Identifying Muscle Dysmorphia

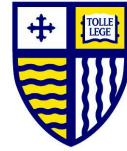Alex Butera, Ryan Canfield, Patrick Norcross

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AGENDA

✠ Introduction

✠ Data Collection

✠ Methods and Results

✠ Conclusion

Introduction

- Early Setbacks

- Background Information

- Objectives

- Why is This Important

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Early Setbacks

- Our initial dataset pertained to HIV patients and was being provided to us by Johns Hopkins.

- Due to unforeseen circumstances with the data being able to be transferred to us, we could not get it until Christmas at the earliest.

- This was very unexpected and caused us to lose nearly 10 weeks of time that we could've spent analyzing another data set.

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Background Information

- Muscle dysmorphia is a psychological condition where individuals feel distress or dissatisfaction with the size, shape, or appearance of their muscles. It's often associated with body image issues and a perceived discrepancy between one's actual muscle mass and the desired or expected level of muscularity.

- **Overall Goal:** To find patterns and correlations between factors that can tell us if an individual suffers from muscle dysmorphia.

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Objectives

- **Objective 1:**
  - **Characterize resistance training behavior, and mental health, in a sample of men with symptoms of muscle dysmorphia.**

- **Objective 2:**
  - **Explore whether a worse mental health, including symptoms of muscle dysmorphia, are associated with more frequent and intense resistance training behaviors.**

- **Objective 3:**
  - **Explore any associations between mental health and substance and supplement use.**

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Why is This Important

- **Helps us Understand Mental Health**
  - Can have a profound impact on an individual's mental well-being, leading to distress, anxiety, and even depression.

- **Prevention and Education**
  - Can raise awareness and educate people about the factors that contribute to body dissatisfaction and unhealthy behaviors related to body image.

- **Impact on Physical Health**
  - Can lead to extreme behaviors like excessive exercise or steroid use, which can have detrimental effects on physical health.

- **Support and Treatment**
  - Research helps in developing better support systems and treatment strategies for individuals experiencing muscle dysphoria. (Ex: therapy & support groups)

- **Social and Cultural Implications**
  - Muscle dysphoria sheds light on societal and cultural influences on body image standards, particularly those related to muscularity.

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Data Collection

- Collection
- Description
- Preprocessing
- Sample Demographics

Data Collection

- The dataset was given to us in two parts by our client Dr. SantaBarbara.

- It was collected by him during his masters and doctoral dissertations.

- Both datasets were in .SAV files, which we converted and combined into a .CSV file.

Data Description

- Resistance training Behaviors

  - Perceived Intensity

  - Chest, Arms, Legs, and Biceps strength

  - Days per week

  - Minutes per session

- Substance and Supplement Use

  - Substances: Marijuana, Hallucinogenic, Steroids, Cigarettes, etc.

  - Supplements: Protein, Creatine. etc.

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Data Description Cont.

- Mental Health Indices - Various mental health survey questionnaires
    - CESD - Depression, Clinical cutoff of 10 and above considered "depressed"
    - STAI - Anxiety, Clinical cutoff of 40 and above considered "very anxious"
    - MDI - Muscle Dysmorphia Inventory
    - RS - Emotions pertaining to gaining/losing weight and nutrition habits
    - BDS - Bodybuilding Dependence, emotions pertaining to workout habits
    - SPAS - Social Physique Anxiety
   - AUDIT - Behavior and relationship with alcohol.

Preprocessing

- Aligned the data sets.

- Removed underscores, and spaces, and uppercased all characters.

- Renamed remaining variables that didn't match the previous conditions.

- Dropped columns that did not match.

- Double checked values that didn't portray information in the same way.

- Removed all rows that had participants who did not have muscle dysmorphia.

