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EXHIBIT

AN INIATITIVE BY:

anveshana

IISER
THIRUVANANTHAPURAM

Mental Health Survey

Introduction:
It is surprising how when one says 'health', we think of only the physical aspects of it. We rarely acknowledge how much our minds contribute to our health and wellbeing. Most of us become defensive when the terms mental illness or therapy are mentioned. Even in distress, we find excuses to push mental health under the carpet.

Mental health needs maintenance, just like physical health. A stitch in time saves nine, and the first step is to acknowledge that you need a stitch. It is high time we start talking about mental health the way we talk about physical pain or illness. Especially now, as we are all going through very uncertain times, having an unprejudiced dialogue about mental health is imperative. The objective of this survey is to initiate such a dialogue and to promote mental health awareness.

Overview:
The survey received 403 responses in all. A total of 381 people from IISER Thiruvananthapuram participated in the survey, out of which there were 276 BSMS students, 96 research scholars (PhD, iPhD and postdoctoral scholars) and 9 faculty members.

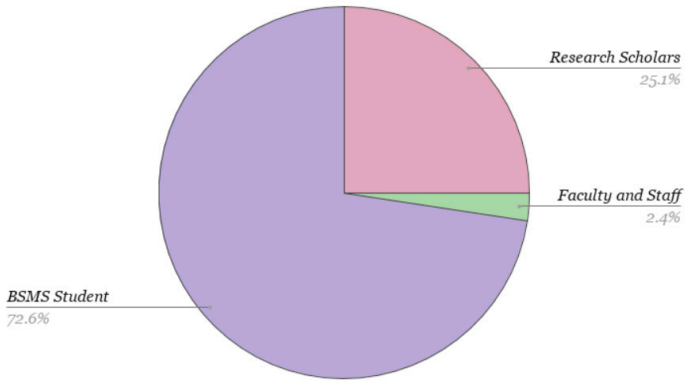


Fig. 1: Distribution of respondents

The survey tried to assess the mental health of the respondents at two time periods, six months before the onset of the pandemic and during the last few months as we continued to be affected by the pandemic. Ten proxies were chosen to assess the mental health at these time points. The choice of proxies was made referring to the 12-item General Health Questionnaire (GHQ-12) which is commonly used to screen minor psychiatric disorders. This set of questions was devised to get responses on a five-point Likert scale. Apart from these, the survey had questions on the mental health history of the respondent and one descriptive question on how they have been generally coping with the pandemic. This questionnaire was not and cannot be used for clinical diagnosis. On conducting Cronbach's alpha test with the data collected by the survey, an average reliability score of 0.8052 was acquired. A Cronbach alpha value of above 0.7 is generally considered a good reliability score. So, the data collected can be considered internally consistent and reliable.

Results:
Mental health assessment pre- and post-pandemic:
Friedman's test was conducted in order to compare mental health trends before and during the pandemic. The mean ranks assigned by Friedman's test at the two time points were compared and the percentage change in the ranks was measured. All the proxies except eating habits and sleep quality suggest that the mental health of individuals has deteriorated in the last few months. Stress levels have increased by 23.88% post-pandemic and this is the most affected parameter.

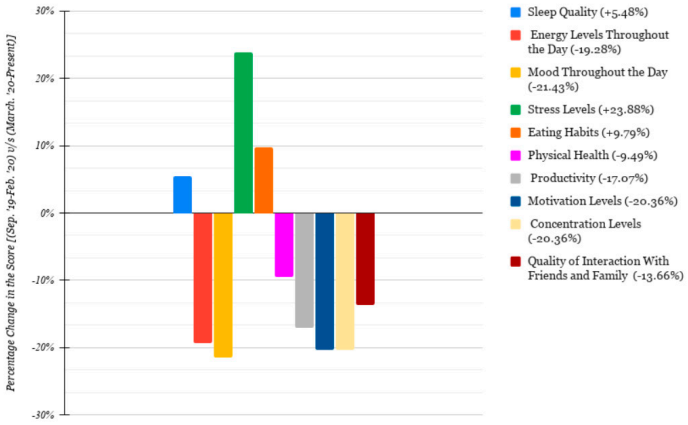


Fig. 2: Graphical representation of the percentage change in the mean rank of various parameters

	Friedman Test-Mean Score (Sep. '19 - Feb. '20)	Friedman Test-Mean Score (March '20 - present)	Percentage change in Mean Score
Sleep quality	1.46	1.54	+5.48%
Energy levels throughout the day	1.66	1.34	-19.28%
Mood throughout the day	1.68	1.32	-21.43%
Stress levels	1.34	1.66	+23.88%
Eating habits	1.43	1.57	+9.79%
Physical health	1.58	1.43	-9.49%
Productivity	1.64	1.36	-17.07%
Motivation levels	1.67	1.33	-20.36%
Concentration levels	1.67	1.33	-20.36%
Quality of interaction with friends and family	1.61	1.39	-13.66%

Table 1: Mean ranks of various parameters pre-pandemic and post-pandemic and the percentage change in rank

Given below is a graphical representation of the number of individuals that were affected positively, negatively or not affected by the pandemic with respect to the following proxies.

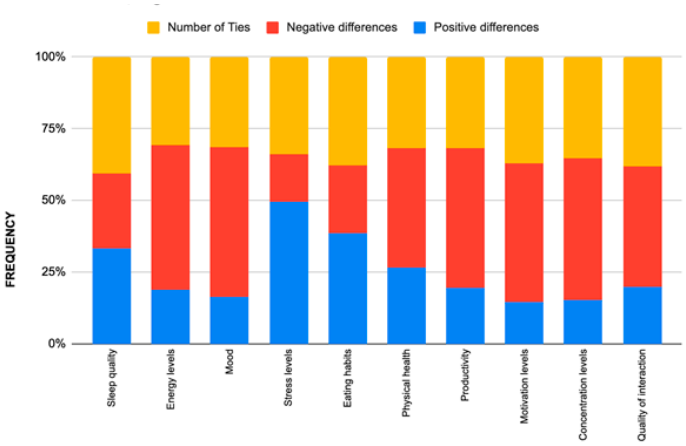


Fig. 3: Frequency of positive differences, negative differences and ties in ranks

The data from BSMS students and research scholars (PhD, iPhD and postdoctoral scholars) were analysed separately to see if there was any difference in how they were affected. BSMS students seem to be worse affected overall. The stress levels have increased twice as much for BSMS students in comparison to the research scholars. This could be because most of the research scholars had returned to their normal lives when the survey was conducted, while the BSMS students still had a lot of uncertainties bothering them. Eating habits and sleep quality have worsened for research scholars while they have gotten better for BSMS students. Everyone suffered from lower motivation and concentration levels.

