THE CNL

The official newsletter of the Einstein Cognitive Neurophysiology Lab & the Human Clinical Phenotyping Core of the Rose F. Kennedy Intellectual and Developmental Disabilities Research Center

Editorial

We are pleased to share with you the Winter 2021 edition of THE CNL! As this year comes to a close, we feel so proud of the work we've accomplished and look forward to all the excitement the new year has in store. In this edition, you'll read about some new folks who have joined the team, some research we've published this year, and new work on Cystinosis that will continue into 2022! And for those of you who have participated in our research before, you will know we often measure brain waves with EEG in our studies. So in this edition, we're breaking EEG down step-by-step so you can learn about how it works! As always, we want to wish you and your loved ones a very happy and healthy holiday season, and can't wait to see you all in the new year!

Stay safe and see you soon,

Alaina Berruti, Ana Francisco, Filip de Sanctis, & Sophie Molholm

To access the links inside, please see the online version of this newsletter: cognitiveneurolab.com/newsletters

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EINSTEIN
Albert Einstein College of Medicine

The Rose F. Kennedy
Children's Evaluation &
Rehabilitation Center

The Rose F. Kennedy
IDDRC

The Children's Hospital at Montefiore

Montefiore

Meet our newest lab members

KATHRYN-MARY WAKIM-TAKAKI

Dr. Wakim holds a PhD in neuroscience from the University of Rochester. In her PhD, she investigated recovery from addiction in individuals with comorbid* HIV using functional MRI and EEG. Her current work in the CNL focuses on identifying electrophysiological markers of Autism Spectrum Disorder for early diagnosis and intervention.

Maimouna is a Study Coordinator. She is involved in the CNL's project on cystinosis*, for which her responsibilities include recruitment of study participants and collecting data. She also wears the hat of social media manager, and is responsible for community engagement and outreach, for the IDDRC. Maimouna is currently pursuing a Masters of Science in Biomedical Sciences with a concentration in Pharmacology at Rutgers Biomedical and Health Sciences, and intends to pursue a career as a medical doctor.

MAIMOUNA DIAGNE

ELIZABETH AKINYEMI

Elizabeth (aka Lizzy) is a Study Coordinator. She supports ongoing research projects by being involved in tasks such as recruitment, data management, data collection, and clinical assessments. She has a degree in Psychology and a Masters in Child and Adolescent Mental Health from the University of Ibadan in Nigeria.

She has been working in the field of pediatric mental health for over a decade and has played a major role in raising awareness about ASD and other neurodevelopmental disorders in her community.

TRINGA LECAJ

Tringa Lecaj is a Student-Trainee at the CNL. She is involved in helping with database entry, and assisting clinical assessments. She is currently an undergrad student, getting a Bachelor of Arts degree in Psychology at Iona College. Outside of school and work she enjoys reading literary fiction and binge watching tv shows.
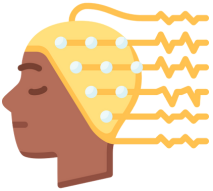
What is EEG?

WE KNOW THAT DIFFERENT PARTS OF THE BRAIN COMMUNICATE WITH EACH OTHER USING ELECTRICITY.

EEG IS A WAY OF RECORDING THE BRAIN'S ELECTRICAL ACTIVITY.

How do we record electrical activity in the brain?

1 OUR PARTICIPANTS WEAR **ELECTRODE CAPS** ON THEIR HEAD. THESE LOOK LIKE SWIM CAPS BUT THAT HAVE MANY HOLES IN THEM.

2 WE FILL EACH HOLE WITH **CONDUCTIVE GEL**. THIS IS A TYPE OF GEL THAT ALLOWS ELECTRICITY TO TRAVEL THROUGH IT.

3 WE PLACE **ELECTRODES** ON TOP OF THE GEL. THESE ARE LIKE LITTLE MICROPHONES THAT RECORD THE BRAIN'S ELECTRICAL ACTIVITY.

CAUTION: ELECTRODES ARE VERY SENSITIVE, SO SOMETIMES, THEY PICK UP MORE THAN JUST BRAIN ACTIVITY! THIS IS CALLED **NOISE**.

