SUMMARY

THE COMPASS OF PLEASURE

DAVID J. LINDEN

QuickRead
FREE BOOK SUMMARIES

Summary of “The Compass of Pleasure” by David J. Linden

Written by Lea Schullery

How Our Brains Make Fatty Foods, Orgasm, Exercise, Marijuana, Generosity, Vodka, Learning, and Gambling Feel so Good

Introduction

On the streets of Bangkok in 1989, author David Linden hailed a tuk-tuk, a three-wheel motorcycle taxi, and hopped aboard. Being a solo male traveler, his young driver immediately began the usual interrogation, asking him, "So… you want girl?" Linden replied "No." Of course, this interaction led to a long line of questioning about what kind of experiences Linden was looking for. Did he want sex? Drugs? To gamble? Linden explained he was only looking for some food so the driver, disappointed, eventually gave up on his quest to fulfill the vices that many travelers are searching for. The encounter left Linden wondering, "Aside from various shades of illegality, what do all his offers have in common? What is it exactly that makes a vice?"

As humans, we have a complicated and conflicting relationship with pleasure. We spend our time pursuing pleasure, yet our cultures also attempt to regulate it. In various places around the world, we find specific rules and ideas about pleasure that have persisted throughout history; we have rules and customs surrounding sex, drugs, food, alcohol, and even gambling. As a result, jails are filled with people who have violated these laws and others profit by encouraging others to do so. Throughout The Compass of Pleasure, Linden argues that most experiences in our lives, illicit vices and socially sanctioned practices like exercise or mediation, all activate an anatomically and biochemically defined pleasure circuit in the brain. "Shopping, orgasm, learning, highly caloric foods, gambling, prayer, dancing 'til you drop, and playing on the Internet: They all evoke neural signals that converge on a small group of interconnected brain areas called the medial forebrain pleasure circuit." So, if you're ready to learn more about the science behind human pleasure, then let's begin.

How Pleasure Influences Our Behavior

No matter your vice, whether it's indulging in illegal activities or merely seeking pleasure through eating a slice of cake, or both, your vices all share a common characteristic: they all activate the area in your brain called the medial forebrain pleasure circuit. In other words, injecting heroin might be drastically different than having sex or eating cake, but the science behind each activity is the same.

Here's just a bit of science to explain how we experience pleasure. When neurons in the region called the ventral tegmental area (VTA) are active, brief electrical impulses (called spikes) race from their cell bodies along long, thin information-sending fibers called axons. Each axon has an end-point called an axon terminal. When the traveling electrical spikes reach the axon terminals, they trigger the release of the neurotransmitter, dopamine. Neurons of the VTA also send dopamine-releasing axons to other brain regions, including the part of the amygdala, which is the part of the brain that controls our emotions. Furthermore, dopamine is then sent to the dorsal striatum, which is involved in some forms of habit learning. So when you indulge in something, like eating a slice of cake, you'll enjoy it and want to continue eating it! Unfortunately, you might want to continue repeating this pleasurable experience which is how habits can easily lead to addictions.

To study the relationship between our medial forebrain pleasure circuit and our behavior, scientists have completed experiments in which the pleasure circuit is intentionally stimulated. Unfortunately, some of these experiments were incredibly unethical. One such experiment was done by Dr. Robert Galbraith Heath, the founder and chairman of the Department of Psychiatry and Neurology at Tulane University. In 1972, Dr. Heath aimed to discover if homosexual men could derive pleasure from heterosexual intercourse. So Patient B-19, a 24-year-old homosexual male, entered the operating room where electrodes were implanted at nine different sites in deep regions of his brain.

During the experiment, Patient B-19 watched a 15-minute long film featuring sexual intercourse and related activities between a male and female. Unsurprisingly, he was sexually indifferent. However, following the pleasure circuit self-stimulation, he agreed to rewatch the film and this time became sexually aroused. The patient was now beginning to exhibit heterosexual tendencies, but would he ever pursue a sexual relationship with a woman? Dr. Heath then made another unethical decision to hire a hooker to attempt to seduce Patient B-19. She succeeded. Additionally, Patient B-19 went on to have a sexual relationship with a married woman in the months following the conclusion of the experiment.