Sample population Demographics

General summary statistics that give us a good idea of who these people are and their living conditions:

	NUMBEROFROOMMATES	AGE
mean	1.083333	25.235294
std	1.421770	5.022303
min	0.000000	18.000000
25%	0.000000	21.000000
50%	0.500000	24.000000
75%	2.000000	29.000000
max	6.000000	41.000000
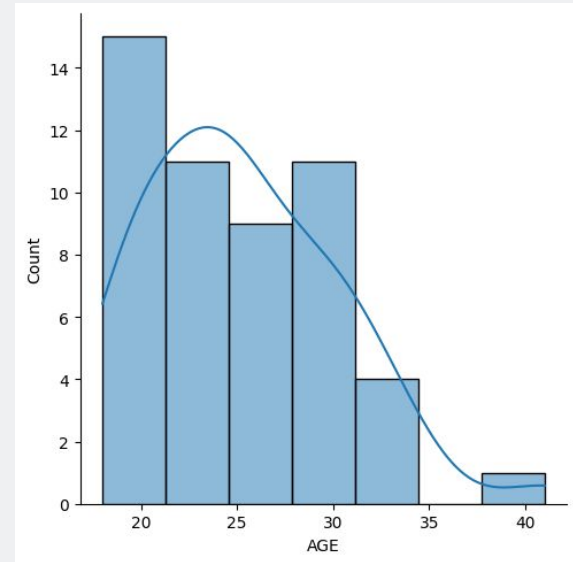
Sample population Demographics

General summary statistics that give us a good idea of who these people are and their living conditions:

Count of each sexual orientation

Count of each race
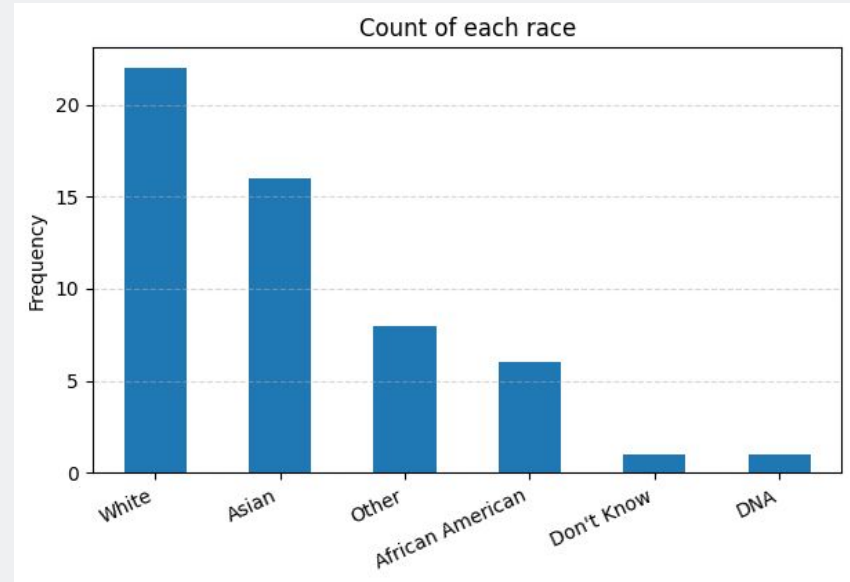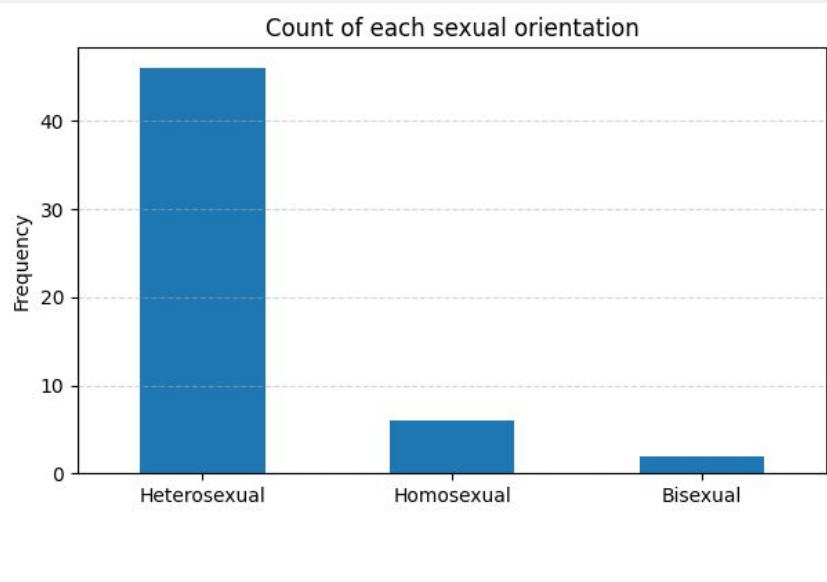
Methods and Results

✛ Methods for Each Objective

✛ Results for Each Objective

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Objective 1 Methods

- **<u>Objective 1:</u>** Characterize resistance training behavior, and mental health, in a sample of men with symptoms of muscle dysmorphia.

