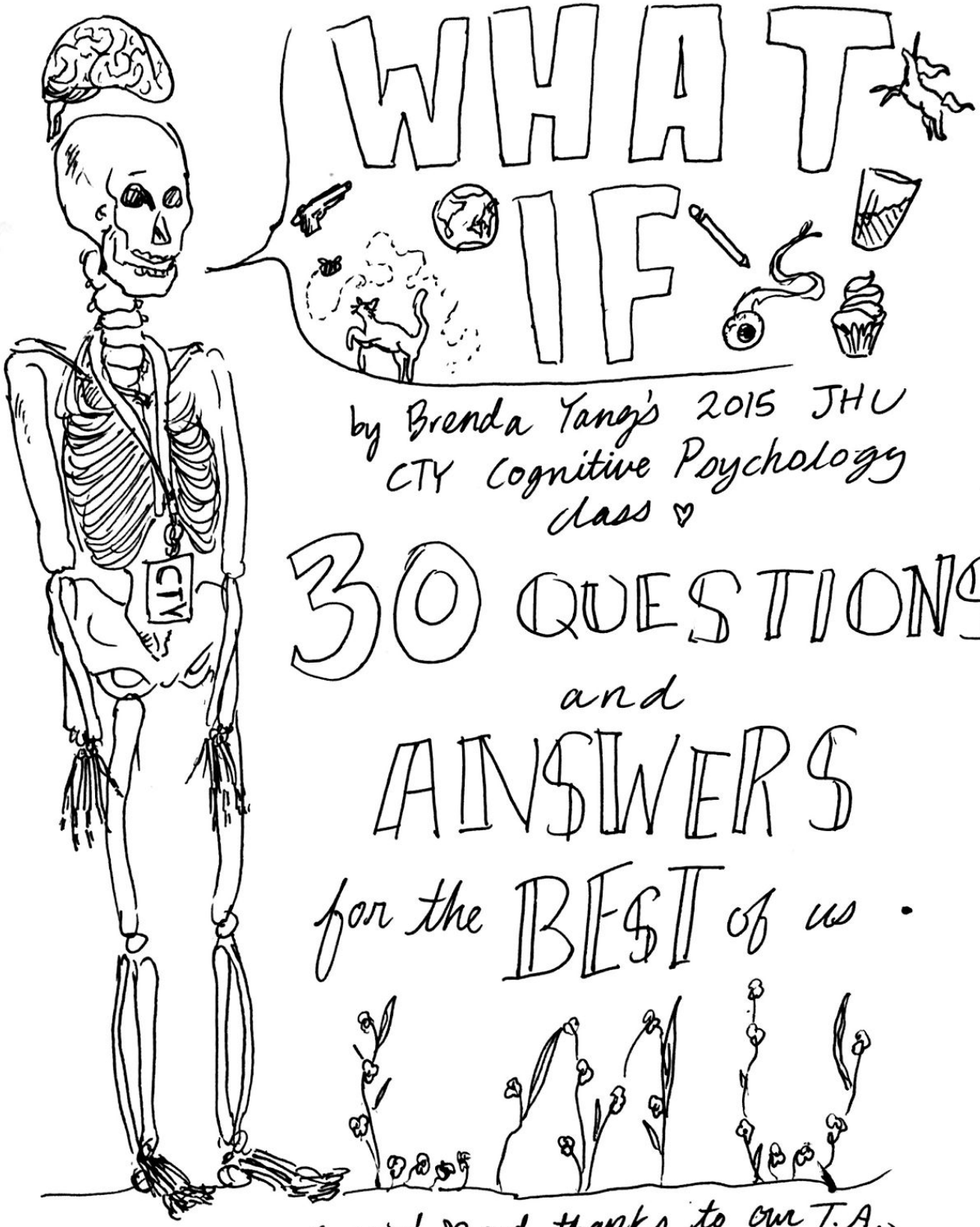

by Brenda Yang's 2015 JHU CTY Cognitive Psychology class ♥

30 QUESTIONS and ANSWERS for the BEST of us.

Special ♥ and thanks to our T.A., Chaparrelle Mogavero-Cline

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THE INTRODUCTION

Q: What in the world am I holding in my hands?

A: The short answer is…well, a book.

The longer one?

Settle down for a second, and we'll tell you a story. A story of thinkpieces and neuron posters and late-night meditation sessions. A story of palm trees and sweltering sun and breezy nights. A story of three weeks on the bright campus of Loyola Marymount University.

A story of CTY.

We walked into our Cognitive Psychology classroom for the first time on the morning of June 29th, 2015. The whole day, we tiptoed around each other, half-afraid to voice our opinions or even so much as speak.[1] There are many ways to explain this phenomenon neurologically. Amygdalae lighting up, fight-or-flight in overdrive, plain old nerves. But the detailed brain stuff comes later in this book. For now, let it suffice to say we were (just a little) *scared*.

You're holding a book. You're also holding proof that we all got past our fear, day after day, hour after hour. We got to know each other. We got to know our instructors. We got the brightest orange shirts in the history of t-shirts and of colors.[2] And we got to not just understand the mysteries of the noggin, but apply them to the biggest questions we could whiteboard.

We took our inquiry as far as it could go. Maybe you know where to go from here. Maybe there's a "What if…" in here you've always wondered yourself. Whatever happens as you dig into our learning, know that we had an amazing time asking ourselves these huge questions. Because we'll always know the biggest question, the question of "Will we become more than just a bunch of kids near a bluff?", has a clear and resounding "Yes!"

Happy exploring,

The 2015 JHU CTY Cognitive Psychology Class, Session 1

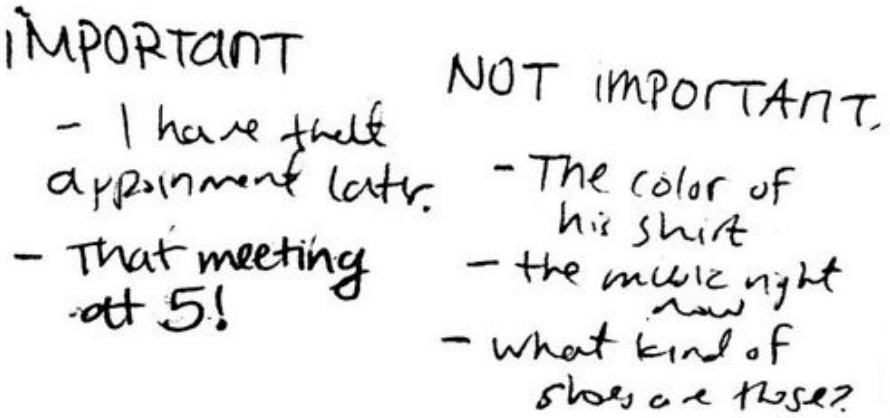
[1] Yeah, that didn't last long.

[2] No really—I mean, have you seen them?

#NoFilter

Q: What if the brain couldn't filter out relevant vs. irrelevant information?[3]

A: The brain is an amazing organ. It's approximately the size of our two fists put together, and it controls our WHOLE ENTIRE body. Along with the senses and motor movements (and don't forget all the other stuff we do), the brain also has to filter out irrelevant sensory input that we receive all the time.



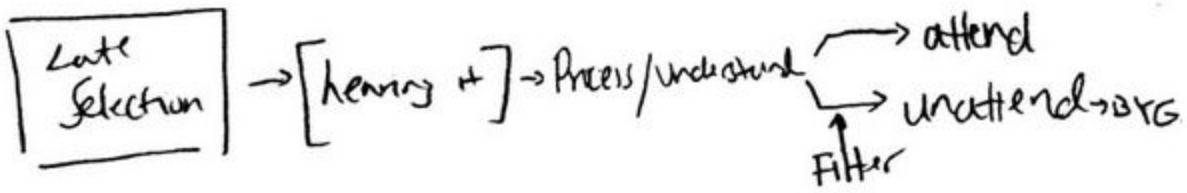
Early and Late Selection
The "cocktail party effect" is an exhausted topic in psychology, but the findings made during the experiments used to investigate it were extremely helpful: we determined whether brain filtering was more similar to an early selection or late selection model. The main findings of the experiments were collectively nicknamed the "cocktail party effect" because they applied best towards a situation normally encountered in, well, cocktail parties. You would be in a crowd of people, being able to focus on one stream of dialogue (most likely your own one, unless you were eavesdropping on others), even though you would be surrounded with a bunch of other conversations. The question is… how do you NOT manage to accidentally eavesdrop on EVERYONE? That's where early and late selection come into play.

This guy named Donald Broadbent came up with the early selection model, where you physically hear a bunch of noises, start filtering the less important sound stimuli out next, and then finally process and comprehend the attended conversation (the one that you pay attention to).

This theory worked well, until another guy named Donald MacKay (and some other theorists) realized that you noticed when someone said your name in another random

[3] Disclaimer: I'm not accountable for any damage to the eyes resulting from viewing my drawings.

conversation. A conversation that, according to Broadbent, you were supposed to already have filtered out and thrown out. So, therefore, the LATE selection model was created. In contrast to the EARLY selection model, late selection shows that the brain processes and understands information BEFORE filtering unnecessary subjects out. That's why when someone randomly mentions us, we automatically process it (because it's important and relevant) before turning around and going, "Huh?" at the people behind us.



Seeing ALL the Blurs

In addition to choosing which stimuli we respond to, we also filter out some of our vision, to a certain degree. Our attention (where we focus on) is kind of like a spotlight. It can't fit two people on the stage. So when we sit at our computers staring at the screen or typing up essays, we don't see the people next to us (heck, we can't even see the word next to the one we are typing or reading), but we still turn our head when someone walks into the room. Why? Because our brains decide that, "Hey, that moving person is more important than this screen," and focuses on the person instead. Because our spotlight is so small, things will always shove other things out of the way.

So, in theory, if we couldn't even filter out irrelevant information from our sight, doesn't that mean that we would see and register everything? But how would we register everything we see? Would we even register that weird blurry thing right next to the eraser that I can't notice because my spotlight of attention is that small? I don't know about anyone else, but I would not want to be registering blobs of blurriness every time I see something. But in reality, the spotlight is so concentrated and small that we can't register the blobs (thank goodness for that).

Pencil Mania

And as for memories? In reality, it probably isn't necessary that I remember what color shirt that girl wore when I interviewed her twenty years ago, what kind of dressing I had on my salad last week, or even that a serving for sour cream and onion Pringles is 150 calories (why do I even know that? Because I eat too many Pringles. By the way, a serving is 15 chips.). So, I filter that stuff out and I won't remember it -- it's just not important enough to

keep in my head. If our brains weren't able to filter out useless information, we would all be like Mr. S, a man who is able to recall pretty much everything through synesthesia (where you associate things like sounds and shapes and letters with colors, tastes, emotions, etc… It's basically connecting two things). At first, this might seem pretty cool. After all, who wouldn't want to be able to remember everything? But once you think about it, it's really not that great to be like Mr. S. Imagine if someone said the word "pencil." You'd remember the word "pencil," but you would also remember every single pencil you've ever seen, every pencil you've ever held, every type of pencil and the differences between them, every color pencil, literally **every pencil.** I could never live like that.

So…What Happens?

As I'm sure you know (because I just went through a rather lengthy explanation of it) , our brains effortlessly go through a complicated information filter before discarding it. Since we know that we DO filter information, let's see what would happen if we didn't. The world would probably pass by in utter confusion. You would hear EVERY stimulus around you, understand every conversation that reaches your ears, and probably be conscious of random thoughts floating in your head (kind of like Mr. S). I don't know about anyone else, but I'd prefer not to think "The grass is green," every time I see it and I'd prefer not to hear, "Did you hear about that girl that wore those shorts yesterday? Ugh, she's so gross," and "BROOO THE MAC AND CHEESE WAS THE BOMB DOT COM," and, "You know, I don't know what the answer to seven-thousand-two-hundred-fifteen squared is," at the same time. My head would probably explode.

Written (and sadly illustrated) by Christie Chen

LIVING FOREVER

Q: If you lived forever, would there be a limit to your long term memory?

A: Even if we could live forever, where would our memories go?

Would they remain in our heads or be wiped out? After all, our brain does filter out unnecessary knowledge. And we are not vampires. We could not possibly know what we did 57 years ago, at exactly 4:13 pm, if we were actually given a perpetual lifetime. Remembering everything would just be impossible.

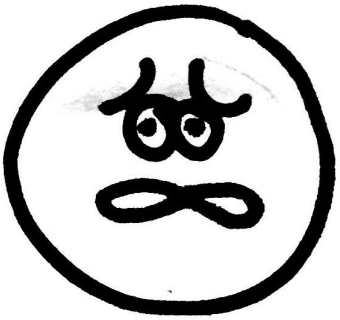
Water in a cup would be a perfect example for this. Just like how water fills up a cup, our memories fill up our brains. Without water or our memories, the cup and our brains are just a seedless cover of nothing. The quote from Luis Bunuel, “You have to begin to lose your memory, if only in bits and pieces, to realize that memory is what makes our lives. Life without memory is no life at all… Our memory is our coherence, our reason, our feeling, even our action. Without it we are nothing.” But too much of either of them cannot necessarily be categorized as “fitting.” After all, there are limits to everything. The cup would overflow if there is too much water and same goes for our brains.

Now think about what happens if the cup is overflowing with water. Water would be spilling out all over the place. The capacity for long term memory may have been proven to be unlimited; however, forever is a really long time. I'm merely speculating that if we were to be immortal, all memories won't be able to stay in our brains. If they did, it would be bad. I mean, like really bad.

This brings me to talk about Mr. S. He was very normal. Except for the fact that he could take one look at an enormously, long sequence of numbers/words and remember them all, he was completely normal.

Mr. S could memorize EVERYTHING word for word; therefore, his visual cortex had been hugely enhanced. Several scientists had experimented with him. They made him read a passage of a certain book and test him on how much he recalled. He did his task well. In fact, he did it perfectly. Even after 15 years, the same experimenters found him and tested him once again on the same material. Despite 15 years having passed, he recited it word for word, without any mistakes.

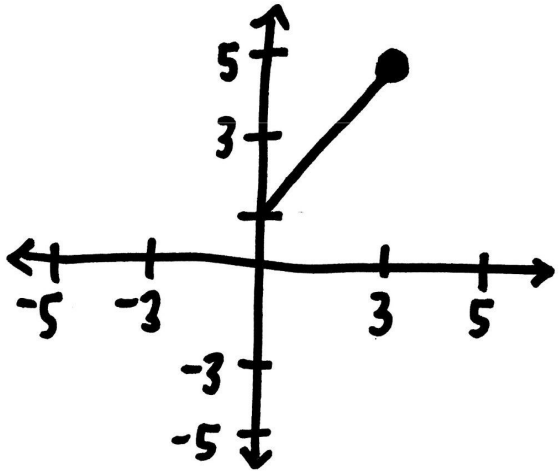
This amazing ability of his earned him a job; he was a news reporter and also had another job at carnivals where people would come and admire his talents. He would tell the audience members to call out a certain number and he would remember them ALL. He did this flawlessly, as well. He was paid well, he was respected. But eventually, he reached his limits. The constant stream of memories going through his head started to confuse him.



Words from the experimenters, his audience, and random people walking down the street would circle his mind over and over again. He would hear echoes of people saying things

when he would lie down to sleep. All of these thoughts started to get mixed up and drove him crazy.

Remembering every little aspect of our lives would not be possible. Nor would it be good for our brains, even if we were given a everlasting lifetime. Just like how our bodies are made anatomically for walking, and not for flying, just like how there is a set answer for every mathematical equations, there are limits to everything.

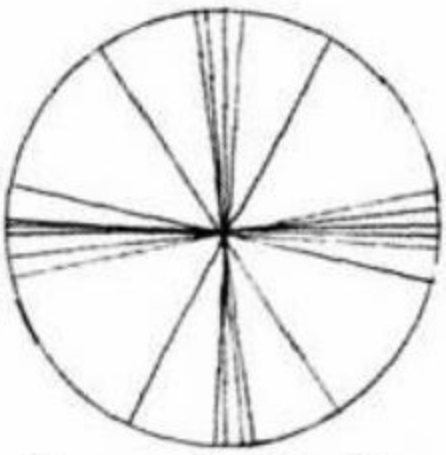


Written by Kirsten Huh

LEARNING SIGHT

Q: What if someone was blind their entire life and suddenly gained sight?

