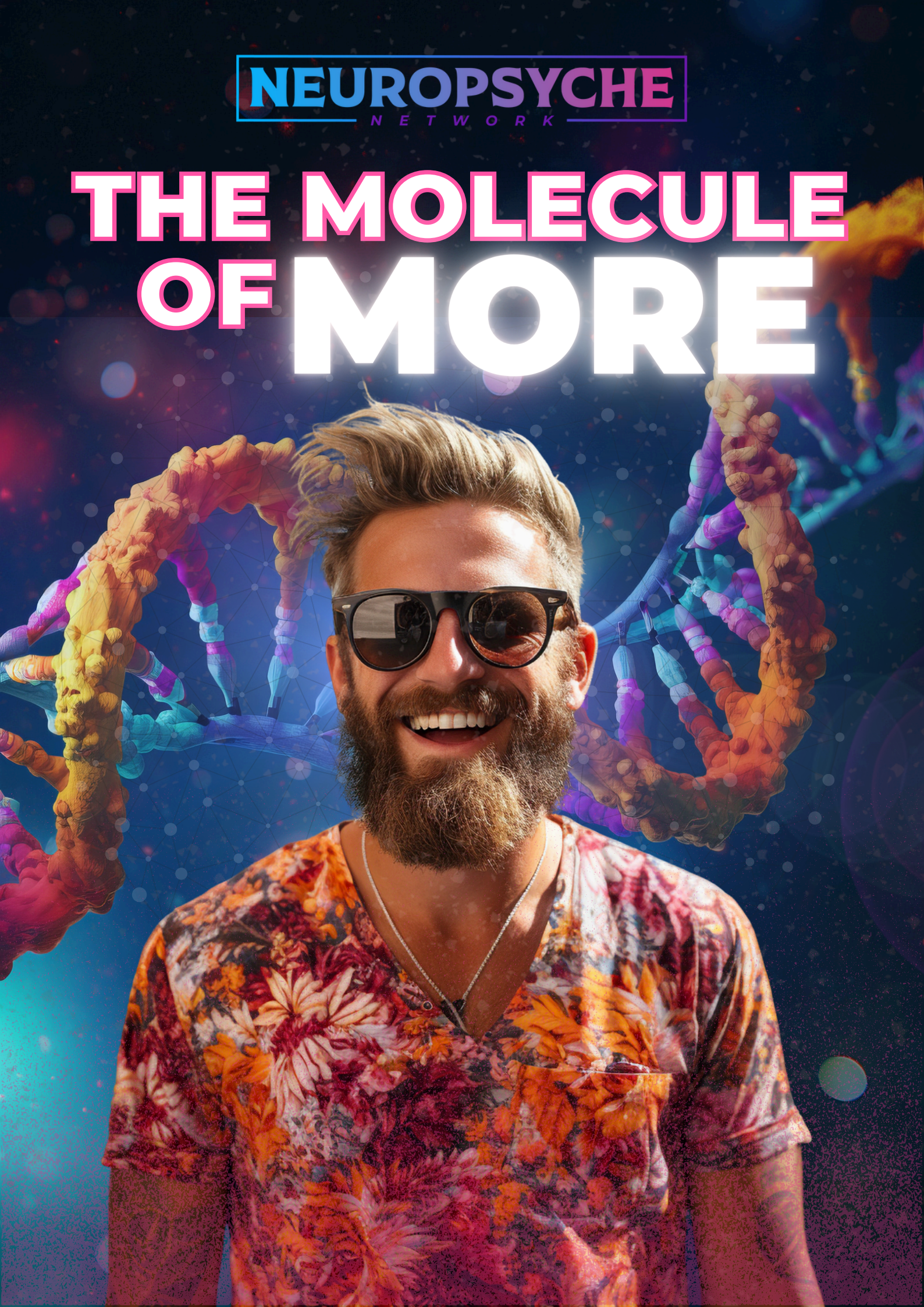
NEUROPSYCHE
NETWORK

THE MOLECULE OF MORE



WHAT'S IN IT FOR ME?