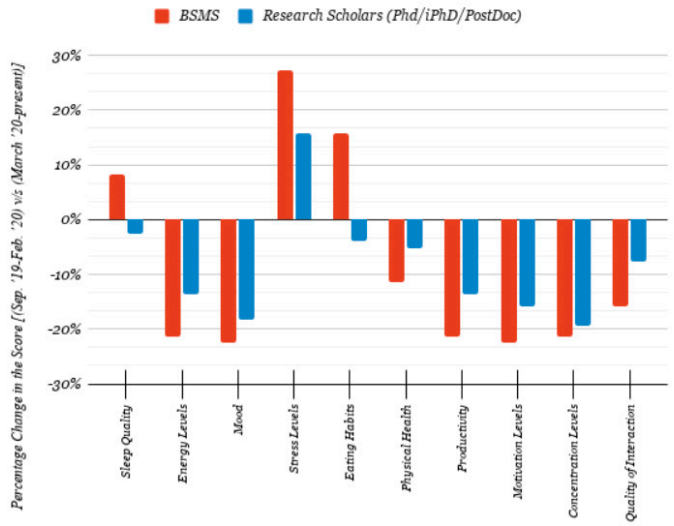
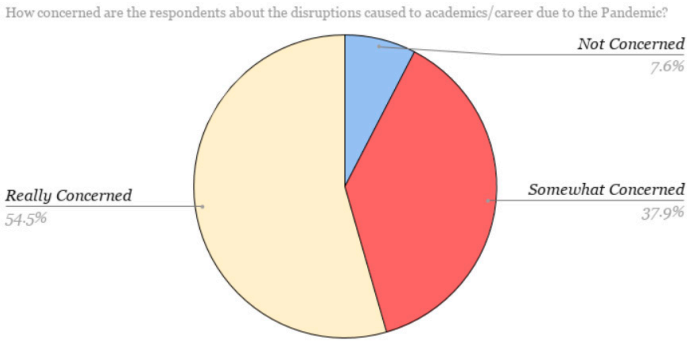


Fig. 4: Comparison of the impact of the pandemic on BSMS students and research scholars

The participants were asked how concerned they were about the impacts of the pandemic on their academics or career. A huge percentage of individuals mentioned that they were highly concerned. See Fig. 5 for a graphical representation of their responses.



CATEGORY	Percentage	N (out of 380)
Not concerned about academics/career	7.63%	29
Somewhat concerned	37.89%	144
Highly concerned	54.47%	207

Fig. 5: Pie chart representation and table of how concerned the individuals are about their academics/career

Mental health history of individuals and their view on therapy:

It was found that 10.23% of individuals who participated in the survey were previously diagnosed with some clinical mental health condition and 7.87% of the participants continue to face them. 22.31% of the respondents were seeking therapy in some form, be it in-person counselling, online counselling or medication. About 69.4% of the individuals seeking therapy had to discontinue it due to the pandemic, while 29.4 % continued.

The respondents were asked if they were willing to seek therapy if needed, to understand how open they are to the idea of getting professional help. The responses we received were pretty positive, with 33.2% willing to seek therapy when needed and 42.6 % considered taking therapy but were slightly hesitant.

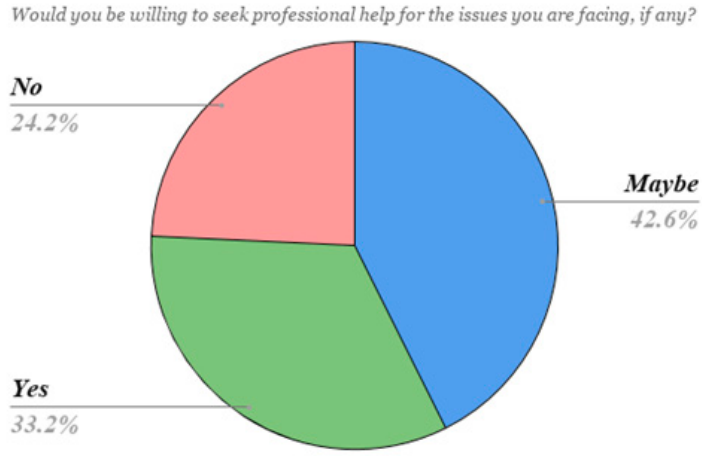


Fig. 6: A pie chart representation of how many respondents are or are not willing to seek therapy when facing issues

On reading the descriptive answers provided by the respondents, certain common causes of distress were observed. Many complained of not being able to adapt to the new normal lifestyle and online classes. In the pursuit of replicating the normal education system through an online mode of continuous evaluation with quizzes and assignments, most of the students were placed in a race to finish work and the interest in the subject was lost in the process. Devoid of equal facilities, opportunities and experiences, students were majorly worried about keeping up with their peers and struggling to compensate for their lost academic exposures, like lab courses and internships.

Lowered levels of motivation and productivity were evident from this survey, as most students wrestle with managing time between classes, chores, and internet limitations. Previously, students were constantly advised by guardians and teachers to keep a check on their screen time and levels of physical activity, but now attending several hours of online classes every day has become the new norm. This technology dependent lifestyle has caused physical and mental exhaustion in everyone.

The uncertainty of when we will return to our normal lifestyles has caused anxiety in many individuals. A few complain about strained relationships with friends and family. Whilst some were able to spend time with their families and by themselves, most found it challenging to find comfort in confinement. Familial issues and a lack of similar-minded people to talk to were reported as common issues.

Some respondents who were previously diagnosed with mental health conditions mention that their symptoms are getting worse since they have discontinued therapy.

Conclusion:

The response the survey got in the first few hours of us sending the form convinced us that this initiative was long-awaited. We believe that participating in this survey gave people an opportunity to introspect various aspects of their lifestyle and hopefully encouraged them to make necessary changes to the aspects they are in control of, both individually and as a community. It is important to be aware of our own states of mental health, and one mustn't hesitate to reach out and seek help when needed. This survey made it clear that all of us share common worries. While that may not be something to feel better about, we can always support each other and make these times a little easier to deal with. Click here for some suggestions by Dr Mary P. R. and Dr Neelima Gopinath (Counselling Centre, IISER TVM) on how to deal with the additional stressors during the pandemic.