A: In 1973 scientists discovered that cats had impaired vision when their eyes were only exposed to vertical stripes in a lab as they grew up.[4] We know from Colin Blakemore's experiments on the visual cortex that an animal's visual systems learn to detect seeing the lines in different orientations while neurons in the visual cortex are developing. Blakemore raised kittens in environments with only vertical or horizontal lines. Once the kitten's visual cortices had matured, he moved the kittens into the real world. The cats were blind to line orientation that they had not experienced before. If the cats had grown up with only vertical lines their brains were not stimulated from horizontal lines or diagonal lines. They just could not see them.



An example of the line orientations learned by a partially developed visual system.

The scientists also learned that the cats had trouble perceiving movement since they had grown up in a primarily motionless environment. By doing brain scans on people, scientists have learned that human minds work in a similar way, although there is debate as to how long the human visual neuron maturing time is. Some scientist says that humans have a critical development period from being born to five years old that their brain can become 'learn sight'. So even if they somehow overcame their blindness, their brains couldn't learn

[4] Well duh...

to process the visual input properly. However scientist Pawan Sinha counters this with the compelling fact that he has given sight to many teenage blind children.[5]

So assuming that you have been blind your entire life and are old enough to comprehend what happens when you become able to see, what would happen? Well first of all you unfortunately wouldn't just sit up off the surgical table and be able to see the world. You would have to develop your visual cortex.

It's impossible to know what exactly would happen when you looked around for the first time. You would probably have no idea what is going on. For the first time your brain is experiencing another a fifth sense, another input for your brain. You would most likely have trouble seeing clearly, like how babies have very blurry vision, but this would clear up quickly. You would need to go through the same processes that a baby does, first learning how to perceive of lines and shapes. Then you would need to learn to perceive movement. Once you have learned these basics you would need to learn to connect them to life, learning shadows and predicting speed. Pawan Sinha had a child walking around obstacles after around a month of training and visual. After this you would be ready to take on the world with all your senses intact hooray!

Written by Peter Segel Kubiniec

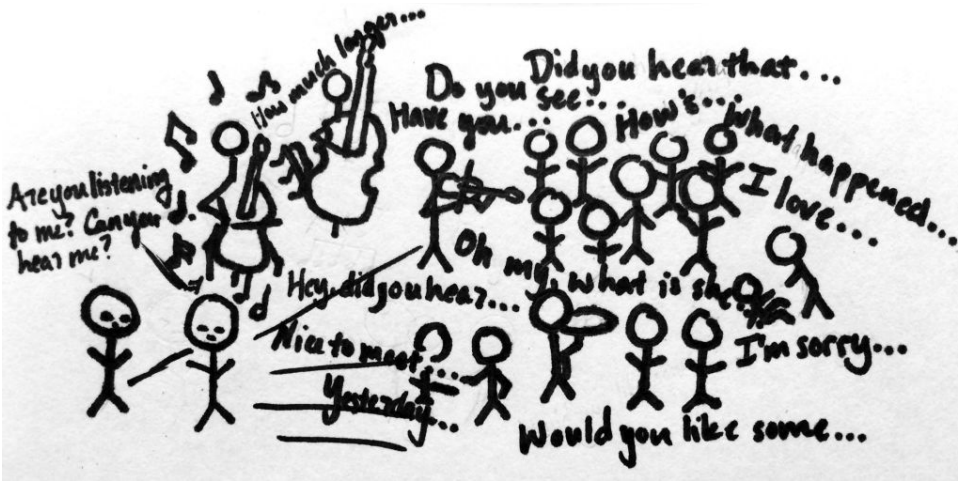
[5] Hoorah!

NOTICING EVERYTHING

Q: What if you noticed everything at once?

A: If you could notice everything at once, assuming that 'everything' means all the inputs from your senses, life would be very difficult. You would be constantly assaulted with new sensations as the environment changed around you. The brain filters out much of the miscellaneous background noises and sights for a reason.

Take, for example, the cocktail party phenomenon as an example of when extraneous sounds are filtered out unconsciously. You are surrounded by conversations and possibly even music, but you are able to focus on what one person is saying. Sure, you can hear people talking around you, but it is just meaningless noise. If you were to notice everything, you would have difficulties separating different strands of conversation and focusing on a single one. However, it would not stop at sound. You would also be able to feel the fabric of your clothes and possibly the coolness of the glass of your drink; you would see the colors and designs of other people's clothes, their shoes, the lights, and each and every one of their faces and expressions. The smell of the food, perfume or cologne, and maybe even sweat of your companions would surround you; your mouth would taste like the dinner you had earlier, your drink, and, well, just the taste of your mouth. And all this information would be presented together, 'at once.' To process all these inputs would be incredibly exhausting mentally, and that is just in a small, controlled space. To be outside would provide an enormous new set of data.



Also, something called "olfactory fatigue" has to be taken into account. After having smelled something for a long time, olfactory fatigue sets in, and you do not really notice the scent anymore. If, in this scenario of being able to notice everything at once, olfactory fatigue does not occur, I think that you would get sick of that scent pretty quickly, especially when it is combined with all the other smells around you.

One good part of noticing everything at once would be the subsequent increased ability in reading. Without the specific spotlight focus of our normal attention, you could take in all of

the words on the page at once instead of reading them one by one. Or, if you were looking at a scene or picture, all the details could be seen at the same time and combined into a single, comprehensive whole. This may actually help reduce some types of stress because multitasking[6] would be possible. Some situations in which this would be helpful would be if you were taking care of children while trying to do something of your own, or if you are still in school, you could do homework while simultaneously doing something that you enjoy. However, we need to consider how much energy it would take to process all these details and create a world that is comprehensible to us. Already the oxygen and calories needed are 20% of our body's intake and consumption. To be able to process all this information, the brain would need more blood, so the capillaries would dilate and the heart would beat faster to deliver the blood and oxygen necessary.

If you were to notice everything, you would have to focus to organize all of your thoughts about which pieces of information are important and which are insignificant, which could be a very stressful task. As a result, you might experience what is called 'burnout' or mental exhaustion from enduring long periods of stress. Overall, however, I believe that it would be a negative experience to live while noticing everything because of the overwhelming amount of information that needs to be processed, so the things that are worth noticing-- the scent of flowers, a bird taking flight-- are more rarely noticed and so more precious when we do.

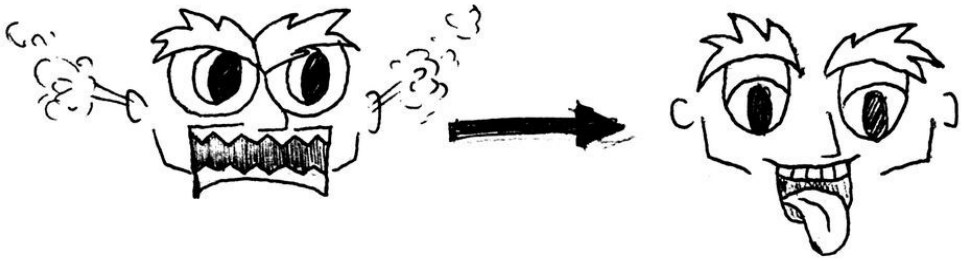
Written by Katrina Liu

[6] Despite all of my claims that I actually can listen to music while doing homework, multitasking is not scientifically possible.

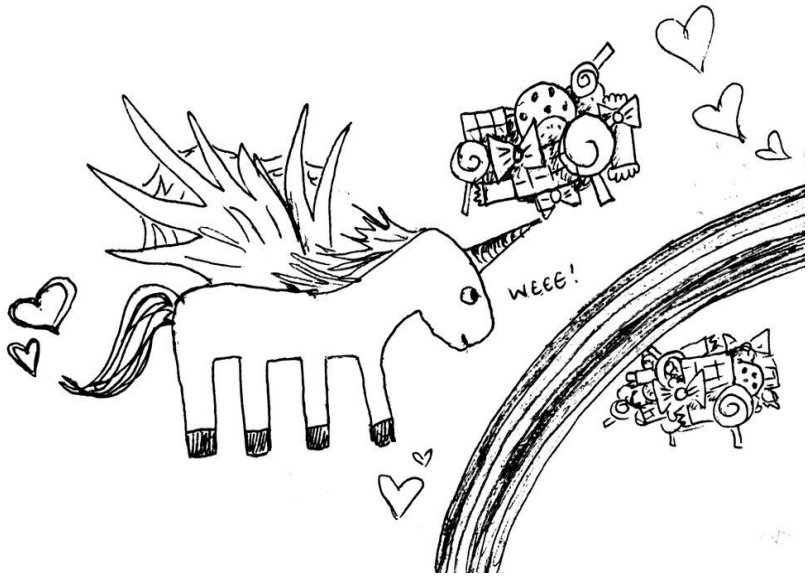
FILTERING MEMORIES

Q: What if our brains automatically filtered out negative memories?

A: At first glance, it seems like a great thing. I mean, who *wouldn't* want only joyful memories? Just visualize it: everything in your mind is pure and happy, without a single demon in sight. Problems like depression and rage quitting[7] would no longer exist!



Good start right? Well, there's more. No more wars, grudges, jealousy, hatred, violence. The world would resemble fluffy unicorns flying past sparkling rainbows and candy clouds. Everyone would get along and love would cluster in the air. This all sounds like a fairytale, so why not live in it?



Here comes the bad news: it'd become utterly impossible to learn from our mistakes and prevent murders/other dastardly deeds. Also even with no negative memories, some people's frontal lobes could just be prewired towards the dark side.[8] They could be greedy, and turn to stealing for money. And we would never know. Why? Because there wouldn't be

[7] This is directed towards those overly dramatic, overly dedicated, passionate gamers.

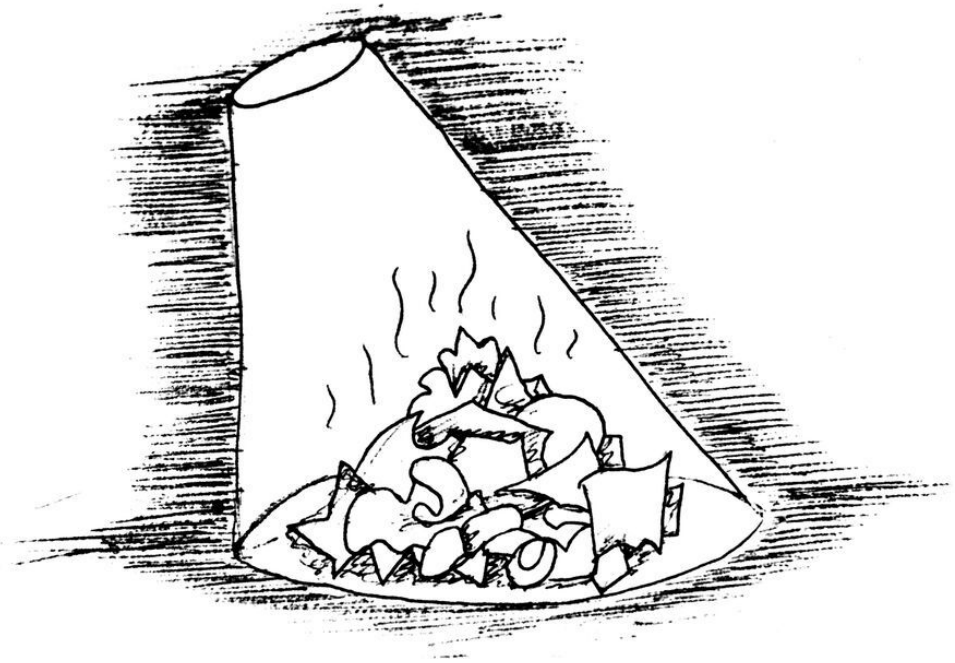
[8] Heh, get it?

a single trace of evil in our minds. We could've been a witness to a murder, but before we could report it we'd completely forget that ever happened, allowing the criminal to carry on with his/her plans. This means those memories would never make it to our long term memory, only lingering for a minute in short term memory and vanishing. Then it'd be the end of the world, once those robbers figure out no one can remember what they did. They could conquer the world and treat you like trash yet you'd be content with their rule.

This brings me to my next point. Where would these crummy memories even go? Psychologists believe we never truly lose or forget. It's the recalling and remembering that we have trouble with. But they're all there. As William James said, "The stream of thought flows on; but most of its segments fall into the bottomless abyss of oblivion." So, although they're in the darkest, deepest, pits of your memory, they're still there. Would that still hold true to the filter? It's possible that those awful memories never *really* disappear, just condemned so down into your mind that it's impossible to bring back.

Now this gets complicated. If our memories don't actually disappear, all of our rotten ones don't either. They'd be sitting, piling up as time goes on… Although there is said to be no limit to your storage capacity, suppressing a large quantity of stinky memories would probably affect you some way or another.[9]

[9] Quite similar to a dirty pile of laundry.



There could always be leaks and slips of sudden flashbacks. You'd be in horror, seeing something atrocious for the "first" time. Over and over! Also, repressed memories can come back, even when you don't want them to. This was the case for Eileen Franklin-Lipsker. Her brain repressed the memory of seeing her childhood friend getting raped and murdered by her father. She claimed to having not remembered anything about the murder until one day, the flashbacks started and everything came back. Does this case mean those filtered out negative memories would eventually surface? And exactly just how many would come out at a time?

But before we even got to that point, we'd be dead. All the evil beings on the planet would have killed us off!

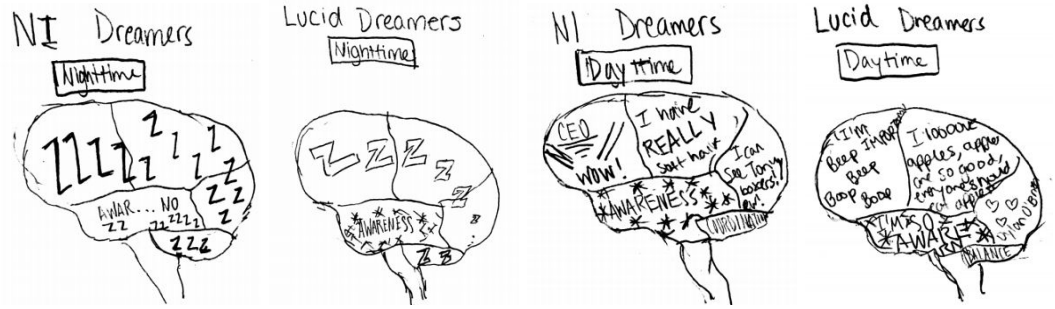
Written by Julia Ma

MEDICINALLY INDUCED LUCID DREAMING

Q: What if we could take pills that could make us lucid dream?

A: In other words, what do lucid dreamers have that non-interactive dreamers don't? Lucid dreams are dreams in which one knows that they are dreaming. For instance, we've all had that dream where we show up to school either naked, or without pants on. What if we could tell that we were awake during dreams like these? We could own that I-came-to-school-half-naked look. We could even make everyone else naked as well. You could rock the look with your friends. Or, you could make it so your nemesis comes to school with only their Pokemon boxers on. We have opened up a whole new realm of humiliation!

Perhaps it's not what lucid dreamers have, but what non-interactive dreamers don't have (for now we'll call non-interactive dreamers NI). How limiting would it be to have the same naked dream, but not be able to control it? Everyone is laughing at you even your best friends and you think it's real because you can't even tell that you're dreaming. When dreaming, NI will not be able to tell whether they are awake or asleep and cannot control their dreams while lucid dreamers can.



But what would happen to society if these pills or injections were open to the public? I believe that just like any other drugs, people would become addicted to lucid dreaming and therefore addicted to sleep. We can't control our life, but wouldn't you control another reality if you could? Of course. You could do anything and be anything. Of course it wouldn't be real, but that's the appeal of video games to some people. Imagine a video game where you aren't given options, there are no limitations, there is no controller, and you are invincible. Everyone can understand the appeal of a drug that would do that for them.

For some reason lucid dreamers know that they are dreaming when asleep. Could this possibly be caused by the temporal lobe which controls awareness? Maybe, the part of the temporal lobe that controls awareness is more active during dreams for lucid dreamers. Or, maybe the temporal lobe has low activity during the night for NI dreamers. Maybe us, lucid dreamers are part of a superhuman race and all of you lowly NI dreamers will perish and the lucid dreamers will rule the world, but hey, these are just theories. It is also possible that lucid dreamers' temporal lobe may be overactive, but it could be true that lucid dreamers' temporal lobe stays the same while NI's temporal lobe decreases in activity.

