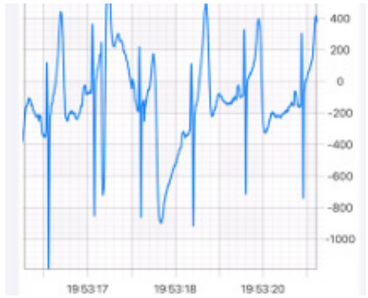
Pictured: Placement of wireless EEG device.

"This creates two important problems: very premature infants who need continuous EEG monitoring are held less frequently, and researchers have never been able to continuously study infant brain activity during skin-to-skin contact."

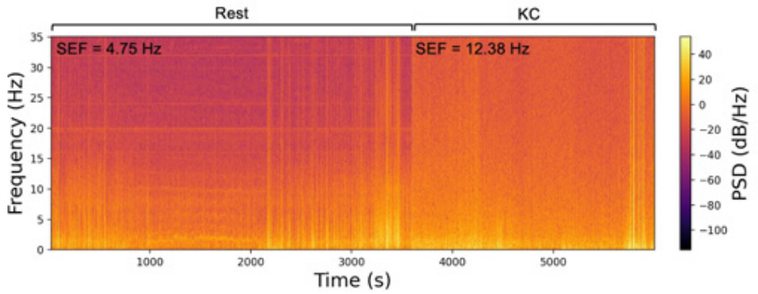
- Sofia Zitella, BS

I am part of a research team of neonatologists, pediatricians, and engineers at Northwestern University that developed the first wireless EEG system for premature infants. Unlike traditional EEG, this device is lightweight, flexible, and wireless, allowing babies to be held comfortably while their brain activity is monitored continuously. We pair this EEG device with a wireless body sensor that tracks heart rate and breathing. Using these tools, we compare infants' brain and body signals while they are resting in the incubator versus during Kangaroo Care with their parents.

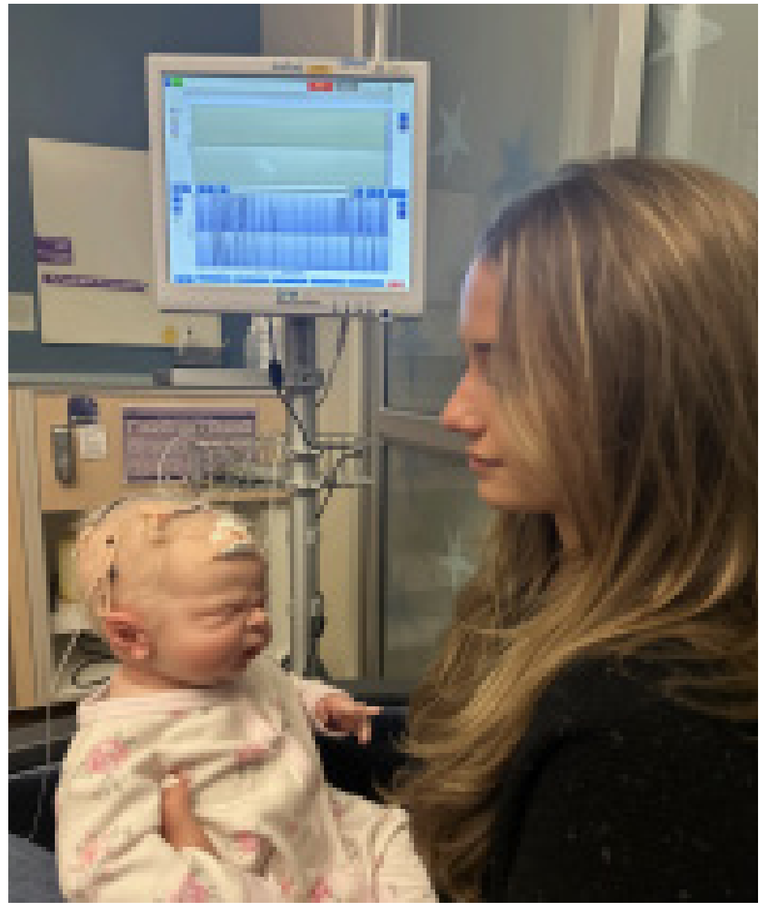
This approach not only makes it easier for parents to hold their babies in the NICU, but also opens the door to new insights in neonatal care. Our system can detect subtle neurological changes, such as early signs of seizures or patterns in brain activity that are not visible with traditional EEG. By capturing clearer, more natural data during parent–infant interaction, we hope to understand why Kangaroo Care is so beneficial and how to optimize it. Ultimately, our goal is to improve monitoring and developmental care in the NICU so premature infants and their families can have better long-term outcomes.



Pictured: Example of waveforms seen on the encrypted iPad, which connects to the wireless devices.



Pictured: An example of a spectrogram that visualizes changes in EEG frequency during rest vs during Kangaroo Care (KC).



Pictured: Sofia holding a realistic infant doll used for modeling the devices with the wireless EEG.

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