4 OUR PARTICIPANTS PLAY **GAMES** WHILE WE RECORD EEG SO WE CAN SEE HOW THE BRAIN RESPONDS TO DIFFERENT THINGS!

5 THE DATA IS SENT TO OUR COMPUTERS SO THAT WE CAN BEGIN **ANALYZING** THE DATA.

How do we analyze EEG data?

6 FIRST WE HAVE TO GET RID OF THE NOISE. WE CALL THIS **PRE-PROCESSING**.

7 WE LOOK AT BRAIN ACTIVITY DURING VERY SPECIFIC EVENTS, LIKE RIGHT AFTER YOU CLICK A BUTTON. SO WE FIND ALL THE TIMES YOU CLICKED A BUTTON AND **AVERAGE** THEM TOGETHER.

8 WE COMBINE THE DATA COLLECTED FROM ALL PARTICIPANTS TOGETHER.

9 WE USE **STATISTICS*** TO SEE IF THERE ARE DIFFERENCES IN BRAIN ACTIVITY BETWEEN DIFFERENT GROUPS OF PARTICIPANTS (E.G. KIDS VS ADULTS).

CLICK HERE TO SEE WHAT IT IS LIKE TO DO AN EEG AT OUR LAB!

C.O.D.E.* update

THIS WINTER, CODE IS BRIDGING SCIENCE AND COMMUNITY BY HOSTING A VIRTUAL CHAT SERIES WITH NEUROSCIENTISTS: BRAINS & BEGINNINGS

science

brains & beginnings

community

12.01 leona oakes, phd
clinical psychologist | assistant professor

12.08 douwe horsthuis, ba
data analyst | lab manager

12.15 catherine sancimino, psyd
clinical psychologist | instructor

12.22 sophie molholm, phd
cognitive neuroscientist | lab director

01.05 seydanur tikir, bs
graduate student

01.12 jacob ratliff, bs
graduate student

01.19 shlomit beker, phd
cognitive neuroscientist | associate

01.26 ana francisco, phd
cognitive neuroscientist | research assistant profess

02.02 rinaldys castillo, bs
study coordinator

02.09 pierfilippo de sanctis, phd
cognitive neuroscientist | assistant professor

ALL SESSIONS AT 7 PM ON ZOOM

A C.O.D.E. INITIATIVE

REGISTER HERE

LEARN MORE ABOUT C.O.D.E. HERE

NEW PUBLICATION

Oscillatory entrainment mechanisms and anticipatory predictive processes in children with Autism Spectrum Disorder

SHLOMIT BEKER, JOHN J. FOXE, & SOPHIE MOLHOLM

Autism Spectrum Disorder (ASD) is a developmental condition that is diagnosed based on differences in how individuals socialize, communicate, and behave. Some scientists think that these features of ASD might be because of differences in how autistic children and adults use information in their environment to predict and prepare for what will happen next. To better understand if this is the case, we turned to research!

For this study, we asked children with and without ASD between 6 and 9 years old to participate. We used EEG (see pages 4 and 5 for description of EEG) to see how the brain uses cues to make predictions during a simple computer game, where they had to press a button to a beep after a series of four images.

When we analyzed the brain EEG activity during this game, we noticed that the brain activity in children from the control group (without ASD) showed that with each successive image in the series, the brain "knows" better and better when the beep was about to come. However--and this was a major finding--this was not the case for the autistic children: their brains did not show the same activity, as if it was not preparing to respond to the beep.

This finding that the brain of children with ASD does not show the typical "signature" before events suggests that they might have a problem in predicting events, thus not being able to prepare for them as well as others. These results could explain the rigidity in behaviors of children with ASD when interacting with their environment. Of course, more research is needed to fully understand these mechanisms.

6 Fun Facts About Your Brain

1. **60% of the human brain is made of fat.** Not only does that make it the fattiest organ in the human body, but these fatty acids are crucial for your brain's performance. Make sure you're fueling it appropriately with healthy, brain-boosting nutrients.

2. **Your brain's storage capacity is considered virtually unlimited.** Research suggests the human brain consists of about 86 billion neurons. Each neuron forms connections to other neurons, which could add up to 1 quadrillion (1,000 trillion) connections.

