

MAZE

ISSUE IX

University of St Andrews Psychology and Neuroscience Magazine



MAZE DISCLAIMER

“The opinions expressed in this Issue are solely representative of individual writers and are independent of the University of St Andrews, The University of St Andrews Student Union, and the MAZE Executive Board”

LETTERS

Dear Readers,

If I've learned anything from my time at MAZE, it's that the best stories often begin with a question you can't seem to let go of. An unrelenting curiosity, and placed before it, a blank page to fill. That's what MAZE has always been about: creating a space for inspired individuals to fill these pages with their boldest questions and tenacious ideas, and for our readers to turn each page feeling a little more inspired and fully, irresistibly curious.

In the fields of neuroscience and psychology, the effective communication of groundbreaking research is pushing us toward discoveries, treatments, and new perspectives that are life-changing. At MAZE, we are committed to contributing to this conversation by exploring subjects and ideas that extend beyond our lecture halls. Our content is personal and brimming with that same insistent curiosity to ask the questions no one else is asking and write the stories seldom told.

This issue is no exception, and within these pages, you'll experience stories of the innate human disposition, the therapeutic potential of the peyote cacti, a bold spotlight on the history of female autism, and so much more. These brilliant pieces fit pages surrounded by thought-provoking art and designs put together by our artist and design teams. This work was perfected and sharpened by the diligent eyes of our editors. Further, shared and amplified by our energetic social media and events teams. This is all seamlessly coordinated by the behind-the-scenes dedication of our secretary and our fundraising team. Finally, I am incredibly grateful to share this role, working alongside my fellow co-Editor-In-Chief, Giulia Schuster, who's dedication and insights continuously inspire me.

Serving as co-Editor-In-Chief this past semester has been a privilege unlike any other. I've watched this incredible team band together through day and night, winter into summer, and across time zones, to ensure the production and publication of this MAZE issue. To work with such curious, committed, and inspired individuals has been an honour, and I look forward to the upcoming semester and the memories it will hold and the stories it will bring.

So...Have you ever been unsure about how to respond when someone compliments your outfit? Wondered about the groundbreaking therapeutic potential of a simple spineless cactus? Considered how your brain might behave in microgravity? Or wished to learn more about the historic invisibility of women with autism?

Welcome to MAZE Issue IX! This issue is for you. :)

Sincerely,

Hannah Betts, MAZE Co-Editor-In-Chief



from the editor in chiefs

Dear Readers,

It is with incredible excitement that we share the newest edition of our magazine, sharing upcoming psychological and neuroscientific findings, fascinating revelations about our history, and eyeopening answers to questions you may never even have asked yourselves. The passion each writer has for psychology and neuroscience is reflected through every article and makes us grow even fonder of this field. It is truly impressive how much thought goes into writing about such topics, whether it be from a personal, a clinical, or a research-based perspective. With language allowing for expression through words, alongside it comes its expression through art and design, as so beautifully depicted by our team of artists and designers.

This edition would not have been made possible without the help of the Fundraising, Events, and Social Media teams, guiding and facilitating outreach, communication, and networking. The same can be said for our editors and our secretary, who help keep things running smoothly. Every semester, each team has grown substantially more than the last semester. As a recently Union-affiliated society, we look back on the goals this society aims to achieve each semester, and we can proudly announce that this latest semester's objectives have been reached. From always prioritizing inclusivity, to increasing collaborations with other societies, to creating a space for sharing passion, creativity, and awareness.

This edition will be the first published in the time that I am Co-Editor-in-Chief. Being in my third year of university and having started as an editor in first year, I am excited to see what the future holds for MAZE, and I hope to be with it every step of the way until I graduate. Most of all, I would like to thank Hannah Betts, my Co-Editor-in-Chief, for her insight, dedication, and the knowledge she was able to share with me throughout this journey.

As you read through these articles, I hope the same excitement we feel is conveyed to you too – the excitement that everyone's hard work is published and out for readers to immerse themselves in. And the excitement of catching a glimpse into the fascinating aspects of this field. Enjoy your read!

With deep gratitude,

Giulia Katharina Schuster, MAZE Co-Editor-in-Chief



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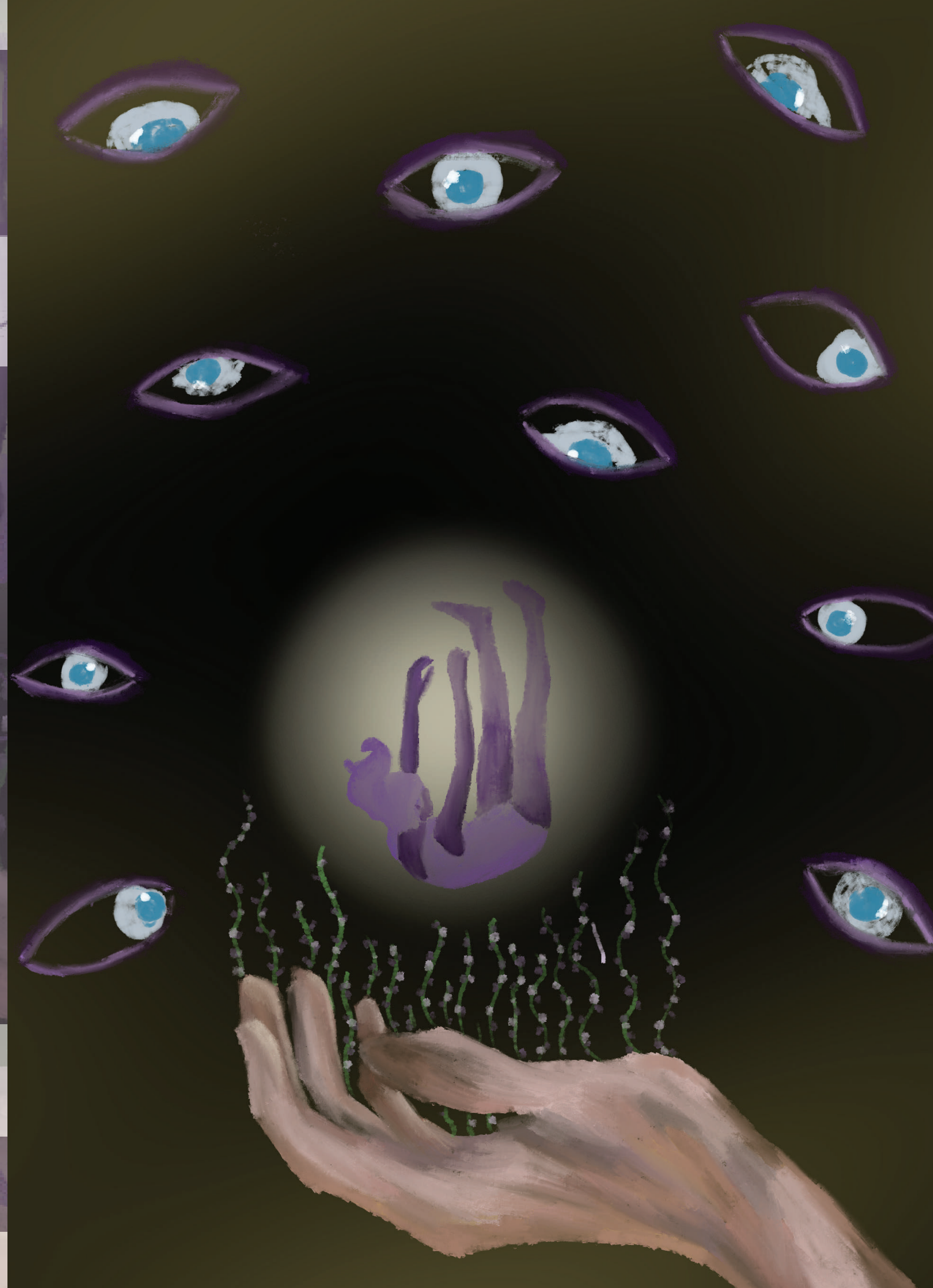
MEET

THE TEAM

Destigmatising

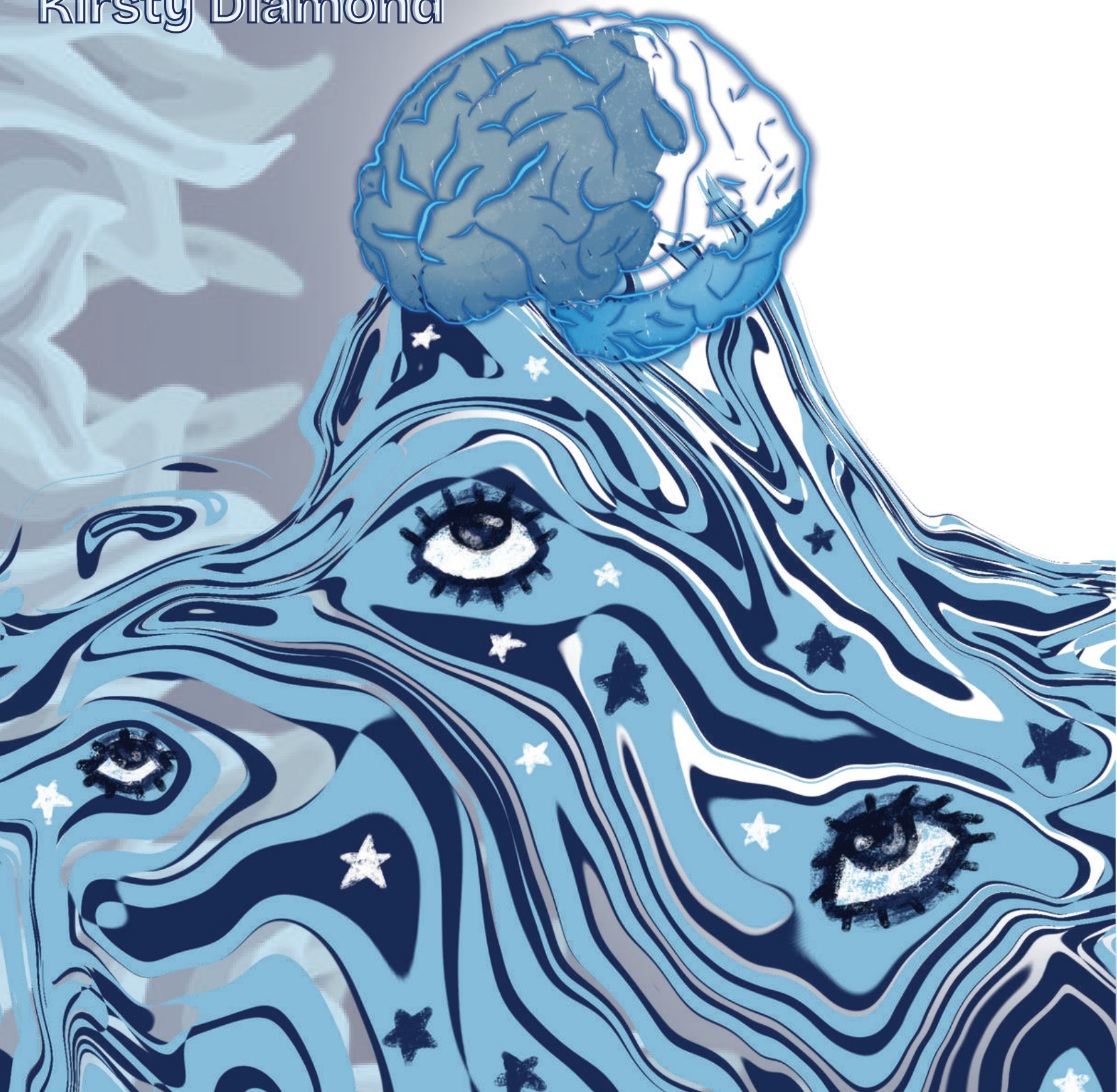
This section focuses on destigmatising mental illness and acknowledges inequality within Psychology and beyond. It aims to remove any embarrassment or unease triggered by certain conversations (e.g. symptoms or treatments of disorders). Writers talk about the stigma surrounding mental health, illness, or Psychology in general. Articles on destigmatising are very important as they help create a more inclusive society for those who read them and those who suffer due to stigma. Content is thoroughly evidenced with reputable research from articles, scientific magazines, or journals.

Edited by Daisy Kay



The Psychology of the The Psychology of the Twisties' in Gymnastics

Kirsty Diamond



Many dream of representing their country at the Olympics. It signifies that you have made it – that you are one of the best. However, very few people get to experience what it feels like. These Olympians have made considerable sacrifices to get there and have committed countless hours to training. Many report that the reality of the moment is not what they thought it would be. All eyes are on you. One attempt to make all the sacrifices worth it. The pressure to not let yourself, your team, or your country down can be overwhelming – sometimes too much. This was the case for Simone Biles in the 2020 Olympic Games, held in 2021. The accumulation of stress led to her suffering from the twisties (Nagesh, 2021). The twisties is a psychological phenomenon that causes gymnasts to feel a disconnect between their body and mind, and lose their spatial awareness in the air (Yu, Chang & Shih, 2022). The danger of this loss of control while performing caused Biles to withdraw. Biles could no longer perform routines that were second nature to her. But what was happening in her brain to cause this?

The twisties is thought to be a form of task-specific depersonalisation (Yu et al, 2022). Depersonalisation is defined by the DSM-IV as “an alteration in the perception or experience of the self so that one feels as detached from, and as if one is an outside observer of, one’s mental processes or body” (American Psychiatric Association, 1994). Research suggests that depersonalisation is closely linked with PTSD and Anxiety. It is thought that it evolved as a response to life-threatening situations, in which the disconnect from the situation improved survival chances (Roth & Argyle, 1988). Noyes and Kletti (1977) found that during a life-threatening experience, 66% of participants reported depersonalisation. This would explain why Anxiety and PTSD, which are overactive threat responses, can trigger depersonalisation. Biles has been open about her mental health struggles, so this seems to align with her case (Lutz, 2021).

The similarity in symptoms of depersonalisation and temporal lobe epilepsy suggest that depersonalisation may be the result of temporal lobe dysfunction (Sierra & Berrios, 1998). Depersonalisation is triggered by mood swings and feelings of panic, which are processed by the amygdala (localised in the temporal lobe), further implicating temporal lobe dysfunction as a key factor in depersonalisation (Roth & Harper, 1962). This is backed up by electroencephalographic recording which showed that brain activity in the temporal lobe differed, with an increase in slow activity and reduced responsiveness, for panic disorder patients with depersonalisation than those without (Locatelli, Bellodi, Perna & Scarone, 1993). Theta activity in the left temporal areas also implicates temporal lobe dysfunction as a cause of depersonalisation (Hollander et al, 1992). Overall, research into depersonalisation suggests that temporal lobe dysfunction is behind this phenomenon.

Depersonalisation can be explained by Sierra and Berrios’s neurobiological model (1998). They argue that stress can result in a conflicting stimulation of opposing mechanisms, which leads to a feeling of detachment from oneself. Once a threshold of anxiety is experienced, the left-sided prefrontal cortex inhibits the amygdala. The amygdala is involved in processing an emotional response to a stimulus, often a fearful response to a threatening situation (Davis, 1992). This inhibition leads to a reduced thoracolumbar outflow. The thoracolumbar outflow is part of the sympathetic nervous system which produces a physical reaction to fear, including an increased heart rate and sweating (Elevier, 2025). Under stress, the whole system is activated causing the well-known fight or flight response. The inhibition of the amygdala, therefore, reduces the physical response to fear, resulting in a feeling of detachment from one’s body (Damasio, 1994). In the meantime, the right prefrontal cortex, which controls attention, is activated. This leads to a feeling of increased alertness and vigilance. The combination of feeling a detachment from one’s body and increased alertness creates the experience of depersonalization.

It is clear that extreme stress, often caused by Anxiety and PTSD, can trigger depersonalisation (Sierra & Berrios, 1998). Athletes have a unique set of stressors and, as a result, unique causes of depersonalisation (Yu et al, 2022). Attention from the media and financial pressure from sponsors can be a burden. Additionally, there is often pressure on athletes to suppress their stress and hide any signs of weakness to their opposition. These athletes may also fear what the media and fans might say about them struggling with this seemingly dream career. The suppression and buildup of stressors have been implicated as a key cause of reaching this stress threshold (Yu et al, 2022). As well as this, research by Michal and Beutel (2009) suggests that the result of intense physical training is neurobiologically similar to PTSD, a source of depersonalization.

Depersonalisation is hardwired into our brains (Sierra & Berrios, 1998), and there is currently no proven medication or therapy which is effective for curing depersonalisation. Therefore, the best way to prevent and overcome the twisties is to remove the trigger by reducing stress and increasing mental resilience to stress (Yu et al, 2022). Once the twisties have set in, overcoming them is challenging due to the additional fear of reexperiencing being out of control of your own body (Yu et al, 2022). An extended period away from training, to decompress, and then slowly building up skills and confidence is effective (Yu et al, 2022). To prevent the twisties, gymnasts should consider training their minds as well as sticking to their routines. Therapy, to improve control over their emotions and make them more resilient to stress, would mitigate the risk that stress poses to a gymnast's performance (Yu et al, 2022).

The image of a smiling Biles wearing her gold medal and GOAT necklace after the 2024 Olympics is a stark contrast to the scenes of her struggling three years prior. It demonstrates that, with the right support and therapy, the twisties can be overcome. While Biles has brought media attention to the twisties, they are something already well-known and feared within gymnastics. Understanding the trigger – intense stress – can help gymnasts prevent the twisties and perform to their best. While it is understood that the twisties is a result of increased alertness combined with an inhibited emotional response, it is an under-researched area. Hopefully, the publicity brought to this phenomenon by Biles will lead to more research into the exact triggers and levels of stress that results in this depersonalisation.