- The main goal of aim 1 was to show an overall data description in order to tell a story of the participants who are in the data set.

- The method that was used to examine the statistics was a ".describe" command which provided the summary statistics for each of the columns in the data set.

Objective 1 Results - Mental Health Scores

- Individuals with Muscle Dysmorphia

	CESDSCORE	MDISCORE	STAISCORE	RSSCORE	AUDITSCORE	BDSSCORE	SPASSCORE
mean	9.971429	29.885714	47.371429	15.657143	3.852941	42.571429	37.057143
min	1.000000	7.000000	29.000000	4.000000	0.000000	28.000000	15.000000
max	22.000000	49.000000	74.000000	27.000000	9.000000	54.000000	54.000000

- Individuals without Muscle Dysmorphia

	CESDSCORE	MDISCORE	STAISCORE	RSSCORE	AUDITSCORE	BDSSCORE	SPASSCORE
mean	6.5	18.315789	36.3	12.368421	3.7	31.157895	26.0
min	2.0	7.000000	26.0	4.000000	0.0	17.000000	18.0
max	13.0	46.000000	47.0	25.000000	6.0	53.000000	34.0

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Objective 1 Results - Mental Health Scores

- We can note that All mental health scores of people with muscle dysmorphia are higher than those without.
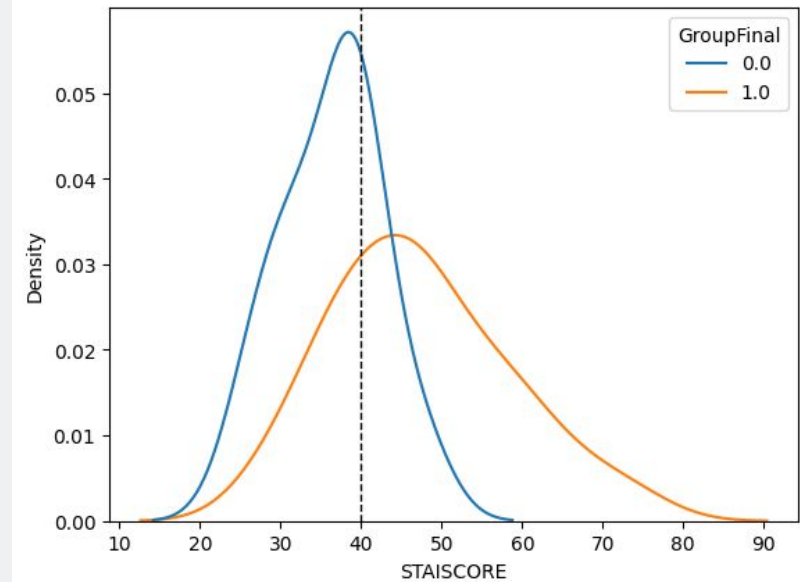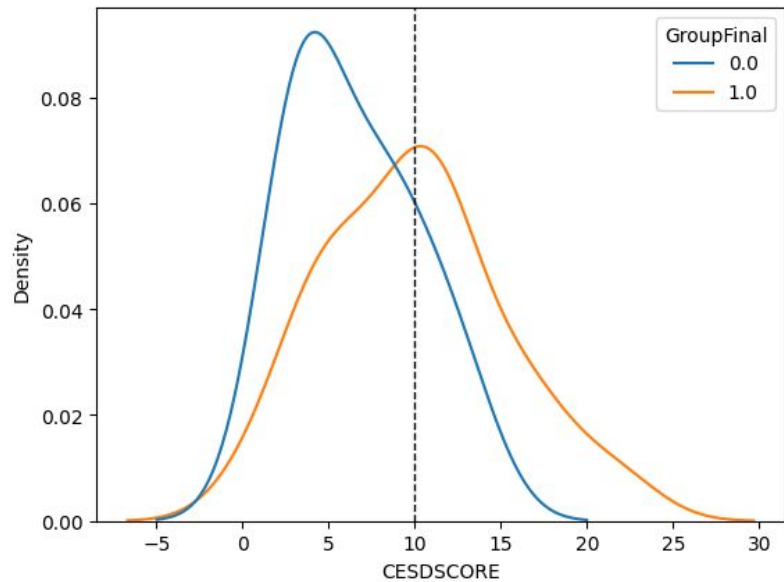
Objective 1 Results - Training Behaviors