Get to know the molecule that makes us human.

"What makes you human? Is it your hopes and dreams, your imagination, your desires, your plans and passions? It's not an easy question. But one thing is certain. Whatever the answer is, it depends on one little molecule produced by your brain: Dopamine.

"Only one in two thousand brain cells actually produces this miracle molecule. Yet the effects of this chemical on your thoughts and behavior are extraordinary. Dopamine governs every facet of human life, from addiction and recovery to falling in love to madness and genius.

"These Neuropsyche shorts combine the latest insights from psychology, neuroscience, and social studies to explore the powers and pitfalls of this incredible molecule.

In these Neuropsyche shorts, you'll learn

- ☑ why passionate romance can't last forever;
- ☑ why liberals and conservatives have such a hard time getting along; and
- ☑ why we should get off the dopamine treadmill once in a while.

The following applications are now being studied, either clinically or via community / citizen science

DOPAMINE IS THE MOLECULE OF POSSIBILITIES.

If you've heard about dopamine before, you likely know it as the brain's feel-good chemical.

Indeed, after the researcher Kathleen Montagu first identified dopamine in a human brain in 1957, scientists quickly dubbed her discovery "the pleasure molecule." That's because pleasure is exactly what people feel when dopamine is active in their brains.

Further research on rats proved that dopamine activity was at its highest when animals received tasty food. Scientists named the parts of the brain involved in this reaction the dopamine reward circuit. As scientific terms go, this name is fairly simple – but it's also misleading. There's much more to dopamine than stimulus and reward.

The key message here is: Dopamine is the molecule of possibilities.

It turns out that dopamine doesn't really care about tasty food. In fact, it doesn't really care about anything that is predictable. Instead, dopamine gets released when we encounter things that are new, unexpected, and exciting.

The bigger and better the surprise, the more dopamine our brain releases – and the more pleasure we feel. The high is greatest when we make a reward prediction error – in other words, when we encounter an outcome that's better than what we expected.

Just think of the rush you get when you check your bank account and realize that you have more money than you thought. That's the dopamine high of unexpected good news.

Recently, scientists have proposed that our brain divides the world into two separate regions: near and far. Everything that's close to us – the things we can touch, see, and feel at any given moment – falls into the "near" category. Anything that's out of our immediate reach – figuratively or literally – falls into the "far" category.

Dopamine gets you excited about the things that fall into the "far" category, and motivates you to pursue them. It encourages a hunter to track that elusive animal, an office worker to apply for that coveted promotion, a shopper to buy that powerful car.

From an evolutionary perspective, this makes sense. After all, the food we have is already here, right in front of us. It's the food that we don't yet have that could decide whether we live or die. And that's why dopamine evolved to make us chase our dreams.

DOPAMINE MAKES US FALL IN LOVE – AND OUT OF IT.

If you've ever been in love, you probably know it can feel like being high. That's because you were high– on dopamine. At the beginning of a romantic adventure, your brain is busy responding to all the exciting possibilities of a new relationship. Dopamine is firing like crazy. And this makes us feel euphoric, headless, love-drunk.

The problem is that relationships can't stay new forever. And when the novelty goes, so does the dopamine. Anthropologist Helen Fisher has estimated that the rush of a new romance only lasts about 12 to 18 months. After that, many couples hit a bump. They begin to feel like something is missing from the relationship. And they're right; they're missing the dopamine.

Here's the key message: Dopamine makes us fall in love – and out of it.

When the dopamine rush subsides, some people separate and move on to the next lover, while others start fantasizing about the thrill of new romance. That's because dopamine always demands newer, shinier, better things. Indeed, there's evidence that people with naturally high dopamine activity have more sexual partners. They are more likely to cheat and less likely to marry.

But even for people with regular dopamine activity, it can be hard to remain excited about an established relationship.

