HIGH SCHOOL EDITION
Journal of Student Research
Volume 13 Issue 4 (2024)

Resilience: Its Importance and Relationship with Cortisol

Aarya Bhushan

Henry M. Gunn High School, USA

ABSTRACT

Approximately 43.8 million adults suffer from a mental health illness in a given year. To put things into perspective, 1 in 5 adults in the United States, alone, experience a mental illness. Mental health issues are one of the most common health problems in the United States. In thinking about how to lessen the burden of mental health, one possible strategy is to increase resilience which has previously been defined as “the capacity to “bend but not break””. One mechanism through which resilience may act as a protective factor is its relationship with cortisol. Cortisol is a hormore produced by the two adrenal glands, which are small, trangular-shaped glands located on top of both kidneys. Its release is regulated by the pituitary gland in the brain, and it plays an important role in the body’s stress response. Maintaining an adequate balance of cortisol is essential for health, especially mental health. In the following paper, we will review prior studies conducted in adults, looking at relationships between resilience and cortisol. We will then summarize key takeaways and discuss potential strategies to improve resilience and cope with negative outcomes of stressful experiences with the overarching goal of reducing the number of 43.8 million adults experiencing mental illness in a year.

Introduction

It is likely that everyone reading this sentence has gone through some type of stressful experience in their lives. The outcomes of stress exposure can vary drastically depending on factors from individuals’ physiological responses to their coping strategies. One potential negative outcome from exposure to stressful situations is mental illness. To put things into perspective, 43.8 million adults experience mental illness in a given year. 1 in 5 adults in America, alone, experience a mental illness. In thinking about how to lessen the burden of mental health, one possible strategy is to increase resilience which has previously been defined as “the capacity to “bend but not break”” (Aizpurua-Perez et al., 2023).

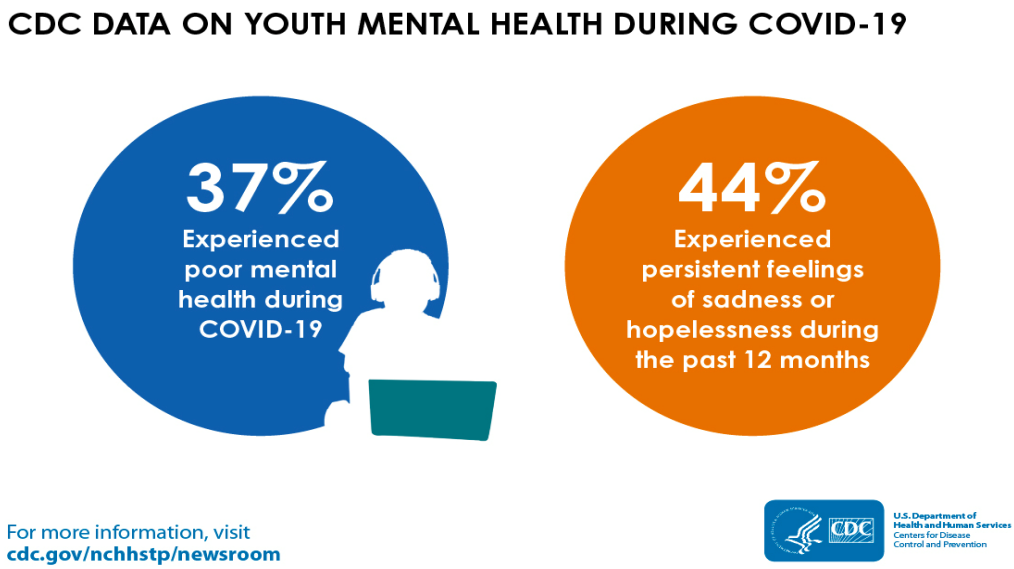

Figure 1. Data showing increase of poor mental health during the pandemic of COVID-19

(Figure from LoBue, P. (2022). New CDC data illuminate youth mental health threats during the COVID-19 pandemic: CDC's first nationally representative survey of high school students during the pandemic can inform effective programs: Press release embargoed until: Thursday, March 31, 2022, 1: 00 pm ET.)

What is Known

One mechanism through which resilience may act as a protective factor is its relationship with cortisol. Cortisol is a hormone produced by the two adrenal glands, which are small, triangular-shaped glands located on top of both kidneys.