- Individuals with Muscle Dysmorphia

	RTINTENSITY	MINSPERWORKOUT	DAYSPASTWEEK
mean	2.287143	71.457143	3.857143
min	1.600000	42.000000	1.000000
max	3.000000	165.000000	6.000000

- Individuals without Muscle Dysmorphia

	RTINTENSITY	MINSPERWORKOUT	DAYSPASTWEEK
mean	2.233333	60.0	3.666667
min	1.800000	15.0	2.000000
max	3.000000	90.0	6.000000

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Objective 1 Results - Training Behaviors

- People with Muscle Dysmorphia having similar training habits to people without Muscle Dysmorphia, excluding workout length.
- The typical patient with muscle dysmorphia workout 3.85 days a week, for 71.45 minutes per session, at an intensity of roughly 2.28/3.
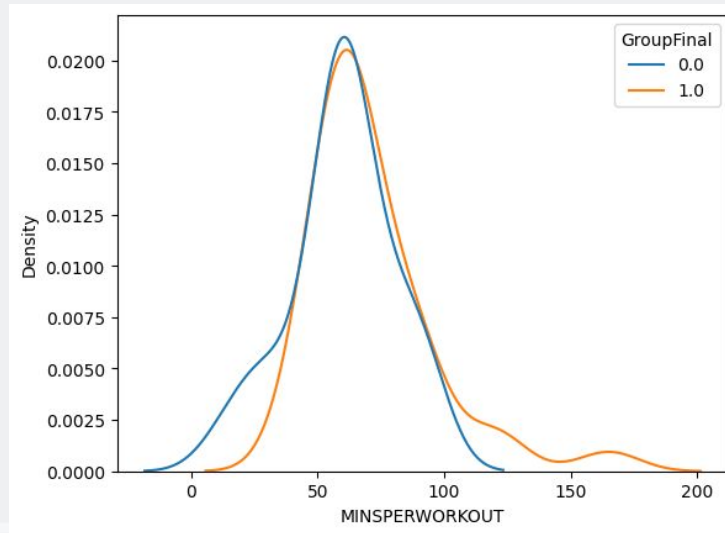
Objective 2 – Further Preprocessing

- **<u>Objective 2:</u>** Explore whether a worse mental health, including symptoms of muscle dysmorphia, are associated with more frequent and intense resistance training behaviors.