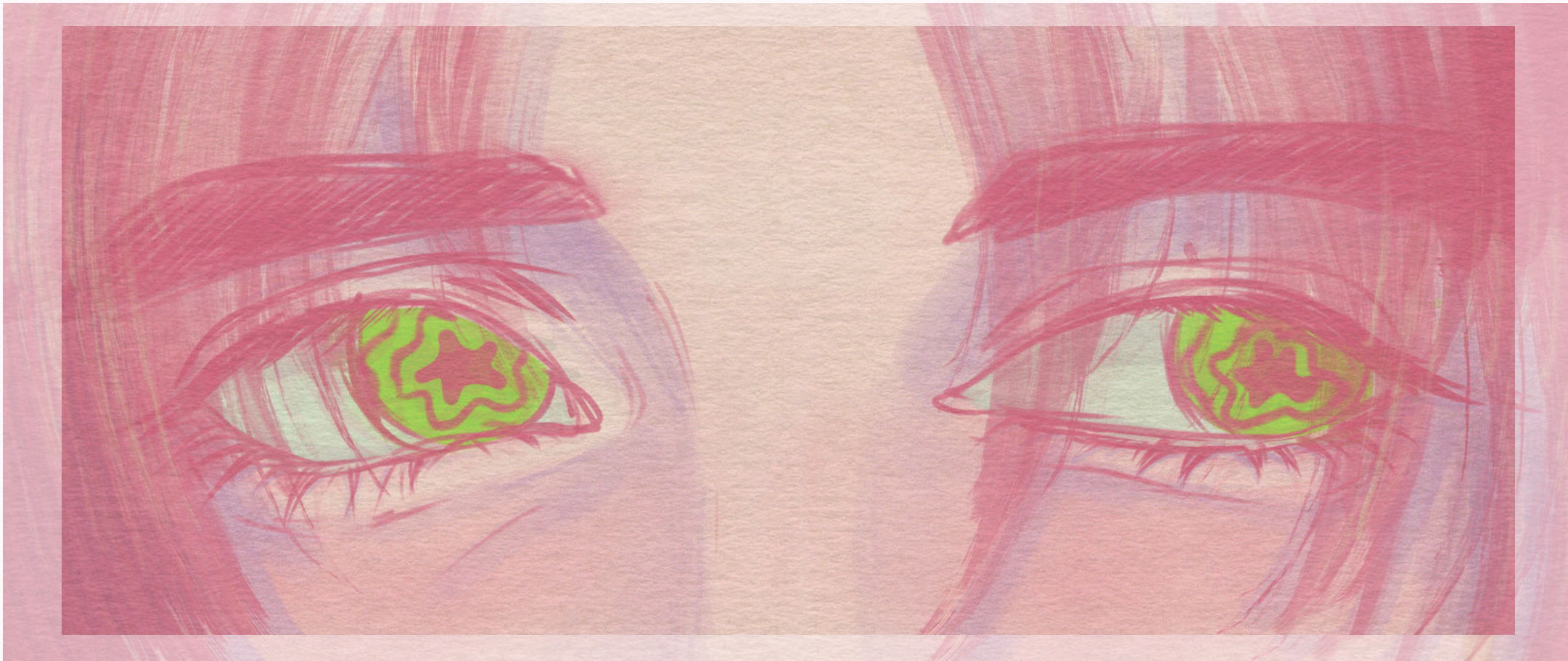


How Drugs Hijack the Brain's Reward System and What This Means for Treatment

written by Kirsty Diamond

I- Introduction

Drug addiction – a chronic brain disorder marked by an uncontrollable compulsion to consume excessive amounts of drugs – continues to affect an alarming number of individuals globally. Prior to the COVID-19 pandemic, drug overdose deaths in the United States averaged approximately 70,000 annually. A figure that tragically surged to over 110,000 by 2023 (Nestler, E.J., 2025). Multiple factors – such as social isolation, economic struggle, limited access to treatment and a lack of resources for underserved communities – were exacerbated during Covid and encouraged people to make unhealthy decisions (Chacon, N.C. et al., 2021). Furthermore, 48.5 million Americans reported experiencing substance abuse in the past year (Editorial Staff, 2024). Paradoxically, these rising statistics contrast with the significant advances we have made in understanding the biological mechanisms underlying drug addiction, which in turn has fueled ongoing research into potential treatments (Potenza, M.N., 2013).



I- Classification of Psychoactive Drugs

Psychoactive drugs, which influence mental functions and consciousness, are typically classified into four categories: depressants, stimulants, hallucinogens, and opiates. Depressants, such as barbiturates, benzodiazepines, and alcohol, exert a calming effect on the body by reducing heart rate, blood pressure, brain activity, and processing speed. In contrast, stimulants, including caffeine, amphetamines, cocaine, and nicotine, enhance brain activity, increase heart rate and blood pressure, and heightens alertness. Hallucinogens, such as LSD and psilocybin, alter perception, leading to hallucinations and an intensification of sensory experiences. Lastly, opiates, which share calming effects with depressants, are commonly used to alleviate pain, with morphine and heroin being notable examples in this category (Australian Government Department of Health and Aged Care, 2022).

III- The Reward Pathway

Stimulants and opioids activate the mesolimbic dopamine circuit, a brain pathway that delivers dopamine – a key neurotransmitter – to regions such as the amygdala, nucleus accumbens, prefrontal cortex, and hippocampus. When dopamine levels rise significantly within this circuit, the amygdala signals to the hippocampus that the experience was pleasurable. In response, the hippocampus – responsible for memory storage – encodes the conditions associated with the sensation to encourage its repetition. The nucleus accumbens, which regulates motor functions, prompts the body to repeat the rewarding action, while the prefrontal cortex focuses attention on the ongoing behavior (MacNicol, B., 2016).

Depressants, on the other hand, function differently. Rather than directly triggering dopamine release, they reduce inhibition of dopamine-producing neurons, indirectly leading to its secretion (Nestler, E.J., 2025). Hallucinogens do not act directly on the brain's reward system. They act on serotonin receptors, influencing perception, cognition, and emotions, so they are not particularly addictive (Canal, C.E. et al., 2016).

III- How Drugs Alter Brain Chemistry

Different types of drugs affect various neurotransmitters and target specific neuroreceptors. Communication between neurons occurs when the first neuron releases neurotransmitters, which bind to receptors on the receiving neuron, triggering chemical changes that transmit the signal. Once neurotransmitters have bound to their receptors, they are broken down by enzymes and later reused for future signals (Loving, D.M., 2024). Psychoactive drugs primarily work by abnormally increasing neurotransmitter levels, particularly dopamine – the neurotransmitter associated with pleasure. To counteract this surge, the brain reduces sensitivity by closing certain neuroreceptors on the next neuron. As a result, higher doses of the drug are needed to achieve the same pleasurable effect – a state known as tolerance. When drug use stops, the brain, having adapted to high dopamine levels, struggles to function normally. With fewer active neuroreceptors, dopamine levels drop below normal, leading to withdrawal symptoms. This state causes discomfort, anxiety, irritability, weight gain and intense cravings, reinforcing the cycle of drug dependence. This is why relapse is common – it occurs when a person experiences intense cravings for the drug after stopping use and struggles to resist temptation (Russo, S.J. et al., 2008).

Opiate and opioid drugs function by activating specific proteins called opioid receptors in the brain and the spinal cord. These receptors are linked to inhibitory G proteins, which help reduce pain signals and inhibit neurons that regulate neurotransmitter levels. Stimulants like cocaine prevent dopamine from being reabsorbed into the nerve cell that released them, causing these chemicals to remain active for a long time and enhancing their effects on the receiving cells. Some psychostimulants directly attach to monoamine (dopamine and serotonin) receptors and block monoamine oxidase – an enzyme that normally cleaves these chemicals. Depressants act on GABA receptors, which are brain-inhibitory neurotransmitters, meaning they reduce activity and promote relaxation. Since GABA inhibits neurons that normally suppress dopamine release, depressants indirectly trigger the release of large amounts of dopamine and therefore activate the reward pathway (Russo, S.J. et al., 2008).

V- Research for Treatments

Drug abuse is a serious issue as it can lead to long-term health effects, such as cancer, heart attacks, and an overdose. Overdosing can happen easily due to the brain's ability to adapt to drug use in familiar environments. When a person regularly takes a drug in the same setting, the brain anticipates its effects and preemptively lowers blood pressure and heart rate to compensate. However, if the drug is taken in a different context, the brain does not make these adjustments, resulting in the usual dose being far more dangerous and increasing the risk of overdose (Siegel, S. et al., 1982). To prevent this and reduce relapse rates, researchers continue to explore effective treatments for addiction. Stimulants, which work by preventing the reuptake of the monoamine's dopamine and serotonin into the presynaptic neuron, can be counteracted by amphetamines, which modify monoamine transporter function, making them operate in reverse and increase the release of monoamines into the synapse. However, amphetamine is a stimulant medication that carries a risk of addiction when used in excessive amounts. (Russo, S.J. et al., 2008). A more promising drug is disulfiram, which can cause severe physical reactions, such as headaches, vomiting and dizziness, when the drug is ingested. It amplifies the negative side effects of cocaine, such as anxiety, and paranoia, making the drug less enviable. Another potential strategy is the development of a cocaine vaccine that prompts the immune system to produce antibodies which attach to cocaine molecules, preventing them from reaching the brain. However, it does not reduce cravings for cocaine and some consumers might try switching to other substances. Unfortunately, relapse among psychostimulant users remains high, highlighting the need for more effective therapies.

Depressants like alcohol can also be regulated using disulfiram, which prevents the oxidation of alcohol at the acetaldehyde stage. The building up of acetaldehyde in the bloodstream triggers severe symptoms, such as facial flushing and hyperventilation. Disulfiram is absorbed and eliminated slowly from the body, resulting in adverse reactions to alcohol for up to two weeks after ingestion.

Opioid addiction could be alleviated by the administration of cannabinoid receptor 1, which reduces opiate reward-related behaviours since CB1 receptors often inhibit excitatory signals (Russo, S.J. et al., 2008). However, most pharmacotherapies for managing withdrawal symptoms involve substituting one drug for another, such as using methadone to treat heroin addiction or nicotine patches for smoking cessation, which is not ideal (Siegel, S., et al., 2002).

Other methods, such as acupuncture, have demonstrated clinical effectiveness in treating opiate withdrawal (Motlagh, F.E. et al., 2016). Individual determination is also pivotal. Multiple therapies have proven to be useful (Carroll, K.M. et al., 2005). However, more effective treatments are required as relapse rates are still high.

VI- Conclusion

Drug addiction is a brain disorder driven by complex neurobiological and environmental factors. While significant progress has been made in elucidating the mechanisms of addiction – particularly the roles of neurotransmitters, the reward pathway, and neuroadaptations – effective treatments remain limited, and relapse rates are high. Current pharmacotherapies, including disulfiram and methadone, and emerging strategies like vaccines, show promise but require further refinement. Continued research into both pharmacological and behavioral interventions is essential to develop more targeted, durable treatments and reduce the global burden of addiction.



History Invisibility:

by: Emma Coombes

Women and Autism

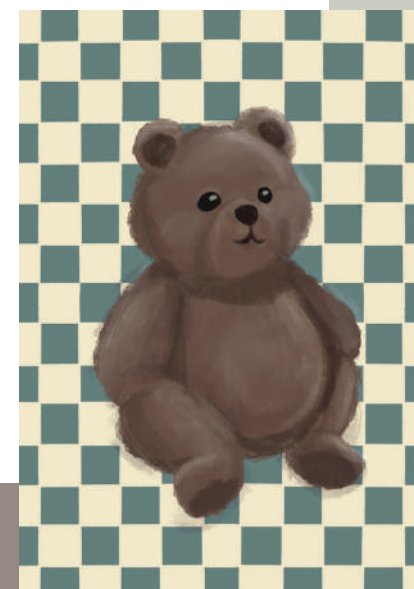


Introduction

The history of women and autism is yet to be written in full. In 1943, Leo Kanner's Autistic Disturbances of Affective Contact was one of the first influential articles to describe autism in young children, focusing on eight boys and three girls. This article was crucial in the recognition of autism as a disorder. Although as one of the first papers of clinical research published on autism, it was disproportionately male-focused. The ensuing research of the middle-to-late 20th-century similarly provided a marginal to non-existent focus on women with autism. This historical disregard of women with autism is due to a wide-scale lack of research, history, representation, and diagnoses for women. The legacy of discrepant 20th-century clinical research has created burdens for women today, leaving them misdiagnosed, undermined, and ignored. However, solutions and improvements are being made today that contribute towards the representation and empowerment of women and girls with autism.

Gaps in the Research

As most information on autism in the 20th-century was created by men for men, large gaps in the research formed. Leo Kanner's monumental paper, which sampled eight boys and only three girls, was primarily targeted towards young boys with severe symptoms, while disregarding high-functioning women and girls. These gaps in the research that were once molehills have now created mountains. For women to obtain an autism diagnosis, they are subjected to a foundation of research that is tarnished by historical sexist discrepancies. Autism has been historically perceived as a predominantly male disorder (Ochoa-Lubinoff, Makol, and Dillon, 2023), which has infiltrated our modern conceptualisations of autism. This causes the dismissal of women and girls with autism if they do not display male-typical symptoms that are cemented into the historical research conducted by men. Frameworks used today to navigate autism diagnosis were designed and validated using largely male samples, resulting in guidelines inherently unsuited to women (Mandy and Lai, 2017). In the last century, women with autism were also often misdiagnosed with conditions like BPD, or their diagnoses were undermined by existing symptoms of anxiety and depression disorders (Lai et al., 2015). This continues in modern society, where overlapping psychiatric symptoms still overcomplicate women's diagnoses (Bellon-Harn et al., 2025). Additionally, autism was perceived by researchers as a disorder that causes autistic people to struggle with social interactions – a key autism indicator in young boys. In contrast, young girls conversely struggle less with social interactions, due to a difference in the severity of symptom displays between girls and boys (Mandy and Lai, 2017). This difference has been overlooked in research before, but professionals now see that women are not always aligned with stereotypical presentations of autism (Bellon-Harn et al., 2025). These oversights only made it more challenging for women today to obtain a diagnosis as they do not always reflect traditional conceptions of autism, and there is a lack of initial research to testify that autism is not a purely male disorder.



Increasing Visibility

The rewriting of this gendered history of autism has been ongoing in recent years. The underrepresentation of women has been recognised, if not fully but by a significant portion of professionals, leading to the implementation of modern solutions. As we live in a digital age, social media provides increased representation and information for women and girls with autism, namely on the platform TikTok. The platform provides an area for women to share their experiences in living with autism and encountering social barriers. Users have created an online community, with TikTok providing a communicative function for previously forgotten women (Bellon-Harn et al., 2025). Communal discourse and social empowerment can be achieved by women through social media, as a product of the growing cultural recognition for underrepresented women. More long-term solutions also contribute to the increased representation of women, with an increasing number of researchers urging for more sensitive and tailored models to determine diagnoses, more gender-informed research approaches, more literature on women and autism produced, and engaging with more autistic people to mend existing stigma of autism (Mandy and Lai, 2017; Strang et al., 2020). Addressing invisibility, inequality, and stigma within social and clinical spheres is imperative so that women and girls with autism are justly recognised for the challenges they face.

Negative Implications for Women Today

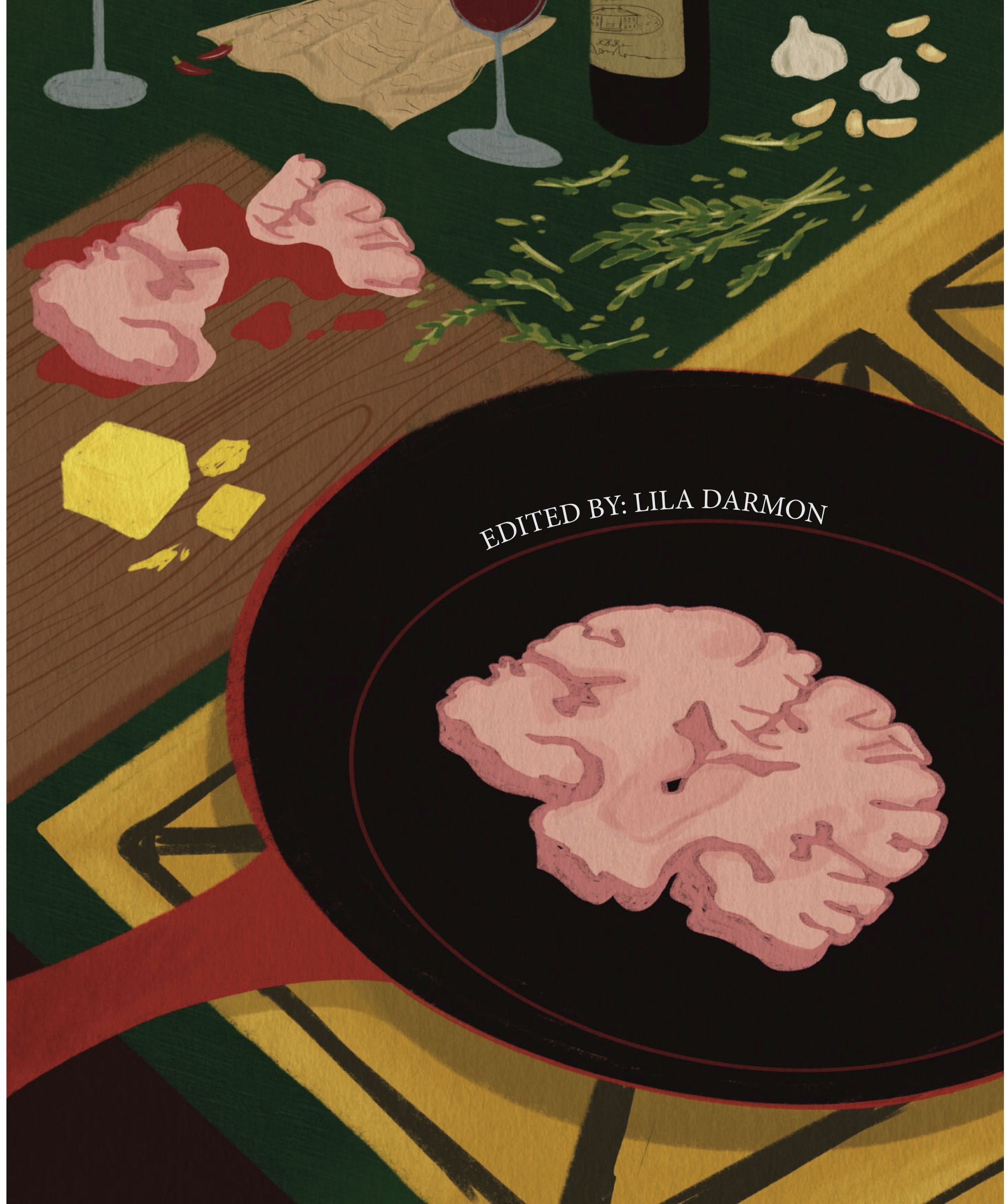
As a result of 20th-century research, our current concepts of autism are still centered around men. In fact, men are four times more likely to receive an autism diagnosis (D'Mello et al., 2022). This is down to current-day screening standards not being tailored to women, often leading to misdiagnosis. There is also a persisting stigma surrounding women and girls with autism, as their social symptoms are disregarded as "just being shy", or a "loner" (Lai et al., 2015), or undermined as something that is not a challenging problem in the short and long term. Cultural gender norms often force autistic women to camouflage into society, by emulating socially normal behaviours, which is the case for many high-functioning autistic women (Lai et al., 2015). These cultural gender norms also inform the stigmas of normal or abnormal restricted interests, as a key symptom of autism. Autistic women tend to have more socially acceptable restricted interests, such as animals, literature, or dancing, so the severity of their symptoms is undermined. It is crucial for professionals today to not overlook the effects that androcentric 20th-century research standards have had on today's women and girls with autism – this has tangible implications for the "study, characterization, and acceptance" of women with autism socially, as well as on their ability to access services (D'Mello et al., 2022). Although there are some optimistic signs of researchers and scholars recognising the problems that surround this historical invisibility, who is rewriting the story of women and autism to overcome this clinical and systematic dismissal?

