

The Physical and Neurological Impact of Excessive Opioid Use in Athletes

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ABSTRACT

This literature review discusses how opioids affect the brain and body, as well as athletic performance. When taking opioids, one may experience physical effects such as drowsiness, nausea, slowed breathing, and dizziness. There are also neurological effects, including euphoria, confusion, and sedation. While all of these can impact day to day activities, they can be even more harmful to the rigorous life an athlete leads. Focus is a big part of any sport, and losing concentration can lead to poor performance and results. Drowsiness and confusion are the biggest factors of fluctuating focus. Not only that, but the decrease in dopamine associated with dopamine leads to brain injury, tiredness, sleep deprivation, and stress. Sleep and stress levels play an important role in performance, determining reaction time, recovery rates, and precision. High levels of stress are also likely to end in burnout. While opioids may seem like a smart decision to deal with pain from injuries, and get back on the field faster, its cons outweigh its pros. There are other pain management methods that are less risky, such as physical therapy, over the counter medicines, and acupuncture.

Introduction

The effects that come with the misuse of opioids can greatly impact one's lifestyle. Because of the availability of these drugs, anyone is susceptible to these dangers. However, because of the mental and physical pressures they bear, opioids can be especially dangerous for athletes. Most athletes feel the need to "play through the pain", causing them to use strong pain killers to expedite their recovery. Because of this common overuse post surgery, athletes tend to form an addiction to these dangerous drugs which drastically decreases their athletic performance. For example, overuse of these drugs have shown to lessen attention span and memory retention. The production of dopamine comes to a halt as opioids enter one's system, causing loss of executive function and control. Additionally, the increased heart rate and slow breathing that accompanies the use of these drugs can be extremely harmful to a player's overall athletic performance.

A part of the cause of opioid addiction in athletes is the drugs they are given post surgery. According to an article by the Arthroscopy Association of North America, a study relating to this cause was performed in Rosemont, Illinois. In this study, researchers showed the mean MME (morphine milligram equivalent) prescribed to athletes during procedures such as a hip or knee arthroscopy in comparison to the MME actually used. It was shown that in a hip arthroscopy, only 223/613 MME was used, leaving a percentage of 64 over the needed prescription amount. Because of this overuse in prescription painkillers, athletes are left more susceptible to developing an addiction with the increase in drugs they are being given post-surgery.

The neurological impacts opioids can bring on is extremely damaging. Since sports and rigorous exercise require flexible and strong bodies, it is common for most athletes to be younger. It takes the brain about 25 years to fully develop, meaning consuming drugs and painkillers at a young age can alter one's brain in various ways, adding to the dangers of these drugs. According to a study by Mountain Springs Recovery, the use of nonmedical opioids can disrupt the brain's wiring and neurotransmitters. By doing this, the brain starts to crave for those drugs, which may be

a slippery slope to addiction. To continue, one in four people who seek out rehabilitation for a brain injury have abused drugs or alcohol. Not only does increased opioid usage put people at risk for experiencing seizures, but it may also cut off oxygen to the brain; resulting in decreasing heart and breathing rates. (Mountain Springs Recovery, ND)

According to the National Institute of Health, an estimated 5 to 8 million Americans use opioids to manage their chronic pain. People use these painkillers to manage pain caused by injury, illness, or diseases. Because of its high majority of accidental overdose deaths, it is not recommended for a long term course of treatment for pain. However, opioid prescriptions have drastically increased over the last 20 years. (Mayo Clinic, 2023) The most common opioids doctors will prescribe for chronic pain include hydrocodone, morphine, and oxycodone. This leaves athletes susceptible to opioid overuse because of the higher risk for injuries through sport. It is estimated that over 3.5 million sports related injuries occur in the United States for children under 14 per year, and over 775,000 of those children are treated in a hospital for their injury (John Hopkins Medicine, ND). It is crucial that steps are taken to protect athletes in this situation from developing an addiction to prescribed opioids.