So is there no hope for love? Well, of course there is. After all, passionate romance is just one stage of love. When we build a solid relationship with someone, we move on to the next stage. This is where companionate love takes over. It is based on a mutual, day-to-day appreciation of your partner. This type of love is less exhilarating than passionate romance, but it's much more stable and satisfying. Companionate love doesn't rely on future-oriented dopamine. Instead, it's mediated by a different set of brain chemicals.

The authors call them the "here and now," or "H&N," chemicals. You may have heard about some of them: substances like serotonin, endorphins, oxytocin, and endocannabinoids. They are all about enjoying things in the present moment. For example, they're active when you're having sex, eating good food, or watching a beautiful sunset. Brain circuits that produce H&Ns tend to compete with – and even suppress – the production of dopamine. When you find yourself in a stable long-term relationship, for example, your brain releases less dopamine but more H&N chemicals, such as oxytocin. Conversely, when you're crazy in love, your serotonin levels drop below usual.

ADDICTIVE DRUGS OVERWHELM OUR DOPAMINE SYSTEM – WITH DEVASTATING CONSEQUENCES.

Have you ever found yourself unpacking your shopping bags at home and wondering – once again – what drove you to buy another sweater you'll never wear? Well, the answer is that wanting something is not the same as actually liking it.

That's because, as we saw in the last Neuropsyche short, our brain uses entirely different systems to produce desire and enjoyment.

The desire circuit is driven by dopamine. It makes us want things – whether it's food, sex, or that extravagant sweater in the shop window. But dopamine doesn't really care whether we'll actually end up liking the objects of our desire. And it certainly doesn't care whether they're good for us in the long run.

The key message: Addictive drugs overwhelm our dopamine system – with devastating consequences.

Drugs like alcohol, cocaine, and opioids make the dopamine desire circuit fire like no natural trigger ever could. That's why they can feel intensely pleasurable. It's also why they're highly addictive. Unfortunately, when you push dopamine activity to unnatural highs, it's eventually bound to drop to unnatural lows. And that can feel so terrible that our brains go haywire. Against all reason, they cry out for another dopamine hit.

Contrary to common knowledge, people who use narcotics don't get addicted to the chemical high of a particular drug. The chemical high actually weakens quickly. It's the dopamine high that they can't get enough of. When they choose a destructive drug habit over friends, family, career, and relationships, this choice makes perfect sense to their dopamine-addicted brains.
In the case of drugs, it's to our detriment that the desire circuit is closely linked to our memory system. Our brains are great at remembering every little detail of our dopamine highs.

In our evolutionary past, this was useful. Imagine a hunter-gatherer who discovered a bush full of tasty berries. This pleasant surprise results in a little dopamine rush. The next time she sees a similar bush, her brain will fire a little dopamine in anticipation. That will make our hunter-gatherer alert and excited about the possible food source.

The same things happen when people who use drugs encounter situations that they associate with narcotics. These associations are so powerful that Alcoholics Anonymous warn members of three major relapse triggers: people, places, and things.

If dopamine is so addictive, how do our brains ever oppose its demands? Well, as we'll see in the next Neuropsyche short, they do so by using more dopamine!

CONTROL DOPAMINE HELPS KEEP OUR DOPAMINE DESIRES IN CHECK.

Our brain uses dopamine for many purposes. One of them is to make us crave things like foods, sex, or drugs. Luckily, it isn't the only one. We have evolved a system which controls our dopamine desires and keeps them in check. You can think of it as a safety valve, and it's driven by the same substance – dopamine. It's called the dopamine control circuit.

This system involves our frontal lobes, the part of the brain in which logical thinking happens. It controls planning, strategizing, and imagining the future. Even though the control and desire systems are driven by exactly the same molecule, their functions couldn't be more different. Desire dopamine makes us want things – and control dopamine helps us get them.

The key message here is: Control dopamine helps keep our dopamine desires in check.

Imagine you want to buy a car. If you'd let desire dopamine take charge completely, you'd run to the next car dealership and buy the first vehicle you see. Through the power of control dopamine, you can keep such unproductive urges in check. Control dopamine makes you compare prices and features before you part with cash. And it makes you actually enjoy this process of planning for the future.