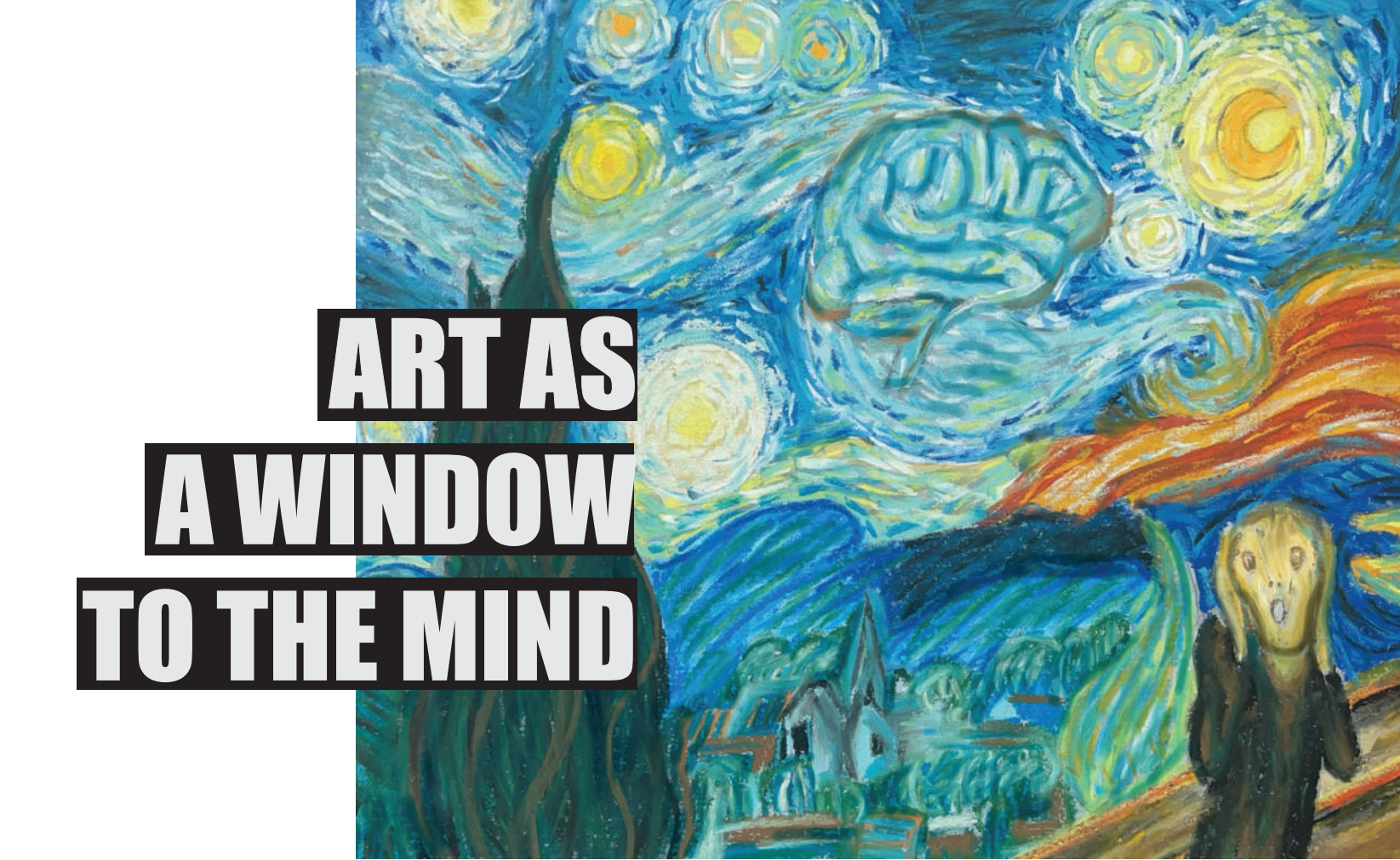
Conclusion

Considering all presented in this article, the fields of neuroscience and psychology have come a long way since the time of Leo Kanner. The improvements for women and girls are slow but steady, as some are empowered through digital communication platforms, but others still face issues obtaining diagnoses. Solutions to this underrepresentation are full of potential, but real-time implementations are yet to be fulfilled. It may take the bigger part of the 21st-century until the clinical and social needs of women and girls with autism are met. But until then, stigmas still stand, functioning as a barrier to the social acceptance of these previously invisible women.

INTERDISCIPLINARY MIND

This section is where neuroscience and psychology meet the world. 'The interdisciplinary mind' explores how both fields converge with diverse disciplines such as philosophy, mathematics, and much more. By highlighting cross-disciplinary insights and bringing forward fresh perspectives, we uncover new ways of thinking about the brain, behaviour, and human experience, showing just how interconnected our mind truly is.





ART AS A WINDOW TO THE MIND

Walking around an art gallery, I think of paintings as being windows into the minds of artists, with each painting providing a snapshot into their psyche. There are many examples of artists that faced mental health struggles throughout their life, and their struggles are immortalised into their artworks, forever hung for critics and psychologists alike to analyse. The narrative of the tortured artist is a hugely popular notion, but how much of this is grounded in empirical evidence? How can we use art as a window into the minds of great artists? Studying cultural icons such as Vincent van Gogh and Edvard Munch will allow these questions to be answered. In addition, empirical studies linking psychopathology and creativity will shed light on how art can be used as both a window to the mind, and as a coping mechanism.

Perhaps no figure embodies the 'tortured artist' more profoundly than Vincent van Gogh. Van Gogh produced some of the most famous works of art of the post-impressionist era, including 'The Sunflowers' and 'Starry Night' (Mota, 2021). Van Gogh's art has been used time and time again by psychologists looking for a link between psychopathology and creativity (Mota, 2021). Van Gogh had some very clear mental health struggles, which were mainly seen in his letters to his brother Theo, to whom he was very close (Nolen et al., 2020). It is

thought that van Gogh struggled with alcoholism, sive episodes, borderline personality disorder, and bipolar disorder (Nolen et al., 2020). His inner turmoil can be seen in his paintings, such as his still life painting 'Café Table With Absinthe', which encapsulates his struggles with alcoholism, or through his self-portraits, 'Self Portrait with Bandaged Ear', which depicts the aftermath of his infamous act of self-mutilation (Geist, 1993). But it is the painting that he created during his time at the asylum that has interested psychologists and art historians alike. This is 'Starry Night' and is widely considered as Van Gogh's magnum opus, as well as a subconscious depiction of his emotions (Richardson et al., 2017). In this painting, a sleepy village lies below a sky swirling with stars and the night, representing perhaps the dizziness and hallucinations of mental deterioration Van Gogh was experiencing at the time (Mota, 2021). Interestingly, the shapes of the clouds and stars move into a pattern that greatly resembles the hippocampus, the location of regulation of behaviour, emotion, and memory, and perhaps the locus of his emotion and affliction (Richardson et al., 2017). Using Van Gogh as an example of a tortured artist, we can see how creativity and mental health can be linked, as his paintings are intertwined into his life and mental state.

Many empirical studies have found links between artistic creativity and affective disorders such as depression and mood disorders (Akinola & Mendes, 2008). It is thought that depressive episodes can provide materials for creativity due to increased awareness, heightened sensitivity, and greater depth of feeling (Taylor, 2017). On the other hand, hypomania, which is characterised by periods of elevated or high mood, (NHS, 2021) is a way of providing motivation to express these feelings (Taylor, 2017), (Mota, 2021). This could explain why so many artists experience mental health issues, as these periods of increased energy are often channelled into creative pursuits. For example, in a study done by Andreasen (2008), rates of mood disorder were found to be extremely high in writers, with 80% reporting some type of mood disorder, and 30% either bipolar I or bipolar II. Another study done by Akinola & Mendes (2008) looked at the relationship between biological susceptibility to negative emotions and artistic creativity. Major depression is associated with the dysregulation of the control of the release of adrenal steroids. One such steroid, DHEAS, has been found to be lower in individuals with depression (Akinola & Mendes, 2008). In a study examining the link between DHEAS and creativity, it was found that individuals with lower DHEAS levels—and greater vulnerability to negative affect, or negative emotional response—produced the most creative pieces following social rejection. This shows a clear biological link between mental illness and potential creativity.

In terms of the link between creativity and schizotypy, a link has been found by investigating brain imaging patterns using fMRI during creative cognition in groups with both low and high psychometrically schizotypy, which refers to the personality traits and behaviours associated with schizophrenia (Fink et al., 2013). Schizophrenia involves abnormal activity in the prefrontal cortex, with increased dopamine levels potentially causing disorganized thinking, delusions, and hallucinations (Mota, 2021). Imaging studies show that highly creative individuals exhibit reduced deactivation in the right precuneus, an area involved in self-referential thought and spontaneous cognition, similar to patterns seen in high-schizotypy groups (Zhu et al., 2017). This shows that the brain's reduced filtering of spontaneous thoughts are mechanisms seen

in both creative ideation and psychotic symptoms (Fink et al., 2013). This means that similar mental processes are seen in creativity and psychosis, indicating a strong link between the two. Additionally, patients with schizophrenia or bipolar disorder and their non-diagnosed relatives are over-represented in creative occupations (Kyaga et al., 2013). Generally, divergent thinking is essential to creativity, and while schizophrenic thought is not identical to divergent thinking, there are similarities in over-inclusive thinking, or delusions. These findings suggest that some cognitive features of creativity, such as heightened associative thinking or sensitivity to internal stimuli, may overlap with those seen in early psychosis. (Kyaga et al., 2013). This further explains why people with schizophrenia might be more likely to be creative, and vice versa.

Certain personality traits such as self-reliance, persistence in the face of scepticism, and resilience to rejection are seen in those who are more creative, all of which make them more vulnerable and more likely to suffer from mood disorders (Mota, 2021). This highlights how these traits aren't always pathological and can be a result of protective factors from hardships during poverty and social exclusion, such as those that van Gogh faced (Drukker et al., 2007). Tragically, while he was alive, only one of his works was sold (Mota, 2021). This lack of validation is thought to be a huge factor in the development of his mental illness.

Creating art is a hugely effective tool in treating many mental health issues, as well as neurological disorders such as dementia, and improving quality of life during terminal illness (Fancourt & Finn, 2019). This therapeutic potential may help explain why many artists are drawn to creative expression, as they use art as a way of coping. An example of a great artist that used art as a way of expressing his feelings and coping with grief in his life is Edvard Munch. Many of his most famous paintings depict the struggles he faced. In particular, 'The Sick Child' is a painting depicting the moments before his sister died of tuberculosis. Munch returned to this subject repeatedly, with each version showing a sick child with a caregiver so distressed by grief that she averts her gaze from the child (Skryabin et al., 2020). The dark palette undoubtedly reflects the distressing scene, as well as Munch's own



WRITTEN BY: ISABELLA ABBOTT



his creativity, fearing that treatment might extinguish the very force driving his art (Azeem, 2015). This is something seen in patients suffering from schizophrenia and bipolar disorder, with studies suggesting that they will self-suspend pharmacological treatments due to reduced creativity by psychotropic drugs (Mota, 2021). This is because patients often feel that the euphoria and energy associated with manic states enhance creativity, and don't wish to stunt this through pharmacological treatment (Andreasen, 2008). Munch's work provides a clear example of how personal struggles and mental states can be transmuted into powerful visual expression, allowing a window into his own world and suffering. As he put it, 'my pictures are my diaries' (Azeem, 2015), he used art as a way of coping with his own issues and struggles.

Using art as a therapeutic method to treat mental illness is also important to consider. From a neuroscience perspective, brain regions such as the medial prefrontal cortex and the amygdala have been associated with creative pursuits (Barnett & Vasiliu, 2024). Human's ability to process and regulate emotions stems from these two brain regions, providing a clear link between creativity and emotional regulation, and the treatment of mental illness (Barnett & Vasiliu, 2024). Additionally, taking part in creative activities has been linked to an increase in neurotransmitters such as serotonin (Nan & Ho, 2017), as well as a decrease in stress hormones like cortisol, creating less inflammatory immune responses (Shukla et al., 2022). Falling Up Together is a Fife-based art collective that advocates for mental wellbeing by facilitating

socially integrated artistic collaborations for all levels of mental health (About | Falling up Together, 2023). The initiative originated in 2016 by Dr Drew Walker, as part of his own recovery from ill mental health and is based around the communal art process promoting healing at the House of Artists in Gugging, Austria. The most recent exhibition took place at the Fire Station Creative in 2024, and featured works of 46 participants, with the theme of art, mental illness and recovery (Falling up 9 | Falling up Together, 2024). In more recent times, art has been used therapeutically, and this highlights the way art is not only linked to mental illness, but can be effectively used to treat it.

By looking at some of the most famous examples of the tortured artist, it can be seen that art offers an extremely powerful lens into the minds of artists. From a neuroscience perspective, empirical evidence further supports the link between creativity and psychopathology. However, this stereotype may be harmful as not all artists suffer from mental health issues, and not all mental illness yields creativity. Moreover, portraying this image onto artists may be a generalisation that normalises mental illness in the creative industries. This romanticisation of mental illness in creative individuals risks reinforcing harmful stereotypes and may discourage artists from seeking help. We can use art as a window into the psyche of great artists from a perspective of understanding how they lived and dealt with struggles. Looking ahead however, it's encouraging to see a growing wave of young creatives leading the charge in mental health advocacy, pushing for a more compassionate and supportive culture within the creative industries.

mood (Azeem, 2015). 'The Scream', one of Munch's most famous paintings, further externalises his own anxieties. In this painting, a figure appears screaming on a bridge over a sunset scene. Munch painted this after seeing a sunset, and 'feeling like nature was screaming', he felt great anxiety until he had painted this. The painting represents a reflection of the way his psychological state made him view the world (Azeem, 2015). Although he suffered many psychological traumas, he refused to undergo treatment, stating: 'They are part of me and my art. They are indistinguishable from me, and it would destroy my art. I want to keep those sufferings.' (Azeem, 2015). Munch recognised his psychological anguish as inseparable from



MULTILINGUAL MINDS, EMOTIONAL LANDSCAPES

The Art of Feeling in Many Languages

Have you ever noticed yourself instinctively switching to your native language mid-conversation, especially when emotions are running high? Or perhaps you've seen a friend struggle to express a thought or a feeling in a second or third language, only to conclude that "it just doesn't sound the same". In my multilingual household, I've frequently encountered this when my parents, who typically speak to me in English, suddenly switch to their native language when emotions run high, like when expressing frustration over unfinished chores. For many multilinguals, this shift between languages during heated moments is a familiar experience. With an estimated 43% of the global population being bilingual and 17% being multilingual, the psychology of language and emotion is a universally relevant topic (Gration, 2025). It is therefore crucial to explore not only why these shifts occur, but also how emotions may be felt and expressed differently across languages. Do these linguistic shifts enhance communication, or act as a barrier?

This link between language and emotion is closely tied to the phenomenon of 'code-switching' (CS), the practice of alternating between languages within the same conversation, or even within a single sentence (Albarillo, 2018). Typically occurring between bilingual or multilingual speakers, CS involves a complete switch from LX to L1 or vice versa. In linguistics, the term 'L1' is usually a person's native language(s) while 'LX' denotes a language acquired later in life. As a multilingual speaker, I've often found myself code-switching when certain expressions in Romanian simply don't carry the

same meaning or emotional weight in English. For example, the Romanian phrase "vezi cai verzi pe pereți", which literally means "to see green horses on the wall" is used to describe someone with unrealistic dreams or unattainable dreams, a nuance that no English phrases fully capture. Sometimes during CS, both languages blend seamlessly, provided the sentence structure remains consistent (Skiba, 1997). For example, one might say, "îadore apprendre new things" or "I love learning de nouvelles choses", where the verb-object pattern remains unchanged despite the switch. But why do we code-switch? Research shows that code-switching happens for various reasons: to integrate into social groups, to express emotions when struggling to find the right words in one language (e.g., due to tiredness or distress), and to convey specific attitudes or intentions (Crystal, 1987, as cited in Skiba, 1997).

Code-switching is not limited to adults—it can be observed early in childhood as well. While earlier research suggested that CS in children indicated confusion or incomplete language acquisition, research from the 1990s onward has challenged this view. Instead, Bolonyai (2005) and Zentella (1997), as cited in Bullock and Toribio (2009), describe it as a deliberate and functional choice. In a study by Reyes (2004), bilingual children, specifically seven-year-olds and ten-year-olds, were observed during both social and cognitive tasks. Both groups tended to switch to their L1 when navigating social contexts, such as integrating into peer groups. Interestingly, during cognitive tasks like a scientific project, children also switched to their L1 to facilitate problem-solving. This reveals that code-switching can be a valuable linguistic strategy for both social integration and emotional and cognitive support. The study further highlights that older children code-switch more frequently, suggesting

that this ability becomes more sophisticated with age as executive functions such as cognitive flexibility continue developing. Rather than creating communication barriers, code-switching can build bridges, enhancing understanding and cooperation.

