# The Relationship Between Cortisol Levels and Depression

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# Depression on College Campus

Statistics

- Academic year of 2020, more than ⅓ of college students were diagnosed with having at least one mental health symptom
  - 27.7% → Anxiety
  - 22.5% → Depression
- Between 2009 and 2015:
  - 5.9% increase in Anxiety
  - 3.2% increase in Depression
- In terms of age, students 25 or older tend to have fewer mental health issues than younger students

# What is Meant by Depression

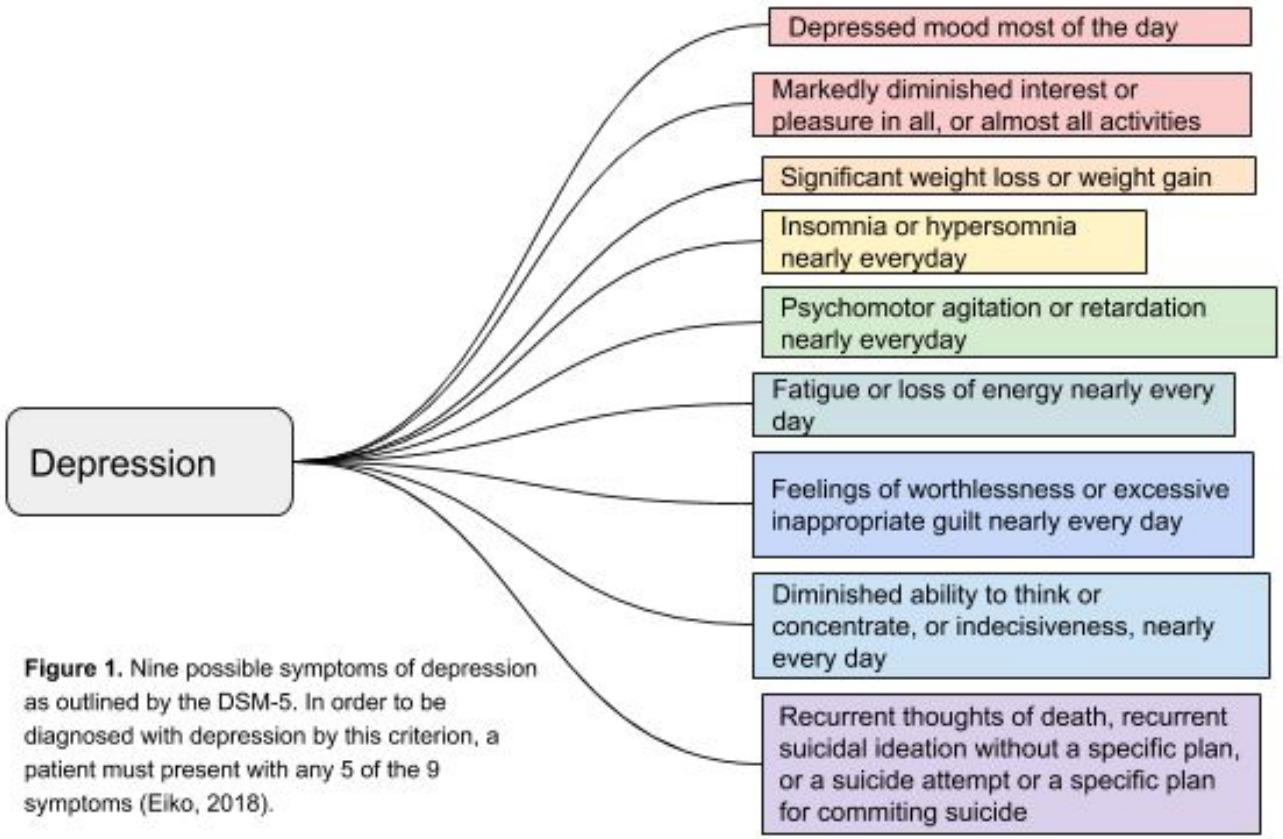


