

# Correlation between Stress and Immune System of High School Students

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## **ABSTRACT**

The human body's immune system comprises several complex parts and processes. It helps us protect and defend our body against several infections. The immune system comprises White Blood cells, antibodies, the lymphatic system, and more. Apart from just fighting off infections, the immune also remembers the microbe, which makes it easier for our body to fight it off the next time we are infected by the same microbe. As our immune system plays a crucial role in our lifestyle, it is important to understand what impacts the functioning of our immune system.

## **INTRODUCTION**

With a variety of parts and processes, our immune system works together to defend the body. From the superficial to deep levels, our immune system has mechanisms to defend our body from foreign invaders. The physical barriers consist of skin and the mucous membrane and they are considered to be the first line of defense. The phagocytes destroy the foreign invaders by destroying them. The Natural killer cells attack the cells that are infected and they also fight against tumors. B lymphocytes produce antibodies, the T lymphocytes help in orchestrating the immune response, and the B cells and T cells are memory cells. The process of fighting a foreign invader works in a 4 part process: recognition of immune cells, activation of immune cells, destruction of invaders, and memory formation.

The immune system continuously helps us in our day-to-day lives. However, the choices that we make in our lifestyle can impact our immune system as well. These choices include diet, sleep, exercise as well as stress impact our immune system. As a busy high school student, with a weak immune system, it was crucial to further understand the correlation between lifestyle and the functioning of the immune system for juniors and seniors studying in high

school. Understanding the impact of certain lifestyle choices and their impact can help in the discovery of precautionary measures for upper high school students to protect their immune systems.

Though there is a lot of research present that explains the relationship between the immune system and our lifestyle, detailed research with specific qualitative data for the age group of 15-18 and how their lifestyle choices affect their immune system is elusive. This paper dives deeper into stress and its impact on the immune system.

### **MATERIALS AND METHODS**

To conduct this research, a primary research survey was conducted that surveyed high school students who are juniors and seniors. They were asked a variety of questions regarding their lifestyle as well as their immune system to help further understand the relationship between lifestyle and the immune system.

The form asked about their workload at school and outside of school, the frequency and intensity of physical exercises, sleep schedule, diet, substance usage, stress levels, medical history, and certain symptoms that help infer the strength of their immune system.

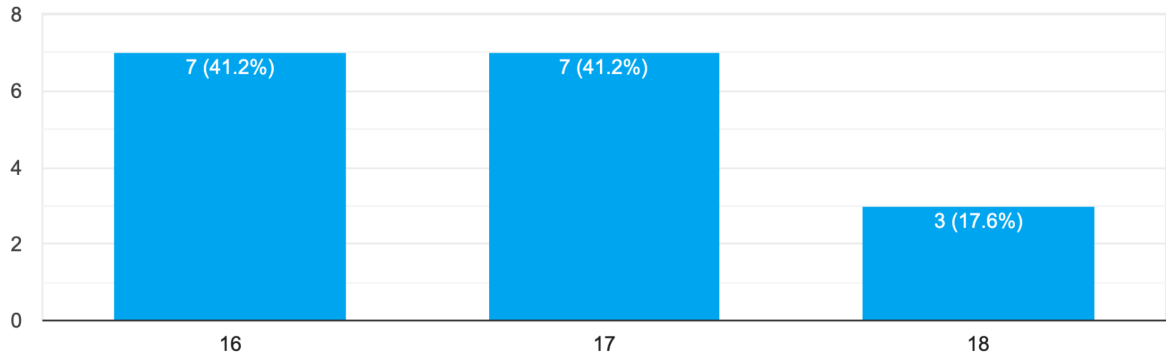
Later, all of the results were compiled in an Excel sheet and were converted to charts and tables to decipher the relationship between the immune system and lifestyle.