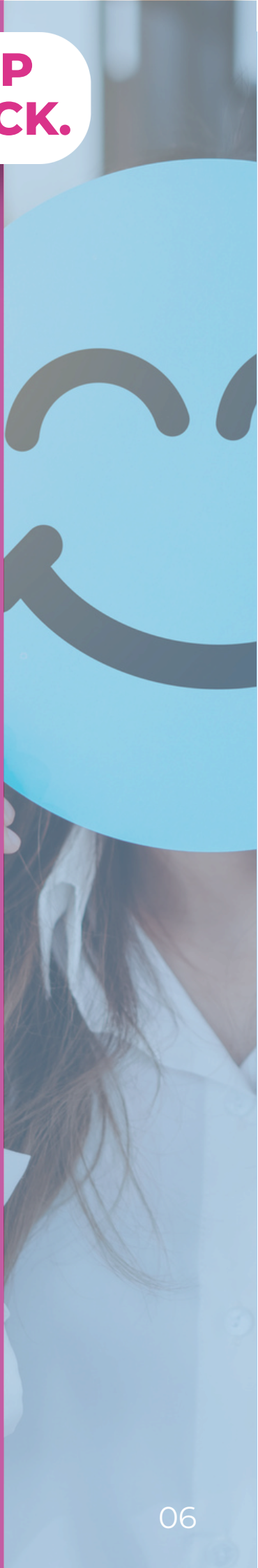
Research shows that the more dopamine courses through our brain, the more effort we put into getting the things we want.

Remember those rats that scientists studied? Well, researchers found that a healthy animal would press a lever that drove the food machine one thousand times in 30 minutes. Rats who'd been given a dopamine-suppressing drug pressed that lever almost half as often.

And there was something else. The machine didn't simply release food with each press of the lever – no, the rats had to really work for it. And the more presses it took to earn a food pellet, the less motivated the dopamine-depleted animals became. When the number of presses per snack reached 64, the rats simply gave up.

Scientists have never depleted humans of their dopamine. But they do know that, in some people, dopamine control systems are less active. Those of us who live with Attention Deficit Hyperactivity Disorder, or ADHD, seem to fall into this category. As a result, they struggle to suppress urges and distractions, and they have a hard time staying focused.

People whose dopamine control systems are very active, on the other hand, tend to be intellectual, ambitious, and overachieving. They are less emotional, and that means that they can keep a cool head in stressful situations. But there's also a flip side: the excess of control dopamine prevents them from fully enjoying their achievements. In the next Neuropsyche short, we'll learn more about the perks and perils of too much dopamine.



DOPAMINE CAN PRODUCE CREATIVE GENIUS OR PSYCHIATRIC DISEASE – OR BOTH.

Our brain uses control dopamine to plan, imagine, and strategize. Why? Because these things help us make our future better than our present. But achieving this aim often means thinking outside the box and making new connections between seemingly disparate things.

This is where creativity comes into play. It is the skill of making unusual connections.

Artists, musicians, and writers tend to have brains that are rich in dopamine. This allows them to think in new, unconventional ways – and to come up with connections no one's ever thought of before.

But the creative power of dopamine has a flip side. When dopamine activity gets out of hand, people can experience hallucinations, delusions, or mania. This is common for people who live with schizophrenia or bipolar disorder.

The key message here is: Dopamine can produce creative genius or psychiatric disease – or both.

If we compared professional artists, musicians, and writers to people from other industries, we'd see that creatives are more likely to carry risk genes for schizophrenia and bipolar disorder. And people with schizophrenia and bipolar disorder often produce amazing art during bouts of illness.

So what's the link between creativity and mental illness? Well, the answer again seems to be: dopamine.

One very common symptom of schizophrenia, for example, are delusions. People with schizophrenia are often convinced that they're being followed or manipulated. How does dopamine produce such fantastical beliefs?