Psychology Today reports that lucid dreamers may check and re-check their surroundings several times a day which exercises the part of the brain that controls awareness. Therefore, helping that brain develop more thoroughly which then leads to an ability to lucid dream.

If we could take pills to lucid dream, each and every lucid dreamer would be able to push the limits from the known to the unknown. Some experienced lucid dreamers have been able to taste fire, to fly to the sun, and to test their other boundaries. With lucid dreams we could do anything that wouldn't be possible in reality. Even though these dreams wouldn't be real experiences, the sky's the limit, literally.

Written by Chinasa Mbanugo

ONLY ONE EMOTION

Q: What if we could experience only one emotion?

A: The simple answer is, we would all die. :D

Let's start by defining what an emotion is. As defined by Google Dictionary, an emotion is a state of mind triggered by a circumstance, mood or relationship. Thus, this definition covers many things, from shame to happiness or love. In reality, many reactions consist of numerous emotions occurring very closely to each other, such as when opening a gift, one would feel both happiness and (hopefully) surprise, occasionally mixed with some gratefulness. Some reactions, like this could get incredibly awkward if it consisted only one emotion.[10]

Before even beginning to dwell on the implications of this, let's begin by seeing the effects of the loss of only <u>one</u> emotion in a person. In the classic case study of SM, after the part of her brain known as the amygdalae, which were responsible for fear, were damaged, she became unable to feel any fear. This has put her life in danger many times, including several muggings, and it has become so serious that her identity needs to be kept secret, as if anyone were to approach her, she could not sense any danger. And this is only the loss of ONE emotion. Just imagine how dangerous it would be to lose multiple emotions to our lives.

Figure 1.1 Paralyzed by indecision.

There was another case study with a man known as Elliot, who after being studied by Neuroscientist Antonio Damasio, after undergoing surgery, and suffering damage to the prefrontal cortex, which was responsible for emotions and decision making, was unable to experience any emotion. He was formerly a very successful person, but after he lost his ability to feel sympathy for other people, all of his relationships with others collapsed. As emotion is also a crucial part in the decision making process, he would toil for hours wrestling with a decision as trivial as which colour pen to write with, to the point of being

[10] What a nice birthday gift. Ah! Ah! Ah! Ah! (looks around at puzzled guests) Oh. I am so glad. Yay. (looks around again) Ah! Ah!

unable to function. [11] Essentially, this is a man who would be unable to live without the support of other people.

As we can see, only having one emotion could be pretty dangerous. One emotion is not that much different from having none. In reality, if we wanted to remove all or the majority of our emotions, we would either damage or affect the prefrontal cortex and the limbic system, which are also responsible for decision making and memory respectively. Assuming that we could use our sole emotion as needed (unless of course it's a reflex one like surprise, in which case it doesn't matter that much), we would be unable to decide when to use it, but then briefly after that, we would forget what we would deciding on. Thus, we would be unable to actually do anything.[12]

Figure 1.2 "Happy" conversations about birthdays

But that's just if we were to execute that in real life. So let's begin by imagining a hypothetical situation, where the loss of all but one emotion doesn't affect any other part of the brain. That's still a lot of things that we wouldn't be able to do. Let's construct an imagined reality where we only have one emotion, and start with something supremely easy: sadness, something that we probably all experience on a frequent basis. If someone could only feel sad, that would exclude them from a variety of social situations. Probably the only thing that they could understand would be feeling remorse at a funeral. That would make for GREAT party conversation.[13] The person with the inability to interact with others would become even more depressed and would probably commit suicide. Oh dear.

As we can see, a scenario where we can only experience sadness is a pretty bad one. But what if we tried that opposite of that? What if we had a scenario where we only experience happiness? One would think that this would be a much better emotion to experience. Normally, it's good to be positive and enthusiastic around people, but when faced in danger or life-threatening situation, such a person would not be able to feel fear, and therefore wouldn't run.[14] Also, such a person also would not be a good person to talk to in times of need, as they wouldn't be able to sympathize or relate to a negative experience. There would always be a ridiculous amount of endorphins in the bloodstream if someone is happy all the

[11] Hmm…should I pick up that cup of water? I'm really thirsty and I will die without it, thus I need it to ensure my survival, but then I'm simply too lazy to pick it up. Such hard decisions.

[12] Ugh. I'm not sure whether to be worried about this scenario or not. Hmmm…..Hmmm…..Hmmm….Wait what was I thinking about again? Meh. Whatevs. It probably wasn't that important. (Thinking about eating food)

[13] It is your birthday? Cool. You just got a promotion at work? Oh how I care. Your grandpa just died? Oh I feel so sorry for you!

[14] Hi creepy masked man with the bloody knife and gang mask standing in the middle of dark alleyway. How are you doing today? Pleased to be of your acquaintance. Oh what's that cloth? And that smell? What a nice smell of a knockout drug. Oh! You're coming close to give me a hug while holding your knife!

time. Endorphins are what give us a 'rush' while we're doing something really exciting, and can help cover up pain. This would mean that a person with high amounts of endorphins would not notice if they were injured or in pain, which is an indication for us to get treatment, and may die simply by not realizing it.

With the demonstration from two different emotions, it is clear to see that having only one emotion would not be good for any of us. However, this is only in context of one person. If everyone in the world were to only experience one emotion, things get a little trickier. For starters, does everyone have the same or different emotions? If everyone had the same emotion, they'd all be able to relate to each other, but the danger that is posed to everybody is amplified greatly. If everyone has a different emotion, then people are able to cover up for each other, but could also more easily exploit other people if they did indeed, only have one emotion. Either way, it ends up pretty horribly for the rest of humankind if that happens.

It has been raised: what if we could switch between the emotions that we could feel? Well, a common misconception is that people can experience multiple emotions at once. At any given point, we can actually only experience one emotion. There are experiences that consist of multiple emotions, but they happen in extremely rapid succession.[15] And in the case where your body is sensing two different emotions, one is usually predominant and masking over the other. Thus, if we were given the ability to switch between single emotions, life would carry on as it always had.

In conclusion, if we were to have only one emotion in our lives, it would be an incredibly weird and dangerous one that none of us would want to live in.

Written by Ryan Ng

[15] Because I'm happy, clap along if you feel that I'm so sad, so sad…Shatter every window till I see how big your brave is.

THE COCKTAIL PARTY EFFECT

Q: Why can you hear your name in someone else's conversation if you are focused on a conversation of your own?

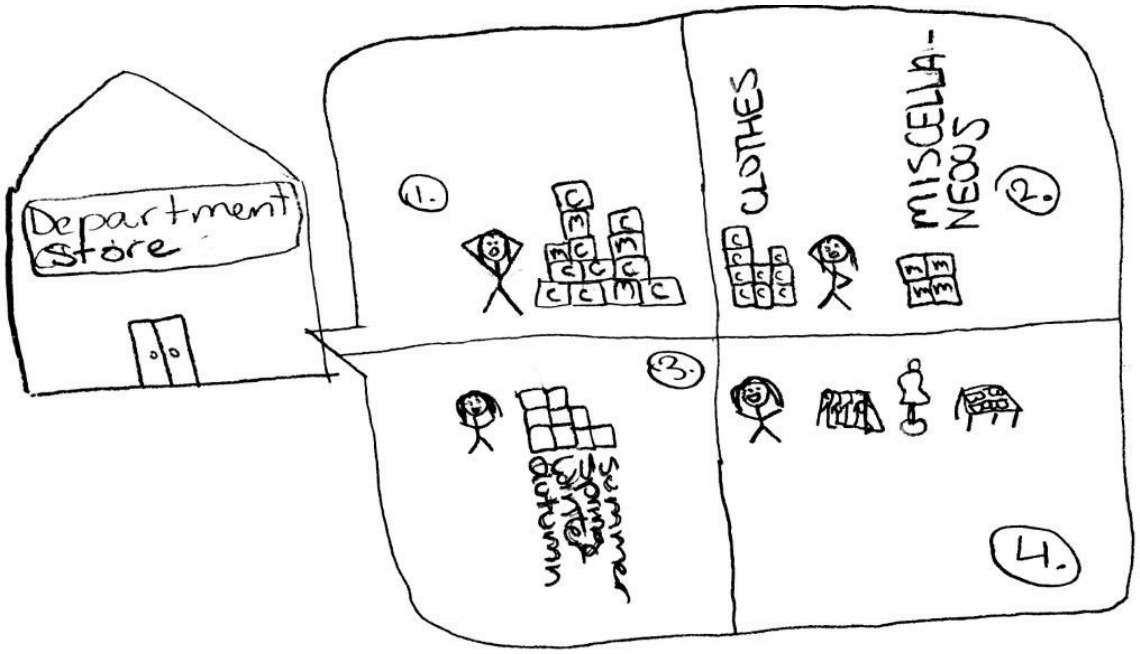
A: Imagine that you are in a noisy, crowded cafeteria, and you are having a conversation with a few of your friends. One moment you are immersed in what they are saying, but in the next moment, you hear your name mentioned from a few peers sitting two tables over. You turn back towards your friends surrounding you to see if they might have heard the same thing, but they still keep chattering away. You look down at the cafeteria table and think to yourself, why is it that you can hear your name in someone else's conversation even if you weren't listening to what they were saying?

Well, in order to answer this question, you first have to ask something else: why is it that in a room full of people, you can attend to your own conversation without being distracted by everything that is going on around you? This is because of something called the cocktail party effect.[16] Basically, the cocktail party effect is the ability to focus your attention on a single topic of importance while your brain puts a filter on everything else that could be a distraction.

In 1958, a scientist named Broadbent created a way to show how thoughts are processed in the brain. This is called the filter model of attention. This model could be equated to a situation taking place in a department store. At this store, there is a huge shipment of boxes; however, not all of them contain clothing. It is your job to sort the articles of clothing from the other items in the boxes. This is similar to what the brain is attempting to do when it receives information. When the information first enters the brain, it doesn't understand what is important and what isn't. It has to use characteristics of the message to identify the most important ones. At the department store, you must use the characteristics of the items to identify what are clothes and what aren't. To end your task, you search through your pile of clothes and conclude what items need to be sold at the current time versus what clothes

[16] Has nothing to do with alcohol.

can go to storage. To conclude Broadbent's model, the brain is able to conclude which messages to act on and let through the "filter" versus those that aren't as relevant.



Because of Broadbent's model, scientists can show that when you are in a crowded room, you can still focus on your conversation without distraction because your conversation is what the brain thinks is the most important things, therefore is supposed to be focused on. Likewise, if someone mentions your name, you will hear it because it is also a message that your brain considers important.

Written by Grace Stenger

RECORDING DREAMS

Q: What if we could record our dreams?

A: Recording our dreams is already possible…or well watching them, that is.

According to an article on Science Daily, UC Berkeley researchers used a process called Functional Magnetic Resonance Imaging (fMRI) to create an image using the brain activity of subjects who had watched a movie preview. The subjects watched the movie trailers and technology was able to show what they saw. This may not seem phenomenal, but in the future…who knows *if* advancement in technology might allow us to watch our dreams after we wake up!

A benefit of this technological advancement would be gaining the ability to see into the minds of those who cannot verbally communicate. The article states that the innovation would be useful to "stroke victims,[17] coma patients and people with degenerative brain diseases." This will be extremely beneficial in criminal cases, where a person is unable to speak and contains valuable information. Thus, resulting in a case being solved even though there are thousands more to be solved.[18]

One of the experiments that lead to this technological breakthrough involved the subjects looking at black and white photographs. The researchers then observed the activity in the visual cortex through fMRI, and were able to predict which image the subject was looking at through the information that they collected. Though the images are not extremely accurate, it similarly resembles the photographs shown earlier.

17 Bye, Grandma.

18 Any crime show fans here?

However, Japanese scientists have learned how to interpret your dreams by measuring your brain's activity during sleep. First, the subjects need to hook themselves up to an EEG machine (electroencephalography) to identify when they entered their dream phase. This process was repeated approximately 200 times for each subject. These scientists scrunched the data and discovered that certain types of objects from their dreams could be correlated with brain patterns from fMRI scans. They then used a search engine to match all the objects in their dreams into a *specific* algorithm.

Despite the technological advances, the research is still in an elementary phase. The results are only a crude approximation (60%), but the percentage will rise over the years as a new and better algorithm to peer into minds are created. The learning algorithm would be through experimental test subjects going through an MRI machine.

Written by Arwin Thong

MEDITATION

Q: What if comas had the same effect as meditation?

A: Picture this: you wake up for the first time in six months and realize you're in a hospital. Turns out, you've been in a coma for the last six months due to an overdose from mixing four different categories of illegal drugs. But even though you jumped out the third floor window of your mom's apartment and stayed the night in that daycare center, you feel very enlightened from your coma. *So does it really feel like you came out of a six month meditation session? I believe so, because the brain shuts down a lot of functions and processes in an unconscious state.*

In a sense, a comatose has slipped away from all worry and even conscious processes. Since they fail to respond to pain, light, or sound, a comatose has reached a state that meditation devotees aim for: ignorance, yet bliss. We're left to wonder, does being in a vegetative state really mean that we can find our inner peace? One man describes his coma experience, so let's see if they feel more enlightened.

One man said, "I couldn't work out what she was doing in the strange world I now inhabited, but my wife's presence was enormously reassuring" ("Coma", 2015). Although he recalls being uptight when doctors tried to operate on him, this story shows how the patient had a newfound deeper appreciation for those in his life. Same goes for meditation. I'm not an expert in it, but I feel gratitude towards those around me once I finish.[19] Although this is a mere assumption, perhaps awaking from a coma really gives a sense of bliss.

If the majority of your brain systems shut down for six months and you slipped away from the real world, I bet it would feel amazing to wake up again. You would have no concept of time, since you are unaware of how many years you just slept through. But imagine this. You were an unresponsive body sitting in a hospital bed, and the only functions active were

[19] Or I'm just fooling myself.

your heartbeat and breath. Wouldn't waking up give you some sort of energy, since your conscious brain has been disengaged for so long?

In addition to personal benefit, reaching enlightenment through comas would have a great cultural impact on the world. We often hear about communities that devote their life to enlightenment, such as monks near central Asia. In fact, oxygen deprivation is a cause of comas. Perhaps that is why so many people hike up the Himalayan Mountains and practice meditation there; the air is so much thinner. But who needs to do that anymore, when you can just whack yourself atop the head and get induced in a coma![20] If comas are proven to have the same effect as meditation, many religions or cultures suddenly will find a shortcut to bliss (and meditation will soon fall out of popularity).

But before you go around telling all of your friends that comas will give you inner peace, consider the economic disadvantages. If you use coma meditation to cure your clinical depression, you might fall behind in school. If the President of the United States gets induced in a coma to relieve his stress but then falls asleep for three weeks, corruption might take over the government. And once the garbage truck drivers and economists and bus drivers and schoolteachers all decide to take a three week coma break, half of America will be in a coma to find their inner peace.[21] So, even if this method works, keep it a secret between you and me.

Written by Justin Tsang

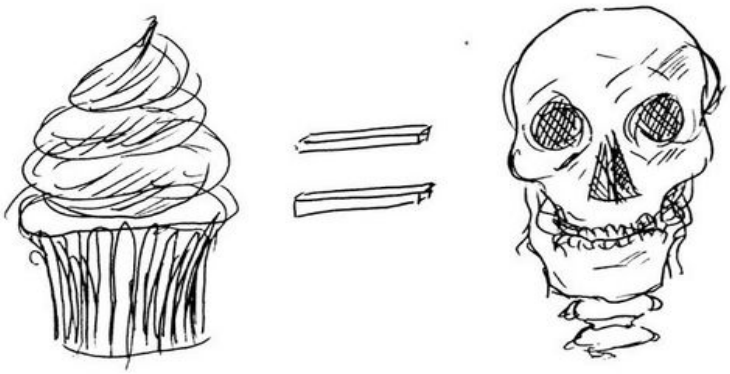
[20] Warning: can cause head injury

[21] And your mom. Who are you gonna beg for money once she drifts away for three weeks?

DISINHIBITION

Q: What if everyone's brains stopped filtering out negative behavior?