Methods used:

The survey was conducted using Google Forms. All the respondents participated voluntarily and were clearly informed that the information they share will be kept confidential but will be used to produce a report on the mental health of our community. The forms could be filled anonymously and did not record email IDs. The IBM SPSS was used to analyse the data.

Acknowledgements:

This survey was curated by members of Exhibit A—Riya Sheokand (batch '17), Rasajna M. (batch '17), Aiswarya P. S. (batch '18) and Balaram Vishnu Subramani (batch '17). We would like to thank Dr Manpreet Kaur (M. Phil and PhD in Clinical Psychology from NIMHANS), Dr Mary P. R. and Dr Neelima Gopinath (Counselling Centre, IISERTVM) for their relentless support and guidance which made this happen.

Interview with Pragya Lodha

Earlier this month, Anvesha had the opportunity to interview Pragya Lodha, a clinical psychologist in Mumbai. She is one of the main practitioners of the Yellow Club. The interview was conducted and transcribed by Shreya Venkatesan (SV) and Akshita Mittal (AM) of BSMS Batch '19. The following is the transcript:

SV: Mental health is a rather taboo topic in India, riddled with myths and misconceptions. How has this stigma shown through, if at all, in your interactions? How can we destigmatize mental health issues among older generations?

PL: Mental health as a phenomenon and aspect of health has always remained stigmatic, irrespective of age and demographic. The stigma can be seen right from the beginning at homes, where we simply don't talk about our emotions or feelings very openly. The stigma, if we look at adults and the elderly, is also equally prevalent, very often missed. We assume that they are people who know better, are wiser and cannot make mistakes. So, starting right at home, the stigma prevails when it comes to addressing our problems and feelings, not just within the family but also with a mental health professional. We're not very open to seeking help because mental health is seen

as a space or a sector of health where only people who are 'insane' or cannot handle themselves, or who are not doing too good in life go. Even if one attempts to go, one is very fearful about revealing to people around them that they are taking mental health support. They fear that once revealed, they will be made fun of and labelled. The stigma in today's times also prevails from very quickly labelling people around us. We term this 'romanticisation of mental illnesses or mental health' in general, where on very simple or very obvious behaviours people are labelled without understanding that mental health is a spectral phenomenon and our health lies on a spectrum. So stigma, in general, prevails right from addressing our issues to addressing mental health and understanding mental illnesses as well.

AM: Leading from the previous question, what would you say to those who want to seek professional help but are not receiving any support from their family or cannot afford it? What course of action can they take?

PL: I generally prefer to tell adults who can support themselves to get help that it's okay if they don't announce it to their peers, family, or spouses. In general, even if you are able to realise that you need professional help and you go and take help, that is a big step towards breaking stigma.

If somebody is a minor, I often tell them to find someone they can trust who may support them to get help, which would first mean to start talking about what the issues are.

For people who lack financial support, I would suggest they approach certain NGOs or suicide prevention/emotional support helplines that provide free counselling. It can often be a challenge to find out which would be the best, however there is support on the internet where people can find a trusted helpline or NGO. There are websites* that don't give a rating but give an understanding of which one is reliable and which isn't and why one should not go to them.

SV: In your experience as a mental health professional, what are the most common mental health issues students face, and what is the first step to dealing with them?

PL: When we look at it diagnosis-wise, depression and anxiety are the most common problems that we see amongst the student population, which also include social anxiety and panic attacks. When we're looking at the kind of problems students face, most commonly we see that they are:

- Problems in the students'
  - parent-child relationships
  - peer relationships
  - romantic relationships
- Issues regarding competition and academic performance
  - a general sense of fear about performing well and managing their careers
  - pressure about managing academics along with doing something that involves their volunteering capacity or internships or even additional courses to amp up their resumes
- Anxiety when it comes to using social media—talking to someone over the phone, building relationships over dating applications
- Substance use and abuse (although it is not the first issue they bring up in therapy, eventually it does come up)

I think one of the biggest reasons that we look at in millennials and gen-z is the need for perfection. It is one reason they are really alone and sad and more isolated from the rest of the people. Suicidal ideation (suicidal thoughts) is also commonly encountered. Especially during the lockdown, there has been a very high increase in the number of cases of suicidal ideation and tendencies. Panic attacks are a very common reason—mostly stemming out of some sort of disturbances in interpersonal relationships, either with the family or with their relationships in general. These would be some of the more prominent reasons that we see youngsters approaching mental health help and therapy. On the better hand, a lot of youngsters have this insight. They are very aware of their childhood issues and unresolved childhood conflicts and very actively address them in therapy.

AM: What is your opinion on the diversity of the population of mental health professionals in India? Taking intersectionality theory into account, isn't it better to consult a therapist who is from a similar background?

PL: To begin with, I think there is a shortage of mental health professionals, not just psychiatrists and clinical psychologists, but also counselling psychologists and social workers in mental health. The concept of psychiatric nurses is not very well established in our country. We still rely on our hospital ward staff to help us with whatever is needed as the role of a psychiatric nurse.

Intersectionality [across social and economic backgrounds] is not always needed for specialisation as a mental health professional because as part of our training, we look at something called 'multicultural counselling,' and the diversity of socio-demographic variables is something that we study right from the beginning of our training. So one may not really be required to have intersectional training but I would ascertain the fact that one needs to have an idea of the intersectional understandings and frameworks of the patients, especially when we're addressing trauma, domestic violence, sexual abuse; or providing psychotherapy to someone from a

minority caste or the LGBTQ+ community. This can be maintained with reading and learning from one's practice, keeping oneself up-to-date with situational happenings and getting well-versed with them. For example, giving psychotherapy to somebody who is visually challenged, is very different from traditional psychotherapy that is practiced with someone who has vision because so many things change- right from lifestyle modification to whatever activities are done in therapy as well. This is the kind of flexible adaptation in practice as well as intersectional awareness we need because our populations come from diverse backgrounds, especially given that India is a country that has multiple social, cultural demographics that change within the state also.

SV: You've already spoken about increased suicidal tendencies during the lockdown period. But even generally, the youth suicide rates in India are shocking, especially among college students. What is your opinion of suicide prevention hotlines in India and their functioning?