As we grow older, the phenomenon of code-switching continues and often becomes more nuanced, as individuals switch between languages with greater awareness and purpose. This has particularly been observed in emotionally charged parent-child interactions. Research by Williams et al. (2020) found that emotional arousal plays a significant role in code-switching behaviour. For instance, negative emotions such as frustration or anger often lead to increased code-switching, as heightened emotional arousal reduces cognitive control, making it harder to maintain a single language. Williams et al.'s (2020) research specifically examines how Chinese American parent-child dyads responded to a puzzle box task, analysing how facial emotions impacted CS: negative facial emotions resulted in increased code-switching, while positive facial expressions reduced switching. This aligns with the observation that multilingual individuals tend to revert to their L1 during emotionally intense moments, as L1 is often more automatic and emotionally resonant. In contrast, positive emotions

are associated with less frequent code-switching, as they enhance cognitive control and allow speakers to stay in their second language (LX).

Code-switching also serves as a tool for emotional regulation. As Pavlenko (2005) notes, multilingual speakers may switch to their L1 to express more intense emotions or to their LX to down-regulate emotional intensity, which reflects the unique emotional associations attached to each language. This dynamic is especially evident in parent-child interactions, where parents use code-switching to guide and regulate their children's emotions during difficult tasks (Williams et al., 2020). Research by Pavlenko (2004) reinforces this view, noting that L1 is typically perceived as more profound due to emotional encoding, since it is often acquired in emotionally rich, memory-laden contexts through close interactions with caregivers. In contrast, LX is typically learned in more structured, less emotive environments, such as school. This distinction in how languages are neurologically and emotionally encoded explains why L1 is more emotionally entrenched. In cases where parents blend languages, the switch can serve as a way to signal emotional intensity, whether through discipline or endearment. For instance, a parent might scold a child in L1 but offer praise in LX, reflecting the



Written by: Jessica Dimitrova

different emotional weights carried by each language.

Beyond code-switching, emotional expressivity itself can differ across languages, especially in relationships where partners come from diverse linguistic backgrounds. Romantic relationships - one of the most profound and complex forms of social bonds - rely heavily on effective communication. But how do language differences influence emotional connection and understanding between partners? Dewaele and Salomidou (2017) investigated emotional communication in multicultural couples, examining how it evolved over time. In the early stages of relationships, a third of participants reported no difficulty communicating, while half mentioned that their partner's LX caused limitations, often making the language feel less emotionally resonant. This emphasizes how LXs may lack the affective depth of L1s in the initial phase of relationships. However, 50% of participants noted improvements in emotional communication after several months, resulting in greater cognitive and affective socialisation in LX (Dewaele & Salomidou, 2017).

One particularly intriguing finding from Dewaele and Salomidou's (2017) study was how participants attributed emotional weight to expressions like "I love you" - with 45% reporting strongest resonance in their L1 and 25% in an LX, demonstrating language's role in shaping affective experience. This variation goes beyond linguistic differences and reflects deeper processes of cultural identity formation. Social Identity Theory (Tajfel & Turner, 1979) explains how group memberships shape self-concept, and how language serves as a significant marker of cultural belonging for multilingual individuals. The intersection of culture and language often gives rise to distinct emotional "personalities" depending on the language used. A friend of mine, raised in the U.S. by Latin American parents, recently illustrated this when she

told me that "te amo" carries far more emotional weight than "I love you" - the former reserved for profound declarations in many Spanish-speaking cultures, while the latter is often used more casually in English. This subtle yet powerful difference highlights broader cultural contrasts in emotional expressiveness. Notably, the study also found that emotional attachments to language are dynamic; many participants reported that their partner's LX gradually became the "language of the heart," showing that emotional expression is not static but grows with intimacy and shared meaning.

Another area where code-switching proves to enhance communication is in multilingual psychotherapy. Research shows that it allows individuals to express themselves fully in the language that feels most emotionally resonant at any given moment. Verkerk et al. (2023) note that this is the case for both clients and therapists: clients gain the ability to tailor language to their emotional needs, while therapists acquire a more nuanced diagnostic and therapeutic lens. For instance, when clients switch to an L1, they often access deeper, more visceral emotions, allowing therapists to identify unresolved trauma or other patterns with greater clarity. Conversely, using an LX can allow clients to process distressing events with safer emotional distance (Verkerk et al., 2023). This fluidity in language use demonstrates that multilingualism does not simply facilitate communication, but offers a linguistic repertoire which allows for greater accuracy, regulation, and expressivity.

In essence, multilingualism and code-switching are not barriers to effective communication, but powerful tools that can enhance how we connect and communicate with others. Conveying emotions across multiple languages expands one's emotional palette, allowing for more authentic self-expression, whether in parent-child relationships, romantic partnerships, or therapeutic settings. Research continues to reveal that 'the language of the

heart' - the language in which one feels most emotionally resonant - can change over time. Through meaningful experiences, relationships, and cultural immersion, an additional language can become just as heartfelt as a 'native' language, or even more so, as emotional ties strengthen. Ultimately, multilingualism offers a dynamic and inclusive framework for building empathy and fostering connections that transcend linguistic boundaries.



Edited by Zoya Singh

This editorial section aims to explore areas of neuroscience and psychology that are directly applicable to the diverse challenges and experiences of life at university. It encourages the discussion of cognition and memory, from understanding the neuroscience behind motivation and social interactions to mastering memory techniques and managing stress. Any topics that can enable readers with the knowledge to optimize their academic performance, enhance their well-being, and navigate their social lives effectively. These articles aim to bridge the gap between scientific research and everyday student life.



why do we SUCK at accepting compliments?

author - stella rosenback

"wow i love your shirt!"

"what this old thing, it's just my sister's old hand me downs."

"your presentation was incredible!"

"really? no, i didn't even prepare for it."

"wow, i love your new haircut!"

"ha ha, not exactly what i wanted but thanks"

the intended response

Most of our responses to compliments are just as awkward. You are not alone if you respond to a compliment by arguing, ignoring, or deflecting it with humor. J.D Williams conducted a survey of 2,000 men and women in the UK and found that 45% of people admitted to rejecting compliments, with 52% of women saying they had done so.

Why do so many people struggle with this! The normalized polite response is no longer just "thank you". This relationship is complex and can be traced back to several factors that can reflect a history of bullying, collectivistic culture or bad self perception.

Our attitude towards praise and recognition, however, may not be entirely our own fault... but simply the unintended result of a normal cognitive phenomena. Even the most powerful tech-mogul can squirm when given praise. We would expect that any kind words would always make the receiver feel good, that is the givers intent in the first place. Of course, when we do accept compliments gracefully, they lead to feelings of satisfaction, motivation and pleasure. But then why does the opposite happen all too often?

Compliments function as social rewards that can trigger the reward related centres of our brain. When someone gives and receives compliments, it elicits the release of a certain neurotransmitter. This is when the "feel good hormone" takes the stage. Dopamine is a type of chemical messenger that is induced in the brain, and is associated with feelings you get when you have a pleasant experience. Other chemicals that play a significant role in response to small acts of kindness include hormones such as oxytocin and serotonin, which are associated with trust and loyalty, and increased self-esteem and perceived worthiness, respectively. (Harvey, 2025). It all sounds pretty good right? So then why do we as receivers have so much trouble with welcoming it, considering the social and biological benefits. To put it quite frankly, what is wrong with us?

They are
being
polite,
i am not
that
good.



The unconscious response

Giving and receiving compliments can feel like a social minefield nowadays. Roughly 85% of people worldwide struggle with bad self perception (Guttman, 2019). However, most people that dismiss compliments and experience discomfort do not necessarily suffer from low self esteem. It simply may be learned behaviour and the outcome of a physiological response happening in our brain (Littlefield, 2021). To understand how this response is elicited, we need to examine certain elements that accompany compliments, keeping us from letting in kind words.

- **Surprise**

Interestingly, the surprise you feel when someone jumps out and scares you is actually the same level of surprise you can experience when given a compliment. It can happen when you least expect it hence triggering a certain physical response. Can you feel yourself sweating or your heart rate increasing? All these reactions that occur and the emotions that arise can make us feel vulnerable, and the first instinct is to shut it down. According to Littlefield (2021) this is carried out to establish control and regain comfort, thus we unconsciously dismiss it because it can feel destabilising.

- **Cognitive bias**

Receiving compliments can be cognitively intense. Due to confirmation bias humans tend to search and find information that confirms our beliefs and schemas thus countering any contradicting views. Hence, if our self image does not align with what a person says about us - especially when we least expect it - we try to find a justification that challenges their beliefs. People may not be liars, but it is simply a clash between two different perspectives.

"you look so pretty today!"

Does this mean that we as humans really believe and argue against positive and uplifting images of ourselves? It could be an unconscious act of self protection (Guttman, 2019). In order to avoid disappointment and manage high expectations, individuals actively seek reasons and explanations to discredit positive views of themselves, driven by a belief that they can not live up to them.

digging deeper into a gendered difference

A deep seated culture of raising demure, submissive and compliant women could be a leading factor in the sex based gap in receiving compliments. It is expected for a person of low self-esteem to have an internal view that clashes with an external one. However, most women with high self esteem also reject compliments in order to appear humble and agreeable, as a result of engraved cultural norms (Kim, 2016). They generally feel more uncomfortable receiving compliments.

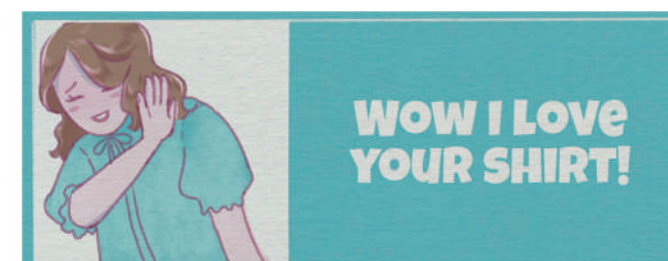
What is truly interesting is how it plays out between just women. Herbert (1999) explores the sex based difference in compliment behaviour, only 22% of compliments given from one woman to another were accepted whereas compliments from men to women were accepted 40% of the time. Such behaviour can be explained through a bioevolutionary perspective, stemming from competition among women for a mate. An attractive woman that acknowledges and accepts a compliment based on appearance may exacerbate feelings of threat and jealousy in other women, as it signals she is aware of her attractiveness. In contrast, rejecting the compliment might reduce those feelings, as it shows she lacks self awareness of her perceived good looks. So, what is the right way to receive compliments? From a social perspective, rejecting praise or recognition might lead to frustration and irritation because it can be interpreted as dismissive and even doubtful of the givers' kindness. Further illustrating the complexity and range of perspectives involved in compliment behaviour.

welcome it with open arms

In a world where rejecting kindness has become a normalised response, stemming from social, cultural conditioning, mental illness, and past experiences etc, it becomes difficult to change one-self. It is often automatic and widely experienced due to physiological reactions, but largely cultivated by many psycho-social factors as well. Maybe the first step, looking at the unconscious physiological response, is to become more aware of our thought patterns and understand that compliments reflect the giver's perspective and not our own. It is a gradual change but it can help to embrace the positive results associated with accepting kindness.

After all, we have always been taught to encourage and give kindness, but let's not forget to welcome it as well.

"no no, i just rolled out of bed, i feel like a complete mess"

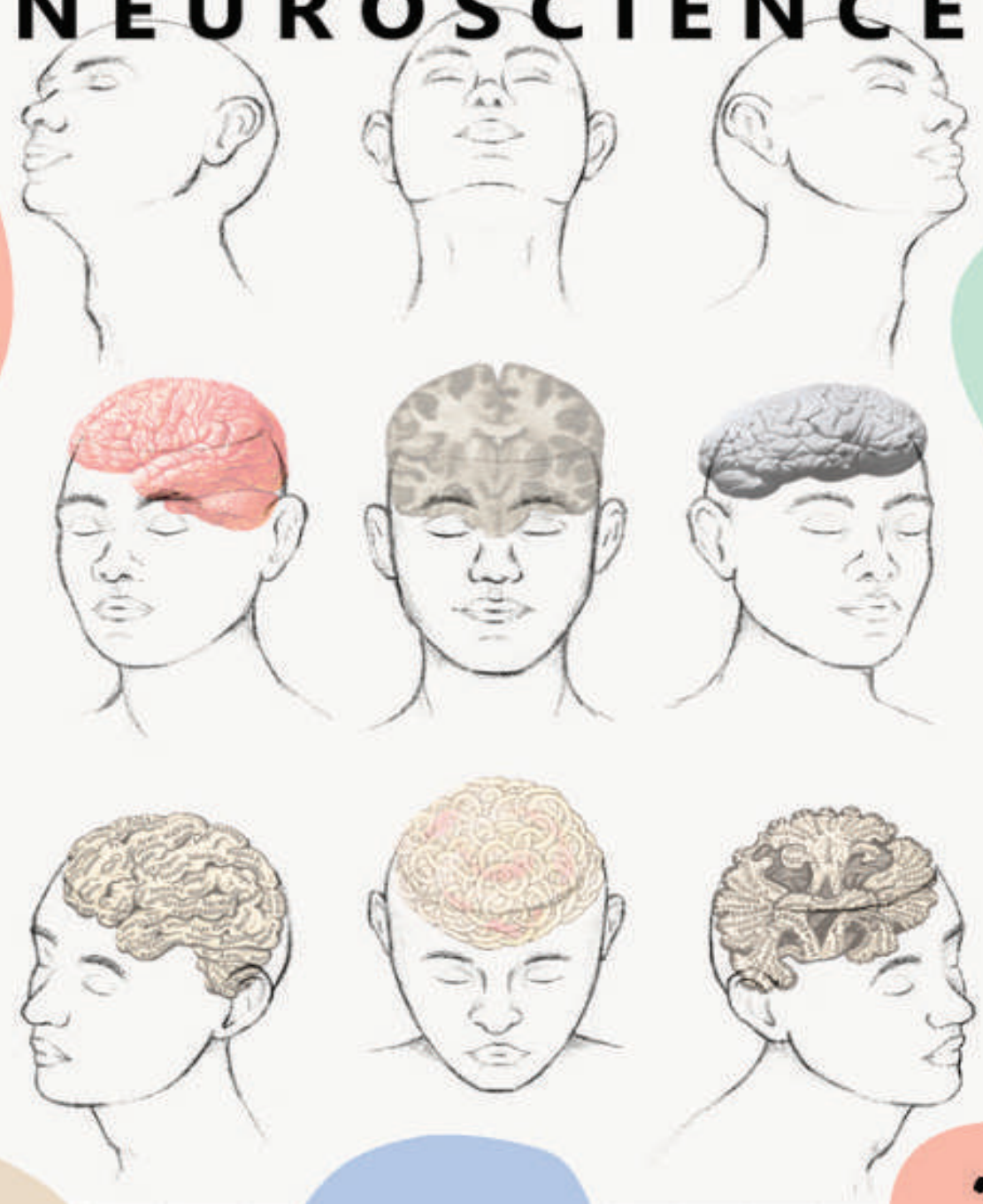


Neuroscience and Psychology: Humanity's Quest for Answers

Editor: Maira Miliaki

The section explores the origin of neuroscience and psychology: humanity's quest to understand the brain, mind and nervous system. This has spanned hundreds of years and has seen major philosophical, scientific and technological developments. You can discuss anything you'd like, from how Ancient Egyptian mummification to the views of Sigmund Freud have shaped modern neuroscience and psychology. This section is casual, allowing you to explore topics you are truly interested in.

DEVELOPMENT of PSYCHOLOGY and NEUROSCIENCE





Autism and Addiction: Implications of Substance Abuse and ASD Comparison and Comorbidity

Written by: Ella Brown

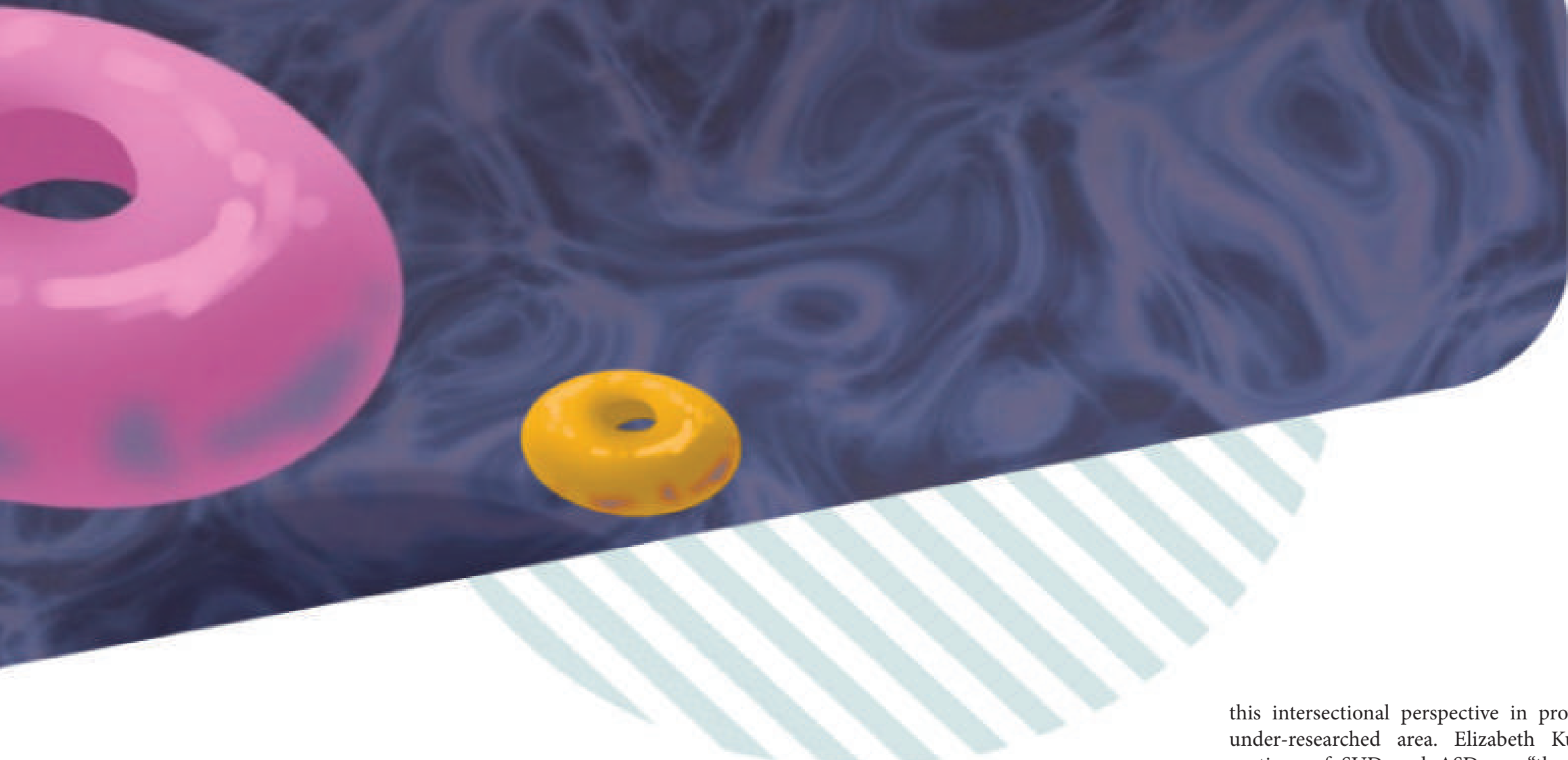
Autism spectrum disorder (ASD) and substance use disorder (SUD) may appear contrasting conditions. ASD is a developmental disorder characterised by social and sensory difficulties and patterns of repetitive behaviour and thought (NIMH), while SUD typically appears later in adolescence and is defined as an unmanageable reliance on mind-altering substances, including alcohol and nicotine (Mayo Clinic, 2023). Presumptions surrounding the social patterns of individuals with these disorders likely contribute to the misconception that the pathologies are dissimilar and mutually exclusive (Kunreuther, 2021). Despite this, the conditions actually share symptomatic and pathological similarities (van Wijngaarden-Cremers et al., 2014). Moreover, research reveals a striking comorbidity between the two, with autistic individuals significantly more vulnerable than neurotypicals for developing a substance use disorder (Butwicka et al., 2017). These findings are directly relevant to mental health care, where understanding dual diagnoses can be crucial to providing effective treatment (Sinclair et al., 2023). Furthermore, the intersections between these disorders help bolster understanding of each and highlight the damage of narratives propelled by stereotyping. Some approaches to managing symptoms have even been found to be applicable from one condition to the other. The disorders present symptomatic and pathological commonalities. In the brain, both are related to dysfunction in the limbic cortico-striatal systems, and present differences in dopaminergic function (van Wijngaarden-Cremers et al., 2014).

