



# College Student Mental Health:



**Analyzing Psychological Flexibility &  
Mental Illness in US College Students**



# The Problem

Did you know that...

51%

*Of college students have suffered from overwhelming anxiety*

1 in 3

*College students report prolonged periods of depression*

70%

*Of students who suffer from mental health problems do not seek help*

1 in  
12

college students have made a suicide plan



Source: American College Health Association study

LISEE PULLARA /Staff

# Research Question

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What's the **relationship** between  
**psychological flexibility** and  
**mental illness** in US college students?

# Client & Dataset

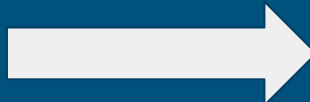
## University of Michigan Research Lab



### HEALTHY MINDS NETWORK

Research on Adolescent and Young Adult Mental Health

conducts



## National Survey



contains



## Healthy Minds Study 2016-17

- 50,000+ students @ 130+ colleges nationwide
- 12 modules encapsulating 1500+ variables
  - Demographics:
    - age, gender, race, religion, field of study, extracurriculars, etc.
  - Mental Health KPI's:
    - depression/anxiety/psychological flexibility scores

### THE HEALTHY MINDS STUDY

2016-2017 Data Report



# Data Wrangling

# Reshaping Variable Groups

WIDE

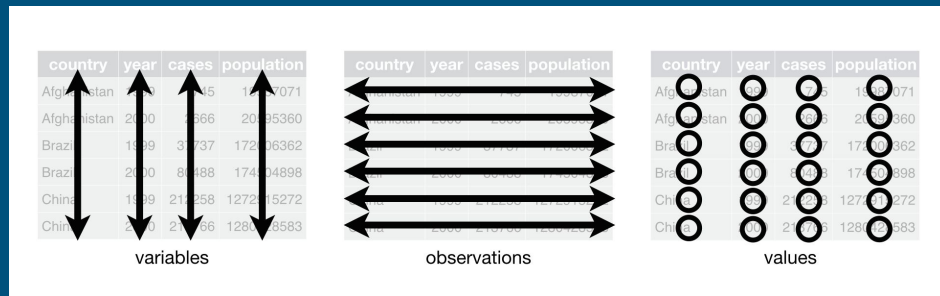
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16	NaN	NaN	NaN	NaN	NaN	NaN	1.0	NaN
17	NaN	NaN	NaN	NaN	NaN	NaN	1.0	NaN
19	NaN	NaN	NaN	1.0	NaN	NaN	NaN	NaN
20	1.0	NaN	NaN	NaN	NaN	NaN	NaN	NaN

tidy

TALL

	deprawsc	anx_score	AAQ_total	race
675	23.0	10.0	26.0	race_black
703	10.0	8.0	26.0	race_black
708	5.0	2.0	20.0	race_black
711	8.0	3.0	30.0	race_black
720	4.0	2.0	7.0	race_black
759	23.0	20.0	43.0	race_black
797	8.0	2.0	16.0	race_black
825	1.0	1.0	7.0	race_black
876	2.0	0.0	21.0	race_black
887	14.0	7.0	27.0	race_black
913	1.0	0.0	13.0	race_black
963	4.0	4.0	20.0	race_black
977	8.0	11.0	24.0	race_black
1048	1.0	1.0	9.0	race_black
1052	0.0	0.0	17.0	race_black

“Tidy Data” by Hadley Wickham: <http://vita.had.co.nz/papers/tidy-data.pdf>



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# Exploratory Analysis:

Psychological Flexibility

# Measuring Psychological Flexibility

## Official Test: AAQ-II

**AAQ-II**

Below you will find a list of statements. Please rate how true each statement is for you by using the scale below to fill in your choice.

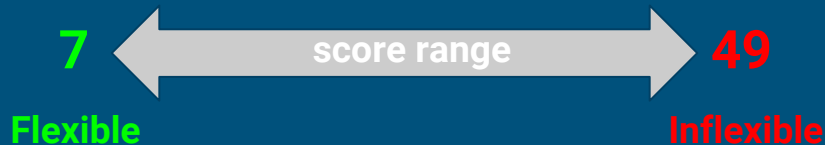
1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true
1. My painful experiences and memories make it difficult for me to live a life that I would value.						
2. I'm afraid of my feelings.						
3. I worry about not being able to control my worries and feelings.						
4. My painful memories prevent me from having a fulfilling life.						
5. Emotions cause problems in my life.						
6. It seems like most people are handling their lives better than I am.						
7. Worries get in the way of my success.						
TOTAL						

## Definition

→ psychological flexibility is defined as one's ability to "contact the present moment fully as a conscious human being, and based on what the situation affords, change or persist behavior in the service of chosen values"