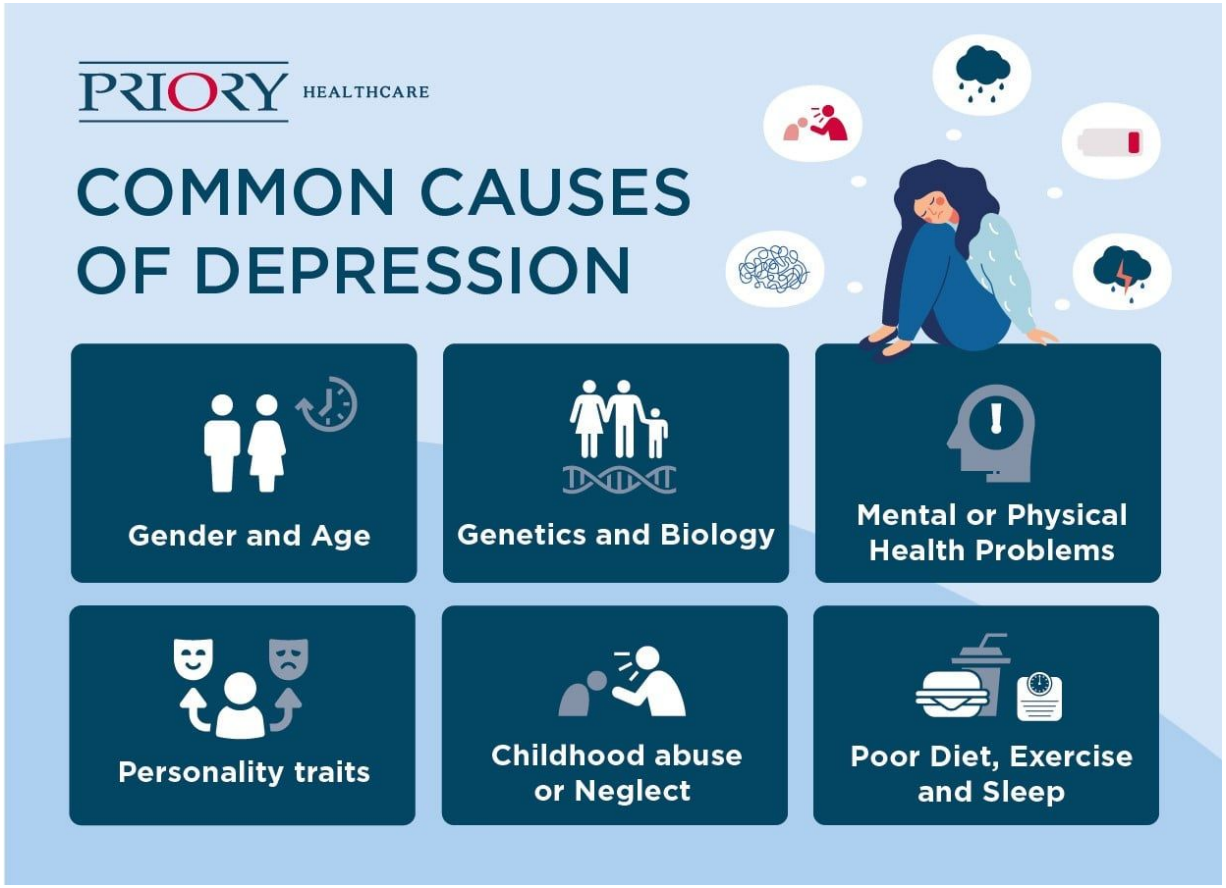

**Figure 1.** Nine possible symptoms of depression as outlined by the DSM-5. In order to be diagnosed with depression by this criterion, a patient must present with any 5 of the 9 symptoms (Eiko, 2018).

- Depression is the leading cause of disease worldwide with over 300 million people currently diagnosed
- 5 out of 9 symptoms defines depression
- 256 possible combinations of depressive symptoms

# Causes of Depression

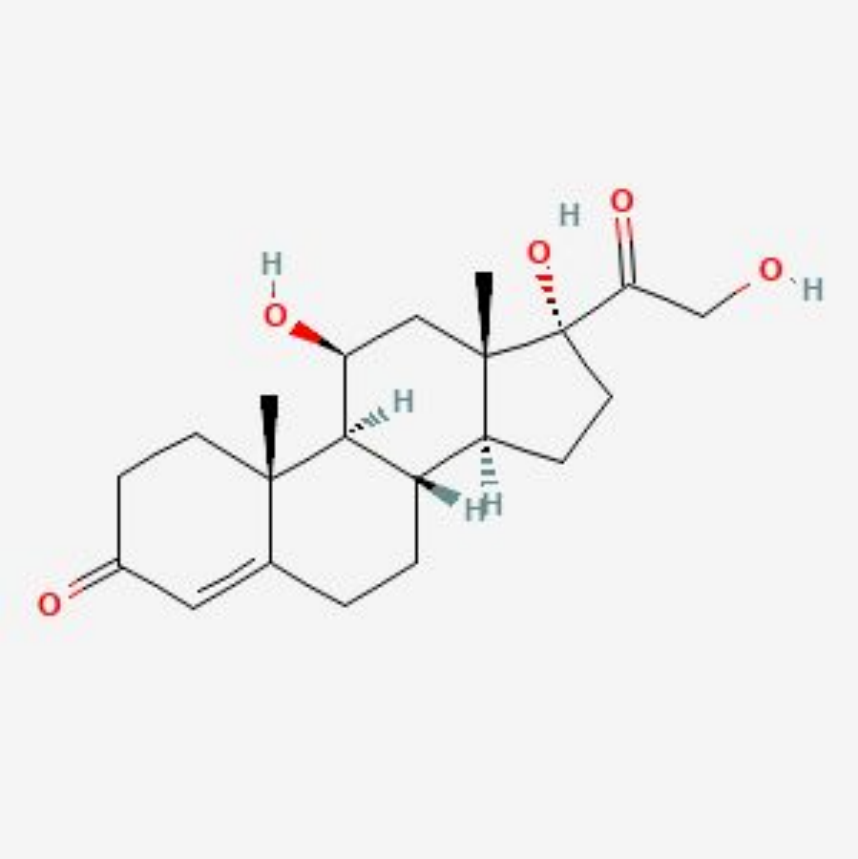
Psychological stress is a major cause of depression