These neurological systems are involved in emotion regulation and reward-oriented behaviour. With knowledge of these pathological similarities, it is understandable that symptomatic commonalities can also be observed between the conditions. Both are associated with compulsive habits, difficulty managing emotions, and extreme focus on detail (van Wijngaarden-Cremers et al., 2014). This manifests in substance abuse as a compulsive use of drugs which may become an individual's sole focus, and in autism as a difficulty dealing with change in routine as well as special interests. The phenomenon of a special interest is when an individual devotes an atypically large amount of time and thought to a particular subject or activity (Jordan and Caldwell-Harris, 2012). These intersections not only exemplify the role of the dopaminergic pathway and limbic cortico-striatal system in emotional and reward processes, but allow for a more informed, nuanced, perspective on ASD and SUD. Van den Brink and Haasen (2014) even hypothesise that the disorders developed similarly over time from food-seeking behaviours. They consider both dysfunctions as developmental disorders, notably applying this category to substance abuse as well, citing the genetic role in predisposing individuals to both disorders and how both are exacerbated by stress. ASD and SUD intersections are relevant to understanding dopamine and the roles of dopamine and the limbic cortico-striatal system in brain function and dysfunction, and how these processes influence individuals' experiences of compulsion and emotion. The similarities between the conditions invite

application of symptom-management tools from one to the other. Addiction research, for example, may provide possible aids to understanding autism and supporting autistic individuals. Naloxone, recognisable by the common brand name Narcan, is an opioid blocker used to revive someone undergoing opioid overdose (National Institute on Drug Abuse, 2022). While this can be vital in substance abuse circumstances, it may also be applicable to managing self-injurious behaviours sometimes involved in ASD. Self-injurious behaviour is hypothesised to be a result of dysfunction in the endogenous opiate system. As this hypothesis may suggest, a 2009 study by Sandman found Narcan to reduce self-injurious urges in autistic patients. Conversely, could techniques for managing triggers in autism, such as sensory tools, then be applicable to managing triggers in recovery of a substance addiction? This area is

scarcely researched but has potential to reveal alternatives to current clinical approaches. Sensory tools, for example, are a traditional aid used by around 60% of young autistics for managing sensory needs and can involve weighted clothing/objects, fidgets, or vestibular system inputs such as sitting on a swing (Schaaf and Case-Smith, 2014). These sorts of aids have had successful preliminary application to addiction treatment in the form of 'sensory integration rooms' which immerse substance-abuse recovery patients in spaces with controlled multi-sensory stimuli (Recovery Ways, 2018). Practitioners have reported that this strategy facilitates better emotional processing, though there is not yet empirical data on its success. The use of Narcan in ASD and sensory tools in SUD demonstrate the applicability of strategies for managing symptoms from one disorder to the other, and the potential in this area of research.





Substance use issues have been misconceived as seldom occurring in people with ASD, but research shows autistic traits raise an individual's risk of developing SUD. Butwicki et al., (2016) found in a study of Swedish population registers that of 26,986 autistics, in comparison to 96,557 non-autistic family members, autistics displayed a doubled risk of substance issues. This comorbidity is relevant to mental health care and addiction treatment. Given such a marked overlap, it is unclear why the assumption persists that ASD and SUD rarely intersect. Elizabeth Kunreuther (2021) attributes this to stereotypical perceptions. The social challenges involved in ASD may be over-extrapolated to presume antisocial behaviour among autistics, but this is nonrepresentative of the diverse range of people who may have the disorder. This assumption plus the association of substance use with nightlife, may

contribute to a presumption that autistics do not encounter substances. Such conceptions don't account for experiential or personality variation. For example, one case study, a 20-year-old man called Peter, underwent detox for substance use disorder and it became clear as his treatment progressed that his addiction stemmed from self-medicating ASD symptoms (van Wijngaarden-Cremers et al., 2014). This emphasises the relevance of the coincidence between autism and substance abuse to individuals' experiences and struggles and exemplifies how the two disorders can develop in tandem. Van den Brink and Haasen (2014) suggests that self-medication, like in Peter's case, explains the high overlap between ASD and SUD, hypothesising that interpersonal difficulties involved in autism facilitate an over-reliance on substances in social situations from which SUD can develop. However, despite the relevance of

this intersectional perspective in providing effective mental health care, this is an under-researched area. Elizabeth Kunreuther (2021) continues that faulty perceptions of SUD and ASD are "the root of the scientific and medical communities' disinterest in this life-threatening comorbidity". As a result, stigma and stereotyping can lead to significant gaps in research and clinical practice, ultimately contributing to inadequate care. Acknowledging the intersection between ASD and SUD fosters holistic understanding of mental health, which is key to effective treatment. Overall, ASD and SUD share overlooked similarities in brain dysfunction and symptoms with approaches such as sensory stimulation and opioid-blockers applicable from one disorder to the other. The elevated risk for individuals with autism to develop a substance abuse issue is under-represented in research and medicine but is enormously relevant to understanding the complexities of individual mental health in substance abuse treatment. Ultimately, understanding the intersections and overlap between these disorders is crucial to providing effective healthcare and may help neutralise stigmas and soften the stark caricatures which often represent people affected by ASD and SUD.



Death Anxiety and Its Relation to the Increase in Current Psychopathological Diagnoses

Author: Isabella Neergaard

Have you ever thought about death? Sat down, focused on your breathing and let the all-consuming existential thoughts wash over you like a salty wave of bone-chilling fear? Maybe you have, maybe you haven't but chances are, at some point, you have experienced death anxiety. What triggers death anxiety in people is radically different: some experience a traumatic event, with death as the overall focal point, which means the anxiety sinks its teeth in like a leopard with freshly caught prey, while for others describe it as an ever-present, looming feeling that never quite marked its entrance but also never really prepares to leave. However, common for all with death anxiety, is the existential dread which rears its ugly head, like some monster in a children's overly cautious fairytale. While diagnoses of psychopathology are on the rise in most populations, the issues surrounding

aetiology remain. Why could it be that disorders such as Generalised Anxiety Disorder (GAD) or Major Depressive Disorder (MDD) are increasing at such a rapid rate? In the western world, reports have suggested that incidence rates of diagnoses of generalised anxiety disorders, given by UK doctors, increased from 17.06 in 2014 to a whole 23.33 in 2018 (Slee et al., 2021). The Mental Health Foundation (Mental Health Foundation, 2024) reported a percentage increase in generalised anxiety disorder from only 19.8% experiencing high anxiety in 2018 to a whole 24.2% in 2021 (Mental Health Foundation, 2024). Of course, the big elephant in the proverbial room of these reports is the COVID-19 pandemic, which ravaged the world like a hungry predator on the savannah. Research has shown that remaining isolated and experiencing a decrease in firm day-to-day habits can lead to increases in



anxiety and depression levels (Matthews et al., 2016; Teo et al., 2013), but surely, this cannot solely account for the rates that we are currently seeing? I personally do not think that the global pandemic is uniquely responsible for the increase in diagnoses, particularly when we account for the fact that diagnoses such as Attention-Deficit-Hyperactivity-Disorder (ADHD) and Attention-Deficit-Disorder (ADD) are also on the rise (Santomauro et al., 2021). Instead, maybe we should aim our focus on global trends, current circumstances as well as our reportedly innate fear of death as a probable aetiological root of the rise in diagnosis. With the introduction of social media, we have become more connected to each other than ever before. This is surely a good thing, right? First-year students can call their parents longingly when they have been away from home for too long and grandparents can stay in touch with their grandchildren across oceans and countries. Here is where the proverbial elephant in the room enters once more, as current empirical research suggests that this connectivity is not actually beneficial for our mental health, it instead triggers hoards of psychopathological symptomatology when overused (Andreassen et al., 2016). With regards to the pandemic and death anxiety, I believe social media played a crucial role in both our safe-keeping as well as our eventual collective mental health decline. While messages like 'hands, face, space' ensured that we all knew to stay home and keep each other safe, the memory of the live death counters is forever etched in my mind as some sort of Machiavellian cave drawing. The feeling of seeing the complete destruction of rural villages as they were ravaged by the infectious disease, left me, and so many others, reeling mentally. We know from research articles that reminders of death can trigger higher rates of immediate death anxiety (Routledge & Juhl, 2010). Therefore, it is not far-fetched to cond that, during the pandemic, when social media reminders of death were near-constant and ever present in our lives, our levels of death anxiety were perpetually heightened, leaving us mentally fatigued, vulnerable to, and at risk of, developing psychopathological disorders. And truly, it is this combination of fatigue and vulnerability that we should be aware of in this case. Stress-Vulnerability Models (Ingram & Luxton, 2005) argue that certain people are predisposed to certain types of psychopathologies but that their

illness is not expressed until a triggering event occurs, leaving the stress to peak over the vulnerability and the disorder to present itself. With such models in mind, we can assess the pandemic and global rises in diagnoses in a whole new way. Our use of social media may have served as a continuous reminder of the death surrounding, potentially leading to increases in death anxiety, which itself leads to increases in stress. For those who may have been predisposed to mental illness but not yet had it present, such continuous stress could have been the tipping point for psychopathology to rear its head. Now, you may be sitting there, reading this article and thinking "Why death anxiety? That seems like such a random thing to pin psychopathology to?" which is understandable. Death anxiety and its relations to psychopathology is a relatively niche field, particularly when accounting for the young age of psychology as a field. In actuality, death anxiety has seemingly been present throughout history, although often overshadowed by more popular psychological theories, such as the dark triad or other more compelling theories and models (Furnham et al., 2013). In his book 'Of Peace of Mind (De tranquillitate animi)' (Crocq, 2015), the Roman philosopher Seneca describes the ideal state of the human mind and the influence of the fear of death. 'Peace of mind' is a state wherein the human is undisturbed and reaches a type of equilibrium. No fears, no worries and no stress impacts the psyche and we can live in guilt-free peace – what a wonderful idea that is! However, we know that disordered anxiety affects large parts of the contemporary population, and this issue also existed in the ancient times of Seneca (Crocq, 2015). According to the philosopher, the one thing that keeps us from reaching this heavenly peace, holds us in our turmoil of anxiety and leads the gnawing feeling of fear to eat us alive, is the fear of death (Crocq, 2015). Seneca describes it better than I would ever be able to: "He who fears death will never act as becomes a living man" (Crocq, 2015). The impact of this saying cannot be overstated, particularly when considering how Seneca himself was ordered to commit suicide by the emperor Nero and how his wife was willing, and indeed attempted, to commit suicide alongside him as a show of faith (Veyne, 2002). Although it is ironic that Seneca argued that true living is only possible when fear of death is not present, when



he himself died seemingly unafraid, the point still stands in contemporary society. Because, yes, a person who is fearful of death, who experiences incapacitating levels of anxiety, will never be able to reach this fabled equilibrium without intervention.

Connecting the ancient postulations of Seneca to a modern, post-COVID-19 world, the brush strokes of a mental image start to take a certain form. Death is one of the only inevitabilities of life, the one thing we can be certain of even in uncertain times. Consequently, it is understandable how the fear of this chapter-ending footnote in the book called life may be related to increases in psychopathology, particularly when we are being exposed to near-constant reminders of our own mortality through the use of social media and world-changing pandemics. If Seneca truly was right in his belief that the fear of death is stopping us from living our lives to the fullest, surely we should be investigating the effects of death anxiety and its relations to psychopathology? While the world is continuing to spin into even more unprecedented and unpredictable times, maybe we should put our focus on the one true inevitability; death.



Brain,

Book,



Traditional and modern knowledge reveal to us that the health and wellness of our bodies and minds are intimately connected. This section aims to explore various practices of health and wellness that can be welcomed into our daily routines, both ancient or cutting edge. Topics will be examined from a scientific lens, discerning how they hold up when held to the scrutiny of pharmacology, neuroscience, neurology, and everything in-between. In doing so “Brain, Book, and Candle” hopes to break down what may often appear magically inexplicable or too scientifically complex, into enjoyable and perhaps inspirational insights into mental health and wellness.



Edited by Thane Graham

and Candle

Post-surgical depression and anxiety

Whilst the intended outcome of surgery is to enhance a patient's health, surgery and the postoperative recovery period can be associated with physiological, cognitive and emotional stressors which can all contribute to patients experiencing post-surgical depression. Studies indicate that up to 18.8% of patients undergoing major surgeries, a hip fracture repair for instance, experience depression following their procedures, therefore making post-surgical depression a significant concern. (O'Gara et al., 2023) This can be characterised by patients feeling sad, hopeless, or anxious after undergoing surgery due to the physical and emotional stresses involved in the recovery process. As a result, there are a number of different preventative methods and interventions which need to be further explored to help ensure all patients receive the support they need to make their journey through surgery as manageable and supportive as possible.

The surgical process triggers several physiological changes that can significantly affect a patient's experience during the post-surgical recovery period. One key response is the activation of the body's stress response. This involves the release of stress hormones such as cortisol and catecholamines, which results in increased heart rate, blood pressure, and blood glucose levels. Additionally, the psychological stress response to surgery can suppress the immune system and promote inflammation, potentially impacting recovery and overall health outcomes. (Cusack & Buggy, 2020) Suppression of the immune system results in increased cytokines,

which are linked to depression. Additionally, elevated inflammatory markers like IL-6 and TNF- α are a common response to surgery. It can impact neurotransmitter function and contribute to depression. The use of anaesthetics during surgery can further influence the development of post-surgical depression. Studies show that anaesthetics, particularly volatile anaesthetics, can influence the central nervous system by altering neurotransmitter systems. These changes may contribute to mood disturbances post-surgery. Additionally, anaesthesia can impair neuroplasticity and the brain's ability to adapt, which can exacerbate feelings of depression or anxiety during recovery. (Ivascu et al., 2024)

Undergoing major surgery often leads to significant emotional challenges, including feelings of fear, loss of independence, and uncertainty. Patients may experience anxiety about the surgical outcome, potential complications, and changes to their quality of life. The prospect of relying on others during recovery can diminish self-esteem and foster feelings of helplessness. (Park et al., 2016) Additionally, the uncertainty surrounding the recovery process and future health status can contribute to heightened stress levels. Chronic post-surgical pain (CPSP) is associated with poor general health, depression, and social withdrawal and it affects between 10% and 50% of patients after common operations (Wylde et al., 2017). Moreover, if a patient spends time recovering in intensive care, it can have a significant impact on their mental health with prolonged stays often leading to delirium and hallucinations, which may persist even after discharge. These experiences are associated with the development of post-traumatic stress disorder (PTSD) symptoms, highlighting the psychological challenges faced during recovery. (Bosco et al., 2023)

With such a large proportion of patients experiencing depression following surgery, a range of preventative measures and interventions have been explored to help reduce the emotional challenges patients are faced with. Psychological interventions, such as cognitive-behavioural therapy and relaxation techniques, have been shown to effectively reduce

Author: Devina Patel

anxiety and pain in patients undergoing major elective abdominal surgery. (Villa et al., 2020) An example of a relaxation technique is guided imagery. It uses mental visualisation to help individuals relax and focus their minds. It involves creating vivid mental images and by engaging the imagination, it aims to redirect focus towards images which are calming and positive. (Anamagh et al., 2024) Implementing strategies such as guided imagery pre-operatively may help prevent the onset of post-surgical depression by addressing emotional distress before surgery.