PL: When I recommend as a professional, the best way to find out if a helpline is good is to first call the helpline yourself and check whether you get help or not. I wouldn't say that there aren't good or reliable suicide prevention helplines, but I think the biggest challenge is to classify which one is reliable and which one is not. There is a list of reliable suicide prevention helplines available online that can be referred. Some of them that I very actively recommend are:

- Samaritans Mumbai
- iCALL
- Bombay Psychiatric Society
- MINDS foundation
- NIMHANS
- Kiran (haven't personally tried it, but I've heard good reviews from my colleagues)

Some of them are 24*7, some of them are also available on email or text message. So, diverse needs are trying to be met, but I think the need in itself is so high that sometimes it's impossible for every helpline to provide 24*7 care. I would say that there are a lot of youngsters who do get in touch, but I think what is interesting to notice is that a lot of adults also do so. I think college students benefit a lot because these are free-of-cost sessions. iCALL and Samaritans Mumbai give counselling sessions for free.

AM: How can someone convince themselves that their issues are not trivial, and they can get help from a mental health professional?

PL: This is a very interesting and important question that comes across often when I've interacted with the youth because there's so much awareness about mental health and mental illnesses that often, one can get caught thinking that their issues are small, that there are people fighting a bigger battle and whether they really need help. There is no problem that is big or small. A problem is a problem, and going to a mental health professional is a way to address it. Most often, when a problem arises for anybody, the first set of people usually try solving and doing something about it on their own. If that doesn't work, and if they have people like their family, peers, or friends that they feel comfortable with or trust to share and find solutions with, they try that. If that also doesn't work, they then usually come to a mental health professional. The second set of people are those who first try themselves, and if they don't find an answer for themselves, then they usually come to a mental health professional because they aren't the most comfortable talking to a friend or a family member about the same. Coming to a mental health professional does not need you to validate or make sure that your problem is big enough. If you are in distress, if you are struggling with something, you can come and speak to a mental health professional, gain insight, gain perspective, learn healthier behaviours and thinking patterns and consequently help yourself. So, every problem is different and no two problems have to be compared to be able to decide which problem deserves help. If there is a problem, it can be addressed with a mental health professional if it is causing you any amount of distress.

SV: Though most colleges offer some form of mental health facilities to their students, it is often underutilized. What could be the reasons for this, and how can they be improved/made more efficient?

PL: This is also an element of stigma. A lot of students don't want to go to school or college counsellors because they fear that someone will come to know that they did. We don't want society to know that we're going to a counsellor, that's one of the biggest reasons why these services get underutilized. This is why people prefer coming to a private practitioner. An efficient way to address this is the school or the college is to have the counsellor deliver sessions for the class as a unit. It's often found out, unfortunately, that the instituted counsellors discuss the problems of the child or the student with the teacher, and then it becomes staff room talk, which is not supposed to happen. So, if the counsellor does their job well enough, maintaining confidentiality and boundaries with the child and with the teacher and the class, as well as by taking regular attempts of coming and addressing the class as a whole, where students can be made comfortable to the idea that they don't have to have something really grave, serious to be able to go to the counsellor, but even if they are not having a good day, and if they feel like they want to just have a word, they can go to a counsellor. The idea of visiting mental health professionals has to be made as common as how one goes to a dentist for a regular

check-up. We're yet to reach that kind of comfort because we need to realise that mental health help is not only for those with 'so-called abnormal', erratic, or grave behaviours. There are lots of misunderstandings about the notion of mental illness, this is where we all need to work towards as stakeholders, as a community in general, that we speak about, and we tell people what mental health is, what the difference between mental health and mental illness is, what mental illnesses are, and how it's not anything equivalent to 'insanity.'

SV: How can administrative aspects of college (like mandatory attendance) be more compassionate towards mental health issues?

PL: We need to be a little more cognizant of the fact that today some of the biggest reasons for a lot of school and college mental health issues to come up are: a) academic pressures, b) peer relationships or bullying, c) romantic relationships, and d) drug use. It's very important that schools keep doing awareness workshops. A lot of times, sex education, suicide prevention, substance use are topics that nobody wants to really address, these are never talked about in school. At some point, we have to understand that these are a part of society and they need to be spoken about in responsible ways. Schools and colleges can become responsible information hubs. For example, administratively, what the school can do is, speak about 'gatekeepers of suicide' as a part of mental health programmes. Here, they will learn to identify some primary signs of sadness, anxiety, and loneliness, among themselves and their peers, so that they are able to address the problem then and there rather than not. The focus should not constantly be on marks, grades, and academic performance, and be more inclusive of extra co-curriculars and the overall well-being of the students. These are the things I would say are challenging for institutions to imbibe because I think the ways they function are systemically different. Some of the things that a school can take responsibility for are — information, having professionals on the ground, teaching and making students more sensitive to their own and their peers' mental well-being, and letting teachers adopt a more sensitive way of interacting with the child, be it talking, teaching, or reprimanding. Lastly, the school can also invite mental health professionals to address relevant topics to school kids and college kids; take part in some sort of mental health activities, campaigns, which the students themselves can do so that they automatically read, know, and become more aware.

SV: Thank you so much for this insightful interview and taking the time out from your schedule.

PL: Thank you.

* Links:
Health Collective
The Print's Review of Suicide Prevention Helplines
Suicide Prevention Helplines by Indian Express

Mental Health Resources:

1. Dr Neelima Gopinath, consultant psychologist and counsellor at IISER TVM (neelima@iisertvm.ac.in)
2. Dr Mary P R, consultant psychiatrist at IISER TVM (drprmary@iisertvm.ac.in)
3. Facebook page of the counselling centre at IISER TVM
   https://www.facebook.com/Counselling-center-IISER-TVM-260832144355471/
4. Samaritans Mumbai, a helpline providing emotional support
   https://www.samaritansmumbai.com
   +91 84229 84528 / +91 84229 84529 / +91 84229 84530 (all days, 5 p.m. to 8 p.m.)
5. iCALL, a telephone and email-based counselling service
   http://icallhelpline.org
   022-25521111 (Monday–Saturday, 10 a.m. to 8 p.m.)
6. Kiran, a helpline by the Govt of India
   18005990019 (24*7)
7. The MINDS Foundation
   +91 9033837227 (call or WhatsApp, 24*7)
   help@mindsfoundation.org
8. A verified and detailed list of mental health practitioners in India
   https://docs.google.com/spreadsheets/d/1pzckT6ns2H1IlmwYwJa8EnBh_1u3gRA9cEOoA4zfilc/htmlview