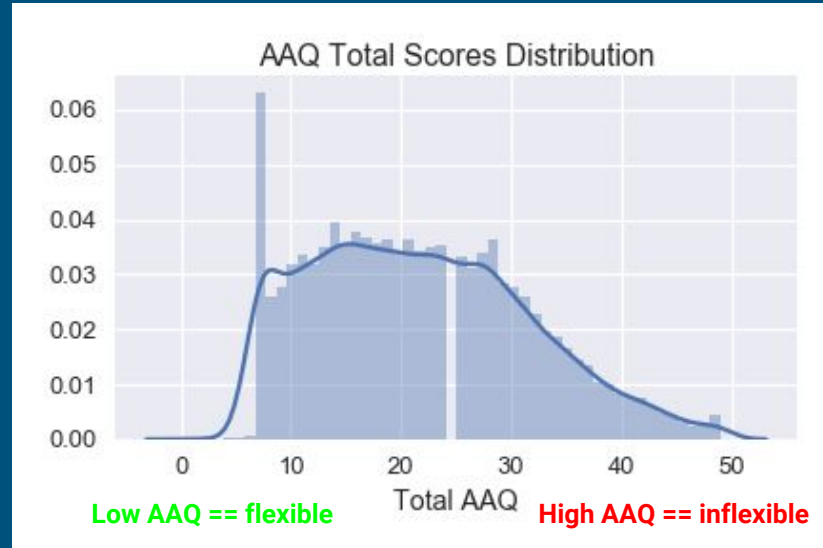
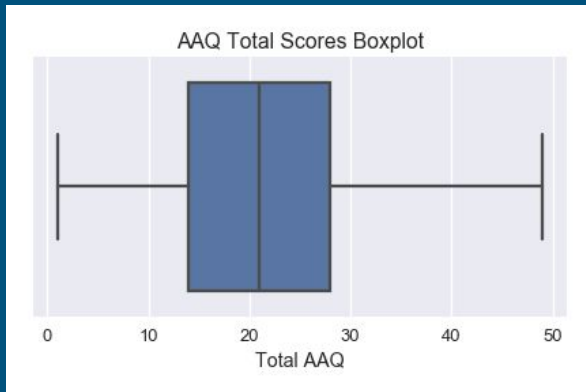
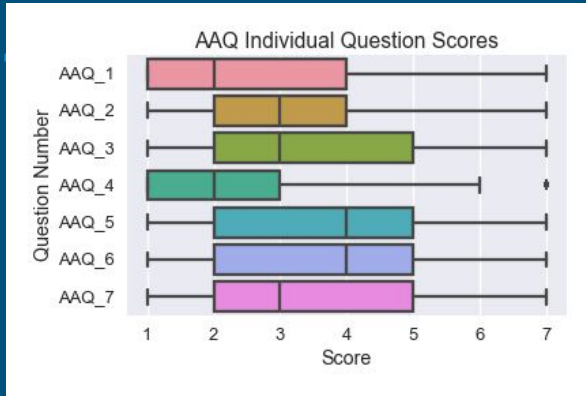
## Fast Facts

- + "Flexibility" is represented by a low AAQ-II score
- + AAQ is the bedrock of Acceptance Commitment Therapy (ACT)
- + studies have shown a consistently strong way to improve AAQ is through mindfulness and meditation practice





# Psychological Flexibility Scores



- Total Scores = 24,997
- Mean Score = 21.7
- Std Dev = 9.82
- Q1: 14 → Q2: 21 → Q3: 28

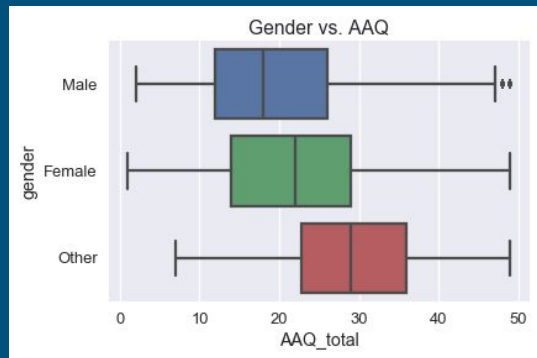
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# Exploratory Analysis:

