

## CAFFEINE EFFECTS

### **What Neurological Effects Do The Prolonged Consumption Of Caffeine Have?**

Madison Jones

Summer Science Research Program, The Opportunity Network

### **Author Note**

Madison Jones is a freshman at the University Of Southern California studying Health And Human Sciences on a Pre Medical track. This research was conducted for the purpose of finding out the long term effects of caffeine on the brain and determining whether regulation on caffeine consumption is necessary. Correspondence concerning this article should be addressed to Madison Jones, Contact: [jonesmad@usc.edu](mailto:jonesmad@usc.edu)

### **Abstract**

This research investigates the long term neurological effects caffeine can have on the body. A literature review was conducted with sources focusing on age, mental health and other factors with the revelation that caffeine can affect the chemicals in the brain, ability to sleep, and other neurological practices. It has also been revealed that research is needed through longitude studies to understand the full scope of impact caffeine can have.

### **Introduction**

Caffeine is a natural stimulant most commonly found in coffee, tea, energy drinks, and even chocolate making it an easily accessible source of energy. Nearly 3 in 4 Americans drink coffee everyday (Allen, 2024). However its prevalence also transcends geographic, cultural, and socioeconomic boundaries and is a fundamental part of the daily lives of millions of people worldwide.

As a central nervous system stimulant caffeine has the ability to increase alertness, concentration and cognitive performance by blocking adenosine receptors in the brain. These effects have made caffeine a popular option to combat fatigue and enhance productivity.

Around the world caffeine is also known to have cultural significance in places like East Asia where tea is used ceremonially and has deep historical roots and even South America where caffeine is often integrated into social events and drives agriculture.

However it is also important to note that while moderate consumption of caffeine can have positive effects, prolonged consumption can cause neurological effects on the brain and body. Over time the continued use of caffeine can lead to physical dependence due to its ability to alter brain chemistry and its addictive properties (Hilliard, 2024). As a result of these addictive properties, regular coffee users experience withdrawals when abruptly reducing their caffeine intake resulting in migraines, fatigue, irritability, and difficulty concentrating.

Current research into the neurological effects of the consumption of caffeine has revealed both short and long term consequences on brain function. More specifically, studies have demonstrated that excessive caffeine intake can disrupt sleep patterns, leading to insomnia and reduced sleep quality, which in turn affects cognitive performance and mood regulation (Roehrs & Roth, 2008). In hopes of gaining a deeper understanding of this topic, longitudinal studies are also being conducted to track the cognitive and neurological changes associated with chronic caffeine use over extended periods (Rogers et al., 2020).

Although current research has touched upon the long term effects caffeine can have on the body, it has also left me curious about the association of long term caffeine consumption with cognitive function. More specifically I hope to explore different mechanisms of caffeine influence on the brain and different neurological processes.

## **Methods**

I will use the research I gathered to set the framework for study. Current information gathered from my literature review includes relevant studies focused on adults 18 years and older and examines the neurological effects of extended caffeine consumption. This is done through longitudinal, randomized controlled trials and meta analysis.

To find relevant sources for my literature review I used Google Scholar and JSTOR. In my search bar I used keywords like “caffeine”, “long term”, and “neuroscience effects” to find information. When reviewing these sources I looked for articles that contained information about the impact caffeine has had on cognitive function specifically in adults and older people. This helped me eliminate less suitable sources solely containing information on adolescents and short term caffeine effects.

I will analyze these studies to find patterns, key characteristics and overall similarities and differences. This will allow me to ensure meaningful connections between studies and will also set the framework for my own research. Building upon the past studies of researchers I plan to conduct a study that will assess the impact of caffeine on cognitive function. In doing this I hope to not only find an answer for my research but also find if the effects of caffeine can be replicated without caffeine.

## **Discussion**

The current discussion regarding the effects of caffeine have begun to explore the implications its consumption can have based on certain factors. More specifically a study presented by Sergi Ferré aims to examine the difference in effects caffeine has on the body in

adults vs children. Additionally a study conducted by Brian Fiani et al. focuses on the effects caffeine can have on not only cognitive function but mental wellbeing.

The two studies share similar perspectives on the idea that caffeine has positive effects on memory. There is however a differing perspective on the conclusion on the impact of caffeine on mood. More specifically the second study believes more research is needed for a conclusion as he had mixed results. Both authors agree that further exploration into this topic is needed as well.

### **Conclusion**

These studies have set the tone for the importance of this topic and influence of future research that is conducted. There is not yet enough information to examine the full long term effects of caffeine on the brain and its functions. Current researchers believe future studies can examine factors that relate to high caffeine use and risk of high-level caffeine use as well as the long-term effects of caffeine use, particularly studies beginning in childhood and progressing to adulthood.” Researchers also believe future research can examine the correlation between caffeine consumption dosage and mood levels as well as the Factors that could influence mood levels within analysis to prospective consumption(socioeconomic, family, etc). Research on this topic has the power to change how caffeine is marketed to the public as well as how much caffeine is put into products. Information about its effects will be more accessible through resources like ads, social media, articles, etc. This research could also impact people seeing caffeine as the first source for energy and even begin regulating their consumption.

## References

Allen, L. (2024, February 1). *2024 coffee statistics: Consumption, preferences, & spending*. Full-Service Market Research Company.

<https://www.driveresearch.com/market-research-company-blog/coffee-survey/>

Ferré, S. (2014, April 23). *Caffeine effects on the central nervous system and behavioral effects associated with caffeine consumption*. Caffeine in Food and Dietary Supplements: Examining Safety: Workshop Summary.

<https://www.ncbi.nlm.nih.gov/books/NBK202225/>

Fiani, B., Zhu, L., Musch, B. L., Briceno, S., Andel, R., Sadeq, N., & Ansari, A. Z. (2021, May 14). *The neurophysiology of caffeine as a central nervous system stimulant and the resultant effects on cognitive function*. Cureus.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8202818/>

Hilliard, J. (2024, May 14). *Caffeine addiction and abuse*. Addiction Center.

<https://www.addictioncenter.com/stimulants/caffeine/>

Rogers, P., Larke, A., Mayhew, H., & Tupper, S. (2020). *Coffee but Not Caffeine Consumption Reduces the Reward Value of Coffee*. liebertpub.

<http://online.liebertpub.com/doi/full/10.1089/ten.tea.2016.0369>

T, R. T. (2008, April 12). *Caffeine: Sleep and daytime sleepiness*. Sleep medicine reviews.

<https://pubmed.ncbi.nlm.nih.gov/17950009/>