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## Dear reader,

We are so excited to share our fourth edition of the eBRAIN newsletter with you! We hope to give you an idea of some of the literature and publications relating to our project, share what we can find out from your biological samples, and introduce you to our student volunteer! We also wanted to give you an update of our work with collaborating schools and a fun neuroscience-themed wordsearch! As you know, the focus of eBRAIN is mental wellbeing for everyone, so make sure you look after your physical and mental wellbeing during these times, practicing kindness to yourself and others.

Well wishes and solidarity, wherever you may be.

The e-BRAIN team

## Why is the eBRAIN study important, what does the literature say?

Adolescence is a crucial and memorable period of time in our lives, where we experience and discover many things about ourselves and our surroundings that tend to **shape us** into who we are. This can be quite an enjoyable period but sometimes also challenging and isolating. For some people, these experiences can have a **long-term impact** going into adulthood.

One of the main adversity that adolescents sometimes face is mental health problems. Research has found that around 75% of adults with mental health problems already had these problems before the age of 18 years, with 50% even before age 15. Also, the risk for these problems seems higher in those who experienced early adversity, such as difficult life events. Thus, we need to have **new research to further our understanding of why this may happen**, so that we can try to prevent the onset of these problems at such a critical period in life.

Many papers report the findings of research that suggests how adverse experiences early in life can be linked to mental health problems in adolescence. One example comes from a paper by Goff and Tottenham (2014) which gave a possible explanation of how **early life adversity may be linked to adolescent depression.** These authors suggested this could happen through a different activation of the ventral striatum, an area of the brain associated with feelings of reward and reinforcement.

This is also relevant to the eBRAIN study, because we aim to investigate potential **biological markers** (biological molecules found in our body which can be measured and can tell us about how different parts of the body work) which may play a role in brain maturation and mental health in young people, and make them resilient, even if their experiences are not always positive.



It is important that the experience of adversities early in life sometimes can have long-lasting effects, not just for the individuals in question, but also for their descendants. Research has found certain stress patterns to persist beyond the individual's life span, also in their offspring and even grand-offspring. This further stresses the value of eBRAIN research into early life adversity. Research like this is crucial because understanding how some stress patterns develop can ultimately help put interventions in place at the most optimal time to minimise such lasting effects.

With this project, we ultimately hope to make a meaningful contribution to research so that we can take a proactive approach towards understanding and improving adolescent mental health.

## The secrets in blood, saliva and urine!

As part of eBRAIN study, **biological samples play an important role** in providing evidence of how mental health, the immune system and metabolism can interact with each other in young people.

There is extensive literature suggesting that the presence of mental health problems, both in adults and children, is associated with an **activation of the immune system**, the one also responsible for fighting infections. This can be seen by looking in the blood, where there can be **higher levels of biological markers** like C-reactive protein (CRP), and cytokines, like interleukin-6 (IL-6). Both CRP and cytokines are very important proteins found in our body, which are involved in our immune system and response.

**Diet may influence the immune system as well!** For example, research suggests that the **Mediterranean diet**, which is rich in whole grains, fruits, vegetables, nuts, and olive oil, has an anti-inflammatory effect. This means that this diet is associated with lower levels of **some pro-inflammatory cytokines**, proteins which promote inflammation, such as tumor necrosis factor alpha (TNF- $\alpha$ ), IL-6 and IL-8, as well as CRP. This reduces the risk of disorders related to long-term (chronic) inflammation and activation of the immune system.

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The rapid development of recent techniques in science has given us the opportunity to **reveal the secrets contained in biological samples**, such as blood, saliva and urine!

## **Blood samples**

As the most commonly used clinical and biological sample, blood can tell us about many early signs of different diseases, such as liver disease, kidney cardiovascular disease, and disease. All of the inflammatory biomarkers mentioned above can be traced in a blood sample. For instance, CRP measurements can be performed in whole blood, or in its parts like plasma and serum, with very reliable results. Furthermore, genomic (all of a person's genes!) biomarkers can be tested in the blood, as a useful sign of some diseases to help treatment of said diseases.

Find out more about the components of blood!



white blood cells + platelets

red blood

Interestingly, **metabolites** (substances produced during digestion) can also be found in a blood sample. For instance, a researcher in our eBRAIN group developed a way to measure 119 polyphenol metabolites (substances found in plants that help us fight diseases) in plasma and urine all at the same time! This can help us study **the relationship between diet and mental health, as well as the immune system.** It's amazing, isn't it?

### The secrets in blood, saliva and urine!

#### Saliva samples

Unlike blood tests, which look at substances bound to proteins as they travel through the blood, the analysis of **saliva** can help us predict, diagnose, or prevent many health problems and diseases. In the area of mental health, researchers have identified **several valuable markers of stress in the saliva**, which are: cortisol, lysozyme and salivary alpha-amylase (sAA). The changes in the levels of these markers in the saliva have been found to be associated with stress and mental health problems, such depression or anxiety. The use of saliva in medical diagnostics is becoming **more and more popular** as it is **cheap**, **non-invasive**, **painless and convenient** for both young children and the elderly.



## **Urine samples**

Since blood and saliva can both provide **so much biological evidence** for us, why do we still collect urine sample? The answer is **METABOLOMICS!** Metabolomics is the study of all metabolites, which are small molecules in the body.

You may say blood can also tell us the information about metabolites. However, greater fluctuations could occur in urine than in blood, and thus they **reflect better the changes happening in our bodies.** Through urinary metabolomics, small metabolites in urine can all be measured.