The most efficient plan to reduce severe outcomes is to educate athletes on the risks of intense painkillers, provide healthy coping strategies, and prevent easy access to pain medication when necessary. It is with urgency that action is taken to protect athletes from becoming addicted to painkillers, as the opioid use rates in high school athletes is 28-46%, and 52% in an NFL player's career (Kalore, ND). Examining multiple credible studies regarding neurological and physical health of athletes suffering with drug addiction, this paper aims to examine the role of opioids and how they can impact athletes.

Methodology

The objective of this study was to educate people on the risks and hazards of overusing pain medication such as opioids and other painkillers. This paper is designed to be a literature review, rather than an in field study. This is an exploratory research paper. It is to be reiterated that this study has been conducted solely using online sources, and because of this no ethical considerations should be observed. No physical tools or resources were used to conduct this study. In this paper, multiple reliable sources have been used, including AANA, NIDA, NIH, Mayo Clinic, and more. Numerous other sources were used to collect data on the neurological and physical impacts of opioid overuse, and how it is applicable to an athlete's lifestyle. To carry out this method of analysis and data collection, numerous primary studies were analyzed to collect data regarding the health of athletes and opioid users. There were conclusions made about the correlation between opioid usage and an athlete's overall performance.

What are Opioids?

Opioids are drugs that can be made from the opium poppy plant or in laboratories, and are mainly used for pain relief purposes. While some opioids including oxycodone, hydrocodone, and morphine can be prescribed for medical reasons, others such as heroin and fentanyl can be produced and used illegally. When one consumes opioids, the drug travels through the blood and into the brain to attach to opioid receptors. These receptor cells are located in the spinal cord and brain. By attaching to these receptors, pain messages are blocked. This is what makes opioids popular for pain relief and pleasure. Some long term effects of using opioids can be euphoria, confusion, nausea, and drowsiness. In most cases of overuse and overdosing, symptoms can include cognitive impairment, delirium, and hallucinations. By taking higher doses, people experienced a slow heart rate and breathing rate, which may lead to hazardous injuries and even death. By developing opioid use disorder, it is more common to see hypoxia. Hypoxia is the low levels of oxygen blood in your tissues, normally caused by a slowed breathing rate and difficulty breathing. This condition can be a direct effect of opioid usage, and is extremely harmful and deadly to the human body.

Neurological Deficits

Opioid overuse for athletes pose many neurological risks, risks that could affect one's athletic performance. When you take opioids for an extended period of time, it can alter your brain's reward system. This is what causes dependency on the drug leading to addiction. The reward system's main purpose is to reinforce the behaviors we need to survive, such as drinking water, eating, and sleeping. These reward systems activate dopamine, a neurotransmitter in the brain, which makes you feel satisfied and encourages you to repeat the reward inducing behavior in the future. Then, when that dopamine enters the amygdala, the part of the brain that processes emotions, it relieves anxiety and stress. This is what reinforces the idea that opioids are rewarding, and causes one to use them more and more often. (Yale Medicine 2022)

According to the Brain Injury Association of America, opioid use impairs the frontal lobe of the brain, which negatively affects cognition and function (Carroll, ND). The frontal lobe is the largest lobe of the brain, and is responsible for movement, communication, reasoning, learning, and recall. When the frontal lobe is damaged by the use of drugs, all these areas start to lack as well. The usage of opioids has also been linked to multiple mental illnesses, such as depression and anxiety. All of these symptoms make it more difficult to recover, and maintain good general health. Athletes may find it difficult to stop using opioids due to the long-term neuroplastic alterations caused by usage, which could result in a vicious cycle of dependency. (Cicero et al., 2014; Volkow et al., 2016).