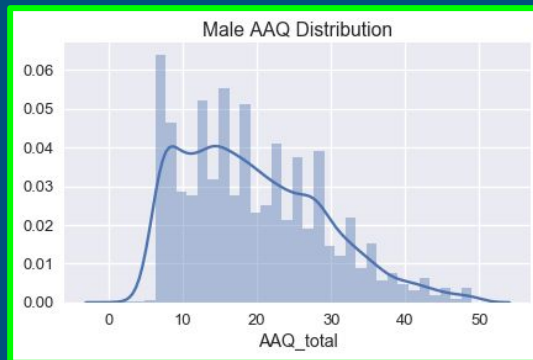
Demographics vs. Psych Flex

# Gender & Age vs. AAQ

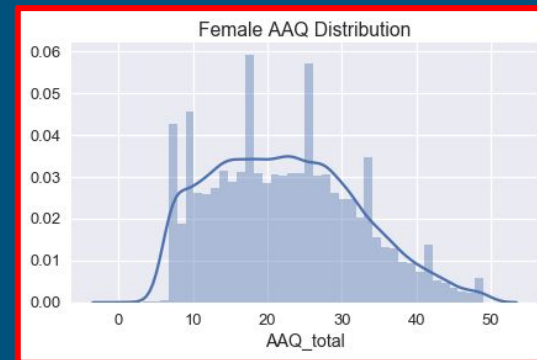
## Gender



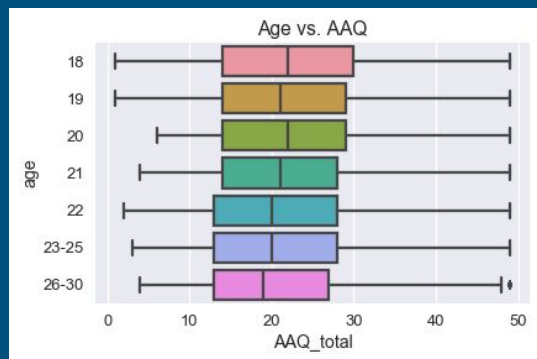
Better psych flex



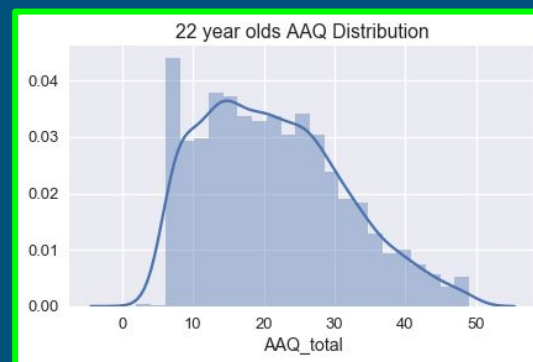
Worse psych flex



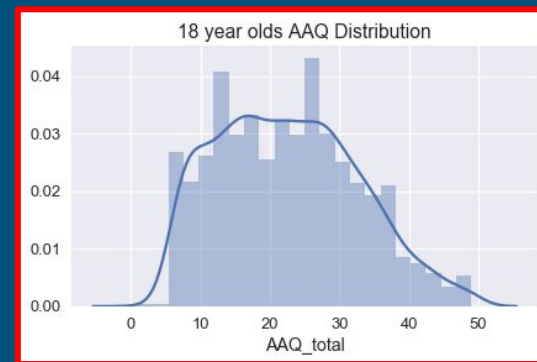
## Age



Better psych flex

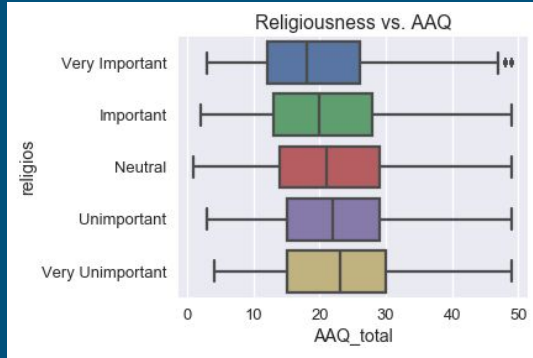


Worse psych flex

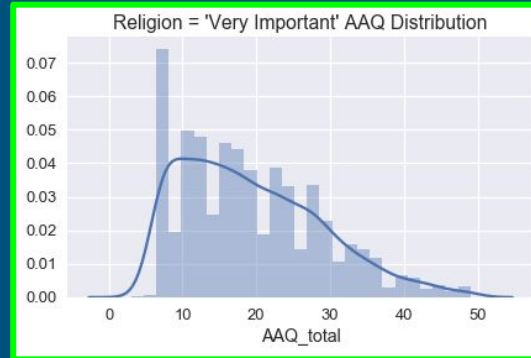


# Religiousness & Religion vs. AAQ

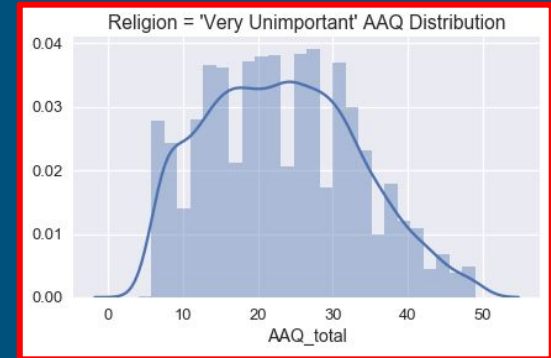
## Religiousness



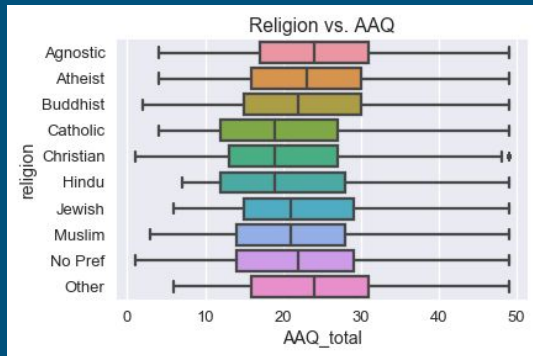
Better psych flex



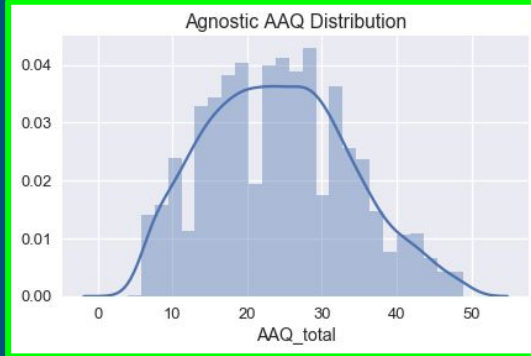
Worse psych flex



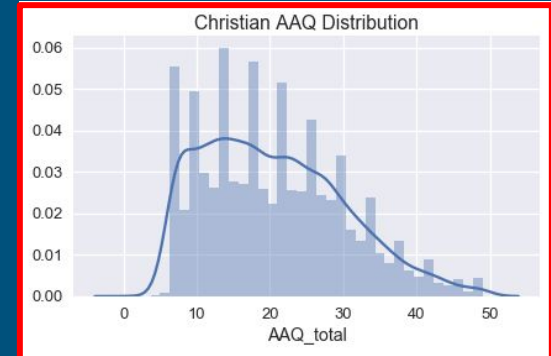
## Religion



Better AAQ scores

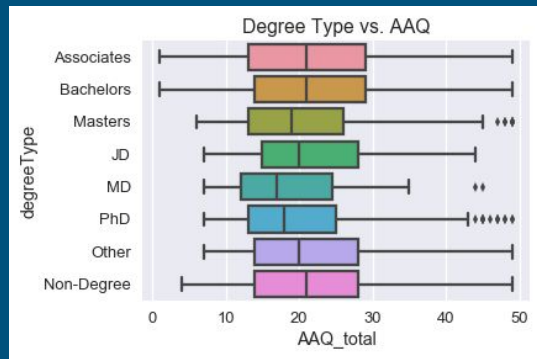


Worse psych flex