Although urine samples are widely used in the study of various diseases, including kidney injury, chronic heart failure, liver cancer, and breast cancer, **its application in mental health is still limited.** 

In our eBRAIN study, we plan to measure **polyphenol metabolites in the urine and look at** their relationship with diet and mental wellbeing.

> Now that you have discovered the many secrets hidden in blood, saliva and urine, do you feel proud to contribute your samples to a scientific study?

Your biological samples will be a crucial step in moving the research forward!

#### Meet our volunteer undergraduate student, Saloni!

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Saloni is a **3rd year Neuroscience undergraduate student** at King's College London. She has been volunteering with eBrain throughout summer 2021 and her contributions so far have been incredibly helpful to the study! We are so grateful for her time and happy that we can offer her with a **valuable work experience** during her degree.

When learning about different mental health problems, it's often **easy to develop an indifference** towards them, especially when thinking we may be less likely to face certain conditions because of our different personality traits.

I think volunteering is a great way to be there for those who may be vulnerable and share some of our time and compassion with them, or even just personally help shed the stigma surrounding mental health. Volunteering with the eBRAIN study over the past few months has made me learn that whilst good mental health can be aided through a good diet or a good social circle, for many of us, difficult experiences can happen at an early age in life. They can also be difficult to overcome later in life due to how they may affect the development of our brains. This has led me to realise the importance of having anti-bullying measures, buddy programs and counselling in schools, where young people's mental health is put at the forefront.

Besides eBrain, I also volunteer with **AGE Concern** where I **provide emotional and bereavement support** to the elderly, and tutor children with chronic illnesses who miss classes due to hospital appointments. My experiences have taught me that **mental health affects us all, regardless of our age, occupation, or even physical wellbeing.** 

Being part of the eBrain study, a project that studies the **links between early life adversity, neurodevelopment and mental wellbeing**, alongside the role played by exercise and nutrition in **building better mental health**, is an incredible way of seeing how mental resilience can be achieved in young people.

The study also has a **wider implication in the world of social psychology**, and I'm incredibly grateful to be a part of it!

# Number of participants from each of our collaborating schools



We have loved seeing so many of you (116, to be exact, as of September 2021!) over the past 2 years for your eBRAIN study visits from **lots of different schools across London!** 

## Mental health and science workshops at your school!

We have also really enjoyed coming into your schools to deliver in-person and virtual **interactive workshops and presentations!** We have explored various topics with different year groups:

- Mental health awareness
- Careers in science and research
- Managing anxiety, especially post-lockdown
- Setting healthy physical and emotional boundaries

If you'd like to take part in these **engagement activities** (which can be tailored to your school's needs) and have campus visits to see **our brain bank and MRI scanner**, we'd love to hear from you! Please email us: **ebrain@kcl.ac.uk** 

## **Comments from our participants!**

We love hearing your feedback at the end of your study visits! It is great to know where we can improve and what you liked about your visit.

Some of the things young people enjoy most about participating in the eBRAIN study are learning about the brain and mental health, researcher attitude, contributing to science, talking about their feelings and experiences, and snacks!

Here are some of our **favourite comments** that participants have shared with us.



eBRAIN wordsearch! Find the definitions below and the <u>solution on final page</u>

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G	Ν	Е	U	R	0	S	С	Ι	Е	Ν	С	Е	N	BIOLOCY
Y	R	Μ	С	С	0	G	Ν	I	Т	I	0	Ν	С	CEREBELLUM
E	R	Μ	Т	Μ	Ε	Μ	0	R	Υ	Ι	С	С	Ε	MENTALHEALTH
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You can also play this puzzle online at: https://thewordsearch.com/puzzle/2786237/

**NEURON:** a cell that carries information within the brain and between the brain and other parts of the body

**COGNITION:** the process by which knowledge and understanding is developed in the mind **SYNAPSE:** a connection between two nerve cells

**NEUROSCIENCE:** the science that deals with the structure and function of the brain and the nervous system

**BRAIN:** the organ inside the head that controls movement, thought, memory and feeling **MEMORY:** your ability to remember things

**CYTOKINE:** small proteins which are secreted by certain cells of the immune system and have an effect on other cells

WELLBEING: general health and happiness

**MIND:** the part of a person that makes them able to be aware of things, to think and to feel **BIOLOGY:** the scientific study of the life and structure of plants and animals

**CEREBELLUM:** the part of the brain at the back of the head that controls the activity of the muscles

MENTALHEALTH: the state of health of somebody's mind

**AMYGDALA:** either of two areas in the brain that are linked to memory, the emotions and the sense of smell

**BIOMARKER:** a naturally occurring molecule, gene, or characteristic by which a particular pathological or physiological process, disease, etc. can be identified **RESILIENCE:** the ability of people or things to recover quickly after something unpleasant, such as shock, injury, etc.

## Dear reader,

Thank you for reading our Newsletter. We hope you enjoyed it! If you'd like to get involved with the study, find out more or ask any questions, please don't hesitate to get in touch! You can find our contact details and social media accounts below. We look forward to hearing from you! Bye for now!

#### The e-BRAIN team



If you missed our last newsletter or would like to view any of our previous newsletters, you can find them here: <u>https://www.ebrainstudy.com/blog</u>

Α	в	S	В	Ι	0	Μ	A	R	Κ	Е	R	С	Ε
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I	L	Ρ	с	R	Α	с	G	Α	0	Ρ	G	I	Ι
0	в	s	Е	0	I	Α	Υ	Ρ	к	I	R	Ν	L
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Want more? Why not check out our <u>website</u> for more eBRAIN content, including blogs, mental health resources, challenges and more! ©

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