- Stress causes hormonal changes that are present in about 70% of depressed people



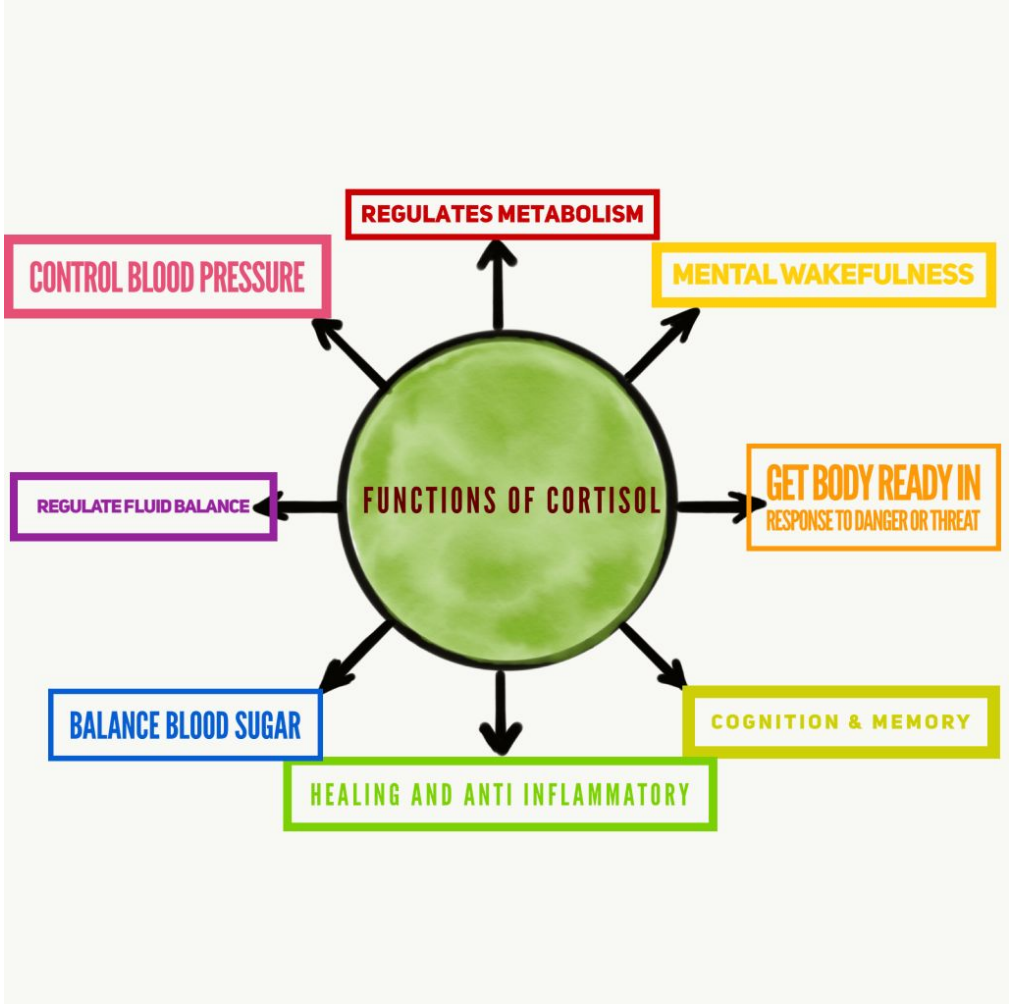
# Cortisol

- Steroid Hormone
  - Derived from Cholesterol
  - Categorized under Glucocorticoids
- Produced and Released from Adrenal Glands
  - Endocrine Gland on Top of the Kidneys
  - Responsible for Responding to Stress