The answer has to do with the psychological concept of salience. It describes the degree to which something feels important to us personally, as an individual. Dopamine is very good at producing salience. Remember the hunter-gatherer who discovered a bush of berries? The hungrier she is, the more dopamine will fire when she sees the bush. That dopamine will convince her that the berries are important for her survival.

But when dopamine malfunctions, suddenly everything can seem super-important. Imagine you're watching TV. A reporter is talking about the nuclear program. Suddenly, your salience dopamine fires – and your brain forms a link. You are now convinced that this nuclear program really is of great relevance to you, personally.

Too much dopamine can convince people that seemingly random things are hugely relevant to them. This is the basis of schizophrenic delusions.

Most of us actually have first-hand experience of dopamine's bizarre creative power. This chemical becomes very active when we're sleeping – and, as a result, our dreams are often a strange hodgepodge of seemingly unconnected things.

OUR DOPAMINE LEVELS CAN INFLUENCE OUR POLITICAL BELIEFS.

In 2002, researchers from the Virginia Commonwealth University published a study on personality and political beliefs. It seemed to confirm what most academics thought anyway. Liberals, the study found, tended to be generous and sociable. Conservatives, on the other hand, leaned toward authoritarianism and impulsivity.

Except the truth was actually the opposite. Fourteen years later, researchers admitted that they'd accidentally mixed up the data sets. It was liberals who tended to be impulsive, authoritarian, and sensation-seeking – and conservatives were charitable and social.

But, mix-up aside, let's ask the big question: How can these tendencies be explained? Again, the answer is dopamine.

Here's the key message: Our dopamine levels can influence our political beliefs.

Liberals often seek novelty; they crave progress. These are both qualities linked to dopamine. Conservatives, on the other hand, tend to be more concerned with the present. They are practical and novelty-averse. These qualities are driven by here and now chemicals, which we discussed earlier.

One finding in support of this connection is that liberalism is linked to a slightly higher IQ. In one study, people who described themselves as "very liberal" registered an average IQ score of 106. And people who identified as conservatives displayed an average IQ of 95.

This doesn't mean that liberals are smarter, of course. An IQ test measures only one form of intelligence – abstract thinking. Like artistic creativity, it, too, is the domain of dopamine.

The brains of conservatives seem to be more geared toward the here and now brain chemicals. Their minds tend to focus on what's in front of them. They value hands-on solutions over abstract plans, and they are more suspicious of change.

This could explain why conservatives often oppose liberal policies that benefit the poor but, at the same time, give far more money to charity. It could also explain why conservatives are more likely to get married and have less sex than dopamine-addled liberals.

But the level of dopamine and H&Ns in our brain isn't always the same. Scientists and politicians know how to manipulate this. Many political campaigns, for example, promote conservative agendas by invoking fear – an intense H&N emotion that suppresses "liberal" dopamine. On the other hand, studies have shown that when people exercise dopamine-dependent abstract thinking, they become more open to liberal views. This shows that our political opinions – just like our brain chemistry – aren't set in stone.

DOPAMINE ALLOWED HUMANS TO CONQUER THE WORLD.

Dopamine makes us seek out new experiences. And the more receptors our brains have for this chemical, the stronger its effect is on our behavior.

This explains why people with a certain version of DRD4, the gene that codes for dopamine receptors, tend to be more risk-taking, adventurous, and keen to learn new things. Worldwide, about 20 percent of people have this gene variation, called DRD4-7R. But here's where it gets interesting: the distribution of this gene is very different from place to place. In North America, 32 percent of people carry it. But a staggering 69 percent of indigenous South Americans have this gene, too.

To find out why, let's go all the way back to the origin of the human species.

The key message here is: Dopamine allowed humans to conquer the world.

Modern humans evolved in Africa about 200,000 years ago. Millennia passed before they began to spread out to the rest of the world. They reached Asia about 75,000 years ago, made it to Europe some 30,000 years later, and didn't settle into the last corner of North America until 14,000 years ago.

When researchers compared these migration patterns to the distribution of the 7R gene variation, they found something astonishing: the further that human populations had ventured out of Africa, the higher the percentage of 7R among their people.