- Further preprocessing required (Switched to R)
  - Dropped all columns except ones involving training and mental health.
- Then PCA was used on each of the seven surveys:
  - MDI, RS, BDS, SPAS, CESD, STAI, AUDIT.
- After, the reduced dimensions were added back with the training variables.
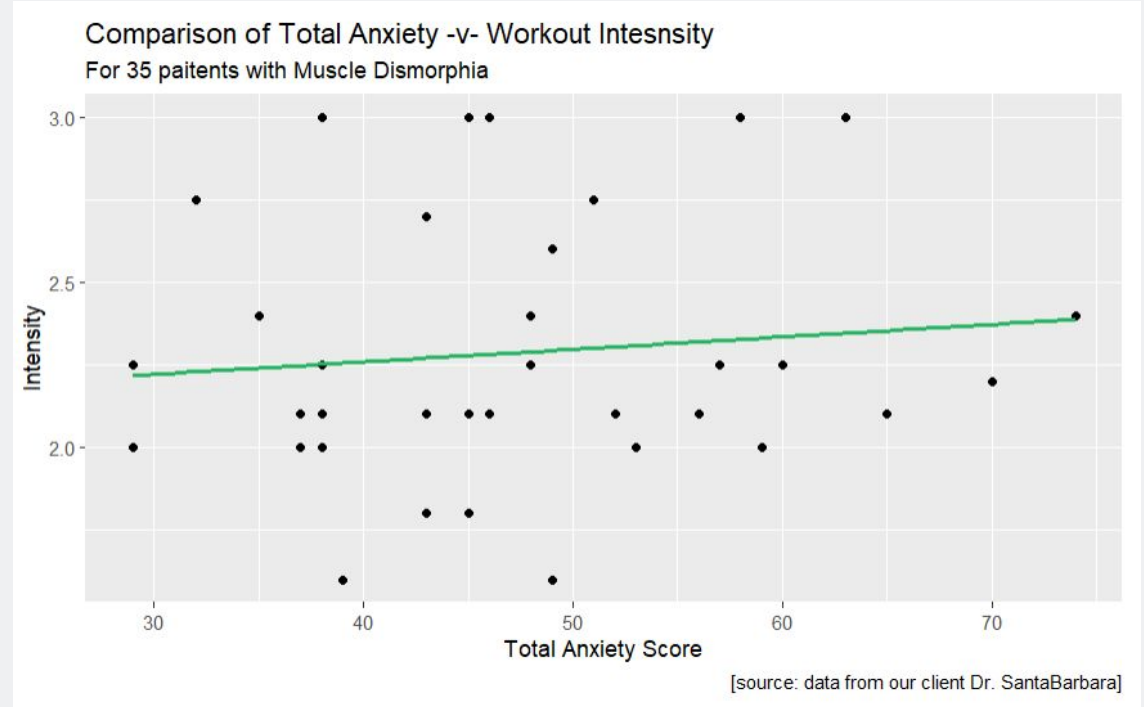
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Objective 2 – Methods

- Linear Regression Model
  - Intensity as the response variable.
  - Statistically significant dimensions from the PCA's as the explanatory variables.
- Forward Stepwise Regression
  - Intensity as the response variable
  - All the dimensions to see if a better outcome would be achieved.
- Regression Tree Model
- Predictive models to see if there is a direct correlation between variables.

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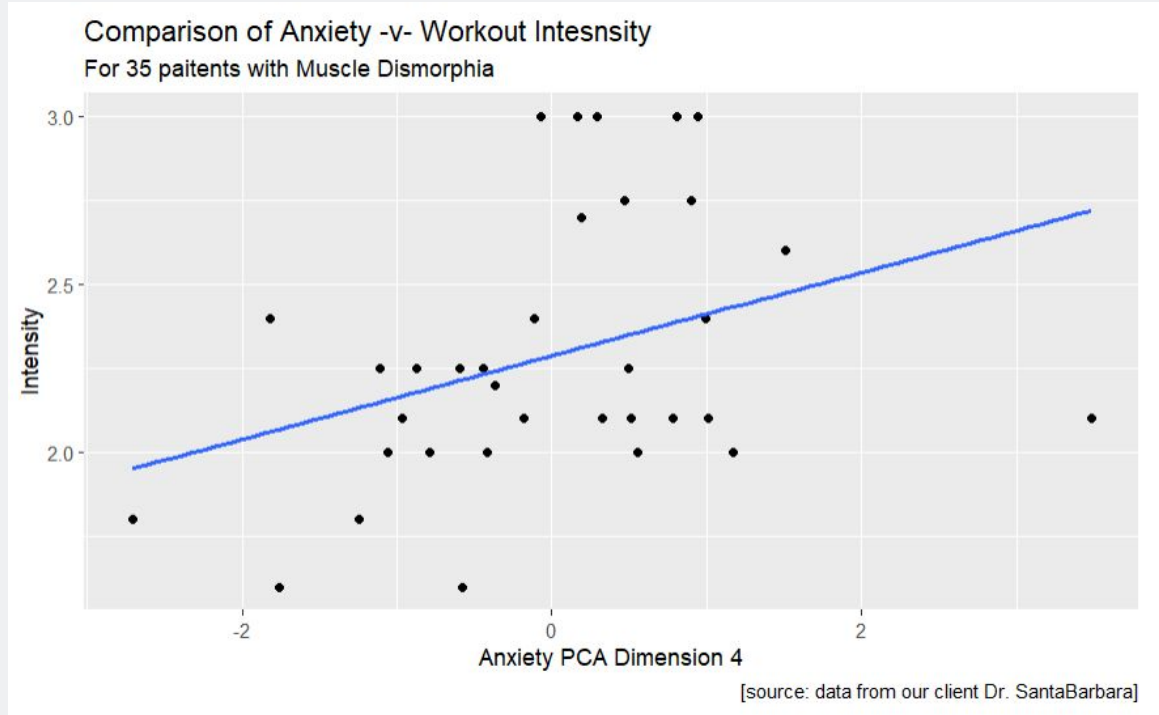# Objective 2 – Results