Additionally, hospitals can potentially improve surgical outcomes by integrating follow-up mental health care into surgical care. Research suggests that targeted psychological interventions, such as therapy and mental health assessments, could help reduce postoperative psychological distress and improve overall recovery. (Srikuengfung et al., 2023). There has also been evidence which emphasises the benefits of taking a more holistic approach by combining cognitive-behavioural therapy, medications, and lifestyle changes in improving recovery after surgery. These approaches can significantly enhance emotional well-being, reduce postoperative complications, and promote overall physical recovery, leading to better long-term outcomes. (Lanini et al., 2022)

In conclusion, post-surgical depression and anxiety are significant challenges for many patients and can be influenced by a variety of factors such as psychological factors or the body's

inflammation and immune response. However, it has been shown that with the integration of early mental health support and personalised treatment strategies, recovery outcomes can be greatly improved. Addressing the emotional impacts of surgery is crucial for enhancing overall well-being and long-term health.



A Potion for Calm: The Real-Life Pharmacology of Lavender

Author: Thane Graham

The essential-oil-loving almond moms like famous GOOP founder Gwyneth Paltrow might seem off the mark, but many of their 'hot takes' are rooted in long-standing traditional practices that have stood the test of time, as well as the scrutiny of science. Growing up, my mother was no stranger to an essential oil diffuser – our home was always dawning a new scent From 'relaxing lavender' to 'synergy citrus,' we were not at a loss for choice. Being the overstressed highschool student I was, I always approached her attempts at 'de-stressing' with scepticism. Lavender wouldn't stop my stress by giving me the good grades I worried about, true, but that doesn't mean it is entirely useless. What if lavender's calming nature was thanks to more than just its pleasant smell, but an even more powerful chemical reaction in the brain? For those who indulge in diffusers, oils, incense and beyond, it may come as no surprise that the real-life pharmacology of lavender backs up the centuries-old traditional use of its calming scent and is even used in prescription anxiety medicine!

Breaking down the science and pharmacology of it isn't actually that complicated. It comes down to two components: Linalool and linalyl acetate. These are the two main organic compounds found in pure lavender oil, and both are observed to have both an anti-inflammatory and sedative effect. How do these components sedate? Linalool and linalyl acetate bond with GABA_A receptors acting as positive modulators, meaning they enhance the effect of the GABA_A receptors. (López et al., 2017) What exactly is the effect of the receptors though? They are neuronal inhibitors – when active they create a calming sedative effect through a complex chemical process. In short, the main compounds in lavender help 'calming' or inhibitory receptors in your central nervous system, inducing an overpowering sensation of relaxation and calm. This process is in fact at the core of prescription medicines like Silexan, a tested and useful drug for patients with mild GAD (generalised anxiety disorder). Important to note: the two main active ingredients of Silexan are linalool and linalyl acetate, which the medicine gets from harvesting and distilling budding tips of lavender flowers. (Kasper et al., 2017) Even more interesting is that the well-known anti-anxiety medication – lorazepam – targets and bonds with the same GABA_A receptors as Silexan and essentially any lavender concentrate. (Ibid)

Important to note here is the difference in potency between medications like Silexan, lorazepam, and also over-the-counter and homemade herbal remedies. You might think, though lavender active ingredients do the same thing pharmacologically speaking, a diffuser doesn't have enough to treat GAD, and you would be correct. There is an appropriate dosage for everything. For GAD, a medical professional's diagnosis is the appropriate route. As we see with Silexan and lorazepam, different strength medications exist to help varied needs. The same is true of a herbal approach – it's not as strong, but it's not meant to tackle massive neurological and psychiatric conditions.

In that sentiment, we examine the herbal approach: a little tool to help us with the everyday stresses and anxieties normal life throws our way. We know how it works, but how is it used? Though my mother was a fan of the diffuser, there are countless ways to enjoy the same lavender in your daily routine, which all fall under the pharmacological schema of drug administration. Diffusers are a form of nasal administration for instance, whereas teas constitute oral administration.

Popular for spa days, methods like bath salts, oil rollers, and creams are all great examples of topical administration. These different methods come with varying efficacy rates based on complex interactions with different systems in the body, meaning they might have a greater or weaker relaxing effect. At the consumer level, rather than clinical/medical level, this doesn't matter too much though. At the end of the day, it's more about finding what method you like as an enjoyable and relaxing part of your unwinding routine. At the end of the day, it's more about finding what method you like as an enjoyable and relaxing part of your unwinding routine.

So though taking a lavender salt bath before bed might not be able to stop panic attacks and exalt you of all your anxiety, it can give you an extra sense of calm that makes your day a bit more enjoyable. It is not so much a Western medical approach of intervention, but rather a method of taking care of the mind and body so they stay healthy. Your day is already full of little stressors, so why not fill it with little moments of calm to keep the balance? So, if you're one to consider mindfulness, the next time you spritz some lavender spray on your pillow or sip some lavender-infused tea, remember you're doing a little more for your brain and body than you might know.

CHANGING PERSPECTIVE: ALTERNATIVE TREATMENTS AND APPROACHES TO PSYCHOLOGY

This section is an exploratory dive into alternative therapies or treatment methods to psychopathology and more. This section provides a platform for new, developing, or less mainstream approaches to psychological care to be proposed. Alternative therapies also include looking to ancient practices and all-natural based medications to treat psychopathology or any other psychological symptoms. For example, Mindfulness Meditation (MM), based on the ancient Buddhist practice of meditating, is an alternative therapy method to more mainstream routes that has been found to positively relieve symptoms of anxiety. Alternative therapies and treatments can be more time consuming, costly, or not have enough supporting research, but it is important to explore new methods and question the current ones. Articles should be evidence-based and sources should include research journal articles.

EDITOR: MATILDE FORCINA



A BRIEF HISTORY OF PEYOTE AND ITS POTENTIAL FOR THERAPEUTIC USE

WRITTEN BY: EMMA COOMBES

INTRODUCTION

Slowly growing in the Rio Grande region of southwest Texas, as well as the Tamaulipan Thornscrub and Chihuahuan Desert of northeastern Mexico, Peyote (*Lophophora williamsii*) is a small, spineless cactus known for its psychoactive effects produced by the active compound mescaline. This unassuming cactus has been central to cultural, spiritual, and healing practices for millennia in Mesoamerican and Native American cultures, and holds promise as an alternative treatment to various psychiatric disorders (Doesburg-van Kleffens et al., 2023).

HISTORY OF USE

The ritual use of peyote has been documented over the past 5,000 years. Mesoamerican cultures, including the Maya and Aztecs, used peyote both ceremonially and medically. However, by 1620, the suppression of peyote began during the Spanish Inquisition with the prohibition of its use and prosecution of its consumers (Dawson, 2024).

By the 1870s, the ritual use of peyote emerged among Native American tribes in the United States region, specifically among the Navajo and Comanche (Carod-Artal, 2015). A century later, the U.S. government banned peyote consumption under the Controlled Substances Act. However, eight years later, the American Indian Religious Freedom Act preserved the legal right of peyote use for citizens of the Native Nation and members of the Native American Church (NAC), as a protected cultural practice. Amendments in 1994 further protected the harvesting, possession, and sumption of peyote for ceremonial purposes (Does-

burg-van Kleffens et al., 2023). Today, over 300,000 NAC members are legally permitted to consume peyote in religious contexts (Dasgupta, 2017).

Despite these legal protections, mescaline remains classified as a Schedule 1 controlled substance, meaning it currently has no accepted medical use and has a high potential for abuse according to U.S. federal law (Dasgupta, 2017).

INGESTION AND FOLLOWING EFFECTS

Peyote is typically ingested in its cactus form or brewed into tea (Doesburg-van Kleffens et al., 2023). Mescaline, the active alkaloid responsible for peyote's psychoactive effects, is quickly absorbed from the gastrointestinal tract. Effects may begin 30 minutes after ingestion, peak in intensity around two to four hours later, and last up to eight hours (Dasgupta, 2017).

The physiological effects of mescaline include increases in body temperature, blood pressure, heart rate, and pupil dilation. Sensory perception is also affected, as changes in color perception and visual hallucinations or pseudo-hallucinations are reportedly experienced. Cognitively, mescaline induces altered states of consciousness, including feelings of euphoria, insight, openness, mystical-type experiences, and an intensification of emotions (Doesburg-van Kleffens et al., 2023). Negative effects, such as feelings of anxiety or panic, nausea, and vomiting, may occur, especially at higher doses (Klaiber et al., 2024).

The psychoaffective effects of peyote are predominantly attributed to mescaline activation of the

serotonin 5-HT_{2A} receptor, similar to psychedelics such as LSD and psilocybin, which result in increased serotonin in the brain (Doesburg-van Kleffens et al., 2023). Interestingly, medications such as SSRIs, used to treat depression and other mental illnesses, also work on increasing serotonin levels, which may provide some justification for why peyote shows promise as a therapeutic agent (Mayo Clinic, 2024).

THERAPEUTIC USE OF PEYOTE

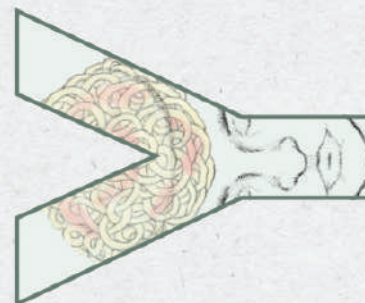
Peyote use in NAC ceremonies has long been associated with effective treatment of alcoholism (Albaugh & Anderson, 1974). A 1974 study found that Native Americans who ingested an average of 500 mg of mescaline in peyote meetings, reported positive effects in the treatment of their alcoholism, as well as increased their suggestibility and openness to communicate.

Further evidence suggests mescaline may be effective in improving various psychiatric disorders. In a 2021 study by Agin-Liebes et al., the relationship between peyote use and self-reported improvement in mental health conditions was investigated. Results of an anonymous online survey showed that 68-86% of respondents reported benefits in depression, anxiety, PTSD, and alcohol and drug abuse following their most memorable mescaline experience.

WHY DOES THIS HAPPEN?

Certain phenomena occurring during psychedelic experiences may give insight into reports of improved mental well-being following use. In a cross-sectional study, Davis et al. (2020) found that mystical experience - which includes feelings of unity, sacredness, truth, transcendence of time and space - and psychological insight, defined as gained awareness of behaviors, emotions, beliefs, memories, or relationships, were specifically associated with a reduction in symptoms of depression and anxiety. Mystical-type experience and psychological insight both enhance psychological flexibility. Psychological flexibility is the capacity to manage stressors and react with value-driven behaviour- an ability typically found to be impaired in individuals suffering from mental illnesses such as depression and anxiety. Therefore, increase psychological flexibility during psychedelic experiences could provide a potential explanation for peyote's therapeutic benefits (Davis et al., 2020).

Additionally, ego dissolution, a disruption in the sense of self, may further underlie positive experiences of psychedelic use (Letheby & Gerrans, 2017). As users experience a decrease in





self-awareness, this may reduce excessive self-analysis often seen in depressed and anxious individuals and may foster a sense of unity, also observed in mystical-type experiences (Sleight et al., 2023).

Each of these effects seem to mediate benefits following peyote use. Particularly as, higher ratings of mystic type experience, psychological insight, and ego dissolution are found among respondents who also report mental illness improvements. Furthermore, reported experiences of insight positively correlated with reported improvements in depression, anxiety, alcohol and drug abuse (Agin-Liebes et al., 2021).

SET AND SETTING

The psychedelic experience is largely determined by the consumer's set and setting. The 'set' refers to the mental state of the person using the drug. Individual expectations, emotions, personality, and intentions may influence this. The 'setting' is the environment in which the experience occurs, physically, socially, and culturally (Hartogsohn, 2017).

NAC peyote ceremonies offer a unique set and setting, which may contribute to their therapeutic benefits. Ceremonies are conducted in tipis, where participants enter at sundown and remain in until morning. Led by the "roadman", the ceremony begins with an initial prayer stating the purpose of the meeting, before the peyote is consumed. Ceremonies may involve rhythmic chanting and drumming as participants sit, gathered around a fire (Calabrese, 2013; Doesburg-van Kleffens et al., 2023). This environment in which peyote is consumed constitutes its setting.

For NAC members, peyote ceremonies are inherently spiritual and sacred. Emphasizing the

significance of the ceremony and entering with the intention of healing or receiving spiritual insight prior to peyote consumption may enhance the psychedelic experience, as the set or mental state of the participant is positively influenced. Consequently, for peyotes' optimal therapeutic use it would be crucial to establish a set and setting favorable to healing.

LONG TERM EFFECTS OF PEYOTE USE

If peyote were to become widely used as a clinical treatment for psychiatric disorders, it is critical to understand its potential long-term effects on the brain. A study by Halpern et al. (2005) found no psychological or cognitive deficits in Navajo Native Americans who regularly participated in peyote use. When comparing frequent peyote users (individuals who had ingested peyote on at least 100 occasions) to a comparison group of non-users, neuropsychological tests revealed no significant differences in cognitive function. However, former alcoholics who were not lifetime users of peyote displayed certain deficits in cognitive function compared to the comparison group. Notably, lifetime use of peyote was associated with significantly higher scores on 5 out of 9 measures of mental wellbeing using the Rand Mental Health Inventory. In contrast, the former alcoholic group scored significantly lower on all 9 measures of mental health than the comparison group. The absence of negative long term effects further promotes the therapeutic use of peyote.

CHALLENGES AND CONCERNS

While peyote is correlated with many self-reported improvements in mental wellbeing, clinical evidence is limited (Agin-Liebes et al., 202; Doesburg-van Kleffens et al., 2023). Outside a clinical setting, understanding the true effect of mescaline on mental

health alone is difficult, as psychedelic experiences can be largely determined by their context. In the case of NAC ceremonies, it is challenging to differentiate between benefits derived purely from the psychedelic experience and those originating from participation in these sacred, communal ceremonies.

Due to the subjective nature of the psychedelic experience, it is difficult to determine the true therapeutic potential of peyote. However, current studies are underway that aim to investigate its subjective effects in addition to the mood and performance of subjects post-mescaline consumption (Doesburg-van Kleffens et al., 2023). These findings and further research conducted in standardized environments, subject to standardized evaluations, may be able to further uncover mescaline's effects and provide a route to its application in mental health treatment.

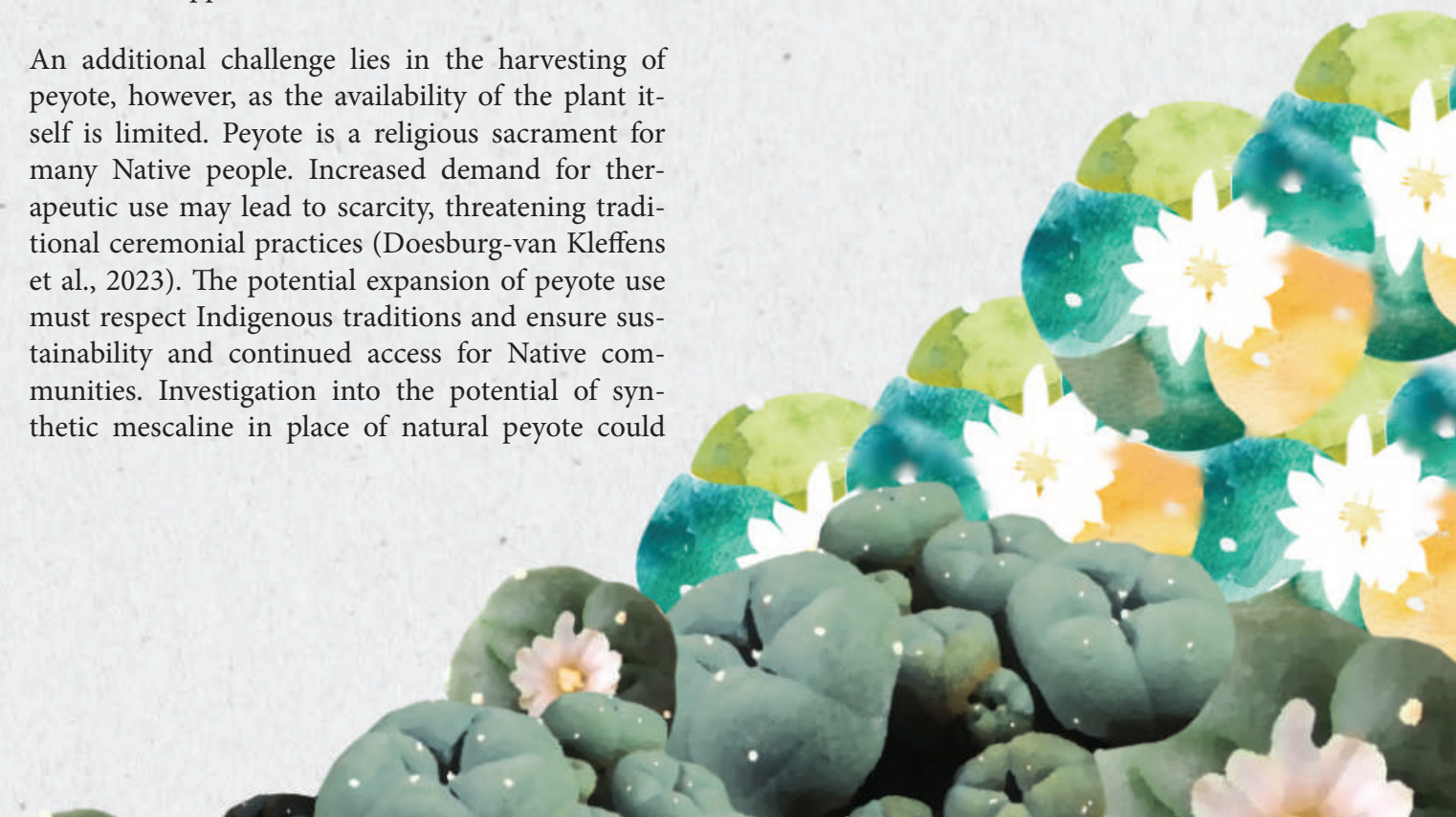
An additional challenge lies in the harvesting of peyote, however, as the availability of the plant itself is limited. Peyote is a religious sacrament for many Native people. Increased demand for therapeutic use may lead to scarcity, threatening traditional ceremonial practices (Doesburg-van Kleffens et al., 2023). The potential expansion of peyote use must respect Indigenous traditions and ensure sustainability and continued access for Native communities. Investigation into the potential of synthetic mescaline in place of natural peyote could