So despite the egregious and highly unethical experiment, we are left with the understanding of the immense power of direct electrical stimulation of the brain's pleasure circuitry to influence human behavior, at least in the short term.

Each Drug Activates the Pleasure Circuit But Not in the Same Way

So while pleasurable activities activate our pleasure circuit, do they each trigger the circuit in the same way? Well, the answer is no. In fact, when it comes to drugs, certain drugs stimulate the circuit more than others. As a result, some drugs are more likely to become habit-forming and addictive. Psychoactive drugs that strongly activate the dopamine-using medial forebrain pleasure circuit - like heroin, cocaine, and amphetamines - are the ones that carry a higher risk of addiction. On the other hand, drugs that weakly activate the pleasure circuit - like alcohol and marijuana - carry a smaller risk of addiction. And then drugs that don't activate the pleasure circuit at all - like LSD, mescaline, benzodiazepines, and SSRI antidepressants - carry little or no risk of addiction.

The activation of the pleasure circuit isn't the only factor that makes a drug addictive or not. In fact, sociocultural factors have a huge impact on the risk of addiction. For example, if a drug isn't easily available to you, you're more unlikely to use it. Legal drugs, however, like alcohol and nicotine are widely available. Semi-legal drugs like benzodiazepines, prescription amphetamines, and cannabis are somewhat less available. And illegal drugs like heroin and cocaine are more difficult to obtain and carry the most legal risk.

This is perhaps why a study in drug use in the United States estimated that 35% of people who have injected heroin become heroin addicts. This may seem like a high percentage compared to the addiction rates of 22% for smoked or injected cocaine, 8% for cannabis, and 4% for alcohol, but it is still much less than the addiction rate for cigarettes. 80% of all people who try cigarettes become addicted. But why is this? This remarkably high number simply reflects the fact that tobacco is legal and the penalties for smoking cigarettes are much less than injecting heroin.

Furthermore, availability isn't the only factor when it comes to addiction rates. The pleasure that heroin and cigarettes produce is also a contributing factor. A heroin user injects a hit and feels an immediate euphoric rush and won't inject again for another few hours. Meanwhile, a cigarette smoker will typically take 10 puffs from a single cigarette and will often smoke many cigarettes throughout the day. In other words, a heroin addict will get two strong, rapidly-delivered hits to the pleasure circuit per day while a pack-a-day smoker will get 200 weak, rapidly delivered hits per day. In other words, the act of smoking means you are being rewarded more frequently throughout the day; therefore, addiction occurs more quickly.

To illustrate this further, imagine that you have a dog that you're training to come when called. To do so you would use a tasty treat as a reward. To create a learned association, you would have to call the dog, and when it comes, you'd immediately give him the treat. If you do this multiple times a day, the dog will learn more quickly than if you did this once a day. "So when we smoke cigarettes, we are being very effective trainers of our inner dog, creating a strong association between puffing and pleasure."

Obesity is Linked to Leptin-Resistance in the Body, Which Can Lead to Overconsumption of Food

In 2008, Linden ate about 1.2 million calories in many forms, from fat-laden restaurant meals to little bags of Cheetos he furtively wolfed down behind office doors. Some weeks he routinely rode his bike for 40 minutes each night, while some weeks he stayed sedentary on the sofa. However, during that year, his weight never fluctuated by more than five pounds. He found it remarkable that with 1.2 million calories of food coming in, his body regulated his appetite and expended the right amount of energy to break even. Therefore, he concluded that the brain must receive signals from the body that indicate its weight which then allows your brain to send signals to regulate your appetite and the amount of energy your body expends.

The hypothalamus in our brain receives those signals from our body and controls our basic driving reflexes, including sex, feeding, aggression, drinking, and regulation of body temperature. It also is how our bodies automatically control our weight. You see, "as we gain weight, the amount of body fat increases, and since fat cells secrete leptin in proportion to their mass, leptin levels will then consequently rise. Leptin then circulates in the blood and crosses into the brain, where it is sensed by leptin receptors expressed on neurons in the hypothalamus. Activation of those neurons by leptin suppresses appetite and increases energy expenditure." Similarly, when weight is lost, the system works in the opposite direction. In cases where people suffer from obesity, they may be leptin-resistant. So even though they are increasing their eating, the leptin isn't working to suppress that person's appetite.

