Brionna Purvis Profesor Rinehart-Kim Genetics- BIO 294 November 3, 2023

## Writing Assignment #5

This source is from a national newspaper, "The Washington Post;<sup>1</sup>" the article was was written on November 2, 2023, it is titled "Can brain ultrasound treat addiction? A cocaine study may hold answers.<sup>1</sup>" This article is related to genetics because it talks about how brain ultrasounds can help treat addiction disorders. Addiction disorders works in our genes by causing epigenetic marks that may cause adverse affect on health and traits that may be passed to children. Cocaine can cause DNA to make proteins that are common in addiction. These altered proteins can cause drug-seeking behavior in the organism. There is an alarming rate of people that suffer from substance disorders, "in 2021- 46.3 million people in the united states age 12 or older were addicted to alcohol or drugs such as opioids and stimulants.<sup>1</sup>"

This article talks about a study that can reset your brain and stem the craving of addiction. There are currently two ongoing studies that have to do with addiction and ultrasounds, University of Virginia (UVA) has a study that evaluate the effectiveness of ultrasounds to treat cocaine use disorder and West Virginia University School of Medicine has a study that ultrasounds are the primarily treatment of substance disorders this can include opioid, alcohol, cannabis, methamphetamine, and cocaine. UVA study has participants placed in a functioning MRI machine, this machine measures changes in blood flow through the brain. Participants are then shown images of addiction like; "cocaine, cocaine use and paraphernalia such as pipes and needles, and asked to rate their craving.<sup>17</sup> Ten to Twenty minutes of treatment was enough for changes to be expressed. Treatment includes low- intensity focused ultrasound (LIFU), it is a non-invasive brain stimulation therapy. LIFU is a important new treatment for helping patients that are currently failing other therapies that have to do with their addiction. The benefit of this LIFU treatment is it doesn't require anesthesia and is non-invasive. This treatment is used to regulate the flow of messages between neurotransmitters which is believed to reset the brain. The individual is no longer influenced by their craving to their specific addiction.

This article also talks about different brain stimulation therapies that are currently being used to treat different conditions. Electroconvulsive therapy (ECT) has been around for about a century now. The patient is placed under anesthesia and has a electric current sent through their brain this can cause a seizure. ECT is still practice today and can be used to treat major depression disorder, schizophrenia and bipolar disorder. ECT is not the stimulation therapy that is used to treat substance disorders. Deep brain stimulation (DBS) requires implantation of neurostimulator being placed into the brain. DBS can be used to treat Parkinson's disease, obsessive compulsive disorder (OCD), and epilepsy. There are over 200,000 people that have gotten these implants across the world, it is highly effective. However one set back can be it requires invasion brain surgery to attach the implants. Transcranial magnetic stimulation (TMS) doesn't require anesthesia or surgery, it uses magnetic pulses to stimulate cells in the brain.

TMS has been approved to treat major depressive disorder and obsessive compulsive disorder. It also shows potential for treating substance abuse disorders, however there is a set back the magnetics used can't precisely target the brain stem that is involved in addiction, so other areas may end up getting stimulated as well. Low- intensity focused ultrasound (LIFU) is used to treat substance abuse disorder, this treatment works by precisely targeting structures in the brain using mechanical and acoustic energy. LIFU has been used in a number of treatment options for things

like Alzheimer's disease, addiction, coma recovery, and brain cancer. For the UVA study that focused on the insular cortex of the brain. This plays a key role in the reward system in our brain, it is involved in interpreting the signals sent from different parts of the body.

## References

<sup>1</sup>Jones, Sam. Can brain ultrasound treat addiction? A cocaine study may hold answers. The Washington Post; https://www.washingtonpost.com/wellness/2023/11/02/addiction-ultrasound-therapy-cocaine/

(2023)