A: First of all, to discuss this topic, we must decide on the meaning of "negative behavior". I should hope that to all reading this, a clear example of negative behavior would thievery, or murder, or something along those lines. However, some actions are, in themselves, not so clearly negative, but their repercussions may be: for example, eating a cupcake is not a heinous act, but if that cupcake was the last bit of food your family had during the apocalypse, to eat it would be rude and possibly life-threatening.



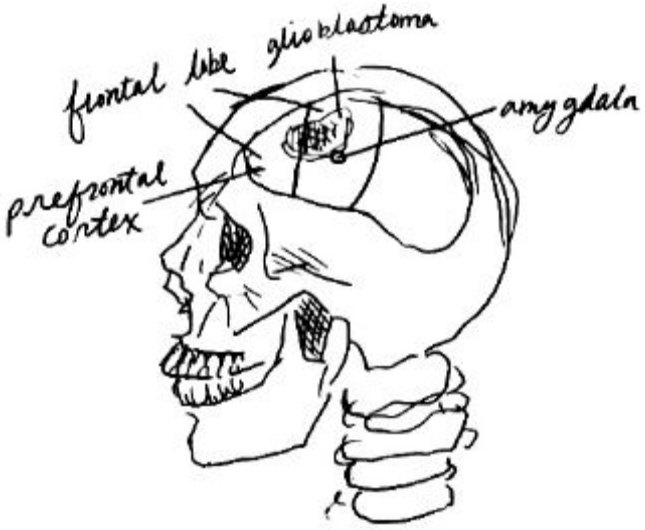
And, of course, everything in moderation. Competition is useful and often healthy, but an obsession with winning is definitely not; healthy sexual habits are, obviously, good for you, but an atypically intense libido can lead to serious consequences. So we have decided: for our purposes, the phrase "negative behavior" refers to behavior that directly or indirectly harms another person or oneself.

This case of a brain unable to filter negative behavior is not an impossible one. There have been many cases of damage to the frontal lobe[22] and amygdalae[23] causing disinhibition, aggression, and sudden personality changes. Specifically, the lack of the filter which the frontal lobe usually provides can cause wild consequences such as shooting sprees, armed robbery, and other hugely dangerous and irresponsible acts. These, I think, could be described as "negative behavior". One case study of this kind was of a twenty-five year old man named Charles Whitman. He was a former Eagle Scout and U.S. Marine, with an IQ score in the ninety-ninth percentile and a wife he loved. Suddenly, he began to feel dangerous urges, such as impulses to kill his wife, which he eventually followed through on. Then, on August 1st, 1966, he went to the top floor of the University of Texas Tower with a footlocker full of guns and ammo. By the time the police shot him, he had killed thirteen

[22] Controls personality, decision making, morality, retention of long-term memories, suppression, and much, much more. Found in the front of the brain. Duh.

[23] In charge of fear, some emotional processing, and aggression (fight or flight).

people and wounded thirty-two more. After an autopsy was done of his body, it was found that he had a glioblastoma: a tumor damaging his amygdala and prefrontal cortex.[24]



So the question is: what if we all lost our frontal lobes, at least, the part which controls that filter? Who would we become? Some people would turn more strongly to drugs and alcohol, others to sex, or to pillaging or thievery, crime, murder, and in a terrible way, freedom. The true freedom to do anything we can think of, no matter how nasty or twisted or absolutely depraved: what kind of a world allows that? A world where nobody can make informed decisions. It would allow us to become animals; worse than animals, monsters. The world would become a sinning mess. There would be naked teens, engaging in sexual acts on their schools' roofs, screaming and cursing at the sky. Soccer moms stabbing at soccer balls and setting their minivans on fire: "Why didn't I go to art school??" Who knows if the American version of democracy would still stand. Who knows if we'd even pay attention to it.

So, yeah. It would be a real mess.

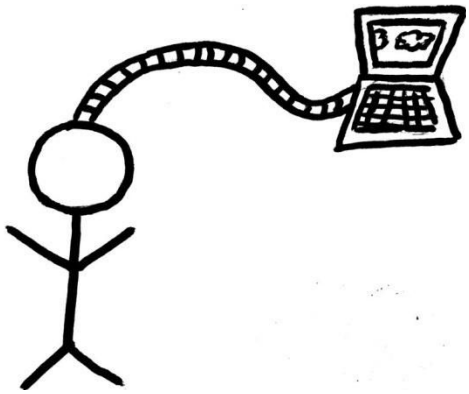
Written by Lola Wilson-Kolp

[24] In charge of long-term decisions, planning, and moderation. Immature in teens.

DOWNLOADING EXPERIENCES

Q: What if there was a way to download experiences?

A: It might just be the new Netflix. Experiences are the events that make up the memories which are what make us, well, us. No scientist is sure where the exact locations of memories are, but we do know they are scattered all about the brain. The only way we would be able to download experiences is to somehow extract them and then play them back on the screen of an electronic device. To extract them we would have to have some sort of cord that we could "plug" into the brain, and have the memories of the experiences travel down the cord and be downloaded into the electronic device of your choice. Then, you would hook up the device to your brain, and have the experience play back in your head. So far this kind of contraption has not been invented yet, but let's pretend that it has.



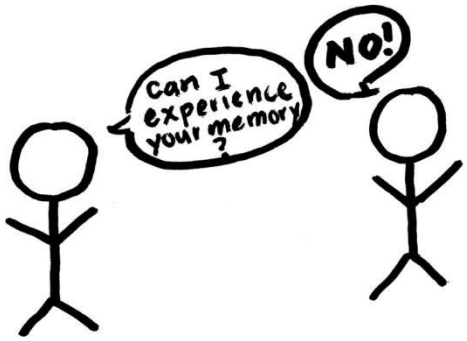
Since this machine has been invented, let's assume that we can extract memories from any person. Imagine how cool that would be. One could experience walking down the red carpet with Cara De Le Vingne[25] at the Paper Towns premiere, or Ed Sheeran's[26] sold out concert that happened a month ago that everyone had been absolutely dying to go to. Every teenager's dream, right?

With technology like this, many complications are presented (like with all new technology). Any procedure involving the brain is dangerous. In addition to this, there would be the conflict of who would be able to experience whose experiences.[27] There would be many drawbacks with attempting to use another person's experiences so it would most likely be limited to re-living your own memories.

[25] The most amazing actress/model/celebrity you could ever meet

[26] Famous British ginger-haired singer

[27] For instance, you may want to experience your best friend's first kiss with that really attractive foreign model, but she most certainly would not want you to.



So, let's say you want to relive one of your favorite memories. You have the procedure done to collect the memory, and then have it downloaded onto your phone. The next thing you do is experience it all over again (in your mind). Now, consider this for a moment. Here you have this memory that is of significant importance to you. Naturally, you would relive it for a second time, and a third, and a fourth, and so on. This gives an incredible amount of power to one's self, and as we all know, power is something that can quickly take a turn down a dangerous path.

As humans, we already obsess over certain experiences for periods of time (ex: a clingy ex-boyfriend obsessing over his ex-girlfriend). If we were able to relive these experiences (in this case the time when the ex-boyfriend was still the boyfriend) whenever we want, this could turn into an even greater (and creepier) obsession than it already may be. People would want to keep reliving pleasurable memories and that could get easily out of hand.

Although reliving experiences may sometimes be beneficial (and of course invoke happiness), it would be equally if not more as dangerous. In addition, even for things that are good, there is such a thing as too much; and the power that this sort of contraption would give is certainly just that . And so in conclusion, the closest we will ever come to this concept is most likely living through the songs Taylor Swift writes about her breakups and other dramatic events.

Written by Renee Yang

CHOOSING TO FORGET

Q: What if you could choose which memories to forget?

A: For the purpose of answering this question, let's assume that your brain still naturally forgets some things. However, in this scenario, you would also get to choose certain memories to become erased from your memory forever. All you would need to do would be to just remember an experience, focus on it, and tell you brain to forget it. Or, you may need to take a pill to erase these memories. Anyways, *how* we would be able to forget these memories is beside the point, it's *what* would happen that we care about here.

Being able to purposely forget memories would help people that have been through traumatic experiences. For example, many soldiers who have returned from war often come back with PTSD, or post-traumatic stress disorder. Basically, these soldiers become very anxious and often have terrifying flashbacks. As of now, people who have been abused or involved in near-death experiences often end up being depressed. Traumatic experience can alter someone's personality and behavior entirely, making it extremely difficult to live a regular life. Victims of abuse may be unable to form happy and healthy relationships. They may be constantly haunted by these memories, or suffer from serious anxiety problems. For serious cases, the ability to forget these terrible experiences would be very beneficial.

However, having access to such an amazing capability can be tempting and lead to negative consequences. People, especially younger kids, would want to forget every single bad experience.[28] For example, a student decides not to study for a test, and as a result, receives an F. He then chooses to forget the experience of failing a test.[29] If he forgets this incident, he'll never remember and learn from his mistakes. As a result, he would most likely keep repeating his mistakes over and over again. Bad memories are a way for us to improve.

Memories make up who we are, and without them, we lose part of our identity. Our soul is made up of our memories, and without all of our memories, do we have full soul? Will we even be our true selves without our bad memories? Anyways, my point is that if people decided to forget every single bad memory, they wouldn't even be themselves anymore. Let's just imagine that a guy named Bob accidentally tripped and spilled Fanta[30] all over the principal one day. Naturally, since already has access to erase his memories, he chooses to forget this embarrassing experience. However, his friend Billy, who watched his friend spill

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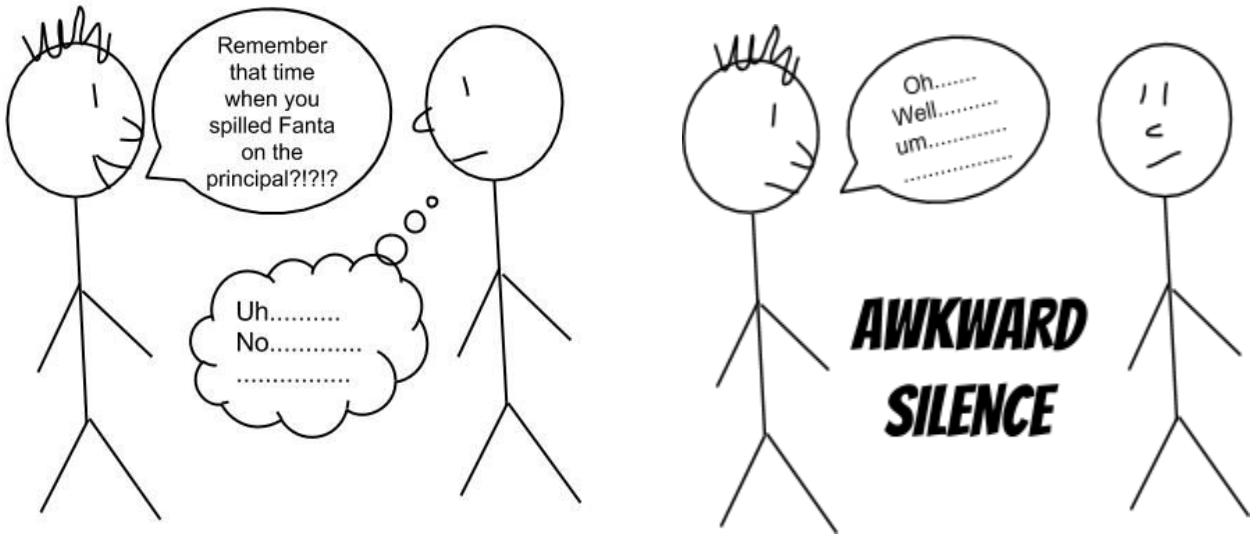
[28] I mean, who wouldn't want to forget that they peed in their pants during math class?

[29] That way, when your parents ask you what grade you got on a test, you can say you don't remember! (because you truly don't remember!)

[30] Why did I choose Fanta? I don't know.

Fanta still remembers this incident. If Billy decides to bring this up in a conversation with Bob, can you imagine how awkward it would be? I mean, a big part of our life is talking about our experiences and memories. There are many times when we feel that an experience was terrible at the time, but later, when we look back onto it, it's funny.



Also, if you forget every bad experience, your experience of happiness wouldn't as happy as it can be. Let's say that a man named Tom decides that he will forget every memory that has even the slightest bit of sadness in it. If he doesn't know what sadness is like, he might take the emotion of happiness for granted. For instance, someone who doesn't know what it's like to feel anxious can't be able to know the feeling of being relieved.

This can provide many benefits, but if used incorrectly, there can be unintended consequences. How the world would end up would really depend on *how* people use it. Who knows, the world may become a much better place, or it may turn into total chaos…

Written by Samantha Yip

CHANGE BLINDNESS

Q: What if you were giving directions to a stranger and they were suddenly replaced with someone else? Would you even notice?

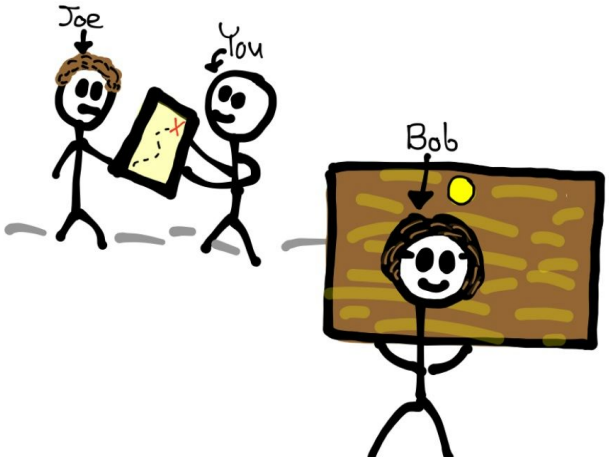
A: Ten bucks says you're rolling your eyes right now.[31] "Well, duh," you think, "Of course I'd notice. I mean, how could I not realize that it was a completely different person?"

Odds are, though, you wouldn't. The reason for this can be explained in exactly two words: change blindness.[32] Simply put, this is the phenomenon in which people tend not to notice subtle (and sometimes even obvious) changes in the scenes around them. Why? Our attention is a good deal like a spotlight. It illuminates every detail of the tiny circle it covers, but leaves everything outside in shadow. Change blindness happens just because we don't know where to focus our spotlight to see the changes. If someone says, "Hey, there's a giant gorilla in the middle of those basketball players!", you're bound to notice the huge primate lumbering through the group.[33]

For argument's sake, let's assume that the stranger you were talking to was just that: somebody you'd never met before. The person replacing them would be equally unknown. Neither of the two would have any easily discernible characteristics, but they wouldn't be identical either. In fact, they could be wearing completely different clothes, as long as one wasn't donned in a rainbow sport coat and the other a plaid kilt!

Now that we've laid out our scenario, let's get on with the actual swap, shall we? So here you are, giving some poor lost soul (let's call him Bob) directions to a place they have no hope of finding on their own, maybe pointing at a map or a sign somewhere, when a large gaggle of people holding a door swarms between you and him. You frown a bit, annoyed, but the door passes quickly, and you can return to your new acquaintance. What you don't know, though, is that Bob is now gone. When you were paying attention to your map, he switched with his friend Joe behind the door, who picked up right where Bob left off.

[31] I hope you are. I don't have an extra 10 bucks to give you.
[32] Of course, I'll be using more than two words to explain it. I think that the words "change blindness" might be a little bit confusing on their own. Just a hunch I have.
[33] More on that later.



Surprise! You're a participant in the 1998 "Door" Study[34], conducted by Daniel Simons and Daniel Levin. Don't worry; you aren't alone if you didn't have a sharp enough eye to detect Bob's exit and Joe's entrance. 8 out of 15 people tested in this way (that's slightly more than half, for the not-so-number-inclined among you) noticed no change when the door passed. Even though Bob and Joe were obviously different people, these subjects had no idea about the swap when questioned later by experimenters. This was for the same reason as any case of change blindness; they weren't really paying attention.

Say that you did notice a change, though. What makes you any different?[35] A better question might be, "What makes *them* any different?" At least according to the Daniels of the "Door" Study, people close in age to the experimenters (in their 20s and early 30s) were more likely to notice the swap than those a good deal older than them (mid-30s to mid-60s). Why? The pair thought this might be because when you meet someone your age, you notice how they stand out, not how they can be grouped. When someone has a huge age difference from you, you tend to shrug them off as being "Ugh, another moody teen," or "Gosh, just so *old*!"