Biological Bases for Mental Illnesses

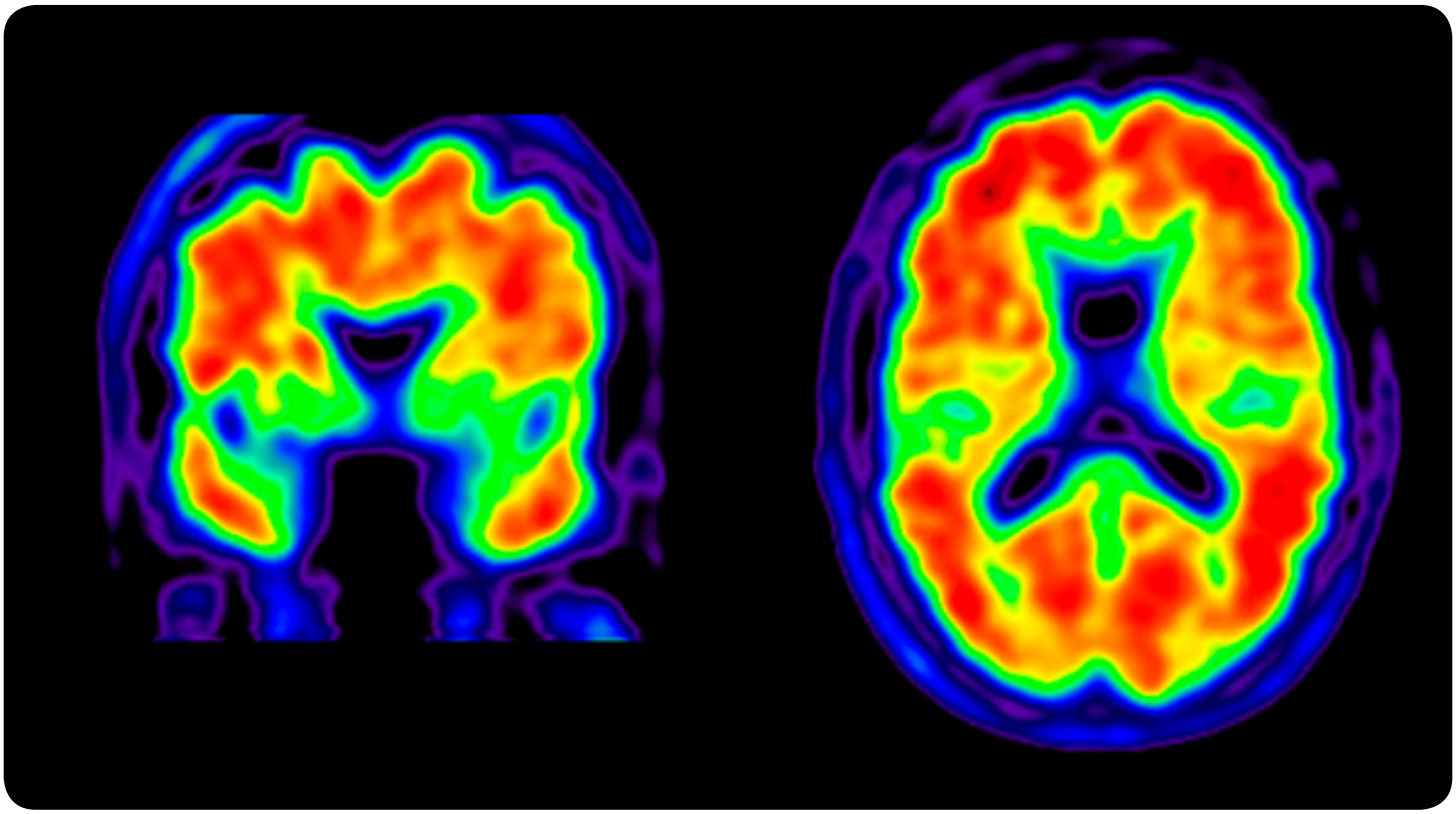
A mental illness is commonly defined as a health condition that changes a person's behaviour, thinking, and feelings, and causes the person distress and difficulty in functioning. There seems to be a public misconception and bias that mental illnesses aren't real or are made up by people affected. Mental illness indeed has a biological basis and is associated with changes in the brain's structure, chemistry, and function.

We do not yet have a complete and comprehensive understanding of what causes mental illnesses as the causes are complex and can vary depending on the individual and the particular disorder. An interplay of psychological, biological, and environmental factors contribute to the development of mental disorders. Environmental factors such as poor nutrition and exposure to toxins, and social factors such as severe parental discord, economic hardship, abuse, neglect, and exposure to violence can increase the likelihood of developing a mental illness. Conditions like autism, schizophrenia, bipolar disorder, and ADHD are more likely to have a genetic factor. The interaction of several genes can trigger the progression of such disorders.

Millions of chemical reactions occur continually in the brain that are responsible for the processes necessary for survival. There is strong evidence to suggest that imbalanced levels of essential compounds that take part in these reactions and issues with neurotransmission can lead to the development of symptoms.

Neurotransmitters are compounds that exist to facilitate communication between neurons. Messages are sent in the form of electrical impulses that cannot traverse the space between two neurons (the synaptic cleft). Neurotransmitters such as serotonin (5-hydroxytryptophan), acetylcholine, GABA, and dopamine can drift across the synapse in vesicles and bind to specific proteins called receptors in the postsynaptic neuron, which recreates the electrical impulse. Proteins called reuptake pumps carry the neurotransmitters back to the first neuron.

Research suggests that a lack of neurotransmitters can cause depression. The Serotonin Hypothesis of Depression, which postulated that a reduction in serotonin leads to increased predisposition to depression through either a decrease in serotonin (5-HT) availability leading to super-sensitivity or a defect in receptor activity, was favoured for a long time. Some initial studies supported this while some evidence to the contrary, i.e. excess of 5-HT at the synapse led to depression, was also available. Arguments in favour of the hypothesis were based mostly on tryptophan depletion studies. Tryptophan is the precursor molecule to 5-HT, and studies tested the effectiveness of tryptophan-free diets in the aggravation of depressive symptoms, based on the premise that lowered levels of the substrate (tryptophan) should result in lower levels of 5-HT. In normal control groups, no substantial effect was observed. Recovered depressed patients, however, displayed symptoms for a very brief period. This



PET Scan

evidence did not lead to large advancements in treatment—administration of tryptophan alone does not produce results, although it has improved the effectiveness of other antidepressants.