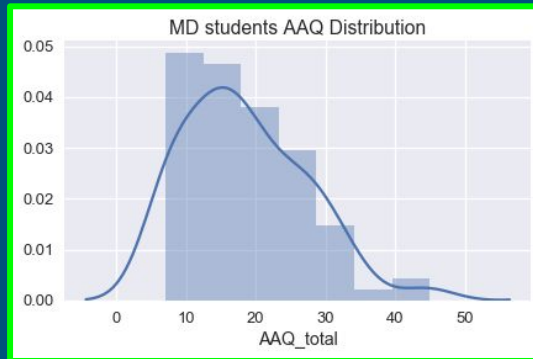


# Degree Type & Field of Study vs. AAQ

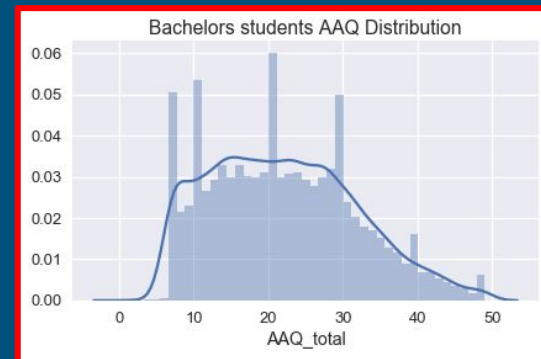
## Degree Type



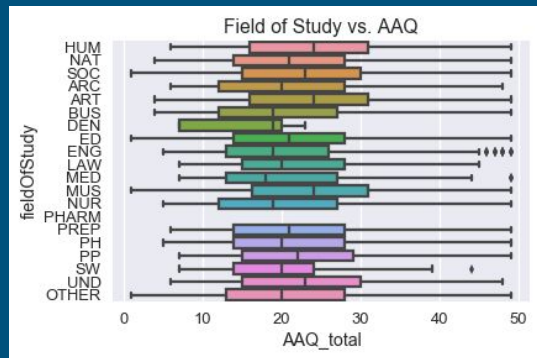
Better psych flex



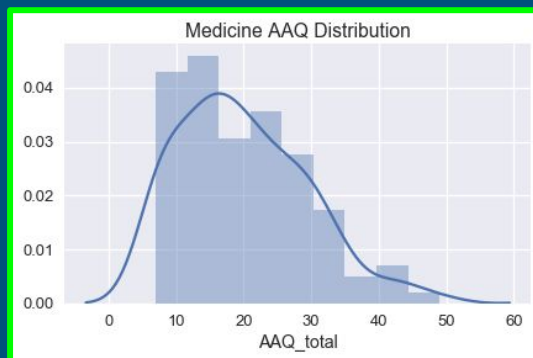
Worse psych flex



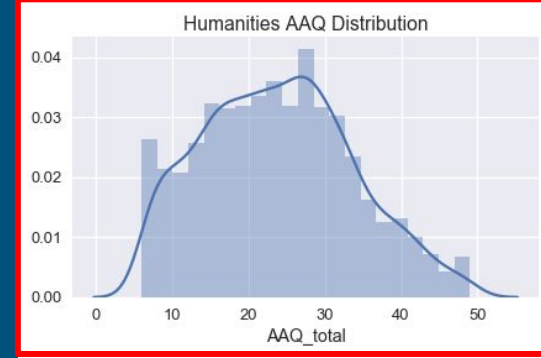
## Field of Study



Better psych flex

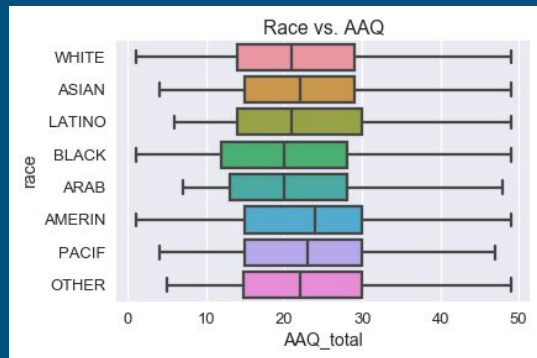


Worse psych flex

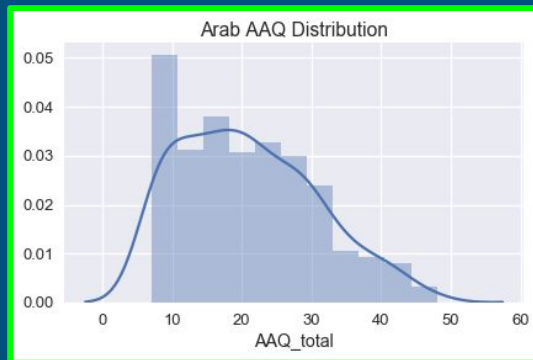


# Race & Activities vs. AAQ

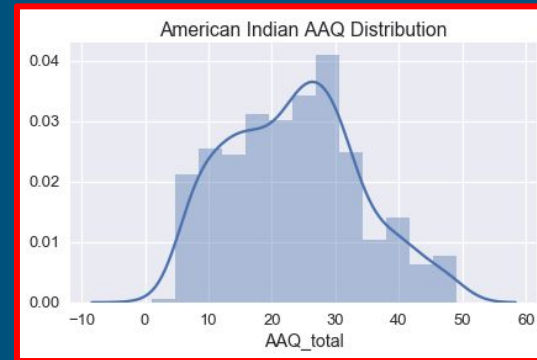
## Race



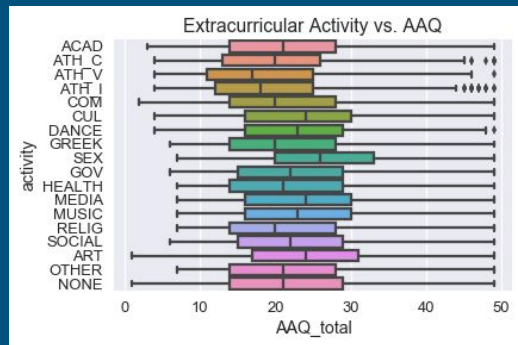
Better psych flex



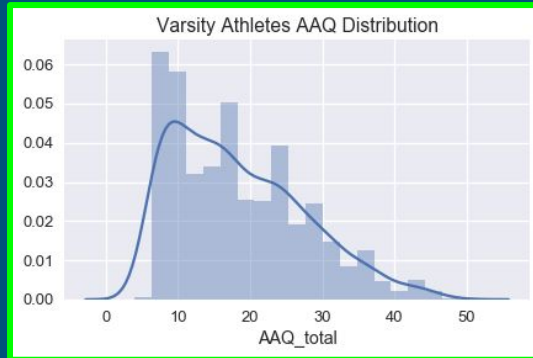
Worse psych flex



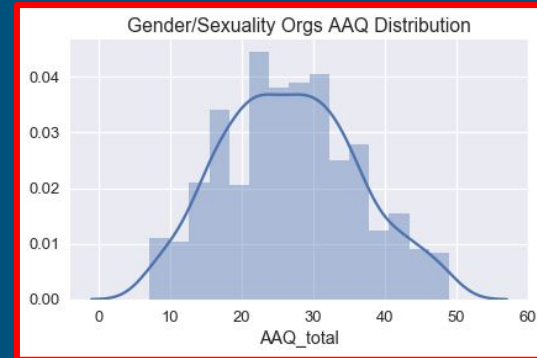
## Activities



Better psych flex



Worse psych flex



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# Exploratory Analysis: Mental Illness