Age is a big reason for being able to distinguish people, but physical traits are also a tip-off that you aren't talking to the same person you were before. Obviously, if a freckled, red-headed boy is replaced with a girl with a unicorn horn and silvery tail, you'll probably notice. Similarly, people who remind you of your friends and family (or are them) usually can't be switched in or out without your knowledge; you know them too well for that. Dramatic differences in gender and race will likely also clue you in to the fact that you're being tricked.

[34] Actually (and less catchily) titled "Failure to Detect Changes to People During a Real-World Interaction." I think I'll stick with the "Door Study", thanks.

[35] I don't mean to imply that you aren't special. I'm sure you're a regular beacon of sunlight in the lives of those around you.

Probably's the operative word here, though. You can't always trust your senses to tell you the truth, as paranoid as that may seem. Our brains filter out most bits of sensory input to leave us with what they consider necessary information. In the 1999 "Invisible Gorilla" Study by Daniel Simons (yes, again) and Christopher Chabris, our near-blindness to change was shown once more. Here's where the gorilla I talked about earlier comes in. In the experiment, subjects watched a video of basketball players tossing around a ball and were told to keep an inner count of the passes made by the players in white. About halfway through the video, a gorilla walked onscreen, looked at the camera, pounded his chest, and exited to the other side. How many people noticed the huge change in what was going on during the video? Again, only about half of the subjects. When your attentional spotlight is focused on one thing, you won't reliably notice the objects in the shadows, even if they are enormous and hairy.

So, even if you didn't believe it at the start[36], you probably wouldn't have been able to tell Bob from Joe. Don't worry, though-- you've still got about 3.5 billion other people to keep you company.

Written by Natalia Zorrilla

[36] In which case, you *so* owe me my $10.

CORRELATION OR CAUSATION?

Q: What if correlation was causation?

A: Although the two can be easily confused, it is important to know that correlation is not the same as causation. Well, perhaps we should establish the difference between correlation and causation first.

Correlation vs. Causation

Correlation is able to predict the outcome. However, it is never an exact answer, but it rather shows a trend. When a variable **correlates** to another, it does not mean that the outcome happens *because* of one of the variables. The simplest way to explain correlation is that it is a type of relationship. Correlation is easy and commonly found in research.

Causation, on the other hand, indicates that the outcome is the result of the first variable. Sometimes, correlation is used to find out causation, but not always. If one event **will happen,** no doubt, after another, it is probably because it was caused by the first event, right? (This is causation.) Usually, another experiment will be needed to identify causation.

There are different ways to find out correlation vs. causation: lesion (where you damage and/or remove a certain section of a brain), stimulation, and recording.

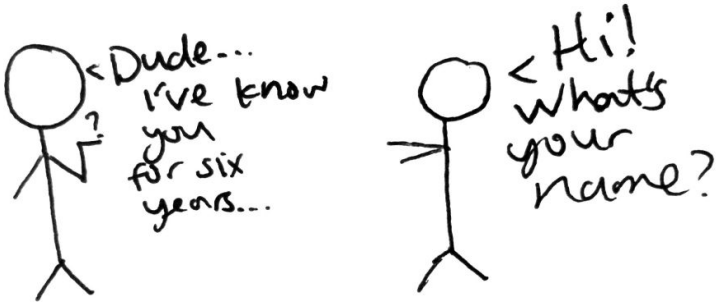
Lesions

Lesion is when a patient has a brain injury leading to some kind of neuronal death. Of course, you can't go around injuring people in the name of science, but there are a lot of causes for lesions: stroke, hypoxia[1], tumors, degenerative disorders, even epilepsy[2] (well, more of the consequences from the surgical operations). But let's be honest, a natural injury doesn't happen in just **one specific** area of the brain at a time, so it's hard to localize injuries with lesions (not to mention that people with brain damage to a specific part of the brain aren't everywhere) and it's not exactly ethical to go around to lesion people's brains. A big reason why people study lesions is because they are excellent support for causality. If someone loses a certain part in the brain and they completely change, develop a new phobia, or something similar, it's pretty obvious that the damaged area affect something with their new behavior.

[37] Hypoxia is the lack of oxygen in the brain

[2] Epilepsy is a disease in which patients get random seizures

Take H.M. for example. After getting his hippocampus lesioned, he couldn't make new memories. That makes it very, VERY obvious that the hippocampus is relied on for memory.

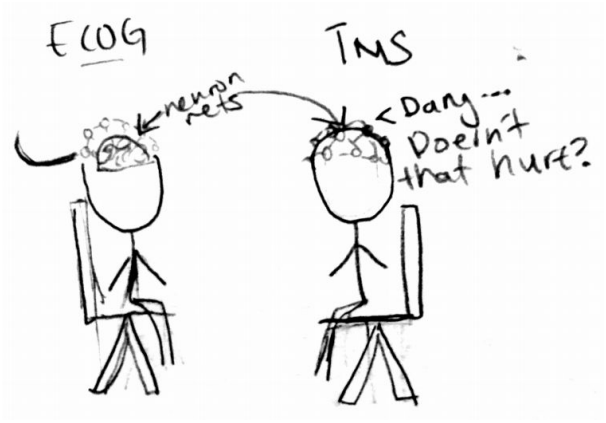


Stimulation

Stimulation is more varied than lesion. There is extremely invasive[3] stimulation (ECOG) where you take off the top of the skull to start neural mapping (placing a web of connected electrodes[4] directly on the brain itself) and stimulating different parts to create different reactions to create out an actual neural map. Yea… it's effective – it gives great causal results and has great spatial and temporal resolution, but the top of your head is off! It's extremely dangerous. The subject is also awake during ECOG, but the scientists and doctors make sure that the patient can't actually feel the pain (there are no nerves in the brain) using strong anesthetics. However, if you don't want to cut the top of your head off, there is also TMS, where the brain is stimulated externally (the neural net is placed on the scalp). Using electrical signals, it can change, suppress, or enhance certain parts of the brain at a time to observe the different effects on the person. It's also great for causality, but the spatial resolution is pretty bad (but it is non-invasive).

[3] Invasive procedures are when tools go into your body and stuff like that. It's not pleasant.

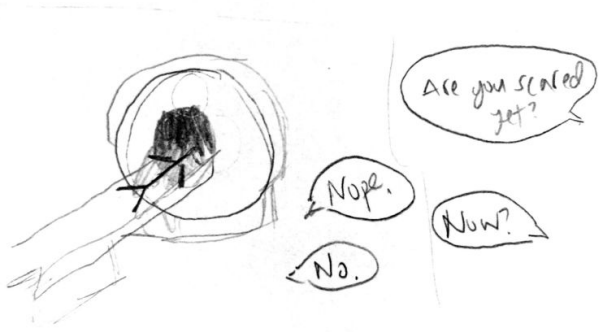
[4] Electrodes are conductors of electricity that can detect electrical changes in the brain (and other stuff, but let's just focus on the brain for our purposes)



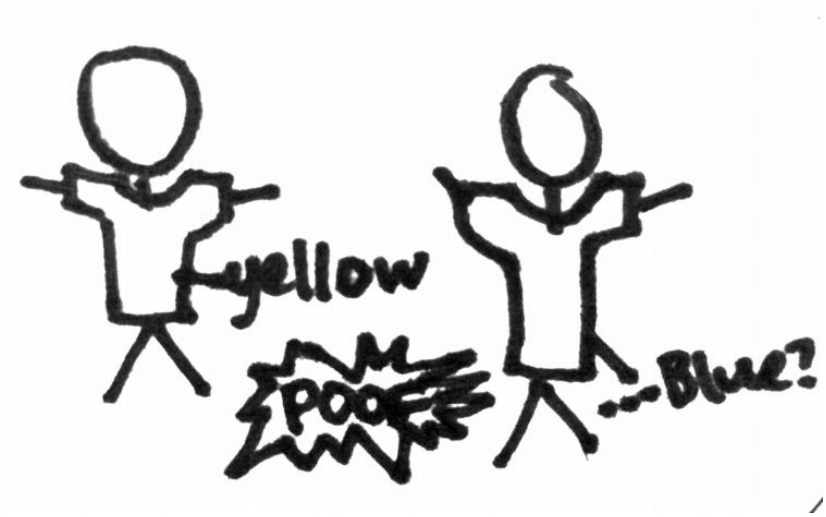
Recording

Last but not least, we have recording. Like stimulation, there are two types of recording most commonly used: structural, and functional. Structural recordings show the anatomy. CT or CAT scans use X-ray computed tomography to show the specific structures of the brain. The CT/CAT scans have great special resolution and a really clear distinction between axons and soma, and it doesn't hurt that it's noninvasive. However, the x-rays are very strong and not great for your body (I mean, how can radioactivity be good for your body? All it does is risk cancer and other horrible stuff). But radioactive waves aren't the only way to see the structure of the brain: MRI (Magnetic Resonance Imaging, non-invasive) uses magnetic waves to align protons and to have them absorb the waves and spin. The spinning creates energy, which is then put into a computer to create a 3D image.

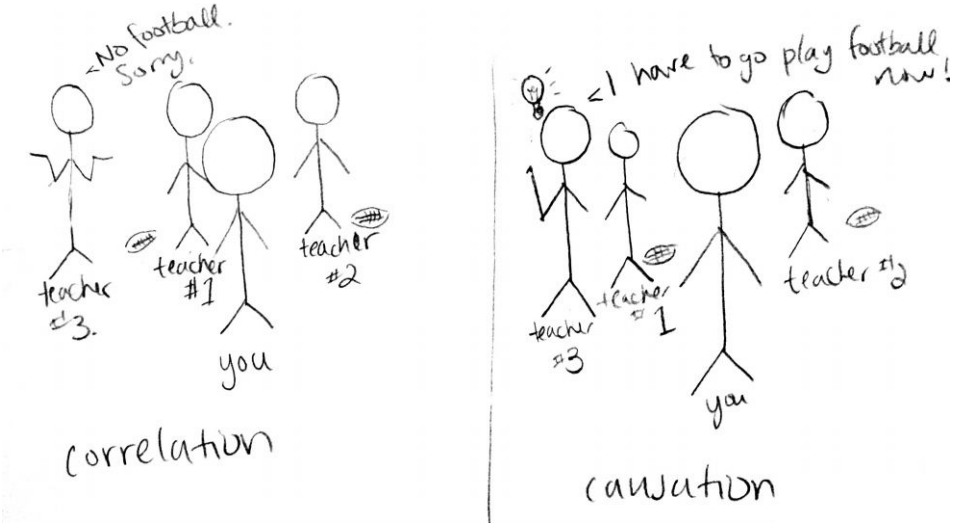
Knowing the anatomy isn't enough to catch everything though, so we also have functional (physiology) recordings. EEGs are non-invasive and, much like TMS, electrodes are placed on the scalp to measure the changes in electrical activity in different areas of the brain. Typically, the result is the average of multiple trials together. EEGs work really quickly, so the temporal resolution is great, but the special is fairly low. Remember MRI's from before? There's also something called a fMRI. fMRIs measure the amount of oxygen in your blood. When brain activity spikes, the muscle in the brain needs more oxygen. Hemoglobin (it carries oxygen in the blood) will release the oxygen near the area in the brain. Since hemoglobin carries (basically) iron, they will slightly change their magnetic field when oxygen is released. The fMRI detects changes in the field and lights them up on the computerized 3D display. For example, imagine S.M., the woman who lost her amygdale – the fear center in the brain. If you stuck her in an fMRI to see how she responded to fear, the amygdale would just not light up because they have been destroyed.



Anyways, what if correlation was causation? Well, we would have a lot of crazy, illogical situations all around us. For example, if your favorite color is blue, and you only have blue shirts, it doesn't mean that you can't have a yellow one! Just because the shirts you have now are blue, it doesn't mean that no matter what color shirt you buy it's going to be blue. There won't be magic: like the shirt won't go "POOF" and suddenly turn blue.



Another example is that if your math teachers for the last three years played football, that is correlation. Just because you have had teachers who played football, doesn't mean that your teachers **have to play football.** If this was identified as causation, then it would indicate that if another person was your teacher, the student -teacher relationship would make them play football, and that's just ridiculous.



Written by Christie Chen

HORIZONTAL LINES

Q: What if you couldn't perceive horizontal lines?

A: What would the world be like if you couldn't see horizontal lines? Before you continue reading, take a moment to think of everything that has a horizontal line in it. I won't start a list, because that could take weeks to make, but I can sum it down to basically anything with a flat surface or any horizontal line pattern, or shapes.[39] There goes half the world. So I guess what I'm trying to say is you would be very confused and lost in a horizontal oriented world.[40]

Let's start with the fact that nature has a larger spectrum of lines then anything human made. This goes hand in hand with the fact that horizontal lines are engrained in our survival instincts. Specific neurons in our brain prefer horizontal lines, they're just better at perceiving them. Let's add that to the fact that many people live in developed areas, meaning they're used to the sight of straight lines in buildings and sidewalks. Growing up in areas like these rewires our brain even further to better perceive horizontal lines. So by not being able to perceive horizontal lines, you are missing an essential part of your survival instinct.

Back in 1958, two guys, David Hubel and Torsten Wiesel, took a bunch of kittens and allowed them to only see horizontal or vertical lines. The kittens were split into two groups, ones exposed to horizontal lines, the other exposed to vertical. They later found that the kittens couldn't perceive the opposite line. This was because the neurons in their brain developed in a way that was more compatible for their environment. Though, the test subject were cats, leaving the results just less than conclusive, it is most likely this effect is similar to the way our brain works, although we aren't limited to seeing just vertical or just

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[39] I surprisingly couldn't find a list to reference to.

[40] I just realized I answered the question- vaguely- in this paragraph, but this is a paper so I'm obligated to tell you about the natural instinct behind horizontal lines and how some would be more affected than others if they couldn't see them. So without further ado more info.

horizontal. This proves we were meant to see horizontal lines, and I don't know about you[41], but losing a part of me- especially one meant to keep me alive- doesn't sound all that fun.[42]

Let's go back to the fact that some of us live in cities while others stick to the suburbs. If you've ever seen a city, you know it's all lines. Buildings, roads, and sidewalks. In the previous paragraph, we talked about the neurons in the kittens' brain changing based off what they were exposed to. We can assume a similar effect will take place in humans' brains when they live in an environment created through hundreds of thousands of lines.Of course if you live in a city and you were to lose any perception of horizontal lines, we can guess it would affect you more than if you lived in the suburbs.

The point is half your world would be gone if you couldn't see horizontal lines. You would also be pretty confused and probably run into a lot of things, meaning lots of bruises and other injuries.[43]

Written by Isabella Goel

[41] But I'm feelin' 22.

[42] Natural Instinct. Check

[43] Maybe you'll hit your head and damage your brain so you can't see vertical lines either.

SIMULATING FEARS

Q: What if we could simulate our own fears?

A: What if our fears could come to life? Just like in books where characters come to life?

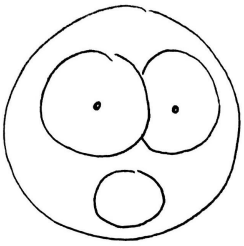
What if the ideas we are terrified of surround and engulf us? Fear is basically a troubling emotion caused by danger, pain, or who knows what else.

If we think about our fears jumping out at us, the world would surely be a frightening place to dwell in, considering the fact that they would be looming over our shoulders the whole time.

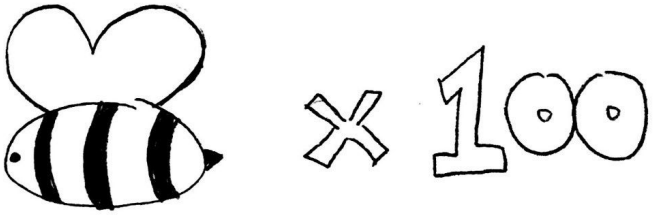
Let's take an example: I personally start trembling and cannot stay still when I see a bee. The distance between "it" and me doesn't matter; the creature may be like 100 feet away and my eyes (which always spot those tiny devils despite my terrible eyesight), would magically be able to identify one.

Imagine one day, I am sitting on my desk, doodling when I'm supposed to be doing homework instead, and my mind wanders off.

The next second, I find myself surrounded with bees.