# RESULTS

## Age

### Age

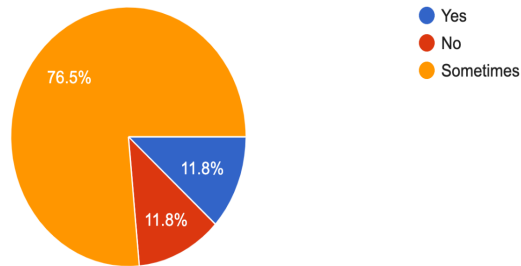
17 responses



## Sleep Schedule

### Do you sleep and wake up at the same time everyday?

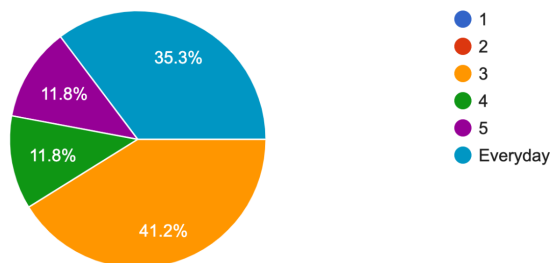
17 responses



## Stress

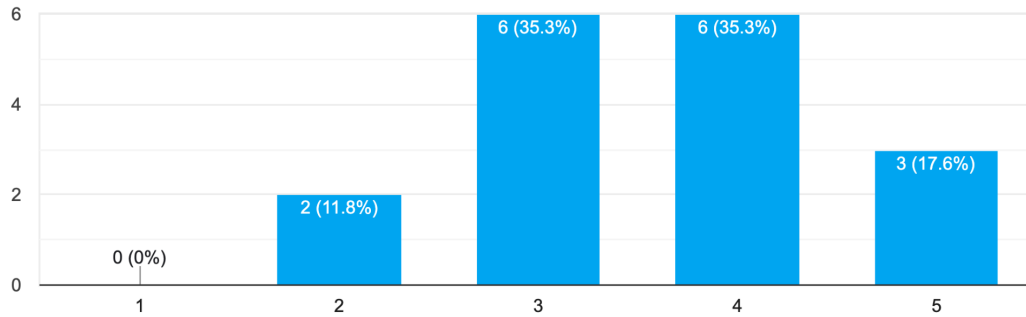
### How often do you feel stressed/ anxious/ overwhelmed in a week?

17 responses



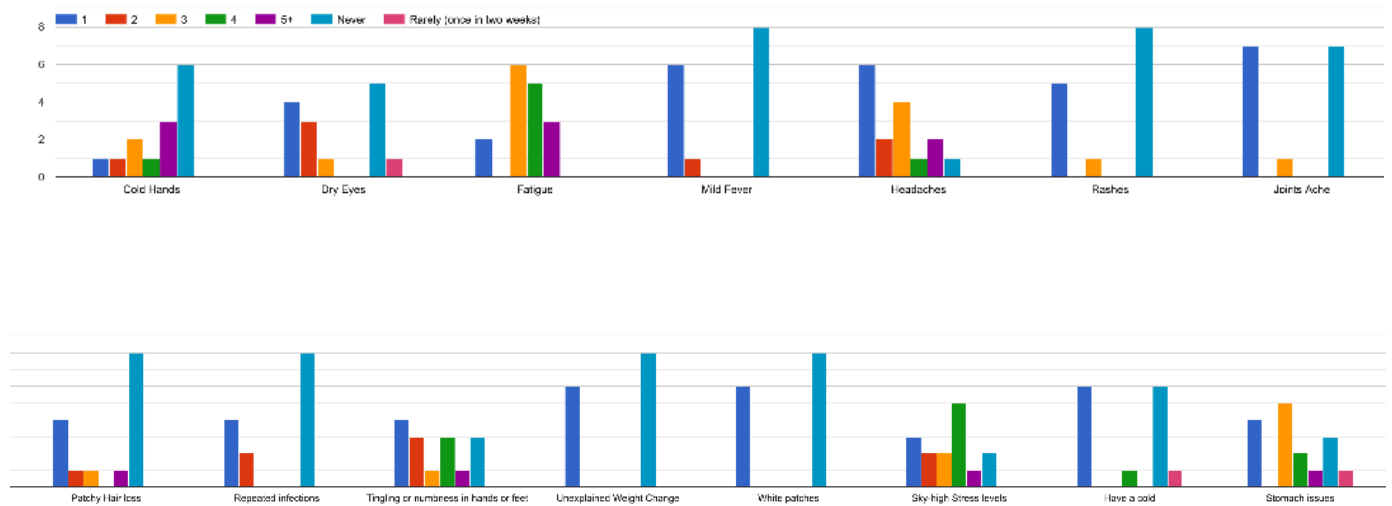
## What is the intensity of your stress levels