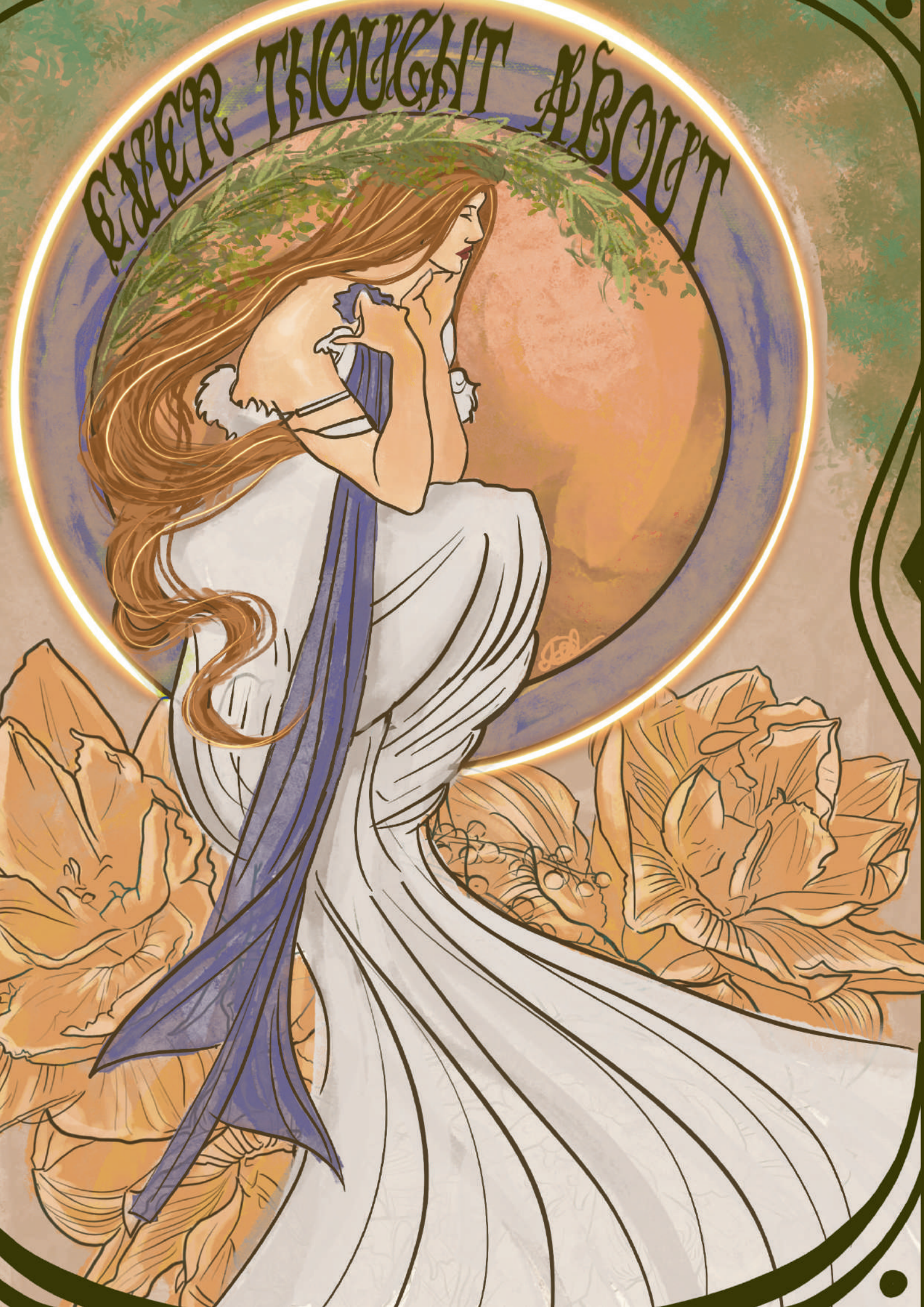
provide a more sustainable alternative, as there would be no need for harvesting of the cactus.

CONCLUSION

With over 900 million people worldwide living with a mental health condition, there is a dire need for further forms of effective treatment (World Health Organization, 2023). While widely used treatments of psychopharmacology and psychotherapy often provide some relief, these treatments are not universally effective for every individual (Leichsenring et al., 2022). Exploring approaches outside of typical Western medicine may be able to provide some insight into alternative views of health and wellness practices beyond our cultural scope. The inclusion of community practices and more holistic approaches differ from the diagnostic and treatment-based philosophies of Western medicine. Yet, in the treatment of mental health conditions, these factors may provide immense benefit as seen in peyote ceremonies.

While further research is needed to solidify its therapeutic benefits, the unique psychological insights and cognitive effects of peyote appear to provide certain mental health improvements that are worth exploring further. There are multiple paths to well-being, and peyote invites us to think about mental health and healing from a new perspective.





Do you ever find yourself wondering about the psychology behind little things? Like why we delay tasks or why certain songs get stuck in our heads? Psychology can often feel complex, but this section will focus on breaking down familiar theories into small, easy-to-follow pieces for a general audience. Whether you're familiar with psychology or just starting out, you'll find explanations for everyday phenomena made accessible. Dive into topics you've always been curious about but never had the time or resources to investigate.

Edited by Imogen Rowley



The Sweet Treat Affair: Why You Can't Get Enough

Written by Alex Tenney



As a self-diagnosed sweet treat enthusiast, I know a thing or two about always craving something after every meal. This week has been particularly challenging, with my chocolate cravings reaching an all-time high (my friends can certainly attest to this). I even made a point to go on a chocolate cleanse, which included iced oat milk chai lattes, although I may or may not have consumed one yesterday, but that's beside the point. The real issue is this relentless sugar battle – and I am determined to come out on top. Surely, there must be a way to outsmart my craving system and prevent spending my paychecks on cookies I definitely don't need.

Sweets vs Health: Is It Really an Addiction?

Well, in my case, I certainly hope not. However, there have been reports of real-life chocoholics (Hetherington & Macdiarmid, 1993). Chocolate contains addictive compounds like theobromine, caffeine, and small amounts of anandamide, a chemical that binds to the same receptors in the brain as THC (the active ingredient in cannabis). These components, along with chocolate's high sugar and fat content, create a rewarding experience that activates the brain's reward system the same way drugs do (Bruinsma & Taren, 1999).

A 1993 study by Hetherington and Macdiarmid highlighted that one of reasons we crave chocolate is for its orosensory (i.e., texture, taste, etc.)

qualities. In this study, self-proclaimed 'chocoholics' were interviewed, and on average, they craved chocolate about six times a week and consumed about 60 grams (12 bars) per week as well. While these orosensory sensations deliver immediate pleasure, they do not produce the same intense lasting high that addictive drugs do. With this information, we can explore how the mouth becomes the primary focus of attention when eating chocolate and how the brain regulates an addiction-like pathway. As of yet, I am happy to report that there is no formal diagnosis of chocoholism.

The Underlying Survival Reasons

Many of our natural behaviours can be traced back to how the brain was hardwired in primitive times. Back then, humans relied on every instinct and survival skill they had, including a strong desire to seek out high-energy foods in order to survive. Food was less abundant and so it was only natural that we developed a strong craving for sweets – after all, the brain depends on sugar as its main fuel, says Vera Novak, MD, PhD, an HMS associate professor of medicine at Beth Israel Deaconess Medical Center (Edwards, 2016). The next time you crave something sweet, remember – your brain is only doing what it has been wired to do for survival!

Glucose, the brain's preferred energy source, triggers cravings that aren't just about hunger. Instead, they constitute the brain's goal-directed behaviour and reward system, specifically the mesolimbic dopamine pathway. These cravings are sparked by a mix of physical, emotional, psychological, and environmental cues. For example, a drop in blood sugar (physical), feeling stressed (emotional), associating dessert with comfort

(psychological), or smelling cookies from a nearby oven (environmental). Unlike hunger or thirst, which are more passive signals, sugar cravings involve an active pursuit. Your brain is motivating you to go out and get that sweet treat! (Wise, 2006).

How the Reward System Self-Sabotages:

The brain's reward system plays a pivotal role in shaping our behaviour. It provides a set of incentives for specific behaviours, such as exercising or listening to music. With these behaviours, we are rewarded with positive feelings, such as a sense of accomplishment, encouraging us to repeat the beneficial behaviour. The more we do these pleasurable experiences, the more our brain begins to associate the good feelings with them. These rewards "reinforce" connections between stimuli and behavioral responses (Law of Effect, Thorndike 1911).

Therefore, when we encounter something that we know will elicit a positive feeling, our brain initiates a craving response in anticipation of the good feeling. For instance, when we see sweet treats, our brain triggers a craving by reminding us of the delightful taste we experienced before. This anticipation is caused by a release of dopamine – A 'feel-good' neurotransmitter that carries signals between neurons – from the ventral tegmental area (VTA) in the midbrain. These dopamine-producing neurons send signals to the striatum, hippocampus, and amygdala. Increased activity in this system, known as the mesolimbic pathway, leads to the production of positive symptoms such as satisfaction. However, decreased dopaminergic activity in a separate pathway called the mesocortical pathway accounts for the negative symptoms (Dopaminergic Pathways - an Overview | ScienceDirect Topics, n.d.). Ultimately, our cravings are not just weakness, they are deeply rooted in the brain's reward system that anticipates pleasure.

While in some cases like having low blood sugar, cravings can be beneficial in maintaining homeostasis, this reward system isn't foolproof. In other cases, the system is surprisingly easy to exploit. Has your little sibling ever begged for dessert after dinner? Or fought for the biggest piece of cake at the birthday party? Mine have – and I've been right there with them. For example, you take one bite of cake and it's delicious, so you go back for another bite. Even if you are no longer hungry, you may go back for a second slice, then



maybe a third. This is because the brain releases dopamine in anticipation of the reward, not solely when the reward is received. The initial bite triggers the release of dopamine from the ventral tegmental area, activating areas like the nucleus accumbens, reinforcing the behavior. The more rewarding the experience is, the more dopamine is released, which creates a stronger motivation to repeat the behavior. Though satisfying a craving can be enjoyable, we often keep wanting more – even when further satisfaction is limited – because our brains associate the craving with the initial rush of pleasure. So, thanks a lot, dopamine.

The Sugar Rush: Sweet Treats and Their Aftermath

Though sweets may be an integral part of your life, too many can trigger adverse effects in the brain. Similar to a true substance addiction, eating a particular diet impacts your feelings after consumption. As dopamine enters the bloodstream when you consume a treat, the feeling of satisfaction takes over as you fulfill your brain's





Conclusion: Can We Overcome Sweet Treat ‘Addictions’?

For all my fellow sweet treat enthusiasts, I have good news. You can still enjoy your favourite treats, but only in moderation. While I may not have all the answers on outsmarting our brain’s reward system, I believe it’s possible to trick it with more natural sugars. There’s hope for us yet!

One solution is to swap out your daily sweet treat with more natural sugars, such as fruit. Unlike processed sugars, the sugar in fruit is absorbed more slowly thanks to fiber, helping to regulate blood sugar levels and keeping you full for longer. Fruit also contains vitamins, minerals, and water, making it a more nutrient dense option. Not only does fruit satisfy your craving, it nourishes your body.

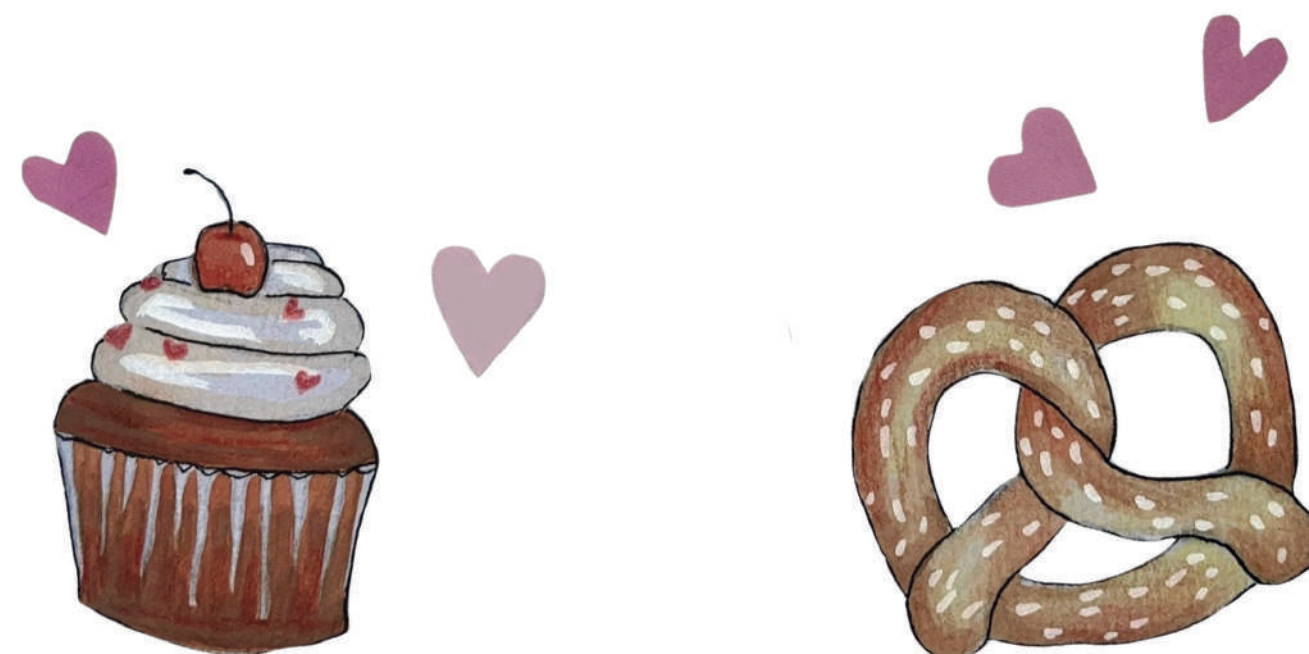
Additionally, certain drinks – like soda or sweet tea – have far more sugar than you would expect. For example, a 16 oz bottle of Coca Cola has about 52 grams of sugar (The Coca-Cola Company, 2024), while a classic glazed donut has around 15 grams (Danahy, 2020). That is over three times the amount of sugar in one drink compared to a donut. Yet, drinking sugar often feels less satisfying, which may lead to overconsumption as your brain continues to chase the initial reward. Instead, try drinking fruit-infused water or sparkling water to spice up your drinks without the sugar overload.

Now, I am no dietitian. However, by consuming foods rich in fiber and more whole foods, your brain will most likely not give you signs that it wants as much sugar, so the temptations will decline. As your temptations decline, so do your addictive tendencies. So, the next time you reach for that chocolate bar, just remember: it’s not you, it’s the dopamine. But hey, no judgement here – sometimes, even our brains need a little treat!

craving. However, with every spike in dopamine, there is a come-down to follow. When your dopamine levels decrease after the fulfillment, an empty feeling of loss may take over.

When you eat sweet treats, dopamine isn’t the only thing that affects how you feel. Blood sugar also plays an important role. After sugar enters the bloodstream, blood sugar levels begin to rise. To remain in homeostasis, your body releases insulin to lower those levels, moving sugar into the cells. It can also result in your blood sugar dropping, which may leave you feeling less satisfied than when you first saw that sweet treat. Due to this process, the feeling of a ‘sugar crash’ from the ‘sugar rush’ takes over.

In general, chocolate has a high energy density along with high levels of sugar, and up to 40-50% of chocolate is composed of sugar (Mellor et al., 2015). This poses problems and increases health risk – the main risk being type 2 diabetes, where there is too much sugar in your blood. To put this into perspective, the World Health Organization recommends that added sugars make up less than 10% of total daily energy intake, and ideally less than 5% – which is about 25 grams (6 teaspoons) of sugar a day (2015).



Raised with Feelings

The Power of Parental Influence on Emotional Growth

Written by Anna Brandolese

Emotion regulation (ER) refers to how individuals adapt and apply emotional knowledge to suitably manage their emotions and react to the environmental and social context they find themselves in (Morris et al., 2007). With this being said, ER is essential for intersocial interactions and for our integration within society. To engage in conversations, we do not only need to gauge, and understand, the emotions of others, but also be able to produce 'appropriate' emotional responses. From the moment we come out of the womb to adolescence, all kinds of external factors influence our understanding of emotions and slowly shape our future emotional reactions. Out of the myriad of casual factors we are exposed to, the one with the most impact on our ER, is our parents. Our observations of the way our mother or father handle their own emotions subconsciously impacts the way we will react to similar situations in the future (Morris et al., 2007). Understanding the impact of individual parental influences on children's emotion regulation is therefore crucial if we are to comprehend their overall emotional development.

Past literature has primarily focused on the role of mothers in guiding their children's emotion regulation (Kiel & Kalomiris, 2015). This is largely because, until the end of the 20th century, fathers were seen as having little emotional influence, playing an exclusively financial role within the family. Therefore, the extent of maternal influence on children and their emotional development, has remained undisputed. Extensive research has shown evidence that mothers, compared to fathers, are significantly more vocal and expressive about their sentiments, exposing a child to different kinds of emotions, thus widening their emotional understanding (Cassano et al., 2007). Mothers have also shown a greater tendency to use more emotion-centered talk, such as: "It's okay to feel sad but let's talk about why you might be". Placing focus on the children's feelings and the possible causes allows mothers to better guide a child to form a complete understanding of their emotions and the possible solutions (LaBounty et al., 2008). A mother also tends to be more accepting of a wider variety of emotions, ranging from sadness to anger, which increases the likelihood of a child being more expressive and comfortable in showing or talking about their feelings, both negative and positive (Denham et al., 2010). Even though this focus on mothers and their influence has been essential, it has offered little motivation for researchers to also investigate paternal effects — that is, until recently.