Furthermore, foods that are high in sugar and fat release more dopamine, the pleasure hormone we learned about in a previous chapter. A study by Eric Stice at the University of Oregon tested the release of dopamine in both obese and lean subjects, all young women. In the study, the women

were hooked up to a brain scanner and given sips of a chocolate milkshake through a plastic tube. Findings showed that the obese subjects showed significantly less activation of the dorsal striatum (the habit-forming part of the brain we learned about in chapter one) when sipping the milkshake than did the lean subjects. This means that obese women experience a blunted pleasure response to food.

Does this mean that obese individuals overeat to compensate for low-functioning pleasure circuitry? That is only part of the explanation. “If you look at the brain response when people are about to get the milkshake, obese individuals show greater activation of the reward circuitry, not less.” This pattern may be the explanation for many problems relating to compulsive and addictive behavior, not just overeating.

How Love and Sex Are Pleasurable in Different Ways

Love and sex oftentimes go together, they are both pleasurable experiences that activate the pleasure circuit of our brain. Helen Fisher, an anthropologist from Rutgers University surveyed data collected by cultural anthropologists from 166 different societies. She found that love was surprisingly similar across cultures, each one describing love as intense, giddy, pleasurable, and even causing a suppression in appetite and distortion of judgment about the beloved. Additionally, when we see all the wonderful things in our partner, we also see those same positive feelings mirrored back. This can explain why when we're in love, we like ourselves better.

Furthermore, the highs become higher and the lows become even lower. So how does our romantic love correspond with brain function? Well, Lucy Brown, a neurobiologist from Albert Einstein College of Medicine conducted a study to answer this very question. After recruiting men and women in the early stages of a relationship who reported being "madly, deeply, and passionately in love," participants were then shown photos of their partner's face while they were imaged in a brain scanner. As a control, they were then shown a photo of an emotionally neutral acquaintance of the same sex and age as their partner. Findings showed that certain areas of the brain were activated by images of their partner but not the acquaintance.

You may be thinking that love and sex produce similar responses in the brain, but this would be an oversimplification. Having an orgasm is not just another "pleasure buzz" similar to an injection of heroin or a bite of chocolate cake. Instead, orgasm is a multifaceted experience with dissociable sensory and affective/emotional/rewarding components. In other words, orgasm is an all sensory experience where we feel things integrated as a whole. However, orgasms can happen even without pleasure. For example, brain stimulation studies have shown that stimulation with an electrode can induce orgasms, in which heart rate increases and muscle contracts but

they don't feel pleasurable or activate the pleasure circuit. These kinds of orgasms occur during epileptic seizures or are experienced by rape victims.

Typically, orgasm is an intense and pleasurable experience due to the dopamine surge it produces. In Gert Holstege's lab at the University of Groningen Medical Center in the Netherlands, heterosexual couples were monitored during sexual stimulation and orgasm. Findings showed that orgasm involved strong activation of the medial forebrain dopamine-using pleasure circuit equally in both men and women. And like all dopamine-inducing activities, sex can become an addiction and can take a toll on someone's life just like any other addiction.

Why Gambling Can Become an Addiction

Just like sex can become an addiction, activities like gambling can wreak havoc on people's lives as well. Many people probably stress over the thought of losing money, but gambling addicts find the thrill of blackjack and poker far too enticing to ignore. In his memoir Born to Lose, Bill Lee describes how his grandfather sold his father to another family in China to cover a gambling debt. Lee's father was raised by this surrogate family and then emigrated to the United States, where he also gambled compulsively. In San Francisco, Lee began accompanying his father to gambling dens as his "good luck charm." Is it any wonder that Lee then became a gambling addict himself?