# Diagnosing Anxiety & Depression

## Anxiety Test: GAD-7

→ Score: 0-21  
higher = more anxiety  
lower = less anxiety

GAD-7 score	Level of anxiety
0-4	minimal
5-9	mild
10-14	moderate
15-21	severe

## Depression Test: PHQ-9

→ Score: 0-27  
higher = more depression  
lower = less depression

Total Score	Depression Severity
0-4	None
5-9	Mild
10-14	Moderate
15-19	Moderately Severe
20-27	Severe

### GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

Total Score — = Add Columns — + — + —

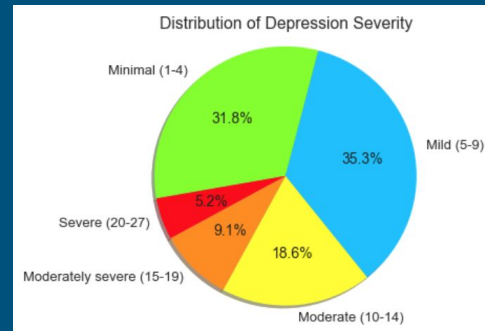
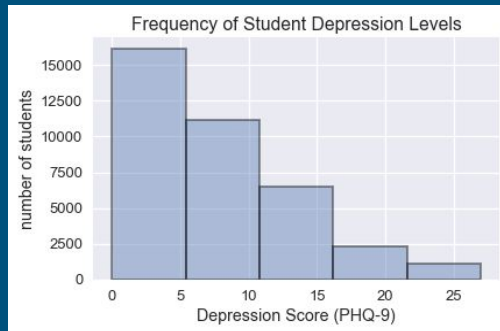
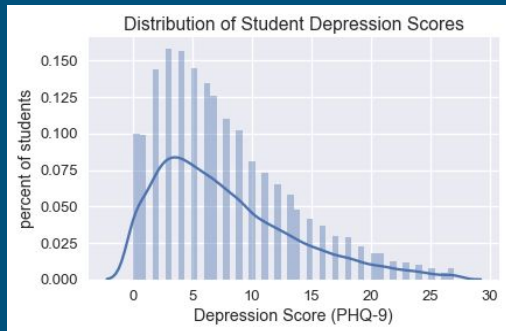
### PATIENT HEALTH QUESTIONNAIRE - 9

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3
<p>FOR OFFICE CODING</p> <p>0 + — + — + — = Total Score: —</p>				

