Addiction and the Human Brain opens with several former drug addicts, now recovering at New York City’s Phoenix House, talking about their experiences with addiction. “I didn’t think of drugs as addictive. I just thought they were just something you did,” one former addict, Chris, tells viewers. Scientist Stephen Dewey of Brookhaven National Laboratories then shares his view that addiction is a brain disease.

The program introduces the brain as the most complex organ of the human body, responsible for thinking, behavior, memory, emotions, sensations—and response to drugs. Viewers meet Dr. Aaron White of Duke University who, along with Dr. Dewey, is one of the country’s most prominent researchers focusing on the causes and consequences of drug use, especially among teenagers. Dr. White reveals that the teen brain is very “moldable,” or able to be permanently shaped by experiences. Dr. Dewey adds that recent studies have shown the brain changes a great deal during adolescence, making it particularly vulnerable to drugs or changes in the environment.

The narrator poses a question: “Are teens more susceptible to the risk of becoming addicted?” Dr. White explains that a teen’s frontal lobes, the part of the brain responsible for planning and decision-making, are still maturing. “The fact that the frontal lobes are not fully mature in the teenage brain may help explain why teenagers take greater risks and act more impulsively than even people only a few years older,” the narrator says.

The program then zeroes in on the role of neurons. Dr. White explains that neurons communicate with each other by releasing chemicals called neurotransmitters. Dr. Dewey tells viewers that hundreds of different neurotransmitters exist in the brain, each one with its own specific role. One neurotransmitter, dopamine, plays a role in euphoric feelings. Viewers then learn that researchers use PET scans to observe and measure changes in dopamine levels, allowing them to image the ways that drugs affect the brain.

Next, the program addresses reward pathways. Two recovering addicts describe how their first experiences with drugs felt; the narrator explains that drugs feel good at first because they raise dopamine levels in the brain’s reward pathway, a chain of nerve fibers running from the brain stem to the prefrontal cortex. Dr. Dewey adds that all addictive drugs raise dopamine levels, but to different degrees.

The narrator points out that the reward pathway is activated by many beneficial things too, like favorite foods, music or a kiss. The surge of dopamine that accompanies such behavior is important to survival because it reinforces essential acts, like eating. But, the narrator tells viewers, drugs subvert the reward pathway in harmful ways. “All these drugs, the one thing they have in common is that they all trick the reward system into becoming activated. So you think you did something good when you didn’t,” Dr. White says. Dr. Dewey describes a study in which laboratory rats chose cocaine instead of food until they starved. The recovering addicts show how drugs take over a human’s reward pathway as well. “You don’t have a life. When I was using drugs, I didn’t even eat,” Amanda recalls.
Next, Dr. White explains that a natural dip in the reward system during the teen years may make teenagers even more susceptible to experimenting with drugs. “One of the things that is really common during adolescence is...for teens to feel a little blah, a little bit bored, slightly depressed on a regular basis,” he says. That dip can make teens more likely to take risks and try new things. Dr. White gives two reasons: a dampened reward system leads teens to take risks and explore, and drugs probably makes teenagers feel better than they would as adults with normal reward pathways. On top of that, he says, a teen’s immature frontal lobes make it harder for him to think about the negative consequences of drug use and therefore keep taking the drug.

The program then discusses tolerance. The narrator explains that drug use actually changes the brain, leading to a reduction in the response to the drug after prolonged use. Some of the Phoenix House recovering addicts describe how they had to begin to take higher doses to get the same effect. “When I first started using heroin, one bag would last me like a day or two. At the end of my heroin use I was [up to] 10, 20 bags. You just have to keep doing more and more,” Chris says. The narrator explains this effect by saying that alcohol, methamphetamine and Ecstasy kill neurons while cocaine causes a reduction in the number of dopamine receptors. “If you lose dopamine receptors, then you lose the ability to feel pleasure from things,” Dr. Dewey tells viewers. That means a cocaine user no longer enjoys things that used to be fun, causing her to take more and more cocaine to compensate for the loss. Nicotine works in a similar way, Dr. Dewey adds, causing the body to adjust to the drug and release less dopamine as time goes on. “There’s no question that chronic use alters not only the reward pathway, but the ability of the reward pathway to respond,” he says.

Viewers learn that continued use can also lead to dependence. Dr. White explains that the brain becomes accustomed to the drug until it can’t function without the drug, making the user feel horrible without it. “I had to have it. If I didn’t have any heroin in my system, I didn’t feel normal at all,” recovering addict Rachelle shares.

The program next moves to addiction; viewers learn that prolonged drug use can change not only the body, but also a user’s behavior. Drugs become central to the user’s life—taking them is no longer voluntary. The narrator explains that addiction is the compulsive physiological need for a habit-forming substance; the brain has been changed to the point where drugs matter more than anything else. Several addicts tell viewers they prostituted themselves or robbed their friends for drug money. Dr. Dewey adds that addicts’ brains can change even more than the brains of people with schizophrenia or Alzheimer’s. “I feel very strongly that addiction is a brain disease,” he says.

Next, the program explores new research about teen brains and addiction. Dr. White tells viewers that a teenager’s brain is capable of changing with experience and learning things quickly—but that ability can make teens become addicted quickly, too. “The body learns that this drug is on board all the time, so it learns to function while the drug is still there,”
he shares. Dr. Dewey points out that statistics show teen drug users are likely to be users as adults; “there’s no question that the adolescent period, the period when the brain is changing a great deal, is particularly vulnerable to the insult caused by drugs,” he adds.

The program moves on to recovery, or “reprogramming” an addict’s brain. Several recovering addicts share their struggles with quitting, emphasizing the power of cravings. The narrator tells viewers that cravings and relapsing are major obstacles to getting better. Dr. Dewey tells viewers that certain “triggers,” or people, places or things associated with drug use, cause a strong craving for the drug. He describes studies in which addicted animals that go to an environment where they used to get drugs actually experience an increase in dopamine. Some of the addicts agree, talking about their own triggers.

Viewers then meet Dr. Leslie Prichep of the New York University School of Medicine. Dr. Prichep describes her work using EEGs to measure the electrical activity in the brains of recovering teen and adult addicts. She reveals that adult addict brains display significant healing after nine months of abstinence from drugs, but that teen brains showed little recovery. “It looked as if the damage done to their brains by the exposure to drugs was irreversible,” she says.

The narrator then reassures viewers that teen addicts are not necessarily doomed; the ability of the brain to change and adapt may help compensate for the damage. Dr. Prichep explains that the brain is plastic—when one region of the brain is damaged, another region can often take over. So while there may have been harm done by drug abuse, she says, the brain can often rebuild its circuitry to get around that damage.

Next, recovering addicts discuss how they must change their behavior in order to successfully quit. Jose Diaz, a former addict who is now a counselor at Phoenix House, talks about his experiences as both a recovering addict and a counselor.

Finally, the program wraps up with Dr. White emphasizing the importance of preventing addiction instead of treating it. “That the brain is changing so much during the teen years means that the decisions teenagers make about what to do with their time have a direct impact on how they shape their own brains,” he says. As the video draws to a close, the recovering addicts tell viewers that they never imagined they would become addicted when they started taking drugs.