After working a series of well-paying jobs in Silicon Valley, Lee's career allowed him to participate in more high-stakes gambling; he played the stock market, then would drive four hours to Nevada to play blackjack for hours, then make the drive back in time for work the next morning. His recklessness contributed to the end of his marriage. Within a few years, Lee was bankrupt and he had gambled away his life savings and his home. Eventually, Lee knew he needed to get help, so he attended Gamblers Anonymous, and as of 2005, he had not placed a bet for four years. Lee's story shows more than just how easily addiction can ruin lives, it also shows some common themes of the disease.

Any activity or substance, like gambling, sex, food, or drugs can become addictive if it leads to persistent repetition despite life-destroying consequences. For Lee, the urge to gamble became worse as his life crumbled around him. Even as he was going through a divorce and a custody battle for his son, all he could think about was getting back to the tables. However, what leads someone to a gambling addiction? For Lee, it was just both nature and nurture that led him to gamble. Gambling addictions run in Lee's family but the nature of his brain certainly played a role as well. In

fact, one experiment shows that our brains are hardwired to find certain kinds of uncertainty pleasurable.

In an experiment conducted by Wolfram Schultz and his colleagues at the University of Cambridge, monkeys were trained to watch a computer screen for visual cues while a tube delivered them a drop of sweet sugar syrup. The monkeys learned to associate a green light with the delivery of the sweet syrup reward and a red light with no reward. Eventually, the monkeys were then introduced to a blue light that delivered a reward only 50 percent of the time. With the introduction of the blue light, monkeys began to experience dopamine surges as they waited to find out if they would get their reward after each blue light, much like a gambler experiences when waiting to see if he won big or not!

Activities like Running and Giving to Charity Can Also Activate the Pleasure Circuit

Jeff Tweedy, leader of the rock bands Wilco and Uncle Tupelo, struggled throughout his life with drug addictions to prescription painkillers, alcohol, and cigarettes. After a successful rehab and several years of sober living, he began running long distances. He ran 4-5 miles a day, 4-5 days a week. One summer he broke both legs from running too much and experienced stress fractures in both his tibias. He simply stated, "Once you're an addict, you're always an addict, so just because I found something good to do doesn't mean I'm not going to hurt myself doing it."

Like nicotine, orgasm, food, or gambling, exercise can also activate the pleasure circuit. But does this mean exercise is a virtue, a vice, or a little bit of both? Running can lead to short-term benefits that wear off after an hour or two, also known as the "runner's high." Runner-high is a short-lasting, deeply euphoric state - beyond the simple relaxation and peace -felt in the moments following an intense exercise. This high can be attributed to the increased opioid released in the brain as well as the increase of endocannabinoids, the brain's natural cannabis-like molecules, in the bloodstream.

Additionally, painful stimuli can also release dopamine into the brain. Jon-Kar Zubieta from the University of Michigan performed brain scans to measure the dopamine-release in subjects who received a painful stimulus produced by injecting a salt solution into the jaw muscle. The result was that long-term painful stimulus was associated with increased dopamine release in both the dorsal striatum and the nucleus accumbens. But why is this? Well, knowing painful stimuli will eventually end can make the relief a pleasurable experience in itself.

What about giving to charity? Can giving to charity activate the pleasure circuit? Some believe that people give to charity out of "pure altruism," that is, they feel satisfaction from providing a public good, like assisting the

needy. This belief implies that such individuals get some sort of pleasure out of giving to charity. Other people believe that being charitable is a result of seeking and enhancing social status. To find an explanation, William Harbaugh from the University of Oregon aimed to explain how various economic transactions affected the brain. The brain scanning results showed that both taxation and charitable giving activated regions of the nucleus accumbens in the same way as receiving money. The results of this study lead to the philosophical question, does “pure altruism” really exist? “In other words, if we catch a pleasure buzz from our noble instincts, does that make them less noble?

Final Summary

Whether you're smoking a cigarette, compulsively gambling, or indulging in sugary foods, many activities activate the pleasure circuit of the brain. The interaction of pleasure and associative learning in our brains is a classic two-edged sword: the ability of experience to produce long-term changes in the pleasure circuit allows us to feel pleasure, which has shaped much of our behavior and human culture. Unfortunately, that same process allows pleasure to be transformed into addiction. Thankfully, there are many other pleasure-inducing activities, like running and giving to charity, that can produce those same feelings without wreaking havoc on our lives.