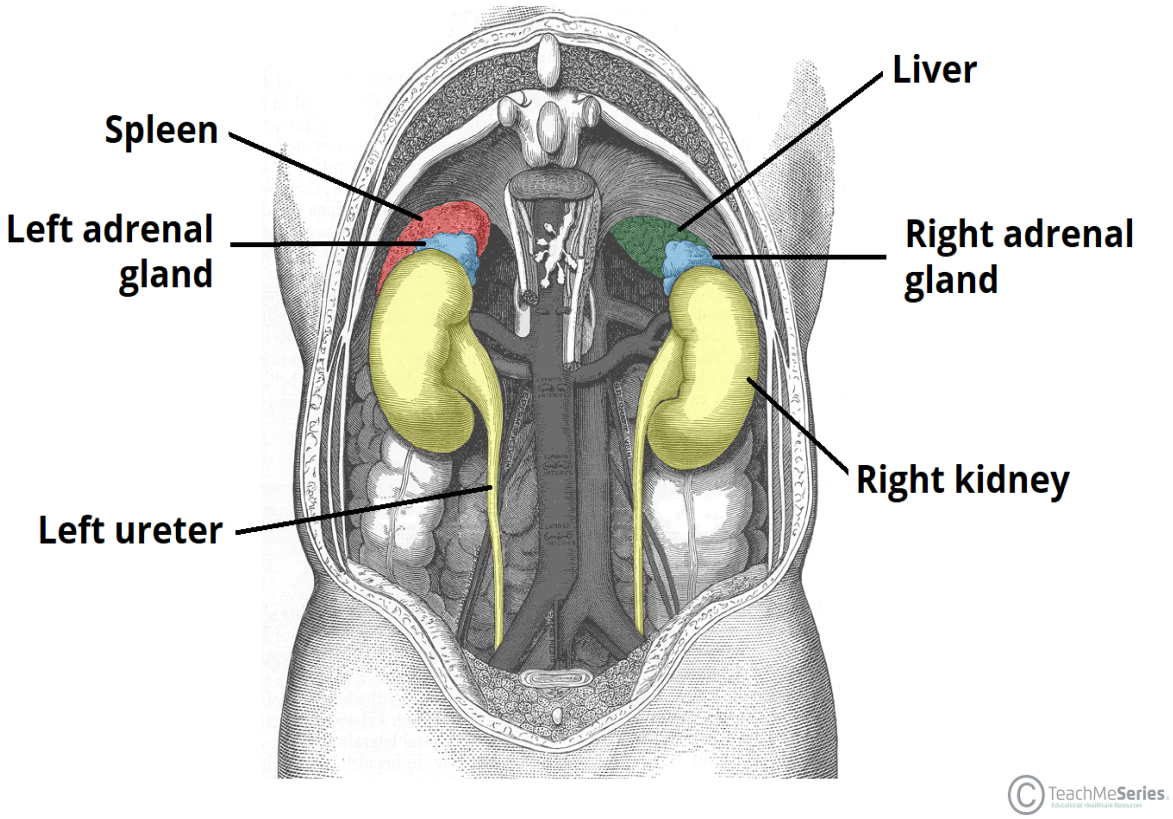

Figure 2. Diagram of the frontal abdominal area of the human body. (Figure from Martin, L. R. (2022, December 19). The adrenal glands. TeachMeAnatomy. https://teachmeanatomy.info/abdomen/viscera/adrenal-glands/)

Its release is regulated by the pituitary gland in the brain, and it plays an important role in the stress response (Pruthi et al., 2023). Maintaining an adequate balance of cortisol is essential for health. For example, abnormal levels of cortisol have been associated with negative outcomes such as depression and emotional irritability (Dziurkowska & Wesolowski, 2021). Prior research has found a relationship between resilience and cortisol levels, suggesting higher resilience may help regulate cortisol levels and thereby protect against negative outcomes from stressful experiences. Therefore, a thorough understanding of prior research will be important to understand this relationship and inform intervention efforts to increase resilience.

In the following paper, we will review prior studies conducted in adults, looking at relationships between resilience and cortisol. We will then summarize key takeaways and discuss potential strategies to improve resilience and cope with negative outcomes of stressful experiences with the overarching goal of reducing the number of 43.8 million adults experiencing mental illness in a year.