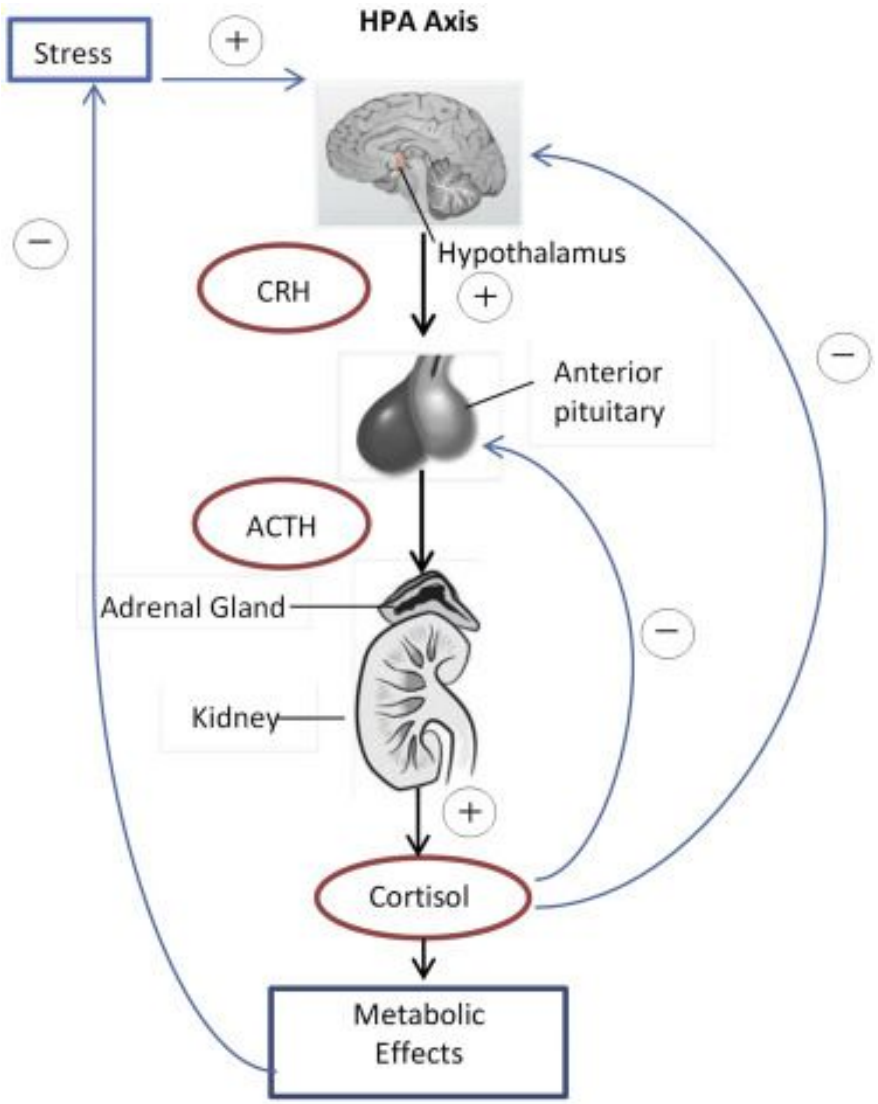


# Why Focus on Cortisol?

Diseases that Cause Too Much or Too Little Cortisol Often Show Signs of Depression



# Hypothalamic Pituitary Adrenocortical (HPA) Axis



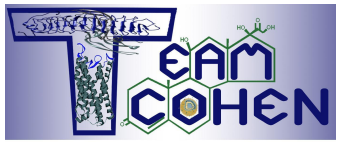
# Hypothesis

There will be a positive correlation between the presence of SNPs associated with increased cortisol responsiveness and the likelihood that an individual will suffer from depression

# Single Nucleotide Polymorphisms (SNPs)

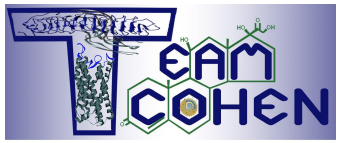
- SNPs are changes in the sequence of DNA in some genes
- Focus Placed On Cortisol and Aldosterone Receptors
- Previously shown to be associated with depression

| SNP | Association | Phenotype |
|---|---|---|
| rs41423247 (BCL1) | GR | Hypersensitivity |
| rs56149945 (N363S) | GR | Hypersensitivity |
| rs10052957 (Tth3) | GR | Resistance |
| rs12086634 | 11BHSD | Hypersensitivity |
| rs846910 | 11BHSD | Resistance |
| rs2070951 | MR | Hypersensitivity |
| rs5522 | MR | Resistance |
| rs1360780 (FK506) | FK506 binding protein 5 | Hypersensitivity |



# Experimental Approach

- Sample Collection
  - Process
    - Consent Form and Demography Question
    - Collect DNA sample by rotating the otate brush on the inside of the cheek
    - Complete CES-D
    - Complete Mini MASQ
    - Debrief
  - After Collection
    - Extract and isolate DNA from each sample
    - Using allele specific PCR determine if an individual has any SNPs within their genes that may be related to GR and MR hypersensitivity or resistance
  - Perform Agarose Gel Electrophoresis