17 responses



## Symptoms of a weak immune system

How many times a week do you face these symptoms

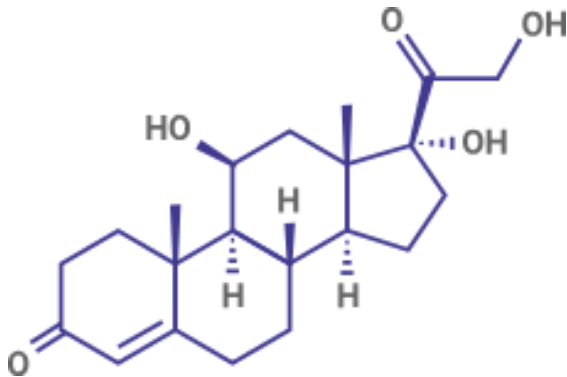


## DISCUSSION

Though most people in the survey feel a stress intensity of level three or four, they show very few signs or symptoms of a weak immune system such as joint aches, cold hands, dry eyes, and more. This data collected seems to deviate from the common misconception that high stress levels can negatively impact the immune system.

Diving deeper into the issue above, though they experience a moderate-high stress intensity level, the frequency of feeling stressed or anxious for the majority of the responders was three. This shows that out of seven days a week, the high school students only felt stressed or anxious only three days which is a fairly low frequency.

This is because, when a person is stressed, a hormone called cortisol is released. Cortisol is a glucocorticoid hormone that is released by the adrenal glands. This hormone is crucial to maintain the physiological homeostatic balance of our body.



(“Understanding Cortisol | Cortisol Matters”)

Cortisol plays a huge role in stress response as well as the regulation of the immune system. When a person is stressed for a short time, the cortisol released can help to boost their immunity. This happens because the cortisol limits the inflammation. Inflammation is a form of a response from our immune system that is usually in response to harmful stimuli that involve pathogens. Cortisol reduces inflammation by downregulating the prominent inflammation

transcription factors. Reducing inflammation in our body helps lower blood pressure, boost a person's mental health, and improve overall health, which helps boost the immune system.

However, if a person experiences prolonged stress levels, cortisol seems to hurt the immune system. Although cortisol is a very common anti-inflammatory response, chronically elevated levels of cortisol can weaken your immune system. Elevated cortisol levels can increase inflammation instead of limiting it, which in turn weakens your immune system. Apart from cortisol levels impacting inflammation levels, it can also decrease the levels of the lymphocytes in the body. Having lower levels of lymphocytes makes you more prone to be infected by viruses and bacteria. A common sign of having low lymphocyte levels is a frequent common cold. This situation is called a "stress-induced sickness" (Clinic). Stress levels can also indirectly impact the immune system. Stress can lead to depression which again leads to higher inflammation levels. When a person consistently has higher inflammation levels, the immune system is over-tired and is consistently fighting, making it harder for the system to fight and protect you against other infections and foreign invaders. Moreover, high levels of cortisol can cause autoimmune diseases. An autoimmune disease occurs when our immune system is overly active, which causes it to attack the tissues of our own body. These diseases can be serious because though there are treatments available, there are not any cures currently present.

The above reasoning helps to prove why the immune system of high school students who experience high-intensity stress levels is not negatively impacted. This is because in a week they feel stressed for only three days and are not experiencing any form of chronic stress.

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