Study #1

Studies of relationships between resilience and cortisol have revealed a complex relationship between these two factors. One study by Nishimi et al. (2022) investigated the relationship between psychological resilience measured via a self-report questionnaire and diurnal salivary cortisol measured via cortisol samples in 916 young adults. In the study, researchers defined psychological resilience using two sub components of the questionnaire: exposure to adversity and psychological health. They then investigated associations between these two

subcomponents and their interactive effect on cortisol levels. They found that relatively few individuals with high adversity demonstrated positive psychological health. High adversity was associated with lower cortisol levels, regardless of psychological health. Individuals with lower levels of adversity demonstrated higher levels of cortisol and among these individuals, psychological health was associated with lower cortisol levels. This is significant because this suggests that high levels of adversity may disrupt the physiological stress system, which could have downward spiraling consequences.

Study #2

Another study conducted by Lai et al. (2020) focused on the relationship between the trait of resilience and salivary cortisol in a group of Chinese undergraduates. Versions of the Brief Resilience Scale, which assesses one's ability to bounce back from a hardship, and the Life Orientation Test, which measures individual differences in optimism versus pessimism, were given to 49 Chinese undergraduates who provided self-collected saliva samples six times a day. They found that higher resilience was associated with a stronger cortisol response upon awakening and a steeper diurnal decline in cortisol from waking at bedtime. The authors explain that this type of pattern has been observed with better adjusted individuals in previous studies. This suggests that in healthy undergraduates, higher resilience is associated with an enhanced cortisol awakening response and a steeper diurnal slope, both of which are characteristics of the cortisol rhythm observed in healthier, better adjusted individuals.

Study #3

It is important to understand, though, not all studies on resilience and cortisol have found significant results. In a review of 35 papers on the topic by Aizpurua-Perez et al. (2023), results across studies were mixed. The authors suggest these mixed results may be caused by differing techniques used to measure cortisol across studies. The conflicting research findings imply that further research is needed to truly understand the complex relationships between cortisol and resilience. However, given compelling evidence from several studies in support of a relationship between resilience and well functioning cortisol systems, interventions and strategies to increase resilience are worth pursuing.

Coping Mechanisms

Several groups have already investigated methods of increasing resilience and counteracting stress. According to a study by Palmiter et al. (2012), methods could include fostering wellness, practicing relaxation techniques, finding purpose, building connections, and most importantly, seeking professional support. The authors convey that it is crucial to remember that no one is ever alone on the journey. Additionally, while some life circumstances are impossible to control, it is possible to grow by prioritizing the aspects of life's challenges that one does have some control over; the support of loved ones and trusted professionals could help with this.

Conclusion

Even though stressful experiences and encounters can be difficult to deal with, they are inevitable for everyone. What is important, though, is learning how to bounce back up, and not let those experiences make a lasting dent in your life; this is where resilience comes in. While some people may have a higher baseline of resilience compared to others, techniques, like those listed above, can be taught to help everyone improve. Although there

is further research necessary to fully understand the relationship between cortisol and resilience, helping individuals improve their resilience could be important in lowering the number of 43.8 million adults that experience mental illness in a given year.

Acknowledgments

I would like to thank my mentors at Polygence for guiding me through the process of writing this paper, and as well as my parents for all their support.

References

Aizpurua-Perez, I., Arregi, A., Labaka, A., Martinez-Villar, A., & Perez-Tejada, J. (2023). Psychological resilience and cortisol levels in adults: A systematic review. *American Journal of Human Biology,* e23954.

Dziurkowska, E., & Wesolowski, M. (2021). Cortisol as a biomarker of mental disorder severity. *Journal of Clinical Medicine*, *10*(21), 5204.

Lai, J. C., Leung, M. O., Lee, D. Y., Lam, Y. W., & Berning, K. (2020). Biomarking trait resilience with salivary cortisol in Chinese undergraduates. *Frontiers in Psychology*, *11*, 536510

LoBue, P. (2022). New CDC data illuminate youth mental health threats during the COVID-19 pandemic: CDC's first nationally representative survey of high school students during the pandemic can inform effective programs:

Nishimi, K., Koenen, K. C., Coull, B. A., Segerstrom, S. C., Austin, S. B., & Kubzansky, L. D. (2022). Psychological resilience and diurnal salivary cortisol in young adulthood. *Psychoneuroendocrinology*, *140*, 105736.

Palmiter, D., Alvord, M., Dorlen, R., Comas-Diaz, L., Luthar, S. S., Maddi, S. R., ... & Tedeschi, R. G. (2012). Building your resilience. *American psychological association*.

Pruthi, S., (2023). Chronic stress puts your health at risk. *Mayo Clinic*.