As gender stereotypes have started to dissolve, developmental research has also taken a turn to adopt a more paternal perspective. In other words, the effect of fathers on the ER of children has begun to take the spotlight. For example, Denham et al. (2010) observed children's emotional understanding and reactions, while also exploring the

individual parental behaviours. Findings revealed that the ability of fathers to balance their expression of both positive and negative emotions had a significant effect on the child's ER development. Particularly, this helped to compensate for the mother's varied, and excessive, emotional expressivity which might instead lead to a child's dysregulated emotional reactions. The results also revealed father's tendency to engage in more playful activities with their children, which might help the child's flexibility in their emotional expressivity by exposing them to different contexts through play. Moreover, other research points to a fathers' more consistent emotion socialization which, has been shown to lead to a child's better interpersonal skills (Baker et al., 2011). Finally, although mothers might place more emphasis on emotion-based discussions, research shown that fathers discuss mental states not only more often but more practically (Labouty et al., 2008). For example, where a mother might reassure everything will be fine, a father might pragmatically form solutions and help the child rationalize through their emotions. This plays a fundamental role in widening a child's emotion understanding but also introduce them to the varied emotions they might be exposed to in the real world. Despite the research that helps to highlight the positive effects of fathers on their children's ER, it is fundamental to discuss contrasting findings. Notably, Cassano, Parrish, & Seman (2007) explored parent's perceptions, acceptance, and responses to their children's emotional reactions to explore a child's ability to regulate their sadness. Their finding revealed a tendency of fathers to minimize or discredit their child's emotions, a behaviour that could have significant, detrimental effects on the child's emotional development. Without the freedom to express ones emotions, a child might grow to form a warped understanding of appropriate reactions and, might adopt their father's dismissive behaviours, forming a dysregulated ER system.

As discussed above, research on emotion regulation has provided evidence in support of the claim that parents are absolutely essential to a child's appropriate emotional development. However, so far the present article has exclusively referred to heterosexual "maternal" vs "paternal" effects and so, as the author, I feel it is incredibly important to briefly highlight the cases in which these gendered norms are dropped: what happens to a child's ER when there is no longer a mother and a father but rather, two mothers or two fathers?

Previous findings indicate that no discernible change occurs. As this topic has long been a taboo amongst most of society, research on this remains fairly limited. However, the literature that has decided to explore the topic clearly points to the absence of negative effects, if any at all, of homosexual parenting to the emotional development of a child. Specifically, findings suggest no differences in well-being, emotion regulation, and academic and social performance of children from same-sex couples (Canning, 2005).

The present article serves as an introduction to developmental psychology, particularly focusing on the regulation of emotions. It acknowledges the undeniable influence of parental figures, regardless of family structure, shaping a child's emotional development and understanding. These influences extend to the child's behavior and social interactions and, in turn, affect how they later approach parenting, creating an intergenerational cycle of emotional and behavioral transmission.

However, the article also highlights a significant gap in existing research: the need for more focused studies on children raised in diverse family structures, including heterosexual, lesbian, and gay households. Such research is essential not only for advancing our understanding of parental influences across different family models but also for deepening insight into how children develop within varied contexts. Recognizing these differences, without casting them in a negative light, is crucial for capturing the full spectrum of emotional and behavioral development.



EXPLORING TECHNOLOGY AND PHARMACOLOGY IN THE NEUROSCIENTIFIC SETTING

The Intertwine of Neuroscience, Technological, and Pharmacological Breakthroughs

This section explores the importance of technology and pharmacology in advancing neuroscience and updating readers on upcoming and relevant news. Technological advances at the forefront of neuroscience give rise to topics like brain-computer interfaces and deep brain stimulation, while pharmacological advances give rise to topics like the application of medication on neurodegenerative diseases. With said advances come several benefits and drawbacks, including but not limited to ethics and privacy. Additionally, investigating the overlap between technology and neuroscience doesn't just involve using technology in neuroscience. It also considers the importance of neuroscience in technology, which this section also explores.

Edited by: Mohit Agarwal



EFFECTS OF MICROGRAVITY ON THE BRAIN

INTRODUCTION

It has been 64 years since the spacecraft Vostok 1 launched Yuri Gagarin into orbit as he became the first person in space. Since then, human spaceflight has come a long way, with NASA announcing that they aim to send manned missions to Mars by the 2030s. To achieve this, humanity will need to deepen its understanding of the long term impacts of space on the human body. Space medicine not only plays a vital role in our exploration of the cosmos but also advances our understanding of medicine on Earth as the physiological changes that occur in space can offer insights into pathologies that occur on Earth.

CEREBRAL HAEMODYNAMICS

Throughout our evolutionary development, gravity has been the only constant factor, therefore it plays a significant role in the functioning of several of our physiological body systems. The pressure of the fluid in our body on which a gravitational field acts, generates hydrostatic pressures. These pressures play an important role in blood circulation and formation of cartilage which is beneficial for tissue healing. However, in space, there is an absence of hydrostatic pressure, so the fluid in the body shifts upwards from lower limbs towards the brain in a phenomenon known as cephalad fluid shift and this leads to a rise in intracranial pressure. Redistribution of cerebrospinal fluid and water content in the brain involves a decrease in volume at the vertex of the brain and increased volume at

the anterior areas of the frontal, temporal and occipital lobes. Several studies have also confirmed an increase in ventricular volume between 7-25%. Recovery to pre-flight levels of ventricular volume is slow and the change can persist for months or years. This is a major contributor to development of spaceflight associated neuro-ocular syndrome (SANS) which is reported by several astronauts.

Microgravity has also been shown to induce vascular effects such as reduced cranial venous outflow. A study carried out on eleven astronauts who spent an average of 210 days in space showed abnormal blood flow in the internal jugular vein which could lead to an increased risk of venous thrombosis (clot formation) in the neck. Not only does fluid shift upwards in microgravity, but the brain itself moves upwards within the cranium. This results in crowding of cortical matter and narrowing of sulci at the top of the brain. A similar pattern of presentation is present in people on Earth with hydrocephalus and intracranial hypertension. This results in constriction of the superior sagittal sinus (a midline vein that drains several structures in the brain) which has been shown to impair glymphatic function. The glymphatic system is a newly recognised unidirectional waste clearance pathway that removes toxic and metabolic waste from the brain. Impaired glymphatic system function has been linked to certain neurodegenerative diseases such as Alzheimer's. This could be a potential explanation for the self-reported levels of cognitive impairment in astronauts.

VESTIBULAR EFFECTS

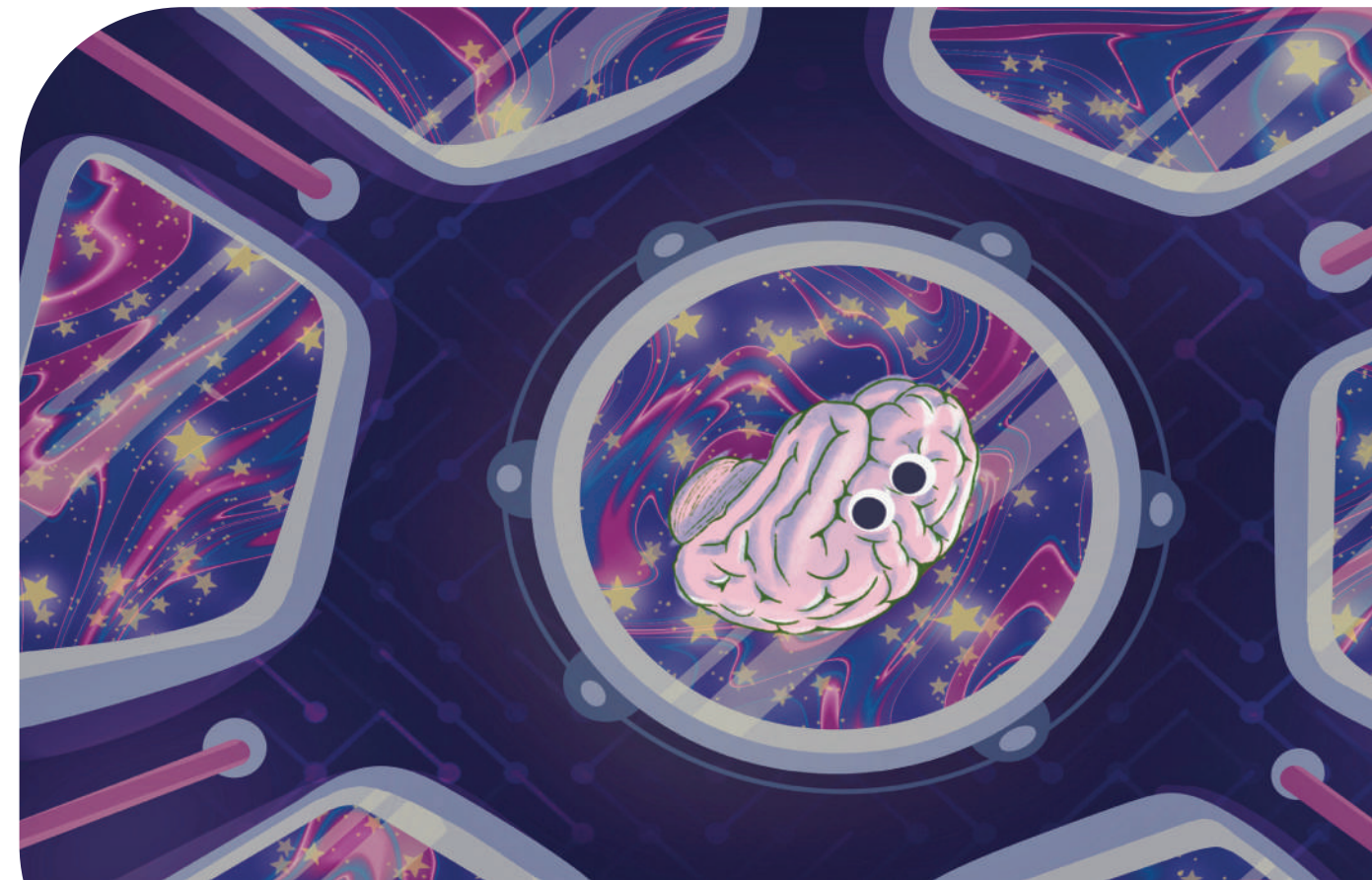
Approximately 70% of all astronauts have experienced some form of motion sickness or other vestibular symptoms when they initially are in space and upon arrival on Earth again. The function of the vestibular system of the inner ear is to give a sense of the position of the body and balance. An important component of the vestibular system are the otolith organs which detect the position of the head relative to its position in the gravitational field of the Earth. However, in a microgravity environment, the signals from the otoliths are altered which leads to motion sickness in astronauts. Over time, during their time in space, the central nervous system (CNS) prioritises the visual inputs over the signals from the otoliths. A study carried out by Pechenkova et al. in 2019 measured decreased connectivity in vestibular networks of astronauts compared to pre-flight levels which required.

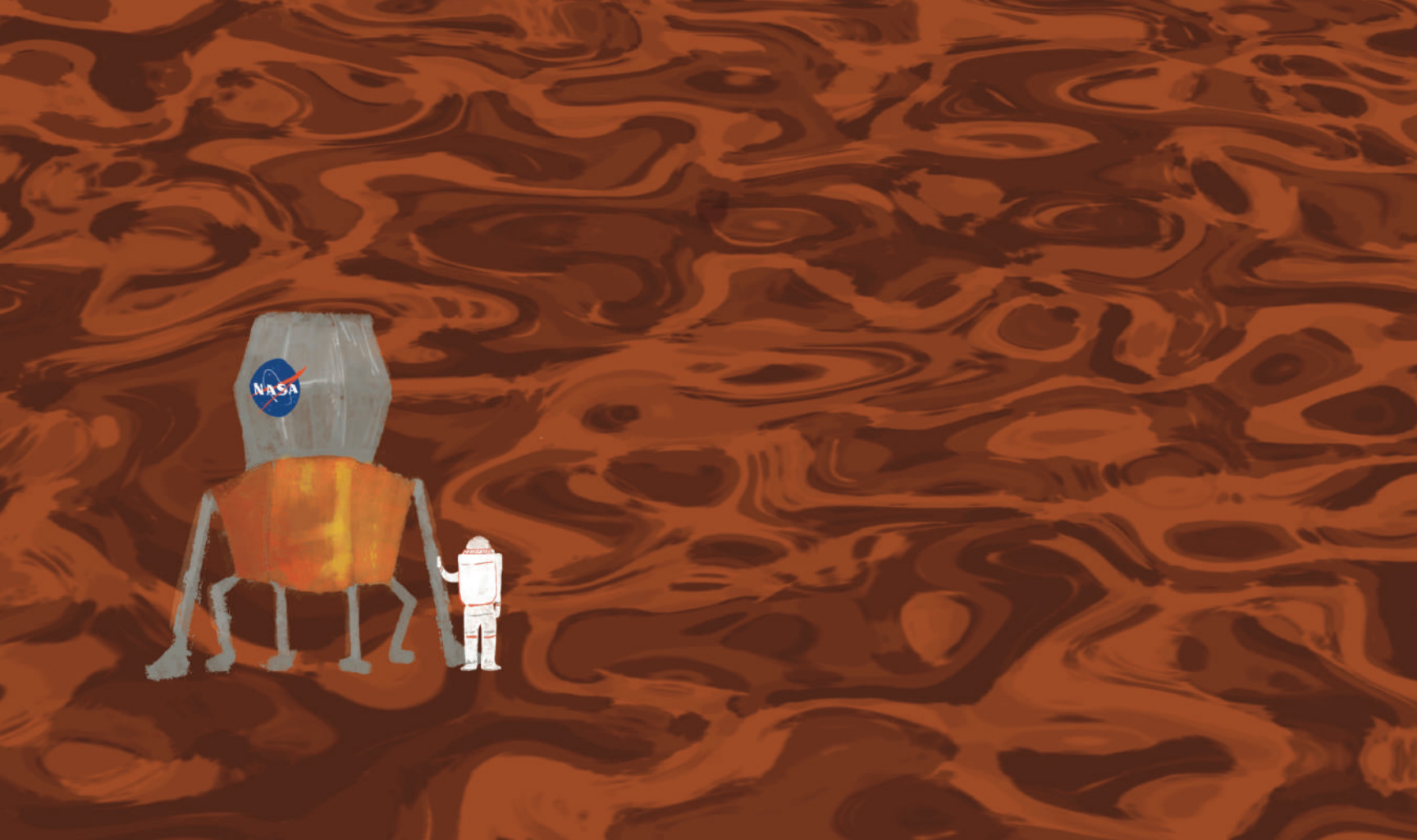
NEUROPLASTICITY

Neuroplasticity is the process by which the brain undergoes structural and functional changes in response to internal or external stimuli.

Written by: Devika Panicker

A study (Van Ombergen et al, 2017) looked at rs-fMRI (resting state functional magnetic resonance imaging) scans of a 44 year old male astronaut before and after his 169 day mission at the International Space Station in 2014. The results showed that compared to the pre-flight scan, there was decreased resting state functional connectivity in the insular cortex region of the brain. This area of the brain is involved in sensorimotor processing as well as containing vestibular, auditory and pain pathways. An additional function of the insular cortex that has been proposed is that it is involved in interoception which is the awareness of the physiological state of the body (such as awareness of thirst or heartbeat). Furthermore, decreased connectivity between the left cerebellum and the right motor cortex were reported which could explain the negative impacts on motor control and balance in astronauts upon their arrival on Earth.





CIRCADIAN RYTHYM DISTURBANCE

The International Space Station, which orbits the Earth at an altitude of between 370-460 kilometers, takes approximately ninety minutes to complete one orbit. Therefore, astronauts in the ISS experience sunrise and sunset sixteen times during a twenty-four hour period, which has a significant impact on their circadian rhythms. Research carried out by Nechaev et al. analysed the error data of twenty-eight astronauts across fourteen missions on the Mir Space Station and they concluded that the error rate was significantly related to deviation from normal circadian rhythm.

POTENTIAL IMPLICATIONS IN NEUROBIOLOGY

Research carried out in 2024 (D. Marrota. et al) modeled the development of brain tissue using 3D cultures of brain tissue grown from adult stem cells from patients with multiple sclerosis and Parkinson's disease. Microglia, which are supportive immune cells in the CNS, were also added to the culture to observe the immunological effects in space. These cell cultures represented simplified models of different areas of the brain because two different cell types were used; cortical neurons, which are damaged in patients with

multiple sclerosis, and dopaminergic neurons which are associated with Parkinson's disease. The cultures were then maintained for 30 days on board the ISS. Additionally, a parallel set of cells from the same patients were kept on Earth for comparison. The results showed that the cultures developed in microgravity had lower levels of genes related to proliferation. However, they displayed higher levels of genes associated with neural maturity compared to the cultures grown on Earth. The effect of other factors such as radiation exposure were minimised during the experiment as the level of radiation was proportional to the exposure level of the astronauts. This study showed that in the microgravity environment, neural cells matured faster but replicated less often. An important distinction between maturation and aging must be made as aging of a cell involves deterioration of the physiological processes. The biological ages of the cells could not be determined. However, maturation is the process of a cell acquiring the key functional adaptations to survive and reach a stable state. Improved maturation and differentiation of stem cells in microgravity environments provide exciting new tissue engineering strategies for degenerative brain diseases. In the future, more research needs

to be carried out to develop methods for comparison between different organoid based studies.

The study of cells in microgravity environments offers new exciting areas of research in neuro-oncology. Glioma is a type of malignant brain cancer originating from glial cells which are responsible for supporting neural cells. Due to limited access to spaceflight, simulated microgravity environments must be developed. One cost-effective method of artificially creating a microgravity environment on Earth is by using a clinostat which is a device which uses a rotational motion to remove the effects of gravity. In the simulated microgravity environment, U251MG glioma cells experienced reduced proliferation. Microgravity also induced apoptosis in these cells due to the upregulation of p21 which is a protein involved in DNA repair. Additionally, downregulation of IGFBP-2 was recorded. IGFBP-2 (insulin-like growth factor binding protein-2) is often overexpressed in glioma and regulates migration and invasion. This offers new therapeutic targets for glioma treatments in the future.

CONCLUSION

We currently stand at the beginning of a new era for space travel with private commercial companies now sending people to space. Understanding how the brain and the body adapt to the extreme conditions of space will be vital to success in future long term spaceflights. To achieve this, further research is required to understand the precise mechanisms by which the brain reacts to the microgravity environment. Due to limited access to spaceflight resources, terrestrial simulated microgravity environments (such as the head down tilt bed rest manoeuvre) are heavily relied upon to carry out research but it is still unclear how these techniques will translate to the actual microgravity environment of space. However, thanks to this research, scientists are currently aware of the shifting position of the brain along with fluid redistribution within the cranium as well as impacts on the vestibular system and circadian rhythm. Additionally, there are exciting new opportunities to study disease in the unique microgravity environment with the potential to deepen our understanding of their mechanisms and provide new therapeutic targets to benefit those on Earth.



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