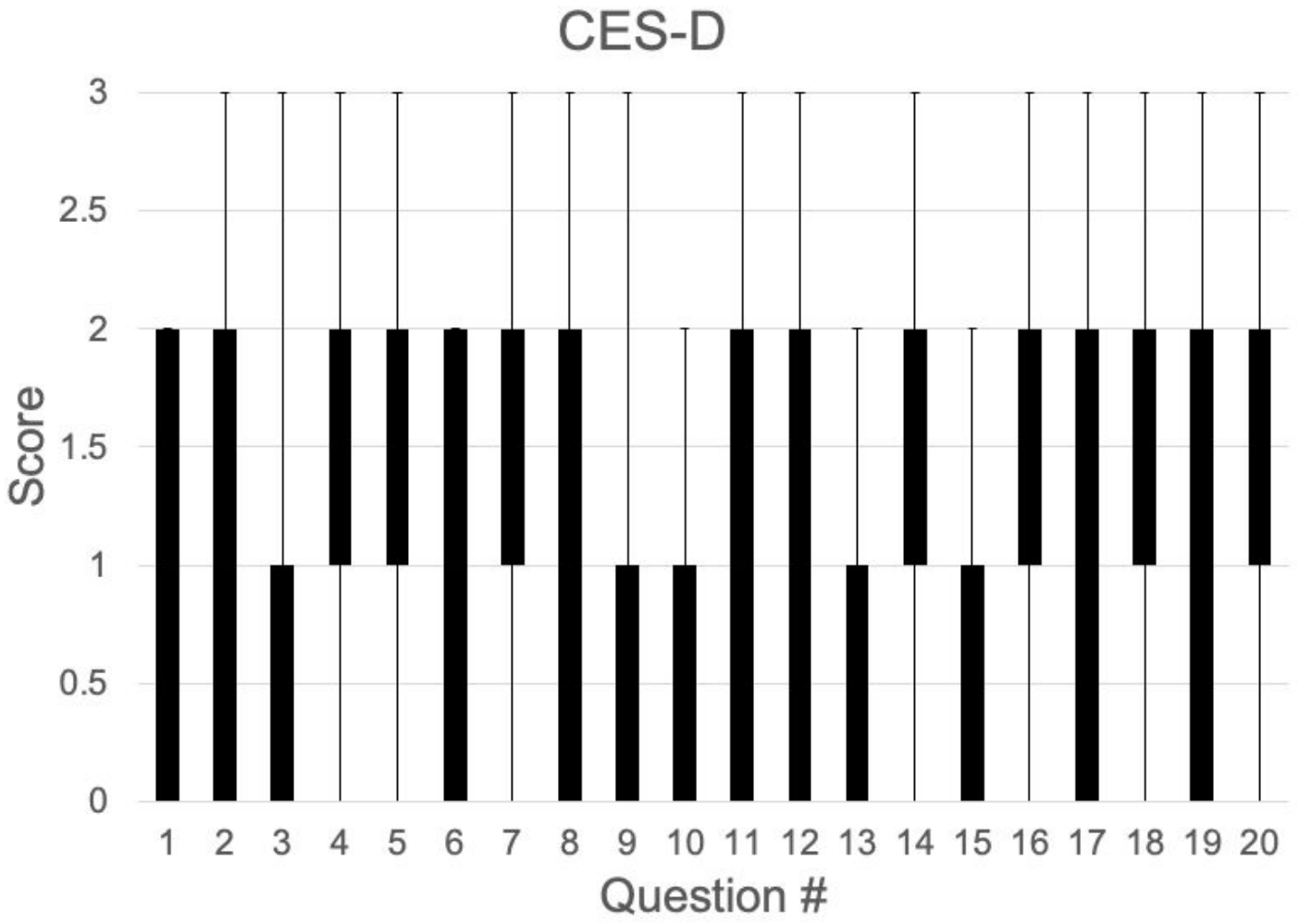


# CES-D

## CES-D Questions

| | |
|---|---|
| 1. I was bothered by things that usually don't bother me. | 11. My sleep was restless. |
| 2. I did not feel like eating; my appetite was poor. | 12. I was happy. |
| 3. I felt that I could not shake off the blues even with help from my family or friends. | 13. I talked less than usual. |
| 4. I felt I was just as good as other people. | 14. I felt lonely. |
| 5. I had trouble keeping my mind on what I was doing | 15. People were unfriendly. |
| 6. I felt depressed. | 16. I enjoyed life. |
| 7. I felt that everything I did was an effort. | 17. I had crying spells. |
| 8. I felt hopeful about the future. | 18. I felt sad. |
| 9. I thought my life had been a failure. | 19. I felt that people disliked me. |
| 10. I felt fearful. | 20. I could not get "going." |