Enthusiasm for the hypothesis still exists due to the effectiveness of SSRIs in treatment. Selective serotonin reuptake inhibitors (SSRIs) reduce the amount of 5-HT that returns to the presynaptic neuron, leading to an increase in the amount of 5-HT available in the synapse for binding to the receptor on the postsynaptic neuron. It is more plausible that low 5-HT function compromises mechanisms that maintain recovery from depression rather than directly lowering mood in all vulnerable people. While the simple positive correlation that low levels of 5-HT lead to depression is no longer tenable "in the age of neural networks and systems-level neuroscience", the efficacy of SSRIs is undeniable. Computational models are expected to reveal more about the combined effects of dopamine and 5-HT. While extensive PET (positron emission tomography) studies have produced many results, causal relationships between the relevant compounds and symptoms of mental illnesses, including depression, are yet to be firmly demonstrated.

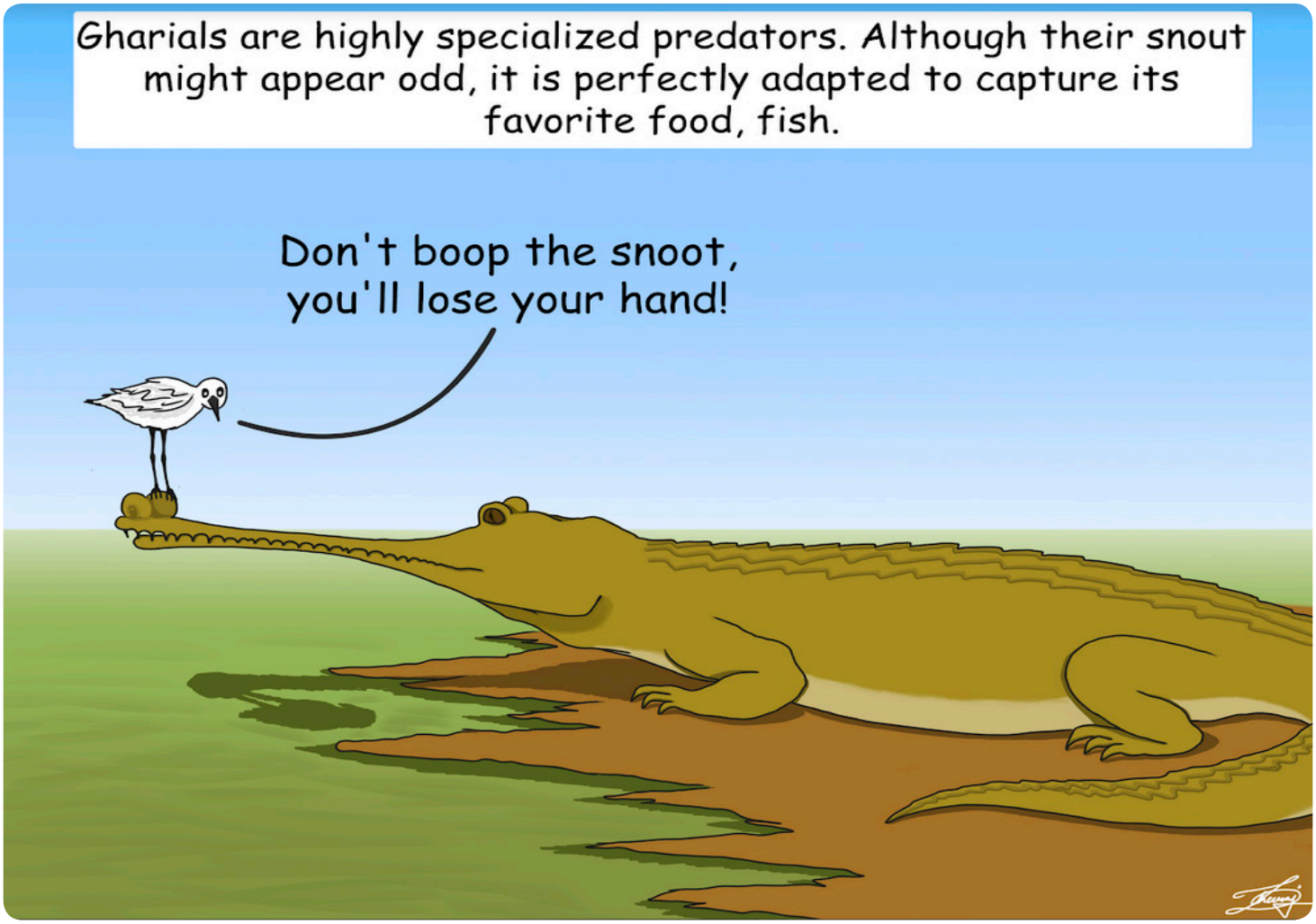
Similarly, the dopamine theory of ADHD (attention-deficit hyperactivity disorder) suggests an association with disrupted dopamine signalling in affected individuals. Genetic mechanisms also seem to contribute heavily, and some correlation with sugar consumption has been found. Schizophrenia has been studied for over a hundred years, and our understanding of it has only recently seen large advancements. MRI studies confirm structural brain abnormalities in schizophrenic patients, including larger ventricles in the brain, medial temporal lobe and parietal lobe involvement, and STG involvement in affected individuals.

While our current knowledge of mental disorders is not sufficient for satisfactory treatment and is nowhere near complete, newer techniques and methods of investigation are continually providing evidence that we hope are small pieces that contribute to the bigger picture. Needless to say, the existence of genetic and neurological bases for mental disorders is irrefutable.