It seems that humans who conquered the world benefited from increased dopamine activity. This makes sense – after all, being risk-taking and adventurous helps when you're heading out into the unknown.

There's evidence that people in America have higher levels of dopamine than people in Asian or European societies. For example, the US has the highest rate of bipolar disorder in the world. It currently stands at well over 4 percent of the population. Bipolar disorder is a psychiatric condition that is directly linked to elevated dopamine activity. In Japan – a nation with almost no immigration – this condition only affects 0.7 percent of the population.

So why is America so full of people with higher rates of dopamine? Well, maybe it's because the US is a nation of immigrants – people who were adventurous enough to make a journey into a new world.

Indeed, outsiders often view Americans as overly optimistic, entrepreneurial, and restless. In the classic nineteenth-century book Democracy in America, for instance, French author Alexis de Tocqueville dedicated a whole chapter to the "fanatical enthusiasm" of Americans.

HAPPINESS MEANS FINDING A BALANCE BETWEEN DOPAMINE RUSHES AND THE SERENITY OF HERE AND NOW CHEMICALS.

Dopamine is the source of our desires, our tenacity, our creativity, and even our political beliefs. For most of us, these are the qualities that make us "us." This means that of all our different brain chemicals, we identify most with dopamine.

The curious thing is that dopamine makes up a pretty small portion of our brain chemicals. In fact, plenty of your character traits have nothing to do with dopamine. And yet, we often approach our life through a dopamine lens.

This can be empowering. After all, dopamine makes us want more; it drives us forward. Millennia ago, it was also crucial for our survival. But, in the modern world, more isn't always better – and forward isn't always the direction of happiness.

The key message: Happiness means finding a balance between dopamine rushes and the serenity of here and now chemicals.

Modern society encourages a way of life that's driven by dopamine. We're taught that we should always strive for more – more achievements, more entertainment, more consumption. On a global scale, this approach has already had devastating consequences. The speed of our production and consumption, for example, has made climate change a terrifying reality.

On an individual level, too, it seems clear that happiness cannot be a result of ever-longer working hours, frivolous consumption, and the inability to appreciate what we already have. Unfortunately, our brain didn't evolve to make us happy – it evolved to keep us alive. This is why its response to dopamine, the molecule of more, is so acute. And it's also why happiness is a process that takes constant effort.

The best way to live a fulfilled and happy life is to find balance between the demands of future-oriented dopamine and the serenity of the present-oriented here and now chemicals. Doing so requires us to get off the hamster wheel of endless dopamine stimulation and make a conscious effort to engage in the more peaceful – and more elusive – H&N enjoyment.

One way to create more balance is to find a hobby that stimulates both types of brain chemicals. Sports, cooking, gardening, and handiwork, for instance, all combine sensory H&N input with the dopamine-driven need to make plans and achieve progress.

So, then, if we can find the right balance between dopamine and H&Ns, we'll be able to strike the perfect chord between motivation and satisfaction, stimulation and enjoyment, progress and peace.

FINAL SUMMARY

“Dopamine is the brain chemical of more. It creates our desires, fuels our imagination, and drives our future plans. It plays an outsized role in love, addiction, creativity, and even politics. The more active a person’s dopamine system, the more likely they are to be novelty-seeking, risk-taking, and curious. But too much dopamine can stand in the way of our happiness. To live fully, we need to find balance between the future-oriented dopamine and the more present-oriented here and now brain chemicals.

Actionable advice:
Sleep on it.

Dopamine is very active when we’re dreaming. Because of the chemical’s role in planning and creativity, the idea that we can solve problems in our sleep is actually not as crazy as it sounds. Take the chemist Friedrich August Kekulé, for example. He claimed that his discovery of the chemical structure of benzene came to him in a dream. Sleep dopamine is something that can help you, too. If you have a problem, spend some time considering it before you go to bed. And make sure that you have a pen and paper ready to write down your dreams once you wake up. It might be a couple of nights until you discover the dream solution to your real-life problem – but the answer just might be, well, the stuff of dreams.