- Basic Linear Regression Model

- Using Total Scores
- Low Correlation

Comparison of Total Anxiety -v- Workout Intesnsity
For 35 paitents with Muscle Dismorphia

[source: data from our client Dr. SantaBarbara]
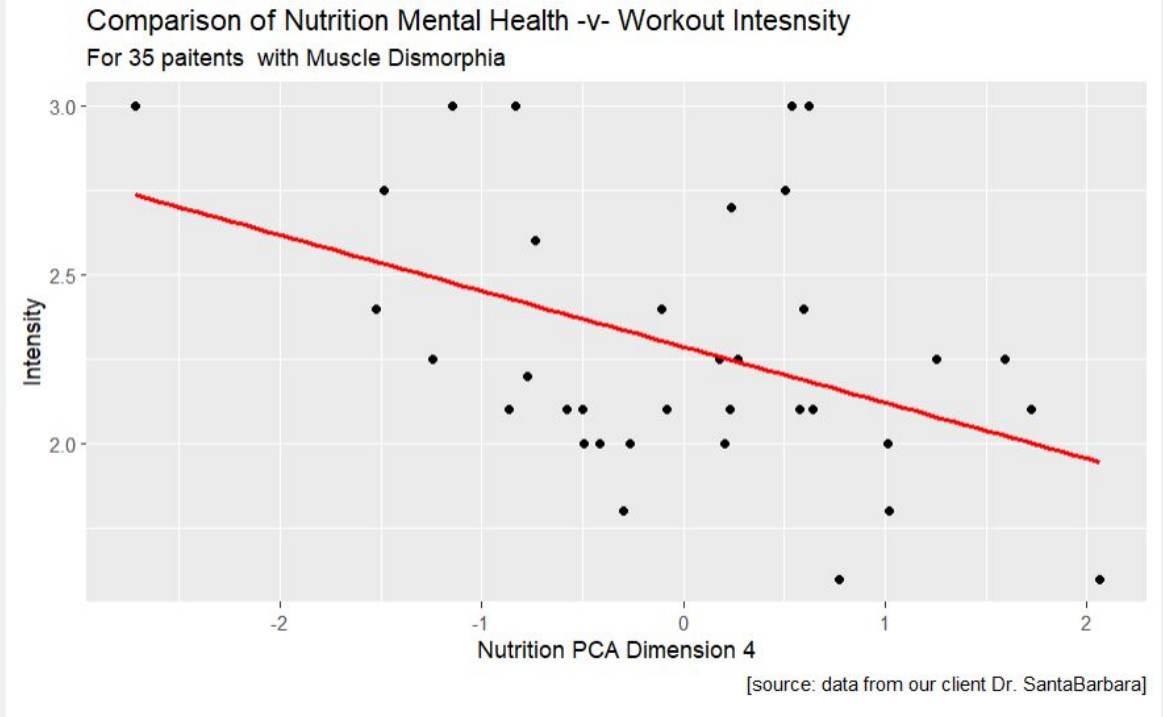
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Objective 2 – Results

- Preformed PCA to reduce dimensions

- Found these significant variables:
  - MDI.Dim.2
  - RS.Dim.4
  - STAI.Dim.4

- Most used question in STAI.Dim.4 –STAI 8

Comparison of Anxiety -v- Workout Intesnsity
For 35 paitents with Muscle Dismorphia