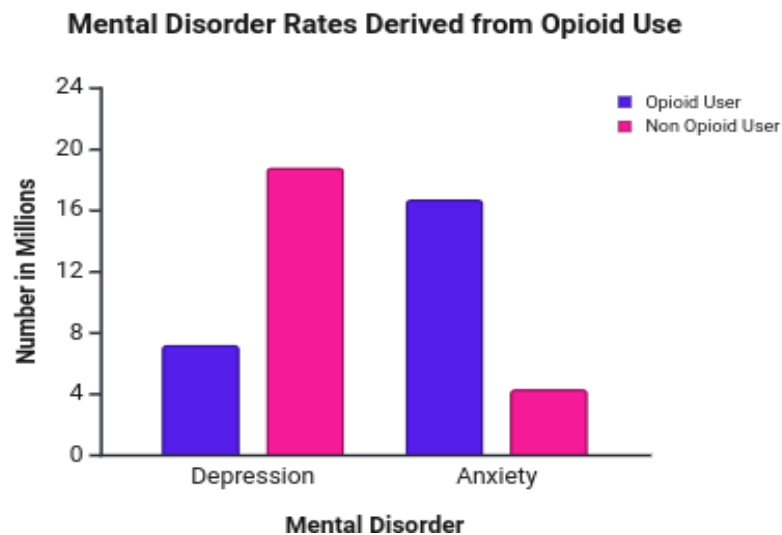


Figure 1. Description: The figure above displays the estimated number of adults with a mental disorder and use prescription opioids. The data shows a positive correlation between opioid use and recorded anxiety cases. (Davis et al., 2017)

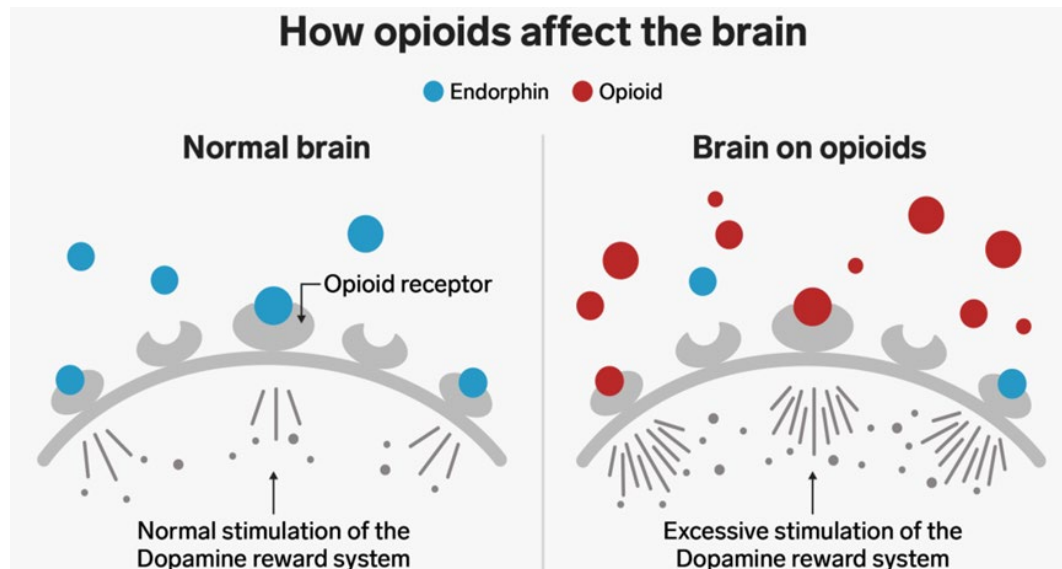


Figure 2. How opioids affect the brain. Source: PursueCare, 2019. Description: The figure above depicts how opioids travel throughout the brain. Normally, endorphins attach to the opioid receptor and provide normal stimulation of dopamine. However, opioids take the place of endorphins by attaching to the opioid receptor, causing an excessive amount of dopamine stimulation in the brain, and causing an imbalance in the brain.

Physical Deficits of Opioid Overuse

To continue, the effect of these narcotics can make an extreme impact on one's physical health as well. According to Yale Medicine, use of opioids alters your brain making your risk for injuries from accidents significantly higher. When using injectable opioids, injecting it into your blood puts you at risk for diseases such as Hepatitis B, Hepatitis C, and HIV, or human immunodeficiency virus. Diseases as such can decrease one's quality of life, and have serious effects. Usage of opioids can also lead to nausea and constipation, suppressing the immune system and making one prone to various illnesses (Ledger 2020).