# CES-D Results



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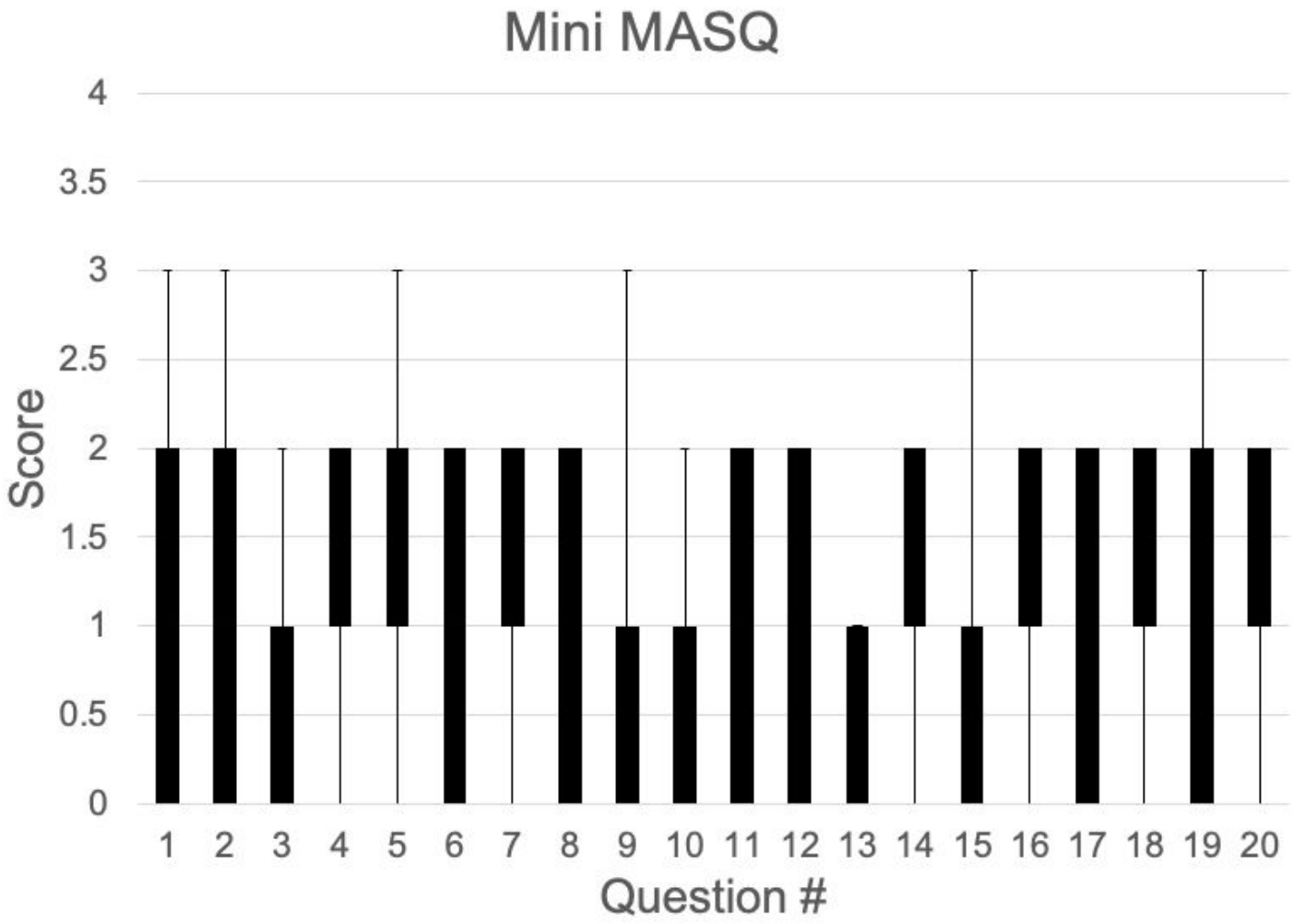
# Mini-MASQ

| Mini-MASQ Questions | |
|---|---|
| 1. Felt really happy | 14. Had trouble swallowing |
| 2. Felt tense or “high strung” | 15. Felt like I had a lot of interesting things to do |
| 3. Felt depressed | 16. Had hot or cold spells |
| 4. Was short of breath | 17. Felt like a failure |
| 5. Felt withdrawn from other people | 18. Felt like I was choking |
| 6. Felt dizzy or lightheaded | 19. Felt really lively, “up” |
| 7. Felt hopeless | 20. Felt uneasy |
| 8. Hands were cold or sweaty | 21. Felt discouraged |
| 9. Felt like I had a lot to look forward to | 22. Muscles twitched or trembled |
| 10. Hands were shaky | 23. Felt like I had a lot of energy |
| 11. Felt like nothing was very enjoyable | 24. Was trembling or shaking |
| 12. Felt keyed up, “on edge” | 25. Felt like I was having a lot of fun |
| 13. Felt worthless | 26. Had a very dry mouth |