3. **Brain information travels up to an impressive 268 miles per hour.** When a neuron is stimulated, it generates an electrical impulse that travels from cell to cell.

4. **It's a myth that you only use 10 percent of your brain.** You actually use all of it, just not at the same moment in time. Yes, even when you are sleeping.

5. **The human brain weighs about 3 pounds.** That's about as much as a half-gallon of milk.

6. **The human brain can generate about 23 watts of power (enough to power a lightbulb).** All that power calls for some much-needed rest. Adequate sleep helps maintain the pathways in your brain.

Adapted from:
https://www.nm.org/healthbeat/healthy-tips/11-fun-facts-about-your-brain
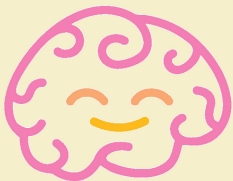
November was 22q11.2 deletion syndrome* awareness month

22q11.2DS is the second most common genetic disorder, yet most people have not heard about it.

AWARENESS CAN SAVE LIVES

LEARN MORE <u>HERE</u> & <u>HERE</u>

Mental and physical health are equally important elements of overall health at every stage of life, from childhood and adolescence through adulthood.

October was mental health awareness month

NEW STUDY

HAVE YOU OR YOUR CHILD BEEN DIAGNOSED WITH CYSTINOSIS?

you/they may qualify for a research study looking at how the brain works in cystinosis

THIS IS A 3-DAY STUDY INCLUDING EEG AND COGNITIVE TESTING.

TRAVEL AND ACCOMMODATION EXPENSES WILL BE COVERED

CONTACT
ANA.ALVESFRANCISCO@EINSTEINMED.ORG
OR 718-862-1824 TO KNOW MORE!

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CURIOUS ABOUT SCIENCE?

WE ARE RECRUING FOR A RESEARCH STUDY LOOKING AT HOW THE BRAIN WORKS

THIS IS A 3-DAY STUDY INCLUDING EEG AND COGNITIVE TESTING.

PARTICIPANTS WILL BE COMPENSATED $15 PER HOUR

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WE HAVE JUST STARTED A NEW PROJECT ON CYSTINOSIS, A (VERY) RARE GENETIC CONDITION THAT AFFECTS VARIOUS ORGANS IN THE BODY.

WE'RE STILL NOT SURE HOW THE CONDITION AFFECTS THE BRAIN, BUT WE'RE LOOKING FOR ANSWERS! FOR THAT, WE NEED YOUR HELP: WHETHER YOU HAVE CYSTINOSIS OR NOT!

LEARN MORE ABOUT CYSTINOSIS HERE &
HEAR ABOUT OUR PREVIOUS FINDINGS HERE.

LEARN ABOUT OTHER OPPORTUNITIES TO PARTICIPATE IN RESEARCH HERE.

glossary

22Q11.2 DELETION SYNDROME: a genetic disorder caused by a missing section of chromosome* 22. This deletion can affect almost every system in the body and can cause a wide range of health problems (heart, immune system, development, etc.).

CHROMOSOME & GENE: our body is made up of billions of cells. Inside most of those cells are chromosomes, which are thread-like strands that contain hundreds, or even thousands, of genes. Genes determine physical traits, such as the color of your eyes. Most people have 23 pairs of chromosomes; we received half our chromosomes from our mother and the other half from our father.

C.O.D.E. (Community Outreach and Diversity Efforts): a volunteer organization founded by members of the CNL, aiming to make science and research practices more accessible and inclusive, with a focus on historically excluded groups.

COMORBID: that exists at the same time as another

CYSTINOSIS: a genetic disorder caused by changes in the CTNS gene*. People living with cystinosis have problems in several organs of the body (kidneys, eyes, thyroid, brain, etc.).

STATISTICS: a branch of mathematics that deals with collection, analysis, interpretation, and presentation of numerical data collected about a specific event or subject.

Warm Wishes and Happy Holidays!

From all of us at the CNL/HCP, we wish you and your loved ones a very happy and healthy holiday season! Cheers to the new year!