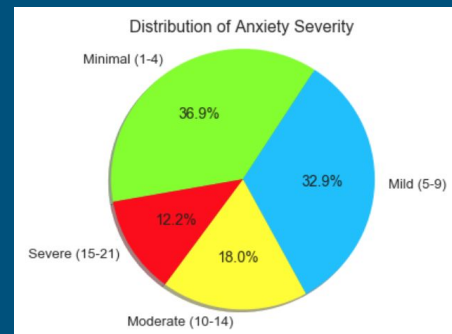
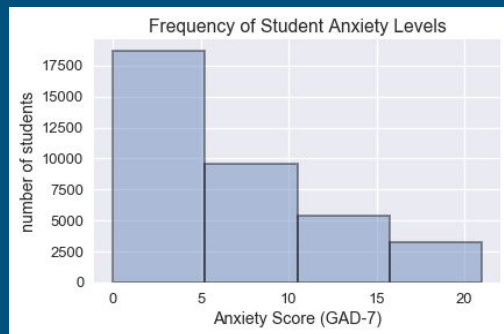
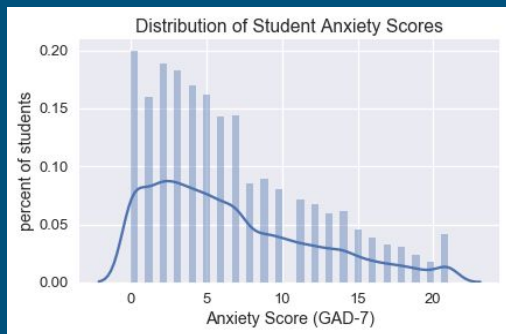


# Depression & Anxiety Scores

## Depression



## Anxiety



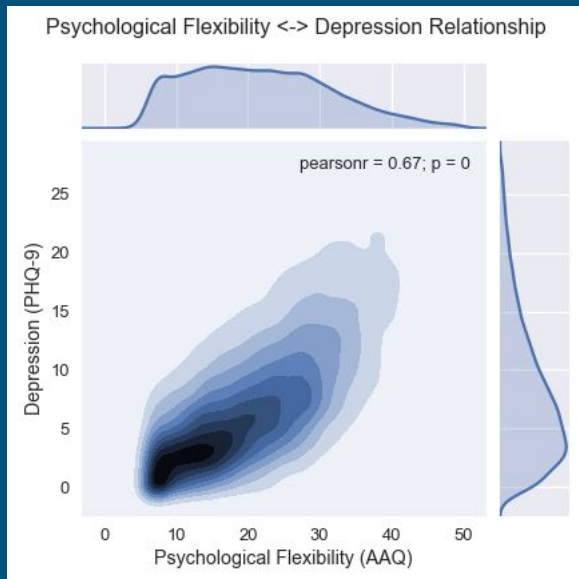
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# Exploratory Analysis:

Psych Flex vs. Mental Illness

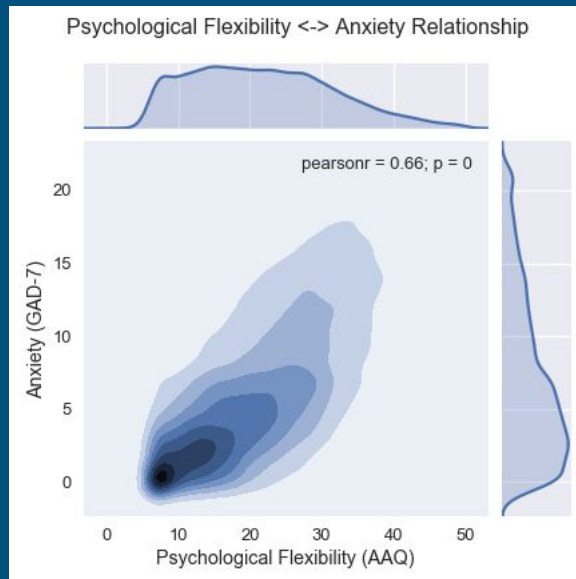
# Psychological Inflexibility vs. Mental Illness

## Depression



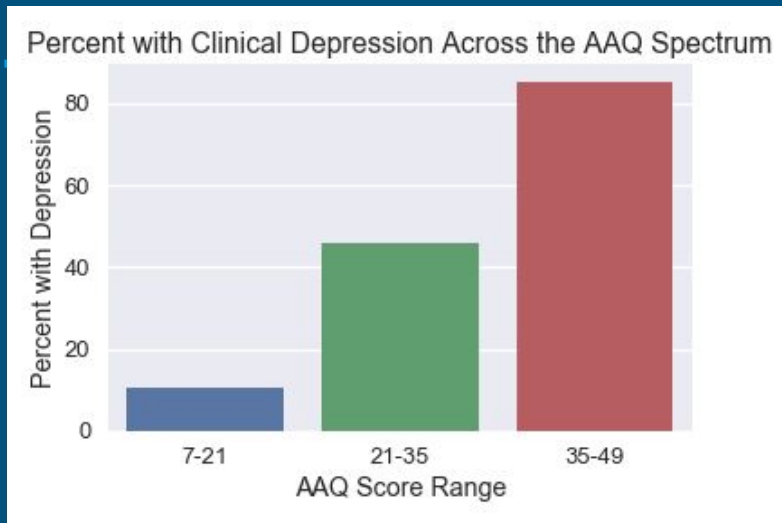
- Correlation coefficient ( $r$ ) = 0.67
- Significance (p-value) = 0.0
- **Strong, significant, positive relationship**

## Anxiety

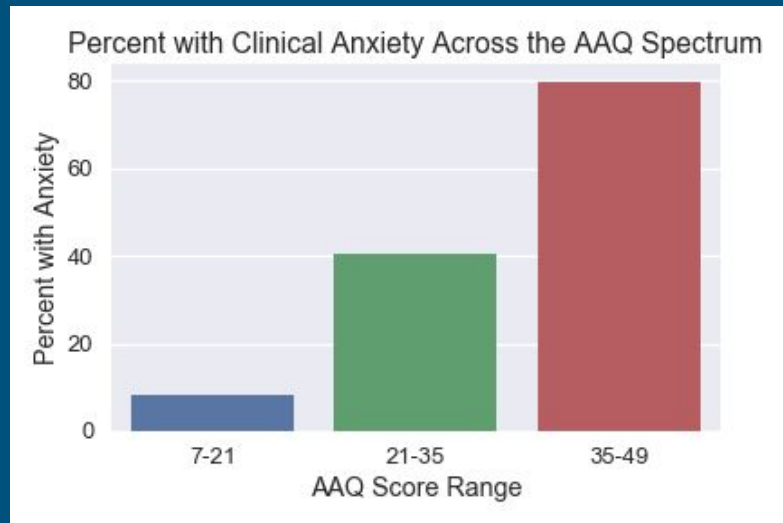


- Correlation coefficient ( $r$ ) = 0.66
- Significance (p-value) = 0.0
- **Strong, significant, positive relationship**