—Rithika Ganesan, B'19
Source

To Boop or Not to Boop

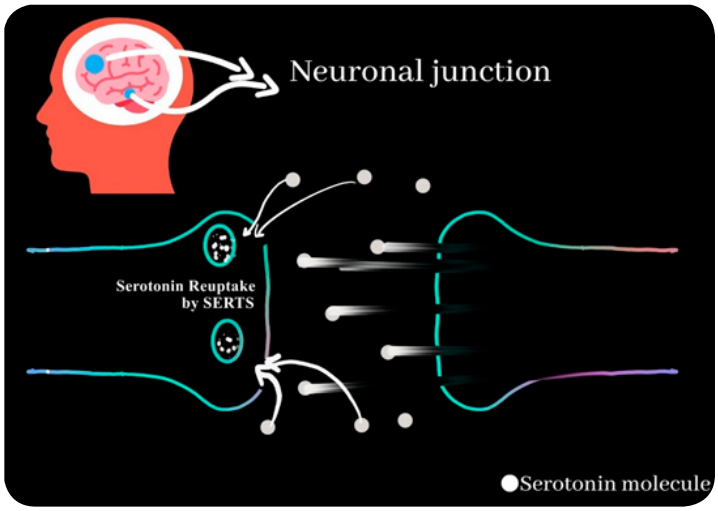
—C. L. Dheeraj, B'17



How SSRIs Work

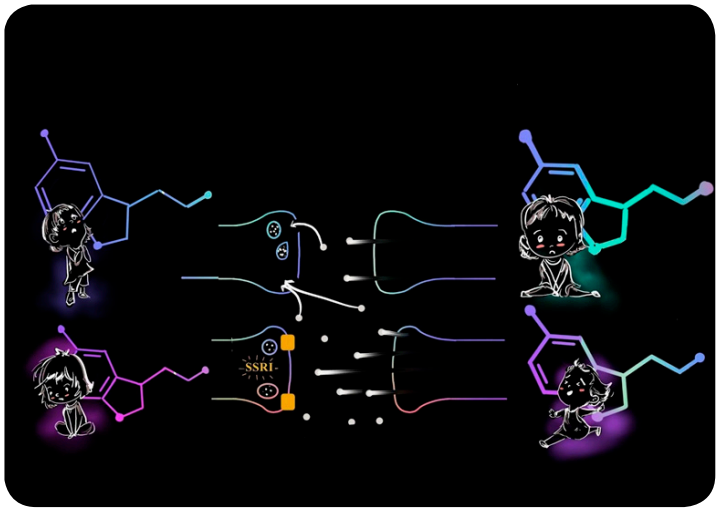
Serotonin (5-hydroxytryptamine) is a neurotransmitter which is responsible for a lot of important functions, most importantly mood elevation and reward sensing mechanisms, giving it the esteemed status of 'The Happiness Hormone'. The role of serotonin in mood disorders like depression, anxiety, and OCD has long been studied. Even though its exact role in emotional well-being is still being discussed in papers as recent as 2020, The Serotonin Hypothesis for Depression, which is almost 50 years old, states that low levels of serotonin in the brain can be strongly correlated with depression. Understanding the impact of serotonin in a simplistic way would be an injustice to the complexity it entails, however it wouldn't be wrong to say that serotonin increases bias towards positive effect/emotions, strengthens new reward associations, and reconsolidates old ones. In other words, it is the chemical that makes you see the world through rose-tinted glasses, and motivates you like a doting grandma!

So, how is this chemical actually manufactured in your brain? Serotonergic neurons mainly reside in a part of your brain called the Dorsal Raphe Nuclei or DRN. However, their axonal projections overarch to a plethora of regions in the brain including the amygdala (emotion processing centre) and cerebral cortex (responsible for decision making). Once serotonin is released, it performs myriads of neuro-modulatory effects by binding to the pre and postsynaptic serotonin receptors. The metabolic steps involved in its synthesis and release are highly analogous to dopamine and norepinephrine—its monoamine siblings. The important part, however, is the fact that serotonin is not only released in a phasic manner (through actual firing of the neuron) but also tonically (passively through the soma) and therefore its release is tightly regulated by various mechanisms, one of which is regulation by serotonin transporters (SERTs).



These serotonin transporters are responsible for taking up serotonin from the extracellular space back into the serotonergic neuron and packing them into vesicles. Consequently, less serotonin would be able to bind to the pre/postsynaptic receptors and carry out the specific serotonergic signalling pathways necessary for its various functions. Hence, it is understandable that if the serotonin transporters are overactive, there would be a decrease in reward sensitivity, reduced perception of positive information, and bias towards attending and remembering negative information, leading to a variety of mood-related disorders, including depression and anxiety.

This is where Prozacs and Citaloprams come into the picture. As the first line of treatment for depression and anxiety, Selective Serotonin Reuptake Inhibitors, or SSRI antidepressants work just as their name



suggests. They specifically inhibit the SERTs from taking serotonin back up into the serotonergic neuron, thereby increasing its availability in the extracellular space to restore normal functioning of the serotonergic pathways.

Voila! We have cured depression. If only it were that simple.

Although the neurochemical pathways behind SSRI action have been elaborately elucidated, the mechanisms of how that translates to alleviating depression is still a hot topic for research, further accentuated by some quirks in the functioning of the SSRIs. For starters, SSRIs don't necessarily work for all individuals, owing to the fact that even though serotonin is called the happiness hormone, its monoamine siblings discussed above (dopamine and norepinephrine) also have significant roles to play in the reward sensing pathway. If SSRIs do not suit someone, they might have to be prescribed SNRIs (Selective Norepinephrine Reuptake Inhibitors)