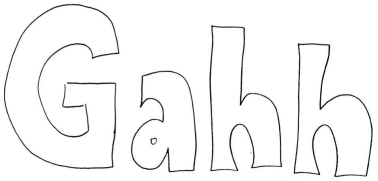


I can barely see the ground; in fact, some of those little friends have already introduced themselves to my skin cells.



I start freaking out and the next thing you know, I'm out on the ground.

I zap back to reality and find myself splayed out onto the cold, cement floor, beads of perspiration dripping down my forehead with my clothes drenched with a disgusting amount of sweat. Despite the bees being gone, the horrifying feelings of their miniscule legs on my arms which are now covered with goosebumps linger.



Think about having this happen to you randomly, having to face something you absolutely despise, loathe, and are terribly scared of practically throughout all your life. I surely wouldn't be able to get used to this. But at the same time, if we face our fears continuously throughout our lives, there is a possibility that we might overcome them.

This is called exposure therapy; a technique used to treat anxiety disorders. It includes the subjects to be completely exposed and vulnerable to their fears, of course, without any danger involved. The subjects are told to repeatedly think or give details about the traumatic events in which they acquired their fears from.

Just like how we will get used to a certain song if it is being played over and over again, just like how we will get used to certain weather if we live in that area for some time, just like how practice makes perfect, scientists working with exposure therapy are hoping for that to happen to the subjects. Avoidance of one's fears will definitely block their way to overcome them. Their goal is for the patients to go face to face with their fears continuously over a period of time and see if they are able to dispose of them.

There may be some people who will get over their fears some day, or others who no matter how many times they face their fears, will never be able to. Some studies show that not all patients had successful times with exposure therapy; in fact, this method got them so depressed that they had to stop. Another reason for some patients dropping out is that anger may get involved when getting therapy. This may interfere and prevent the patients from getting therapy effectively. However, we will never know what would happen if we could, in fact, simulate our own fears.

Written by Kirsten Huh

MULTITASK

Q: What would life be like if you could focus on two things at once?

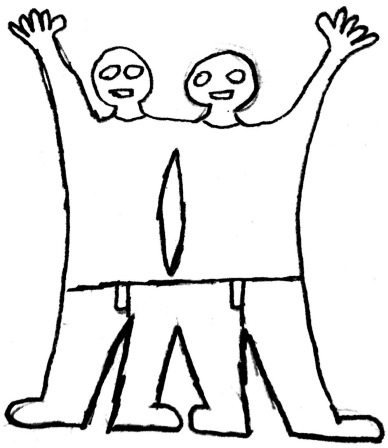
A: Attention is the focus on a specific input from the senses, selectively choosing a stimulus or event or action to think about. A great example of attention is the Cocktail Party Effect, when
you are at a loud conversational cocktail party but can zone in on the voice of a person that you are talking to.

As far as we know, humans (or any animal), cannot multitask; it is impossible to watch television and text or read a book and do your homework simultaneously.[44] However the brain can focus the majority of its energy on a single thing at a time while keeping other senses open as shown with the Cocktail Party Effect Part II. If you are in a conversation with a person in a noisy room, you can still hear your name although you are focusing on something else. The more 'brain power' that the task requires, the less your other senses are open.

If humans began to be born with the ability to focus on two things at once, they would probably have significantly larger heads because you would need to have to fit more stuff in it. At least 4 hippocampuses and two frontal lobes would need to fit within your skull as well as all the connections necessary for the two attentions two work simultaneously. This is because the frontal lobe is involved with concentration and the hippocampus is the major memory creator. In short your brain would have to look very different.

But if you could focus on two things at once you would be twice as productive, right? Sure you could keep up with your television show from listening and text your friends or read a book and work out a math problem but it would be difficult to use two motor functions simultaneously such as writing with two different hands. And if you could do this you would pretty much need two entire brains plus all of the necessary connectors which brings us to our next point.

[44] Not that you should want to.



There are ‘people’ that can focus on two things at once: conjoined or Siamese twins. But being connected to your brother by the hip is quite a downside to being able to focus on two things at once. And if you (and your sibling) want to react to the stimuli by walking in two different directions then you are out of luck. Additionally the brains are (often) not connected meaning that it is less like a single person focusing on two things than two unfortunate people focusing on separate things.

Written by Peter Segel Kubiniec

ONLY HAVING ONE SENSE

Q: What if humans could only perceive the world through one sense?

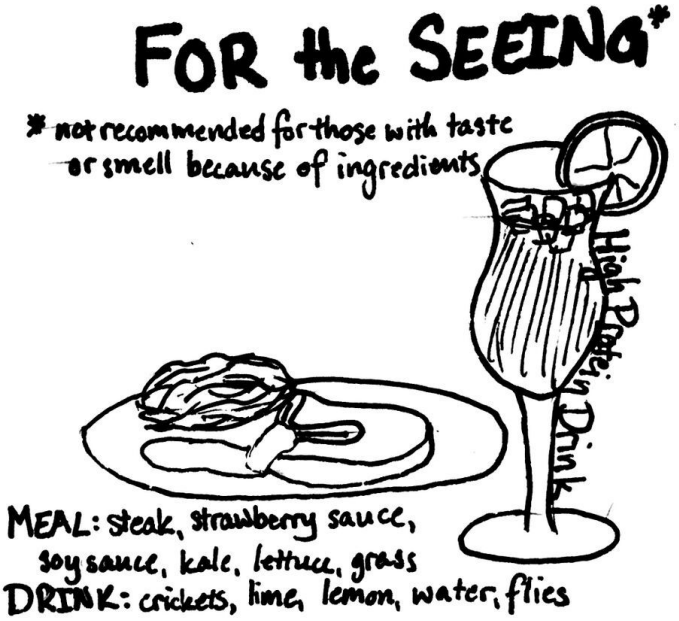
A: Perceiving our surroundings through only one of the five senses would make for a very strange and complicated world to live in. It could be that each and every person's single functional sense is randomly selected,or it could be that it depends on genetics like so many other things do. Also, there is the question of if each person were born with the ability to use all the senses and lost them for some reason or if they were somehow born without the brain structures of all but one of the senses. Either way, it is safe to assume that the one functional sense would improve in order to compensate for the missing senses, just like they would in someone who is blind or deaf. Hearing and sight would sharpen, and the senses of smell,taste, and touch would become more sensitive.

Something else to consider is whether or not this phenomenon of only having one sense has been present throughout history or if this was a recent development due to some dominant mutation or something similar. If it had been prevalent in humans since the beginning, then I wonder: would we have been able to invent language or build the pyramids or accomplish any of the feats that we, humankind, are so proud of? The culture would be so much different from what exists today that we probably would not be able to survive in that world if we were magically dropped into it. But still a larger question lingers. Would we have even been able to survive to this point, hindered by the burden of dangers what we can only perceive through a single sense? In the wild, there is no time to hesitate; there is no place in that world for those who cannot detect and react to threats.

However, assuming that the loss of four senses was caused by a mutation that spread across the entire world or something similar, communication would become a primary concern because it facilitates interactions and connections. Ways to "talk" to people who are blind, deaf, or both would already exist in this case; sign language, writing on paper, or using touch signals are just a few of the many methods. It becomes increasingly complicated when you add in the idea that they can only use one sense. If they did not have their sense of touch either, how are you supposed to communicate? They can't feel your hands form ing signs or writing on their skin, they can't feel Braille, and they can't respond to touch signals. So, now what? Would we have to communicate by using smells or tastes? There are many things wrong with this method. The first issue would be deciding which stimuli corresponded with what words and then how people could be taught to use this method. Second, assuming humankind somehow made the whole communication through smell and taste thing work, how would they communicate with everyone else? They do not know what

it is like to talk, and they cannot feel anything when they touch things. If they were to write or type to respond to smell/taste stimuli, the only way they could be taught is if someone were to move their hands for them while supplying constant smells or tastes that correspond to the words being written to encode the actions into procedural memory[45].

It is a possibility that people would be limited in their job options depending on which one of their senses was functional. However, it is more likely that jobs would be adjusted and have different positions to take care of people with different needs. For example, there would be different cooks for people who have different senses. Cooks with sight would be focused on the presentation of the dish to appeal to the people with visual capabilities, and cooks with the ability of taste would not care as much about the presentation, but rather the taste. Other occupations may need multiple people with different senses working together, like the job of a doctor. A doctor needs multiple senses such as sight, hearing, and touch to diagnose a patient, so a team of doctors would be needed to attend to each person.



Transportation would also be a tricky issue to tackle. For obvious reasons, only those with sight can drive. However, if one can only see when driving, they cannot hear the honking of other cars. Perhaps we would invent a type of visual "horn" that flashed a bright light, but that would risk blinding the other drivers. Pedestrians and cyclists would also be in danger of being hit by cars or each other. Again, only those with sight (which I am starting to think is the most useful in this strange world) could walk or bike the streets, but without hearing, they could not hear cars approaching from behind. Mirrors could solve this problem, but the idea of carrying mirrors around everywhere and using them to constantly look behind us[46] seems very inconvenient to me. Most likely, people would need to be guided by someone or something in order to move around. Possibly, in this alternate universe, we will have

[45] The type of memory used to remember skills, tasks, and actions.
[46] Completely different from using them to look only around corners, as in Harry Potter.

invented mind-controlled technology[47] that can assist in communication with others and direct little robots that can lead us around[48].

Every aspect of life would change if the world could only be perceived through one sense: our relationships, behaviors, and actions. Everything would have to be adapted to fit the needs of each type[49].

Written by Katrina Liu

[47] Not to be confused with mind-control technology.
[48] Be careful or else the world of Wall-E will be our future.
[49] Type refers to the different groups of people, separated by their functional sense.

FOUR EYES

Q: What if humans had eyes on the back of their head?

A: Well to start, we'd probably have another brain to monitor and process all the sensory inputs sent from that extra set of eyes. So as a result everyone would look like a bobble head! Losing balance and falling flat on our faces would be a daily routine[50].

Now we have to consider the fact of multitasking. With two sets of eyes you're receiving so much input that instead of just texting, watching YouTube, and trying to complete your already overdue homework[51] you'd be constantly distracted by all that was going on behind you. If you're constantly attending to all that then obviously it's impossible to concentrate on the task before you.

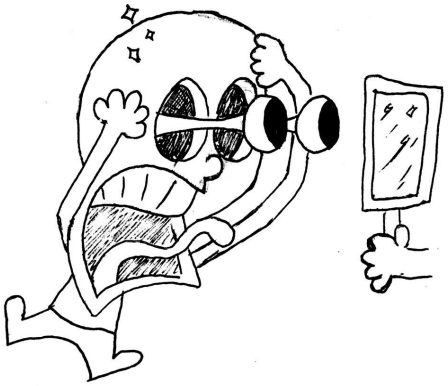
Therefore, the longer we possess these alien like features the shorter our attention span would be. Why, you ask? According to a Stanford study in 2009, "it's impossible to process more than one string of information at a time." Also, the conclusions show when you're pulling so much information in at once instance your poor brain can't focus on filtering out the irrelevant information, causing you to be unable to separate the individual ideas in your mind.

BUT… I did mention we would most likely need an extra brain to process this second wave of information. Maybe then it wouldn't be considered as multitasking, just two brains working respectively in their own space. With that in mind, there arise more problems. Are these two brains social and connected with each other? How is one little person supposed to control two brains? We're not some divine being that can easily monitor them. And does Brain #2 control anything else besides the eyes? How would we switch between using Brain #1 and #2? Could this second brain develop an actual mind? Finally the most important:

[50] I guess nothing would change for me...

[51] Bro let's be real, we've all done it.

WHAT ABOUT HAIR. We'd have to be *bald.* Until scientists research this problem I'm sorry to say having two brains is out of the question.



Going back to our normal brain, we need to consider what having four eyes could do to us. It would cause a serious cognitive overload[52]! At least you'll know no one can sneak up on you right before your brain explodes into little squishy pieces.

There are so many other changes that would happen but I think you've picked up on my point[53]. As we conclude this, don't forget all those teachers who claim to have eyes on the back of their head. They'll all *perish.* It's just a matter of time.

Written by Julia Ma

[52] This phrase is courtesy of our TA, Chaparrelle, thank you!
[53] Just in case you didn't, it's having four eyes would be fatal!

INFINITE RETRIEVAL CAPACITY

Q: What if someone could retrieve an infinite amount of memories?

A: There are two parts to this question. The first part would be whether or not you were born with this ability or if it developed over time. If you were born with this ability I can imagine this being quite a tragic experience for you. You would have no ability to distinguish important memories from unimportant memories. On the upside, you could have any memory you wanted at your disposal. You would be able to recall every happy moment in your life, every kiss, every hug, and every piece of laughter. But, then again, you would also remember every tear, every bruise, and every bit of grief that you've ever experienced. Even though this ability would be amazing there is most definitely a large price to pay.

However, this question completely changes if you weren't born with this ability. Developing this ability would mean that you would understand what constitutes as an important memory and what counts as an unimportant memory. Walking down the street and giving a homeless man some change constitutes as an unimportant memory, but meeting your niece for the first time counts as an important memory. The only way that we know which memories are important, or not is because we remember the important ones, but what happens when you remember all of your memories? How would you know which memories are actually important? I would imagine that this would seem like a gift when you first begin to develop this ability. However, as time goes on would you forget how to distinguish important memories from unimportant memories? Would you grow tired of remembering every negative comment ever whispered about yourself? I believe that after a certain amount of time you would miss your old life, your old knowledge, and your old system of remembering memories.

What would it be like to remember the feeling of your first steps, the thought process behind your first words, your first day of preschool, the first time you broke a toy, or the feeling of making your first friend. I suppose that just like Mr. S[54] certain words and phrases would overload your system. If you were a dog walker as a teenager and you had many memories from that period of time, it is very possible that the word "dog" could send your brain into chaos. Every word that someone would utter could be the catalyst for a terrible experience.

[54] Mr. S was a man who could remember every piece of information. However, this talent soon drove him crazy, because one word could be the catalyst for thousands of memories all at once.

On the other hand there could be ways to train yourself on how to control the overflow of memories. You would have to be able to examine each year at a time for memories and not the entire archive all at once. For example if your friend were to say to you, " Do you remember the time that your brother made us..." you'd have to go year by year in your mind looking for the memory and not search through the whole collection, because that much brain activity could destroy your hippocampus. In conclusion, this power would be extraordinary if you knew how to control it. However, if you didn't know how to control it, I can imagine this power torturing you. On the upside, any memory you wanted would be at the tip of your tongue in seconds. Life would be unforgettable.

STOP. FRAME. VISION.

Q. What is it like for people who can't perceive motion in order to watch a movie?

A: There are a variety of different ways in which one can go about interpreting this, but the way I'm going to do it, I'll talk about the whole cinematic experience: queuing to buy a ticket, buying popcorn at the concession stands, and watching the movie itself. This way, I can talk about it from a variety of different angles.

Firstly, there is a scientific name used to describe this condition, known as akinetopsia. This is where people would be unable to perceive the motion of objects regularly, while still being able to see stationary objects normally. This can be caused by either brain lesions, which is a region in an organ that has suffered damage through an injury, or through Alzheimer's, a disease that causes problems in the brain, in the region of the visual cortex known as V5, which is also known as the middle temporal visual area. As the name implies, this is a region of the brain that is related to vision, specifically, and is only concerned with things that are moving. Most of what we know in regards to akinetopsia is from a woman named LM. She found it hard to perceive depth of things, as well as diagonals, but could still identify the cardinal directions, and had no problems in perceiving colour. While there is no cure or medication for this, she managed to use strategies to try and live a normal life, such as using sound detectors to sense cars.[55]

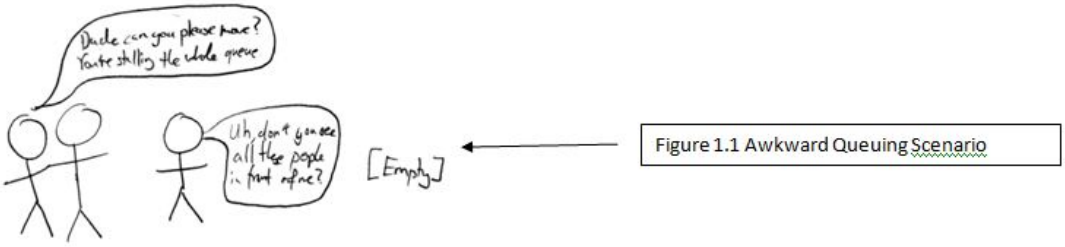


Figure 1.1 Awkward Queuing Scenario

So now, back to our scenario for people going to watch a movie and how that would pan out. While queuing in line for the tickets, depending on how severe the akinetopsia is, it could become really awkward. There are two types of known akinetopsia: inconspicuous akinetopsia, where people watch things as if in a cinema reel, and gross akinetopsia, where the condition is even worse, and people cannot perceive even large movements. Thus, for those with gross akinetopsia, they'd get a lot of angry people constantly behind them, yelling at them to move forward, whereas they are still seeing people right in front of them, so they can't move forward.