[source: data from our client Dr. SantaBarbara]
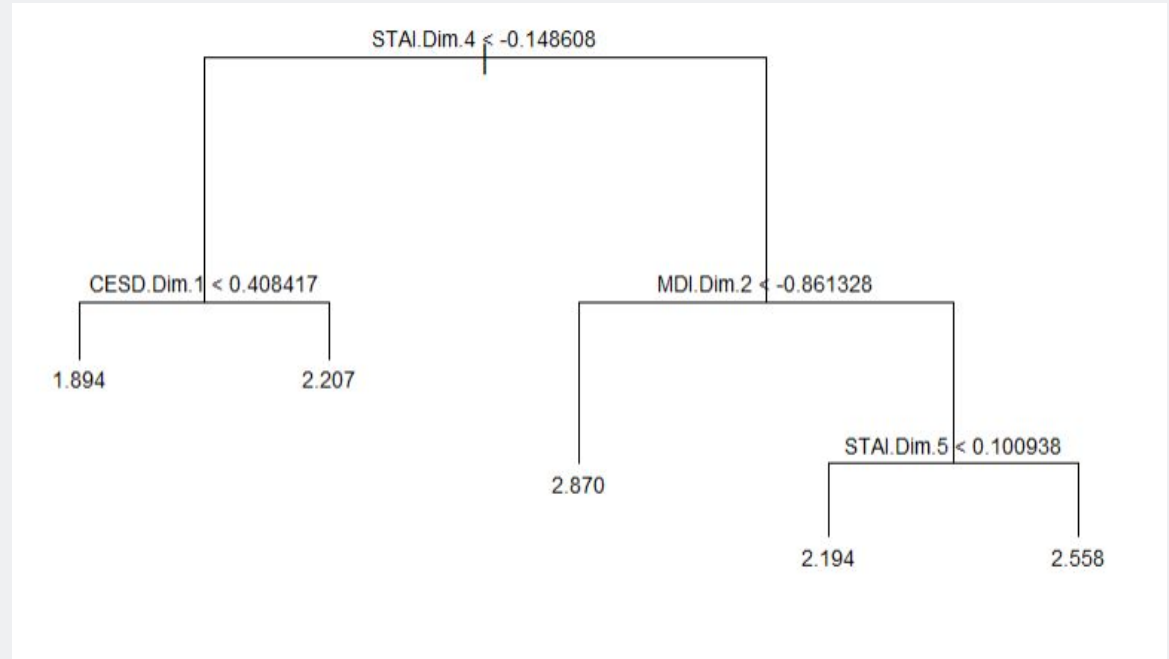
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Objective 2 – Results

- Forward Stepwise Regression to get the best variables

- Found these significant variables:
  - RS.Dim.4
  - MinsPerWork
  - SPAS.Dim.3
  - STAI.Dim.5
  - STAI.Dim.4
  - STAI.Dim.2

- Most used question in STAI.Dim.4 – RS10

Comparison of Nutrition Mental Health -v- Workout Intesnsity
For 35 paitents with Muscle Dismorphia

[source: data from our client Dr. SantaBarbara]

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Objective 2 – Results

- Regression Tree
- Looks at data in a similar way but not linearly

- Numbers at the bottom is the perceived Intensity

STAI.Dim.4 < -0.148608

CESD.Dim.1 < 0.408417

1.894   2.207

MDI.Dim.2 < -0.861328

2.870

STAI.Dim.5 < 0.100938

2.194   2.558

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Objective 2 – Conclusion

	Linear on Scores	Linear on PCA	Forward Stepwise	Regression Tree
R^2	0.1363	0.2141	0.4712	NA
Mean^2 Error	0.3748	0.3534	0.2899	0.0543

- Over all, these results show that the intensity of the workout is not associated with worse mental health, or having symptoms of muscle dysmorphia.

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Objective 3 Preprocessing

- **Objective 3:** Explore any associations between mental health and substance and supplement use.

- Features that are far away from a 50/50 split (17/18 of the 35), will not return any significant results as predicting the mental health score of say 3 people is not reliable.

- From here, I aimed to focus my model building around the first 5 features.