# Psychological Inflexibility vs. Mental Illness



AAQ Score	Depression Rate
7-21	11%
21-35	46%
35-49	85%



AAQ Score	Anxiety Rate
7-21	8%
21-35	40%
35-49	80%



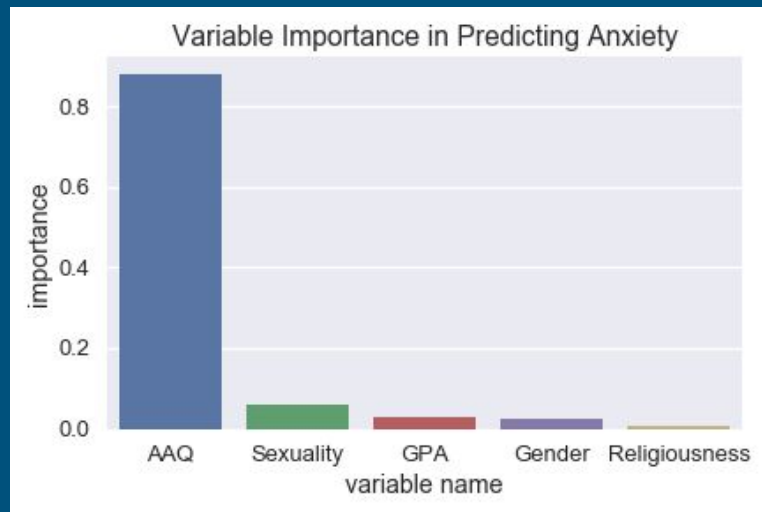
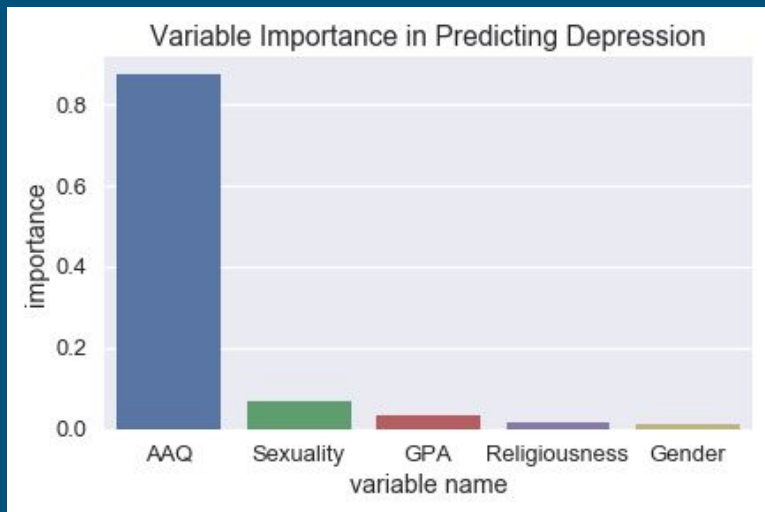
# Machine Learning

# Random Forest Classifier

Classification: simplified mental illness scales into binary labels, removed middle  $\frac{1}{3}$  of “mild” scores

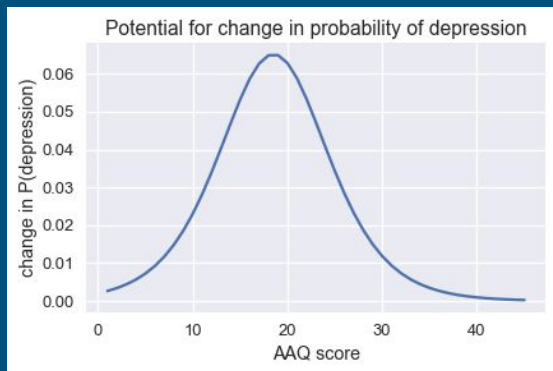
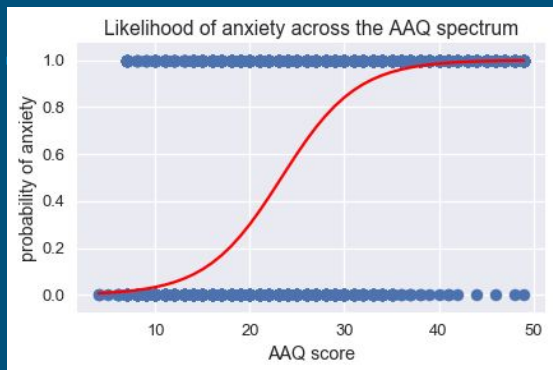
- Not depressed (0) → PHQ-9 score = [1,4]
- Depressed (1) → PHQ-9 score = [10-27]

- Not anxious (0) → GAD-7 score = [1,4]
- Anxious (1) → GAD-7 score = [10-21]