Respiratory depression, also known as hypoventilation, is also a common complication of drug use. This occurs when one does not have enough oxygen entering the bloodstream by breathing too shallowly, and instead carbon dioxide starts to build up in the blood. The increase in carbon dioxide is also called hypercapnia. Hypercapnia can cause hypoxia, which is when the tissues in your body aren't receiving enough oxygen. Respiratory depression can eventually lead to life threatening cardiac arrest, or respiratory failure. (Cleveland Clinic 2022).

While uncommon, it is possible to experience effects such as xerostomia, hyperalgesia, pruritus, and delayed gastric emptying. Xerostomia is the condition of dry mouth. While not very extreme, left untreated it can lead to dental issues such as gum disease or tooth decay. Hyperalgesia is an increased sensitivity to pain, caused by opioids damaging nerves and its pathways. Pruritus refers to itching, and while its most common cause is dry skin, it can also be caused by nerve damage when the itching is localized to one area such as the upper arm. According to sources at cleveland clinic, delayed gastric emptying is "the process by which the contents of your stomach are moved into your small intestine". It is also known as gastroparesis, and is when the muscles in the stomach are weak, and is unable to efficiently move food into the small intestine. Like all the other effects, the common cause of this disorder is nerve damage, which is a direct result of opioid use. (Yale medicine, ND)

Overall Effect of Opioids on Athletic Performance

Overall, the use of pain medication such as opioids have a relatively negative effect on one's health and athletic performance, Although it is easy to use them to deal with pain, whether it;s from an injury, or chronic pain, it can do more harm than good. According to Dr. Amos, opioids are a depressant, and many athletes get depressed because they can't deal with their injuries, and soon become addicted to the opioids. (St John's University, 2023). These same drugs then go on to make these athletes drowsy and confused, leading to a loss in agility, speed, focus, and reaction time- all necessary components for athletic success. Injuries are the easiest way for athletes to access these drugs, as they are used to manage pain. Thousands of athletes get injured due to their sport every year, leaving many people susceptible to addiction. For sports injuries in 2011-2016, 63.9% of patients were administered analgesics, or pain medication. Opioids accounted for 22.5% of those patients. (Benjamin et al., 2024).

Sport	Number of Injuries
Football	394,350
Basketball	389,610
Soccer	172,470
Baseball	119,810
Softball	58,210
Volleyball	43,190
Wrestling	40,750
Cheerleading	37,770
Gymnastics	28,300
Track and Field	24,910

Figure 3. This graph displays the type of sports played, and the number of injuries recorded from people 19 and under in 2012. Source: (State of New Jersey Department of Education, 2012)

The graph above also shows that the majority of injuries are suffered from contact sports, with football having the highest number of injuries. According to the University of Pittsburgh Medical Center, one of the most common contact sport injuries is a concussion, as 10-19% of athletes who play contact sports will suffer a concussion each season(UPMC, 2023). Studies have shown that opioid use can make injuries like this extremely worse. According to the Indiana Department of Health, the use of opioids can exacerbate the effects of a pre-existing TBI (traumatic brain injury) and the cognitive and behavioral impairments associated with the injury. (Trexler et al., 2020)

Conclusion

In conclusion, the repercussions of opioid use can be detrimental to one's health. Not only can it affect you physically, by making you feel nauseous and drowsy, but it can affect the executive function of your brain, causing many mental disorders. This issue is immense, and can decrease an athlete's performance levels severely.

Although opioid overdose is dangerous and hard to recover from, steps can be taken the reduce the risk of becoming addicted altogether. By staying educated on the medication you are taking, talking to your doctor about the risks if they have prescribed opioids to you, and exploring all treatment options that may provide greater benefits relative to the risks associated with overuse and addiction. Ultimately, this research focuses on the impacts of opioid use to one's health and is aimed to bring awareness to the dangers of drug overuse.

Acknowledgments

This research paper was conducted under the guidance of Professor Katie Wilwohl and Professor Virgel Terremocha. I am extremely grateful for their knowledge, as well as Coach Jo from Gifted Gabber and her assistance. I would also like to acknowledge my parents for their overwhelming support through my research journey,

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