RESEARCH NEWS:

DO PSYCHIATRIC DISORDERS SHARE A BIOLOGICAL BASIS?

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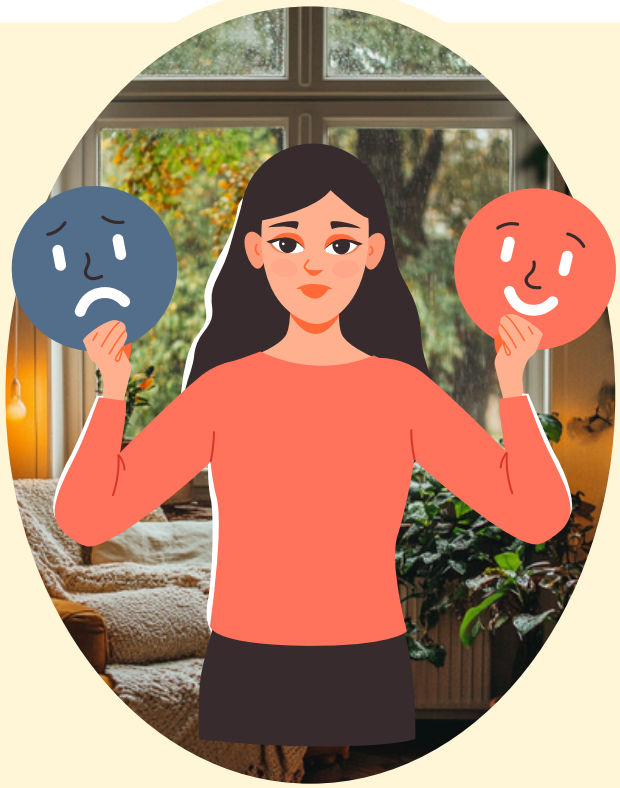
When we think about psychiatric disorders, the first things we think of are usually the symptoms associated with them, for example:

Feeling sad for depression...



...depressed and manic phases for bipolar disorder (BD)...

...and hallucinations for schizophrenia (SCZ).

BUT:

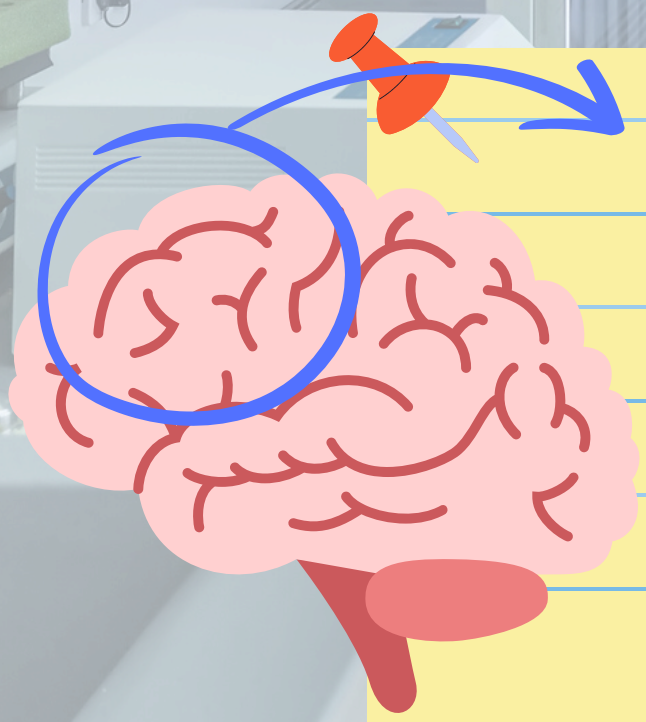
Symptoms like cognitive impairment and mood instability occur in multiple disorders. This made Janine, Karolina and their team wonder: Is grouping psychiatric disorders based on symptoms really the best way?

In fact – what if we grouped disorders based on biological mechanisms instead? To achieve this, researchers need to first understand the biological basis of psychiatric disorders.

So, our researchers analyzed post-mortem **brain tissue samples** from 169 people:

107 **psychiatric patients**, most with SCZ, some with BD or depression

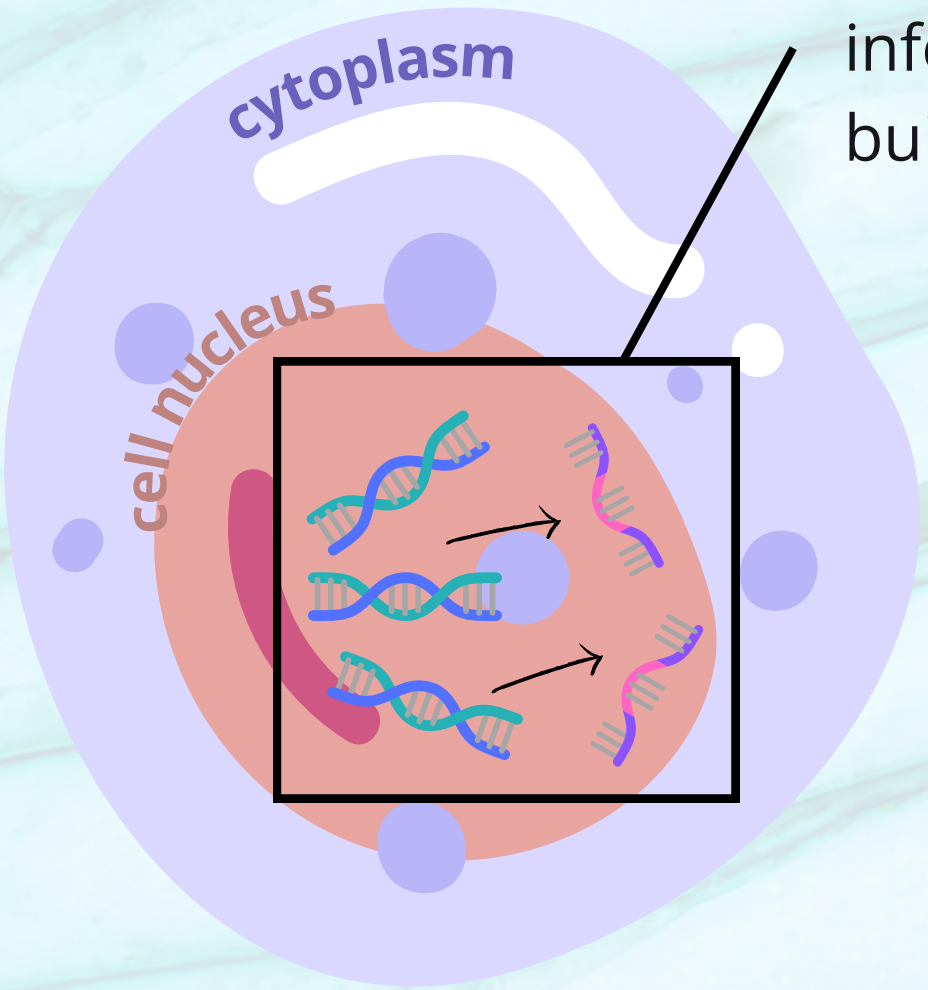
62 **healthy controls**



Specifically, they looked at the dorsolateral prefrontal cortex - a part of the brain that is important for reasoning and emotions - and which is often involved in psychiatric disorders.

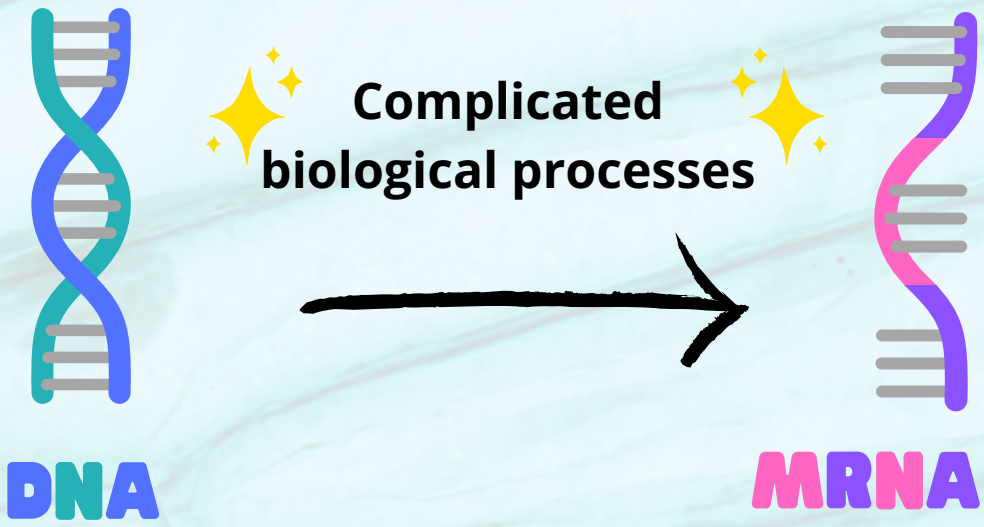
The special thing about this anaylsis: The team looked at gene expression on the exon level. To understand what this means, we need a quick (simplified) protein synthesis refresher:

1 TRANSCRIPTION



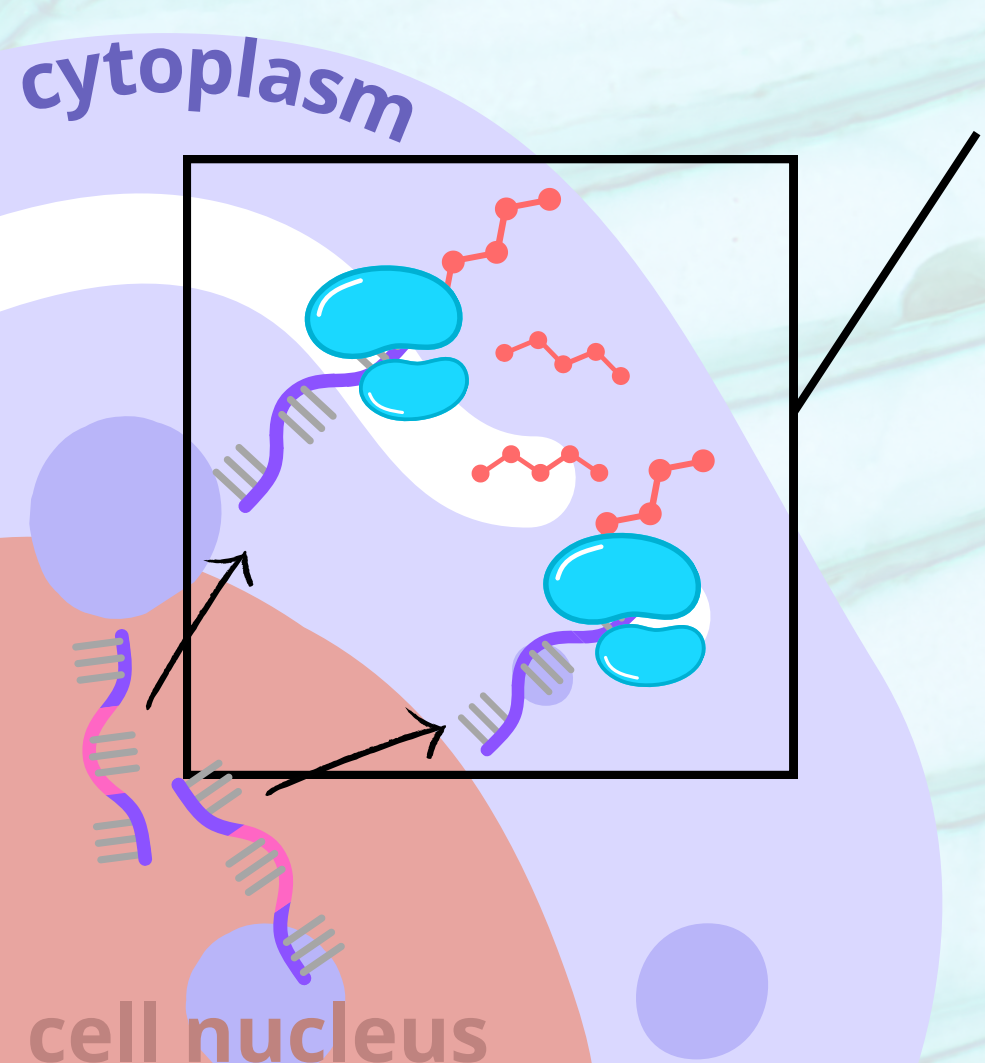
The DNA in our nucleus stores all genetic information, including instructions for building proteins.

Through a multi-step process, DNA is transcribed to messenger RNA (or mRNA), which carries genetic information from the nucleus to the cytoplasm. mRNA consists of **introns** and **exons**.



Before the mRNA gets to the cytoplasm, introns and exons are seperated. **Introns** are discarded, while **exons** are put back together.