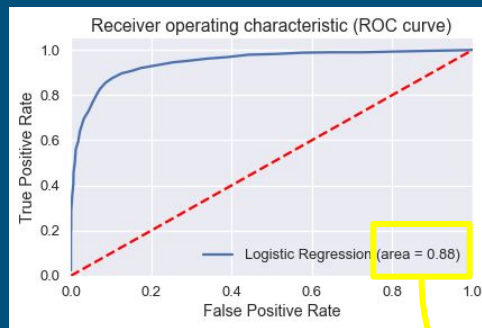


AAQ consistently comes out as by far the most important feature in predicting depression & anxiety

# Logistic Regression - Predicting Depression



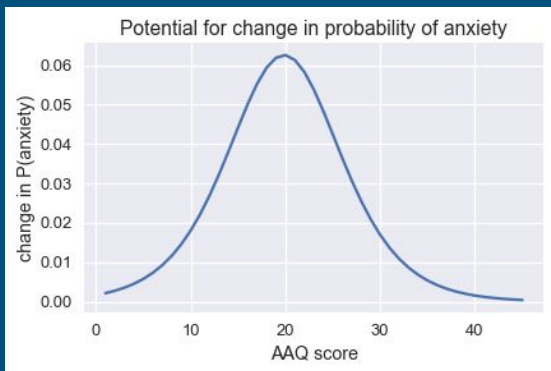
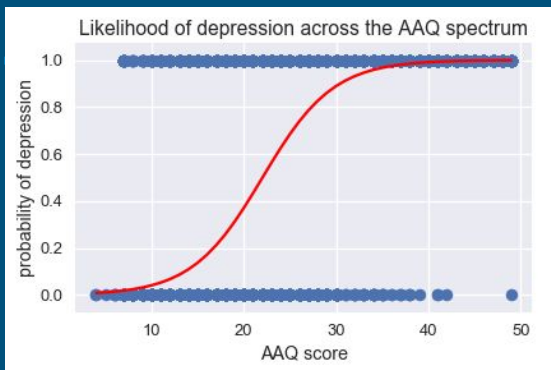
AAQ	P(depression)	prob diff
14	10.95%	2.30%
15	13.76%	2.82%
16	17.17%	3.40%
17	21.21%	4.04%
18	25.90%	4.69%
19	31.21%	5.32%
20	37.07%	5.86%
21	43.34%	6.27%
22	49.83%	6.49%
23	56.33%	6.50%
24	62.61%	6.29%
25	68.50%	5.89%
26	73.85%	5.35%
27	78.57%	4.72%
28	82.64%	4.07%
29	86.08%	3.43%
30	88.92%	2.85%



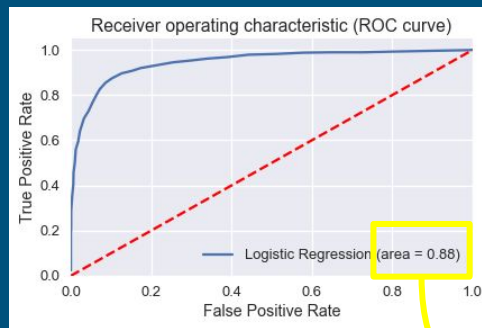
## Key Insights

- Using just AAQ, we can predict depression in college students with 88.7% accuracy
- A 2% change in a student's psychological flexibility (1 unit of AAQ) results in up to a 6.5% change in their probability of depression
- A 20% change in a student's psychological flexibility (10 units of AAQ) results in up to a 60% change in their probability of depression

# Logistic Regression - Predicting Anxiety



AAQ	P(anxiety)	prob diff
14	8.76%	1.81%
15	10.98%	2.22%
16	13.68%	2.70%
17	16.92%	3.24%
18	20.73%	3.82%
19	25.15%	4.42%
20	30.16%	5.00%
21	35.68%	5.52%
22	41.61%	5.93%
23	47.80%	6.19%
24	54.05%	6.25%
25	60.18%	6.13%
26	66.01%	5.83%
27	71.39%	5.38%
28	76.22%	4.83%
29	80.46%	4.24%
30	84.10%	3.64%



## Key Insights

- Using just AAQ, we can predict anxiety in college students with 88.3% accuracy
- A 2% change in a student's psychological flexibility (1 unit of AAQ) results in up to a 6.25% change in their probability of anxiety
- A 20% change in a student's psychological flexibility (10 units of AAQ) results in up to a 55% change in their probability of anxiety





# Results & Recommendations

# Results Summary

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## → Psychological flexibility is...

- ◆ highly **variant across demographics**
  - most significant: gender, religiousness, field of study, age
- ◆ **strongly correlated with depression and anxiety** in US college students
  - correlation coefficients ( $r$ ) = 0.67, 0.66
- ◆ **10x more important than any other demographic variable** in predicting depression & anxiety
  - using just AAQ → accuracy = 88+%
- ◆ potentially **capable of 3x return-on-investment** in likelihood of mental illness
  - boost AAQ by 2% → 6% decrease in probability of depression & anxiety
  - boost AAQ by 20% → 60% decrease in probability of depression & anxiety

# Recommendations for Universities

## Invest in improving student's psychological flexibility!

1. integrate **Acceptance Commitment Therapy** into psychological services
  - AAQ is the bedrock of ACT
    - [Source 1](#)
    - [Source 2](#)
    - [Source 3](#)
2. offer **mindfulness-based student wellness resources**
  - mindfulness is the core teaching of ACT
  - studies have shown a strong relationship between mindfulness & AAQ
    - [Source 4](#)
    - [Source 5](#)
    - [Source 6](#)
    - [Source 7](#)