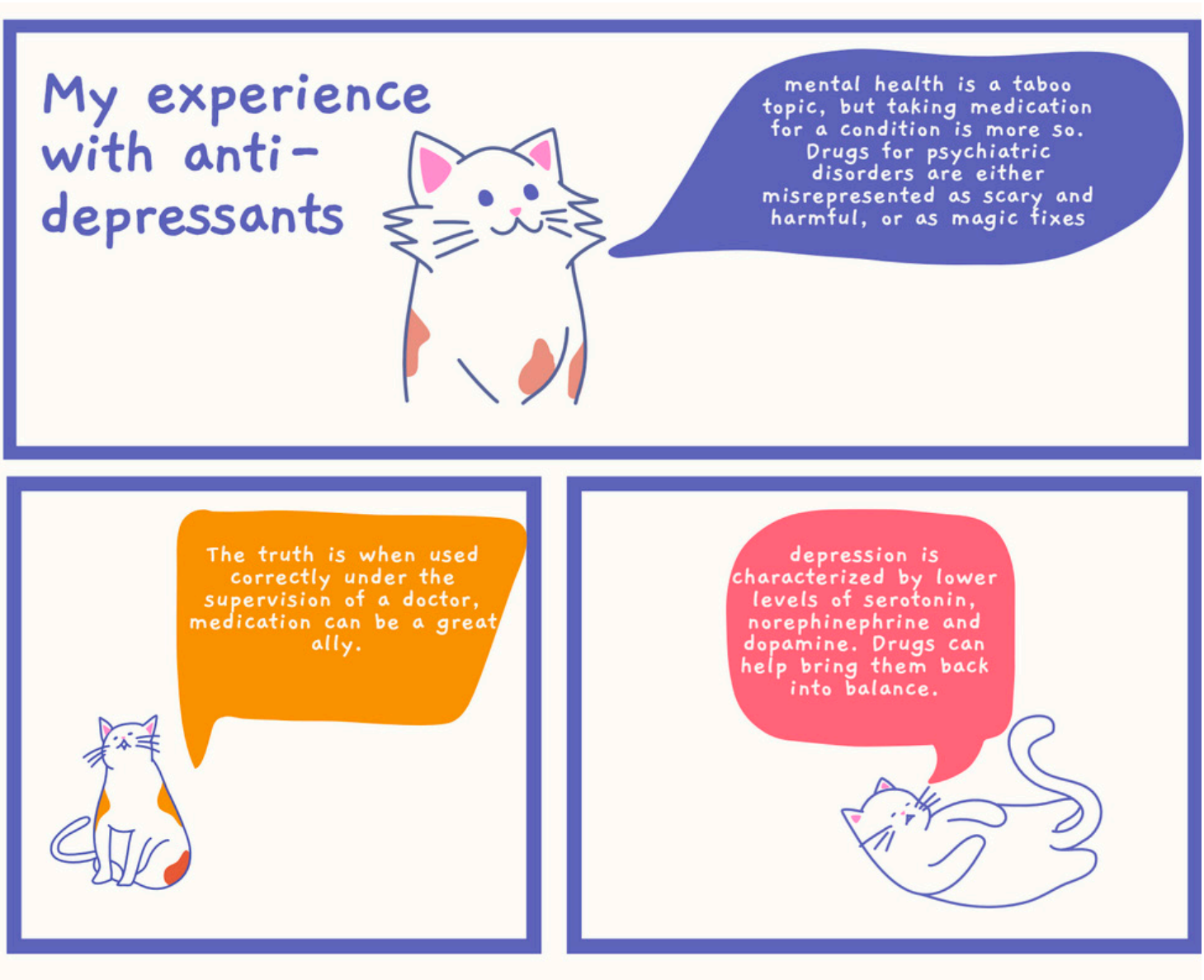
or a combination of both. Even when they do work, SSRIs are characterized by their delayed onset of action, and their efficiency is directly proportional to the severity of depression. Attempts have been made to explain the delayed onset of benefits by incorporating the role of 5-HT auto-receptors. These auto-receptors can modulate serotonin release through the serotonergic neuron by sensing the extracellular serotonin levels, if serotonin levels are high outside the neuron, they cause it to fire less and if they are less, they cause it to fire more. Therefore, in the case of SSRIs when the serotonin levels are increased extracellularly via the action of the auto-receptors, the firing of the neuron is decreased, hence delaying the therapeutic time window. The benefits start once the auto-receptors have become desensitized to the extracellular serotonin levels.

Apart from that, a critical aspect of any change in the brain other than the change in neurotransmitter levels is the change in neuroplasticity. Think of the internal structure of the brain as play dough, moulding and adapting itself to all changes in the environment. That's precisely why, along with antidepressants like SSRIs, behavioural cognitive therapies and counselling are also recommended—not only because they are non-invasive but also because they are necessary for alleviating the symptoms.

—Shreshth Shekhar, B'18
Illustrations by Aiswarya P. S., B'18
Read more at: [1], [2], [3], [4]

My Experience with Antidepressants

—Ira Zibbu, B'19



At the same time, it is inaccurate to reduce depression down to 'an imbalance of chemicals'. It is a complicated disease with environmental, genetic and physiological causes.

The most popular drugs are SSRIs (Selective Serotonin Reuptake Inhibitors) and SNRIs (Serotonin and Norepinephrine Reuptake Inhibitors). I take fluoxetine, an SSRI.

Antidepressants can have side effects like insomnia, dizziness, indigestion, headaches, restlessness and other. Each person experiences different side effects of different intensities.

Your doctor will help find the right drug and dose.

Antidepressants are not habit-forming. You cannot develop a physical dependence. At the same time, abruptly stopping can cause withdrawal symptoms, so follow your doctor's advice about discontinuing use.

Antidepressants will not instantly make you feel happy. Rather, they slowly help you feel like your old self again. It can take anywhere between a few days to a few weeks to see its effects.

Drugs are not silver bullets for depression. Therapy, support from loved ones and lifestyle changes work in tandem with medication to aid your recovery.

Take it from someone who has been through it: it gets better, and don't be afraid to ask for help.

ESI Species of the Month: Amur Falcon

It is November, and Nagaland gears up for an astounding yearly phenomenon—the Amur Falcon migration. This small raptor of the falcon family migrates every year from Southern Africa to Northern China and Siberia to breed. This makes them the world's longest travelling raptors. It is a sight to behold thousands of individuals flying past the Doyang Valley in Nagaland.

Description:
They are named after the Amur River that forms the border between Russia and China. These birds show evident sexual dimorphism. The males are dark sooty grey above, with rufous coloured thighs and bottom, and when in-flight, the wing lining is white, contrasting with the dark wing feathers. The females have a distinctive orange eye-ring, a red cere and reddish-orange feet. Their wings are long, with a wingspan of around 63–71 cm, like any other raptor.

Distribution and migration:
The Amur Falcon breeds in North-Eastern Asia, from the Transbaikalia, Amurland and Northern Mongolian region to parts of North Korea.They travel through India and Sri Lanka over the Arabian Sea and some other islands to reach Southern Africa. Their 22,000-kilometre migratory route is one of the longest amongst all avian species. They usually tend to stray from their migration path and are thus found in Italy, Sweden and the UK. Doyang Lake in Nagaland is better known as a stopover for the Amur falcons during their annual migration. Therefore, Nagaland is also known as the 'Falcon Capital of the World.'

Breeding and feeding:
They usually prefer an open wooded country with marshes for breeding. They breed between May and June, laying around three to four eggs and both the parents take turns to incubate and feed the chicks, which leaves the nest after a month.

Insects make up a significant portion of their diet, with birds, amphibians and small mammals are also eaten once in a while. While migrating, dragonflies make a hearty meal.

Human interaction and relevance:
Amur Falcons were a part of the Naga natives' diet, and every November, the Doyang valley used to be filled with nets to trap Amur Falcons by the hundreds. Dead birds were also sold at roadsides to earn a livelihood. Active conservation of this and other species was brought about by working with the local communities, providing them with alternate livelihoods from ecotourism and research projects. Over the last few years, Amur Falcons aren't hunted but admired as they fly by the Doyang Lake on their yearly migrations.

—Vidyarashmi Hanehalli, B'19
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We hope you enjoyed this month's edition of Exhibit: A!

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