[55] Let's use this funky gizmo thing to see where all the cars are while crossing the road. Okay, so let's see...wait...hmm...it's a red light? Wait, I'm listening to where the car is. Only 3 meters away and still moving? Oh dear. That could be a problem.

And at the snack stand, soda seems to be frozen while being poured. Popcorn hangs at the top of their arcs in the machine. The strange sound of clinking cashier boxes rings out even though no one is buying anything. And how people all seem to vanish quickly from the line. With akinetopsia, since we can only perceive motion one frame at a time, it seems that things which usually move very fast for normal people, can seem suspended in time.[56]

And now for the main event, the watching of the movie itself. For those who don't know, for someone with inconspicuous akinetopsia, it is like watching a stop-frame animation, where things are composed of images, but they are still able to hint at the conversation. For people with gross akinetopsia, they can't understand what's happening in the movie at all: they can hear what is being said, but they can't match the lip-syncing or facial expressions to what is being said. They can only see brief snapshots of the movie, and be completely unable to piece together the whole storyline. They have no idea what is going on, and might as well have not gone to watch the movie. [57]

There would be one scenario in which they would be able to watch any video normally though: if it was a stop frame animation.[58] This way, the patient would still be able to follow the movie at its actual pace, and not miss out on any key scenes. However, that is a rather special situation, and still would not be able to watch most videos. So to answer the question of what it would be like, it would be an absolutely horrible experience. If you have akinetopsia, just don't do it.

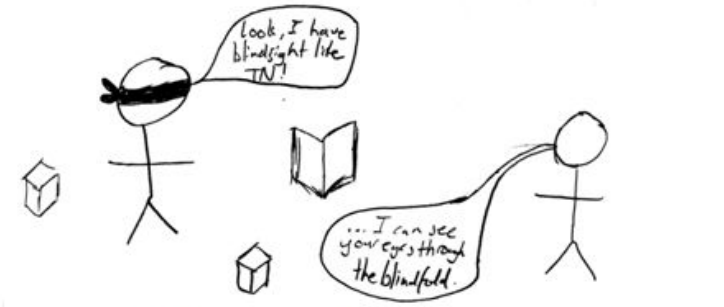


Figure 1.2 TN Wannabes. Epic fail.

So…that would be what happened if the V5 area of the brain would be removed. What would happen then, if we removed some other parts of the visual cortex? Well, let's start with V1. V1 is where the brain processes the images projected on the retina, which is the part of the eye that forms images, from the optic nerve, which is what transfers electrical signals from the images to the brain, and is the primary visual cortex, the parts of the brain most responsible for vision. Thus, if somebody did suffer damage to V1, then they would be completely unable to perceive anything that they saw, essentially they would be blind. However, there have been some cases where people have been able to perceive things without seeing them. An example of this would be TN. After suffering damage to V1 through

[56] How a scientist with akinetopsia thinks about it-Hmm…Are they using electromagnetic suspension to levitate those objects? But then what source of energy generation could I use inside the machine? Aha1 It is nuclear powered. Most certainly.

[57] Hey dude sitting next to me. What exactly is that guy saying? I can't read his lip movements. Mmhmm….so what exactly are you saying?

[58] Why does the movie keep start-stopping? So bizarre. I can never understand these.

strokes, he became blind. However, when he was asked to walk through a corridor filled with a variety of different obstacles, without the aid of the walking stick, he was able to avoid all of them.[59] Afterwards, he had no idea how he had managed to do it. This interesting phenomenon is known as blindsight, seeing without actually doing so.

Next, V2. V2 is the secondary visual cortex, which is composed of four sections, and passes on a lot of information from V1, to V3, V4, and V5, which I will address later. In essence, it acts like a mediator for different signals. Most of the neurons here are meant to see simple characteristics, such as shape, size and color. But there are also a few more complex ones which help us distinguish whether things are part of others. Thus, damage to this area would result in us not being able to see things other than in black and white, but mild damage to this area could also result us in being able to distinguish whether things are separate from each other, such as two buildings. [60]

V3 is just another bunch of a variety of different neurons performing a wide range of different functions, so there's no specific function we can really talk about. Thus, moving on to V4, which is most commonly known as the colour center. This center is composed a variety of different gyri, but together are responsible for creating colour vision. A disorder associated with this is known as cerebral achromatopsia, which means that a person would be unable to see in colour and only in black and white, but still be able to recognize form. Thus, it would be possible for someone with this condition to see the shape and outline of a boat, but would be unable to see what colour the boat was. [61]

Figure 1.3 An awkward game of The Resistance

Finally, let's discuss V6, or the dorsomedial visual cortex, which is just another of the many structures in the brain involved in vision. It is mainly used to see the direction of different lines. Most of the neurons there would react to very long and continuous lines, but doesn't have a lot of neurons responding to direction of visual PATTERNS, and have a generally low responsiveness to different textured patterns. A disruption to V6 would result in one being unable to completely define the form of an object, as the line structure would be disrupted, but would still be able to see colour.

[59] Or does he actually have a secret superhero identity here? O.o
[60] Hmm that looks like a pretty fat building. Why would there be two different colour bricks though?
[61] Oh my god, so he can only see in black and white? That's so, like, last season and old-school.

Figure 1.4 The visual lobes against the vegetable juice.

In conclusion, all of these different parts of the visual cortex are crucial to watching a good movie, as we would need to see colour, we would need to see form, and most importantly, we would need to be able to see motion in order to watch a movie.[62] So anyone with damage to their visual cortices would better spend their time participating in another recreational activity, like the Resistance. And have some V8 instead of soda. [63]

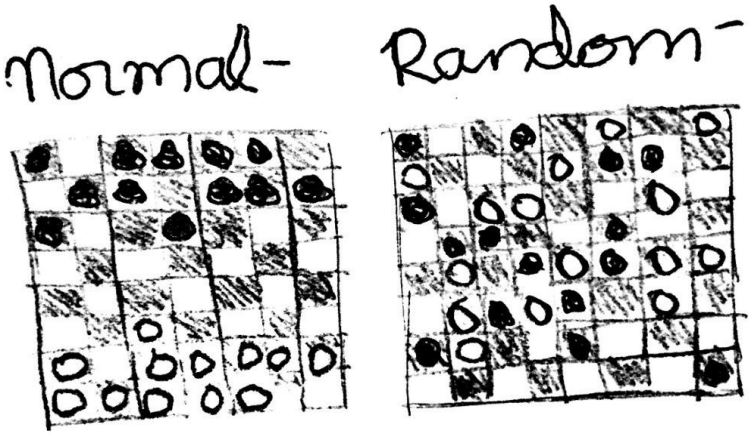
Written by Ryan Ng

[62] Naturally we would also need to see, but that is beyond the question.
[63] 9: See, the carrots in that actually help your vision.

PRIOR KNOWLEDGE

Q: If you had an assortment of pieces on a chessboard, would a grand master or a beginner have an easier time remembering the layout?

A: There are three possible responses to this question: 1.) Of course the grand master would be better, why else would they be called grand masters! 2.) The beginner would have an easier time…beginner's luck? And 3.) They both would have the same amount of difficulty, they are human[64] after all. In 1973, two scientists named Chase and Simon came together to conduct experiments to answer this question. In their experiments, they decided to split this question into two tests. They tested the memory of beginners versus grand masters trying to recall a random assortment of pieces on a chessboard, and they also tested the memory of beginners versus grand masters trying to recall an assortment of pieces on a chessboard that are set in a position from a game.



Their results stated that in the case of the positions from a game, the grand masters remembered the location of the pieces better than the beginners. In the case of randomly placed pieces, however, the beginners found the task less difficult than the chess masters found it. So, to answer this question, the people who answered with 1 or 2 are technically correct, but how could contradicting statements be correct?

When questioning about the brain, it is important to understand that your short-term memory (a memory about twenty seconds fresh) has a limited capacity of seven details, plus or minus two depending on the person. This seems like way too few, right? Well, our brains are actually capable remembering a lot more, but only if you are aware of the tricks. The most important trick to enhancing your short-term memory is having prior knowledge on

[64] I use the term "human" loosely.

the subject. For example, think about the last time you have had a test, but didn't study until the night before. Not only did it probably take you a while to finish studying the material, you most likely had a difficult time remembering it on the test. Now think about the test that you started studying for a week in advance, simply taking fifteen minutes a day to create flashcards or to review your notes. On this test you probably had an easier time memorizing for this test because your brain was aware of the concepts prior to the test. Even more, every time you reviewed your notes, it was emphasized to your brain that the material is important.

Let's think back to the chess players. Which one out of the two groups was more familiar with the game? The grand masters! Now keeping in mind what you just learned about how prior knowledge and its effect on memory, take another guess about the answer for the original question. Which group would have an easier time remembering the layout of a chessboard that had come from a real chess game? The grand masters!

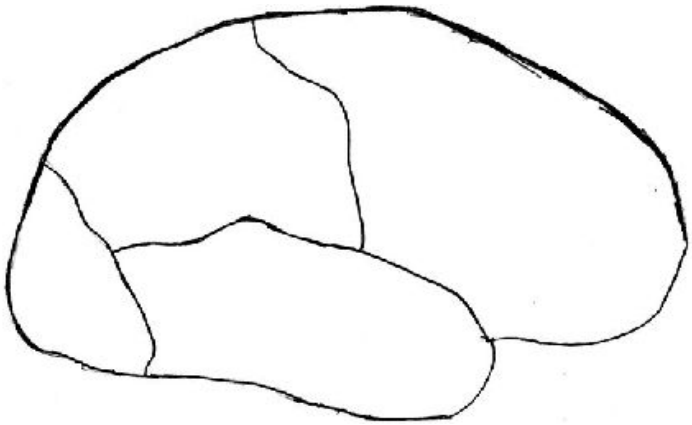
Okay, now that we've gotten that sorted out, it's time to answer the second question: Which group would have an easier time remembering the layout of a chessboard if the pieces were arranged randomly? Again, the grand masters have the benefit of prior knowledge when the pieces are arranged in a random fashion, but this time, it serves as a barrier from remembering the correct pieces. As they are trying to remember the random array of chess pieces, their brains are telling them that the pieces should be arranged in a more logical way for a chess game. This forces them to take a pause; therefore the beginners have an easier time remembering the arrangement of the chessboard.

Written by Grace Stenger

ONE LOBE

Q: What if someone only had one of the four lobes of the brain?

A: The result of having only one lobe of the brain would be fatal. There would be no possible way to survive on your own without outside support. Let's see it this way; the brain is a three-pound structure consisting of 100 billion neurons and trillion synapses. If a large amount of the brain is damaged, it'll cause problems in the brain and cause abnormal function. Such abnormalities can change a person's behavior, personality, and abilities.



With damage to the frontal lobe this can change a person's personality and behavior. The frontal lobe is in charge of decision making, reasoning/problem solving, and natural [65]verbal impulses (cussing). If it is damaged, all of the functions may be impaired or completely annihilated. An example of an impaired frontal lobe would be Phineas Gage; a construction foreman who was working in the railroad. He and his men were using explosions to clear land to place rails, when one of the iron rods crushed his left cheek and pierced through towards the left hemisphere of his brain. After his recovery, reports from his friends claimed his old "hard-working and kind Gage" changed into a lazy and rude person, who died years later.

When the temporal lobe is damaged, the side effects include hearing loss, loss of emotion, categorizing information, memory acquisition (hippocampus/H.M), and face/object recognition. H.M. was required to have bilateral medial temporal lobectomy[1] to cure his epileptic seizures. Once his hippocampus[66] was removed in the surgery, it prevented him from converting his short-term memory to long-term memory. So, if this was not included inside the brain, then nobody would be able to remember anything they read/saw.

[65] This surgery removed his hippocampi, parahippocampal cortices , entorhinal cortices, piriform cortices, and amygdalae.
[66] Part of the brain associated making short term memories into long-term memories.

The parietal lobe is in charge of many functions: It integrates sensory information(five senses), language processing, and body temperature. If these were not incorporated, you would be numb across your whole body and probably not tell if you had hypothermia due to loss of controlling body temperature. The occipital lobe is in charge of the visual center of the cortex.[67] It is a necessity to be able to understand what your eyes are seeing. If our occipital lobe was impaired, or injured, we would not be able to correctly process visual signals.[68]

If you were to use all this information and to interpret this question, the answer would be obvious. Though, lets see it this way: The frontal lobe is in charge with decisions, temporal with hearing, parietal with senses, and occipital with vision. If you were to choose one of these lobes, you would have the ability of one lobe but none of the other three.

67 How you see. Obviously.

68 What you see. Obviously.

PSYCHOACTIVE DRUGS

Q: What if you took all common illegal drugs simultaneously?

A: I know, it sounds crazy. To somehow possess all common drugs would be difficult in itself. But taking them all at once is quite unimaginable. If various drugs were to be taken simultaneously, it would put the neurons under an enormous amount of stress and ultimately lead to confusion.

Various Psychoactive Drugs

In order to complete your collection of common drugs, look out for stimulants, depressants, hallucinogens, and opiates. Each of these categories have drastic differences when it comes to the effect on the nerves. For example, one effect of cocaine (a stimulant) is an overflow of dopamine into the synaptic cleft, between the pre- and postsynaptic ends of a neuron. If you have ever heard of the term "rush", cocaine gives you this.

In contrast, a depressant like alcohol increases the effect of GABA, which reduces action potentials. Suddenly, your judgment would get all funky and you'd get clumsier.

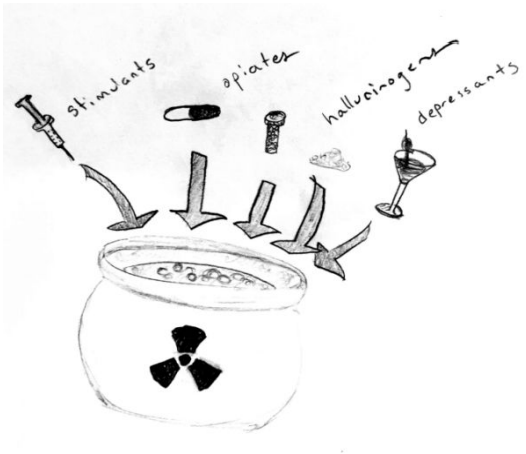
On another note, hallucinogens act on the central nervous system by changing our perception of things—they give vivid hallucinations or vivid fantasies to users. They work by letting the unconscious mind take over and blocking conscious signals from dictating the mind. One example of a hallucinogen is LSD. After using LSD, your synapses will get confused from the various other drugs.

Why not add opiates into the mix? They generate agonists for endorphins, simulating the happiness created by regular endorphins. They are dangerous because the euphoria and freedom simulated by it can lead to addiction very quickly. Opiates also lead to drowsiness. Assuming that you have not died yet, you are probably a feverishly happy person who sees things move, but spikes of depressants periodically make your movements clumsy and uncoordinated.[69]

[69] And you're super happy from the high

Effects

Since stimulants speed up body processes, one instant effect from cocaine would be an instant high. Now, add depressants into the mix. When alcohol starts blocking the postsynaptic receptors, the synapses face conflicting decisions. Since cocaine and alcohol prevent both pre- and postsynaptic processes, I believe that anymore drugs will have diminishing returns. Now let's take some LSD, and we start seeing things. But we're not done yet. Adding opiates will send you to cloud nine for sure. Cool, now you're a jacked up, confused, and drowsy slob with your oblivious head in the clouds.



Other short-term health effects include nausea, slurred speech, lack of coordination, euphoria, dizziness, drowsiness, lightheadedness, hallucinations, and delusions. On the other hand, stimulants will lead to restlessness, increased heart rate, increased alertness, and seizures. Since the brain has so many conflicting inputs, you might injure yourself by believing you're a superhuman; after all, LSD makes you disregard pain and clouds your judgment.[70]

Written by Justin Tsang

[70] So I hope you get the point: like any sensible person, don't try this at home.