2 TRANSLATION

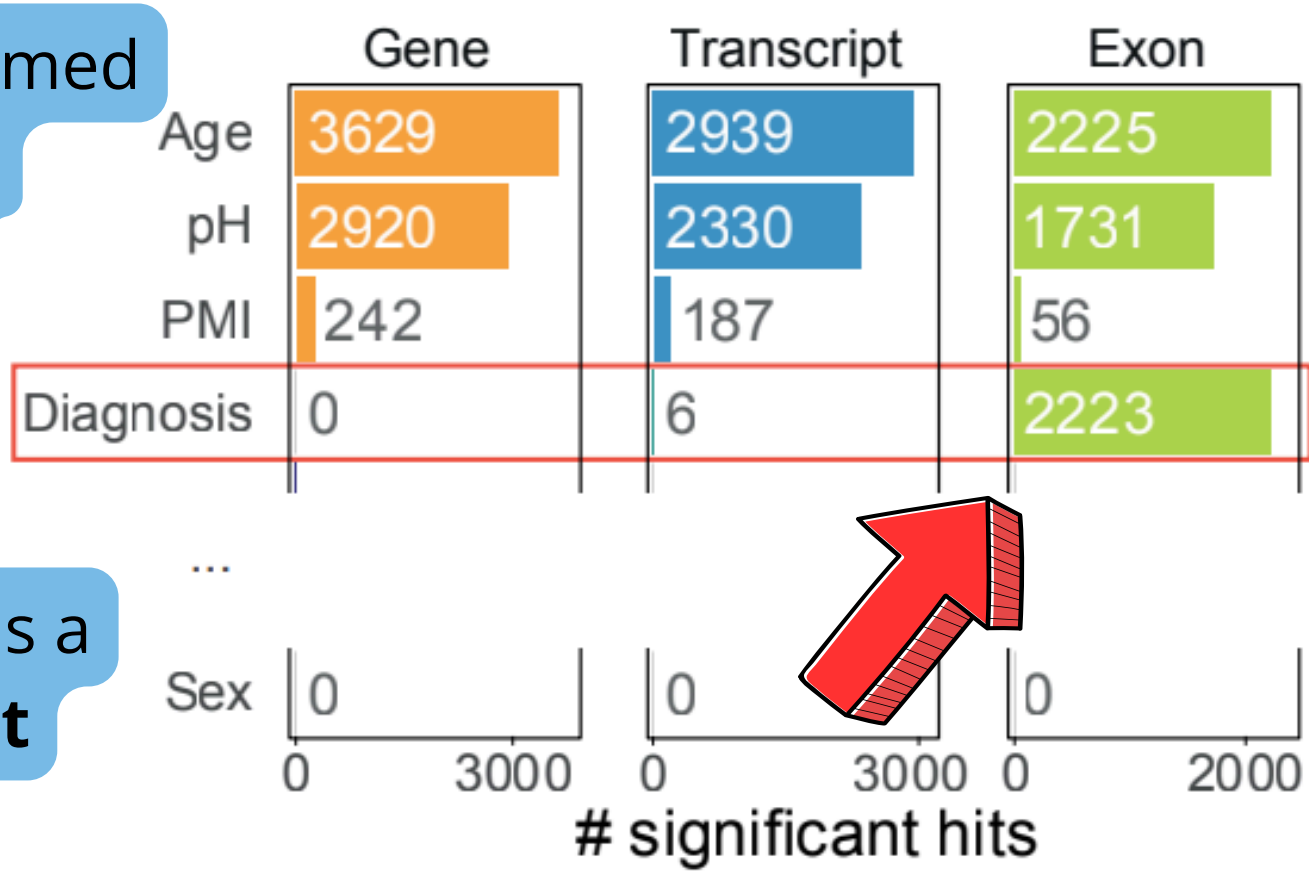


In the cytoplasm, ribosomes then translate the exon-only mRNA into an amino acid chain, which is eventually folded into a protein.

This means that a single gene can give rise to different versions of a protein, depending on how the exons are seperated and put back together.

That's why, to really understand the effects of genetics on psychiatric disorders, we need to not only look at what genes are present in the DNA, but **how these genes are expressed at the exon level!**

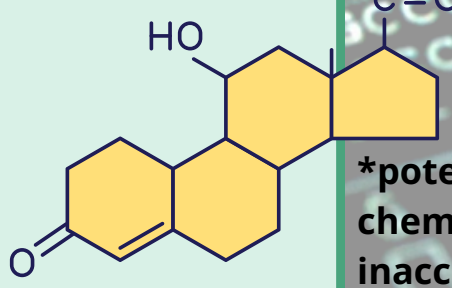
The study analysis confirmed this: While there was no clear difference in gene expression between patients and healthy controls at the gene or transcript level, there was a **significant difference at the exon level!**



What's more: Janine and Karolina found a commonality in the exon level data of the psychiatric patients. Three important pathways were disrupted across SCZ, BD and depression:

1. **Circadian rhythm:** The body's inner clock. Disruptions could be linked to mood instability.

2. **Cortisol:** An important stress hormone. Disruptions here could also link to mood instability.



*potentially chemically inaccurate

3. **Dopamine:** Neurotransmitter, important for feelings of motivation.

WHAT DOES THIS MEAN?

This tells us that three major psychiatric disorders share a biological basis. This is big news: It brings us one step closer to a biology-based classification of psychiatric disorders, as opposed to a symptom-based one!

In the future, this will also help researchers to develop treatments that are target underlying biological processes, as opposed to only treating symptoms.