Protein_lastmonth	23
Marijuana_undermonth	18
Creatine_lastmonth	11
Cigaretes_undermonth	7
Stimulants_undermonth	4
Diaretics_lastmonth	3
Inhalents_undermonth	3
Ephedra_lastmonth	2
Halucogens_undermonth	1
Opiotes_undermonth	1
Morphine_undermonth	1
Xanax_undermonth	1
Steroids_undermonth	0

Objective 3 Early Analysis

- Looking at correlations between the variables expected to be used in the models, it is notable to see that many correlations are not strong.

- This can be a strong indication that model results will struggle.

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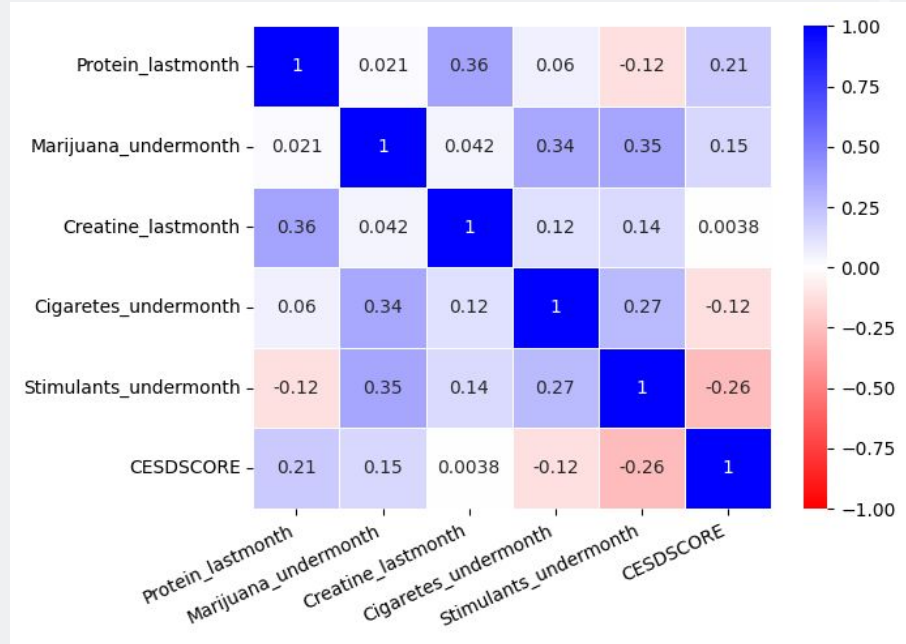
Objective 3 Methods

- Due to the nature of our data, ANOVA regression was the most fitting type of model to use when predicting a mental health score. As many of the substance and supplement use features were categorized as use within the month or use outside of the last month. While the mental health scores were on a numerical scale.

- In one case, logistic regression wa able to be used since the mental health scale "CESD" has a medical cutoff at 10, where 10 is considered as displaying symptoms of depression. Thus, we can use logistic regression to predict if they pass this cutoff.

Objective 3 Results

- Throughout the various ANOVA models testing CESD score, STAI score, MDI score, and other measures of mental health, none revealed any significant results, typically having R-Squared values around .3 and lower.
- R-squared values that low tell us that these substance and supplement features are not good predictors for the mental health indexes.

- The logistic regression model predicting CESD Status was also quite unsuccessful returning an R^2 value of 0.08. Showing that running it as a binary predictor did not work.

Objective 3 Results

MH Inventory	ANOVA							Logistic Regression	
	CESD	STAI	MDI	RS	BDS	SPAS	AUDIT	CESD - Status	STAI - Status
R^2	0.180	0.208	0.099	0.163	0.294	0.189	0.326	0.082	0.121
AIC	219	270	266	228	237	262	154	N/A	N/A

- AUDIT index performs the best at both metrics.

Conclusions

- Overall Conclusions

- Acknowledgements

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Conclusions

- Throughout our objectives, we have seen that results have typically shown to not be statistically significant.

- This does not mean that in a larger population of people that these connections between training behaviors, substance use, and mental health do not exist.

- These results tell us that our sample did not have meaningful connections.

- Statistical significance can be very difficult to find in datasets of small numbers.

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Acknowledgements

- Our Client Dr. SantaBarbara.

- Our Professor Dr. St. Hilaire.

Thank you!

✠ Questions?