# Mini-MASQ Results



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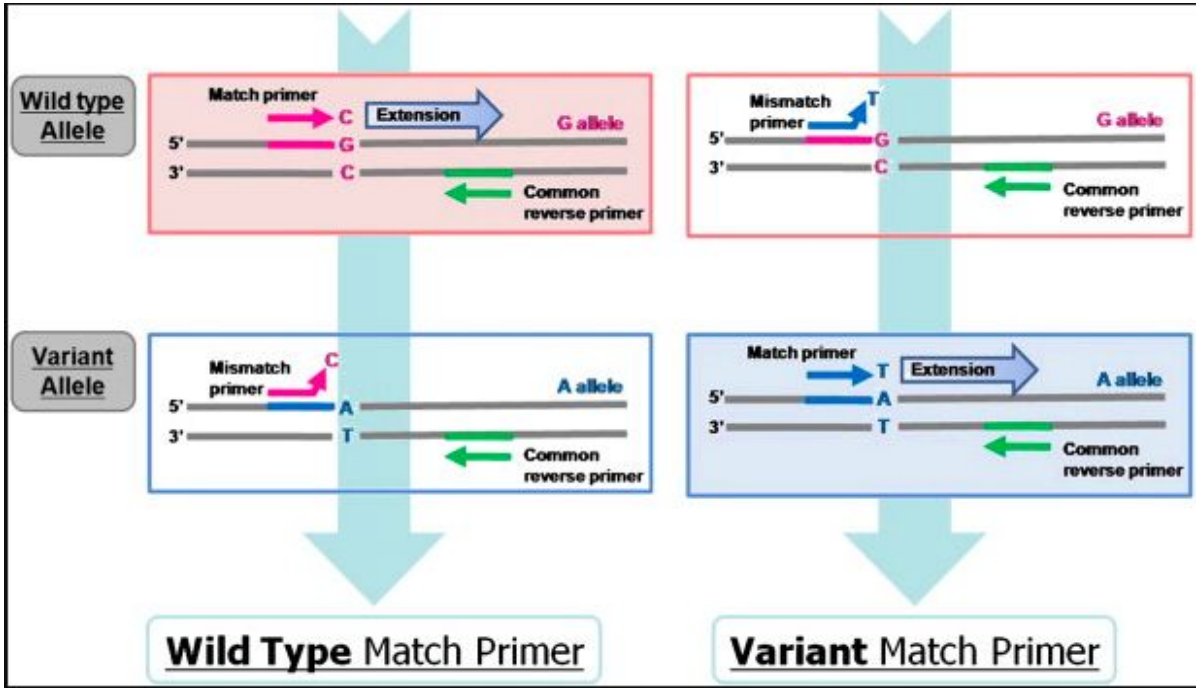
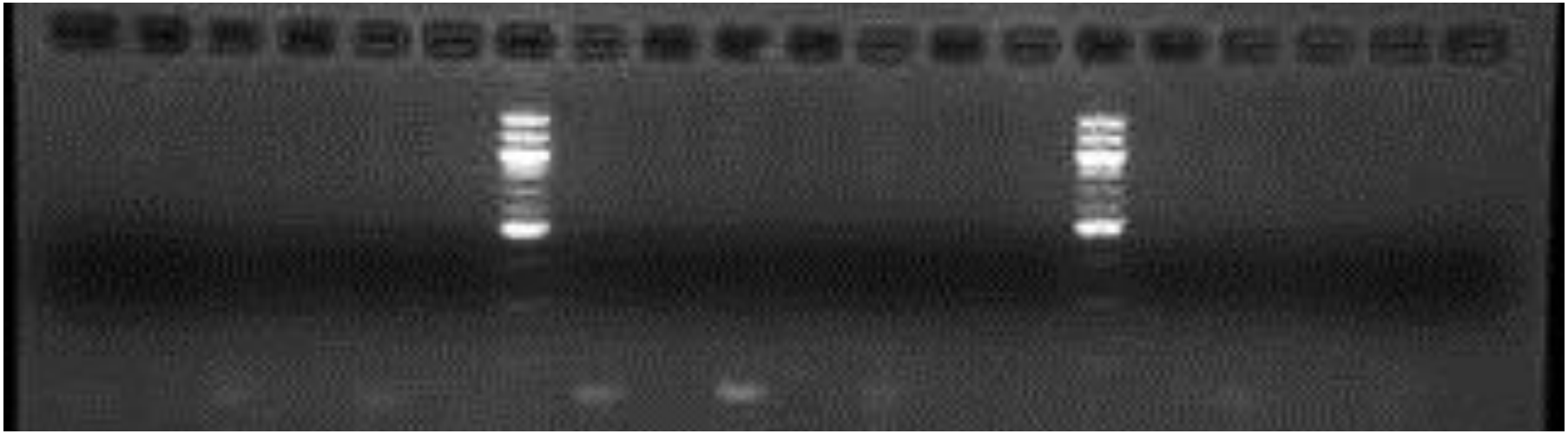
# Allele Specific PCR