HEMISPATIAL NEGLECT

Q: What if you didn't understand the idea of "left"?

A: Up is the opposite of down, red is the opposite of green, and left is the opposite of right. These are things we are taught from birth, things a healthy person will remember for their entire lives. However, there exist an unlucky few who have trouble with these basic facts of life. A disorder called "hemispatial neglect" is identified as the inability to comprehend the idea of either left or right, and is extremely common.[71] But first: the movie *Zoolander*.

In this 2001 comedy, Ben Stiller plays a clueless fashion model[72] locked in a feud with a younger, cooler male model[73] (Owen Wilson). Somehow, he ends up being brainwashed by a dumb-haired fashion mogul named Mugatu (Will Ferrell) to assassinate the Prime Minister of Malaysia. Anyway, the reason I bring this up is that Zoolander, the main character, is unable to turn left. In fact, (SPOILER ALERT), the first time he does so in the film is at the climax, wherein he saves the Malaysian Prime Minister by turning left and stopping a ninja star mid-air. However, there are many differences between Zoolander's situation and the one facing people with hemispatial neglect.

Some of these patients are asked to recreate drawings, and draw only the right sides of everything. They only dress and apply makeup to the right side of their bodies, and the concept of left in terms of their body is wildly difficult for them to understand. One woman, known as Mrs. S in Oliver Sacks's book *The Man Who Mistook His Wife for a Hat*, suffered from this after a massive stroke in her right cerebral hemisphere.[74] She would complain to her nurses, saying that they had not given her dessert or coffee, when in fact that very item would simply be on the left side of her tray. She needed to turn her head to the left, with great difficulty, to even see it. She can turn left, but it will not occur to her without outside help to do so.

[71] As in, 80% of people with midbrain strokes end up with this disease.
[72] Derek Zoolander, a play on the models Mark Vanderloo and Johnny Zander.
[73] Hansel MacDonald.
[74] Right half of the brain.

It's not that her eyes no longer worked; it's that her brain simply did not understand what she was seeing. She could technically "see" the drink on the table; her eye was taking in the sights but her brain was not letting her perceive them. The connection between the eye and the occipital lobe ceased to work, and so she simply could not process the stimuli presented to her.

Without this ability, one's place the world would be drastically altered. It would take me twice as long to write this, or even more, without the use of my left hand or the left side of the keyboard. Without half of the world, it's near impossible to live any more than a half-life (visually, anyway), missing out on half of the experiences and sights that life has to offer. To see a rose is to take in it all, to view it both as a whole and as a collection of sensory stimuli. To see half of a rose is not that much different, only in that the visual input is decreased in size. But still, it is decreased. Life is to be lived to the fullest, and to not even know that your fullest is considerably lesser than mine is the sad but eventual outcome of this disorder.

Written by Lola's two hands

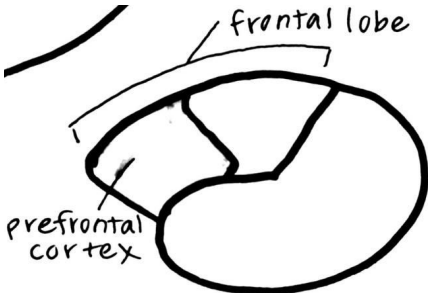
SAYING WHAT YOU FEEL

Q: What if people could only act based upon their emotions?

Note: As humans, we are constantly thinking about what we say and do, and the appropriate actions to take. But what if that filter that makes us say "no, really, that top looks great on you" was gone?

A: That would be a lot of fighting. The frontal lobe plays a large role in controlling our emotions, decision making, and judgment. The majority of times, our actions are based on our good judgment which stems from how we are feeling (emotions). However, this doesn't mean we act accordingly to the emotion we are experiencing. For example, imagine that home cooked meal your mom spent all day preparing. You sit down at the table and take a bite. It tastes horrible, but you know how hard your mom worked on it. Thus, you would tell her it tasted lovely and force the rest of it down (unless you're a terrible person).

Now if people could only act how they feel, then there would have to be some sort of damage to the frontal lobe, more specifically the prefrontal cortex which is largely in charge of appropriating behavior. This would essentially result in a loss of control over suppressing our emotions, creating only truthful actions. In addition, this would cause impulsive behavior solely based on the immediate emotions we feel and would cause a huge shift in the way our society functions.



Society depends on compromises and often obscuring personal beliefs to avoid conflict. I mean do you think everyone was happy with every decision made in the United States? No, of course not. The people who disagreed with these decisions had to "suck it up" and not say anything. That being said, what if they couldn't do so? Expressing every thought and emotion that crossed their minds would inevitably start another argument that would probably end up in a U.S. History textbook. Even in the present day, this could have the same effect; people speaking their minds causing more conflict and ruined relationships.

Most of the time, there is more than one emotion we feel in a short amount of time. You don't feel just happy, just sad, just angry. You could feel happy then sad, sad then angry, angry then upset, or angry then happy. We are constantly feeling a whirlwind of emotions at times, but often suppress the rest and focus on only one. So how would we act if we felt two polar opposites of emotions within a short span of time (as we humans often do) and had to act on all of them?

If this were the case, we would end up switching between all of the emotions we are feeling at the time (ex: bouts of happiness to anger to sadness and so on). Imagine a man coming home from a business trip early without telling his family prior. The wife opens the door and is extremely happy to see him so she hugs him. But wait, why didn't he call to tell her? She thumps him on the head and starts yelling at him. Then she sees the flowers he's holding in his arms and her anger diffuses and is replaced with happiness again. Her husband then tells her that he has to leave on yet another business trip shortly. She becomes sad and begins to cry. This is all in the span of say five minutes and by the end of that short amount of time her husband thinks "Boy, that business trip couldn't come any sooner." But since that is how he's feeling, he doesn't just think it, he acts on it (and you can imagine where this leads).

In short, if people could only acted based upon their emotions, the world would never be the same. There would be a lot more fighting in society because of blunt honesty and impulsive behavior. Perhaps, there would be even more unsuccessful marriages as well. 💔

Written by Renee Yang

EQUALLY REPRESENTED BODY PARTS

Q: What if different parts of the body were represented equally on the surface of the brain?

A: To put things simply, let's just say that it would not end well. In the brain, the motor and sensory cortices have parts dedicated to specific parts of the body. The motor cortex helps you move parts of your body,[75] while the sensory cortex helps you feel. However, the size of these body parts does not affect the amount of space it gets on the brain. Rather, the parts of our body that require more precise movements take up more space on the motor cortex. Body parts such as our fingers and features on our face are represented with a larger space, while parts such as our legs take up a smaller area. Parts that have a larger space on the sensory cortex are more sensitive to touch.

If all the body parts were represented equally, all parts of our bodies would have the same level of motor skills and sensitivity. But, having all parts of our body equally nimble doesn't mean that every part of our body will be skilled. In fact, our body parts won't be very precise and skilled at all. The reason that certain parts of our body are more skilled in the first place is because there are other parts that aren't.[76] So, instead of being able to skillfully pick objects up with our fingers, we would constantly let them slip through our fingers and drop them everywhere.[77] On the other hand, useless parts like our elbow would be very agile. Basically, we would have trouble completing everyday tasks like picking things up or

[75] You just used your motor cortex to look down here. You're welcome.
[76] A regular person's tongue should be able to move a lot more skillfully than say, someone's abdominal area. If that's not true for you, well, you're just abnormal.
[77] Not that I wouldn't drop everything with a regular cortex either.

scowling at annoying strangers who bump into you on the street. Likewise, every single part of your body would be equally sensitive to touch. We would be able to recognize touch better in places like our hip, but places like our fingers and tongue wouldn't be very sensitive. Without a sensitive tongue, our entire process of eating and enjoying food would be ruined! We would be unable to feel a smooth, solid piece of chocolate melting in our mouth, nor would be able to feel the heavenly texture or a squishy marshmallow.

Basically, we would not be able to complete everyday tasks. In fact, we wouldn't even be able to move or use or sense of touch regularly. Our human species would definitely be living a *very* different life.[78]

Written by Samantha Yip

[78] If you still consider them human still, that is.

CONSCIOUS MEMORY

Q: What if you could consciously tell your brain exactly what to remember?

A: If I had to wager a guess, I'd say that you're mentally jumping up and down with excitement right now. "Whoa! Cool!" you're probably thinking. "Obviously, I want to remember that amazing llama I had as a pet when I was ten! And the time I went to England and met J. K. Rowling! And…" Just hang on for a second, okay? Trust me, this might seem like all sunshine and rainbows, but like the moon, it's got a dark side.[79]

Before we start, I should mention that you wouldn't be telling your brain what to remember-- at least, not exactly. After all, your brain already remembers practically everything it decides is important enough. It's retrieving those memories later that gives it pause. To understand this, you need to know that each memory you make has two main qualities: its storage strength and its retrieval strength. Its storage strength is how familiar you are with the memory; it can only increase. Its retrieval strength is how easy that particular memory is to access, and it can fluctuate based on how recently the information in the memory was used.

Try to imagine that your collection of memories is a library filled with shelves and shelves of books.[80] Every time you make a new memory, a new book is added. When you add more pages to the book or replace it with a brand-new edition, you increase its storage strength. When you check the book out, you improve its retrieval strength. But what happens if you let a book collect dust and sit neglected on its shelf for too long? Its retrieval strength declines, and it is slowly forgotten. In this case, when you'd tell your brain what to remember, it would stop that memory's retrieval strength from decreasing, but it wouldn't do anything out of the ordinary to its storage strength.

Let's also assume that you'd have to inform your brain every time you wanted to give a memory that bonus amount of retrieval strength. If you didn't, then the memory would never make it to your long-term memory. Yes, never. In that case, you'd have to come up with some quick way to alert your brain to something that you needed to remember. Obviously, even if the reminder didn't need to be spoken, thinking "Hey, brain! Remember that!" would become pretty cumbersome after a while. After all, you can only have 5 to 9 items in your short-term memory at a time, and those only stay there for about 15-20

[79] So I've been told by Pink Floyd and a certain Disney movie set in ancient China.
[80] Or DVDs, or trinkets, or shrunken heads. Your choice.

seconds each. You simply wouldn't have the time to be distracted so often in the middle of a conversation, bike ride, or class lecture.

The reminder would have to be unique, too. You couldn't tell yourself to remember by blinking because over time, remembering absolutely everything you saw would become a miserable process, with each memory leading to another and then another until your whole life was consumed by nothing but memory. Solomon Shereshevsky, a Russian journalist turned circus attraction in the 1920s, is one pretty scary example of this. Mr. S, as we'll call him,[81] was in a meeting with his editor when the man realized S wasn't taking any notes on the story ideas his boss was explaining. He started to chew out Mr. S for not paying attention, but S told him that he didn't need notes; he could remember everything perfectly well. He then proceeded to repeat his boss's entire conversation, word for word. Dumbfounded, the editor sent him to Alexander Luria, a famous psychologist, who ran tests on S until he finally realized that S could remember pretty much everything, from long lists of words to whole stanzas of epic poems.[82]

S's problem was forgetting. When he remembered one thing, it connected to something else, and then still something else after that. He couldn't concentrate on one thing over the noise of all his memory. Clearly, you'd need to know when to stop, and making that decision would be pretty hard on your own. Despite its occasional mistakes, your brain actually does a pretty good job of deciding what to forget. Mr. S's brain made so many connections between memories that it could not.

Which brings up another issue: this would allow you to choose what you wanted to remember, but not what you wanted to forget. After elementary school, there comes a time when you no longer need to know the "Miss Mary Mack" clapping game, and having it repeat in your head every time you hear the name Mary is a bit too much.[83] Breakups and deaths would also be unbearably painful when your memories of your lost lover, friend, or family member never faded.

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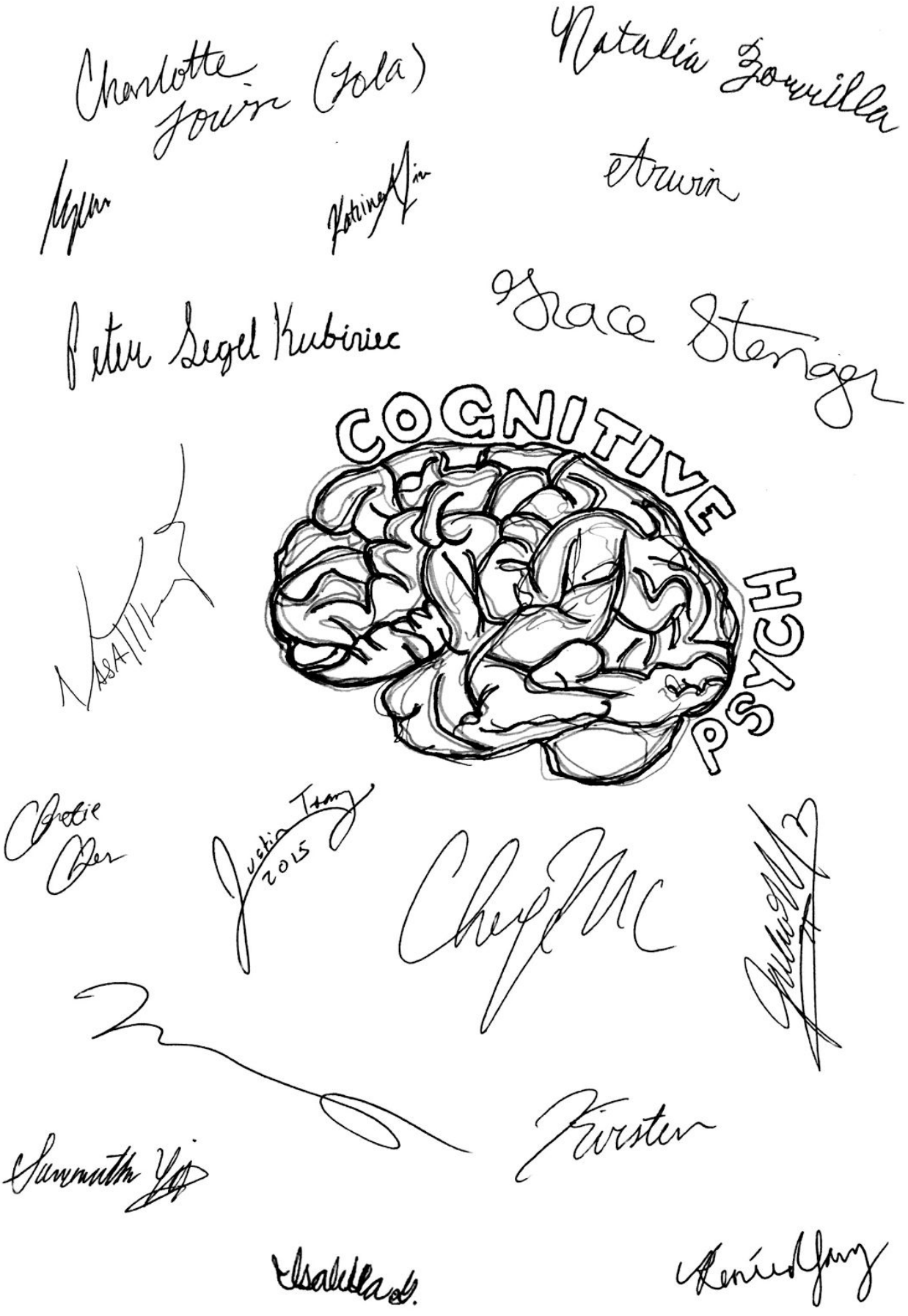
[81] Please don't make me type Shereshevsky again.
[82] In Italian. Word perfect. When he didn't actually know Italian. "Whoa," you say? Yeah, that's an understatement.
[83] Now I have it stuck in my head. Great.

As bad as remembering too much could be, the state of panic you'd feel constantly trying to select the right memories would be even worse. Something as simple as enjoying your birthday party would become nerve-wracking. What if you forgot the taste of the cake? Or the smiles on your friends' faces? Or what about the awesome treasure hunt your parents organized? Somebody, help!

Luckily for us, though, there's no way for us to pick and choose our own memories. Seems like your hazy remembrance of precious Mr. Llama will just have to be good enough.

Information Remembered and Recreated by Natalia Zorrilla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