- Purpose
  - Detection and Amplification of One Specific Allele/SNP of Interest in DNA Sequence

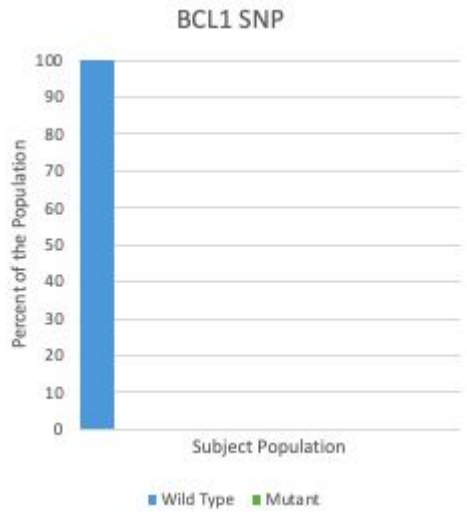


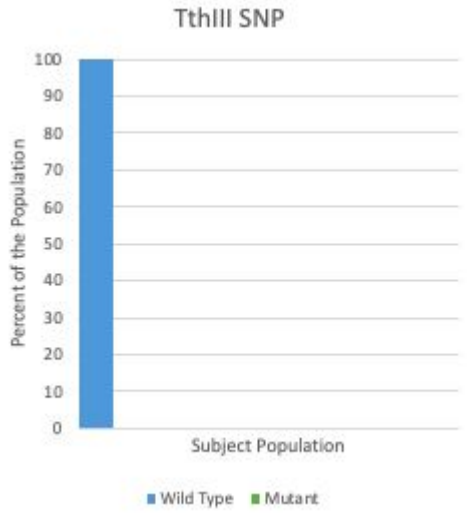
# Gel Electrophoresis Results

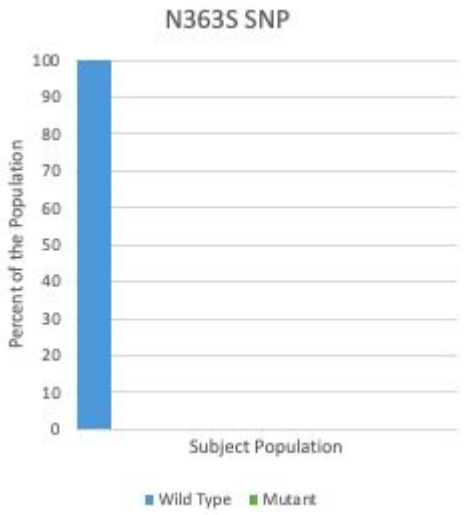


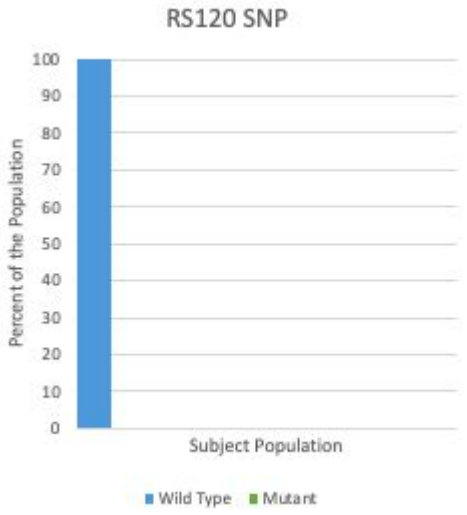
# Results: Allele Frequencies

All Samples Collected Present as WT

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# Conclusions

- Identification of “Spike Questions” that will serve as a basis for trying to identify certain alleles that are connected to the expression of depression (CES-D)

- Able to see how certain individuals are expressing depression and what degree of depression each participants falls into (Mini MASQ)

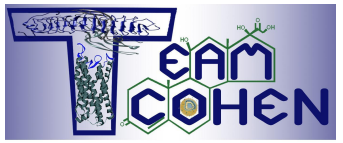
# Future Questions

- Overall Goal
  - The long term goal of this research is to create the ability to predict risk for depression so that clinicals can provide early intervention for at-risk patients, improving treatment and patient outcome
- Future Work
  - Continuing allele specific PCR to determine if an individual has any SNPs within their genes that may be related to GR and MR hypersensitivity or resistance
    - Emphasis placed on this after the COVID-19 pandemic
  - Create a multiplex assay where both alleles of a particular SNP can be detected in a single reaction

# Acknowledgements



- Union College Faculty Research Fund
- Union College Student Research Grants
- Prof. Brian Cohen

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# Thank You!


Any Questions?