



Speech Emotion Perception in Depression

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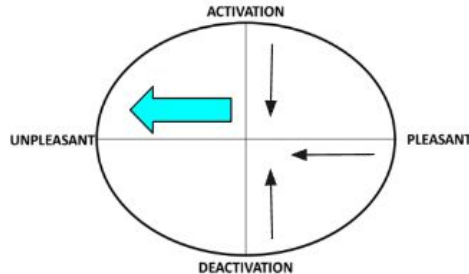
Problem Statement & Hypothesis

Objective:

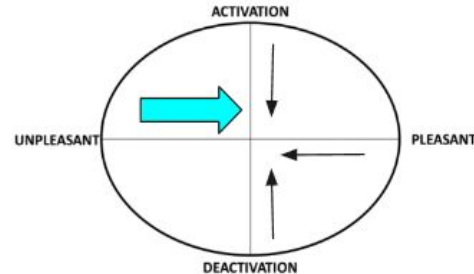
In this cross-sectional study, participants would rate the emotion of the speaker from the audio files presented to them. We then would analyze and infer the effect of self reported depression on emotion perception of speech and whether current mood or demographic details(personal and familial history) seem to play a role in this case.

Hypothesis:

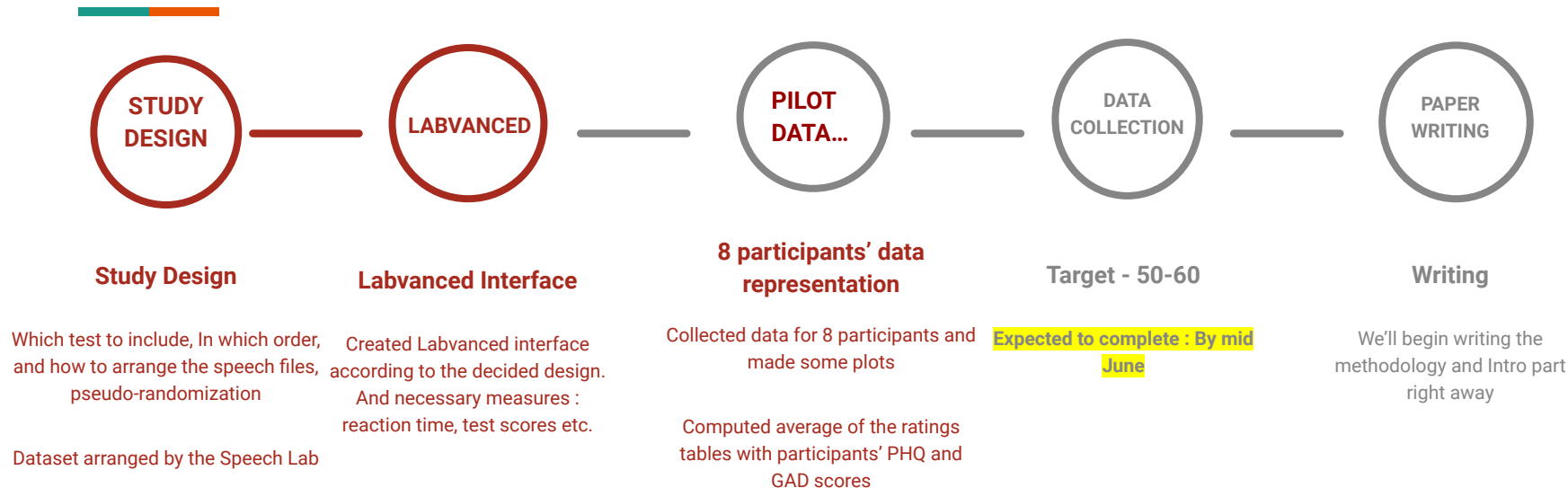
Beck's Depression Theory ?



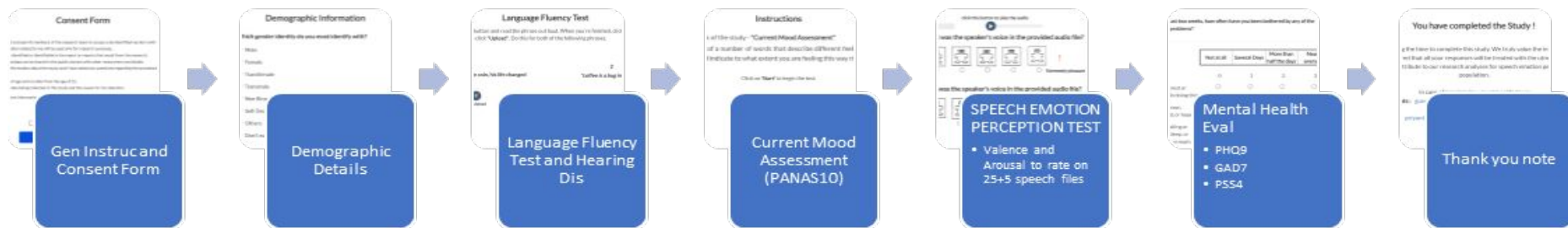
Emotional Context Insensitivity Theory ?



Timeline



Study Design - Labvanced Interface





Dataset

Dataset

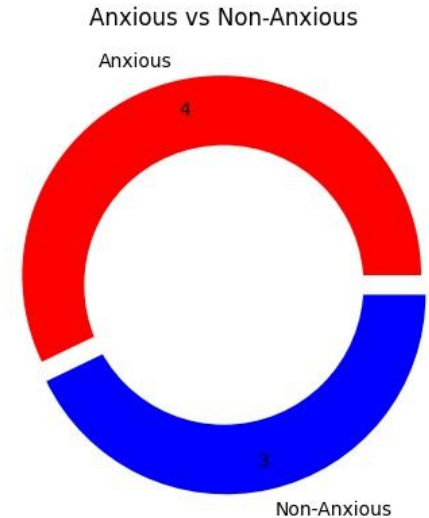
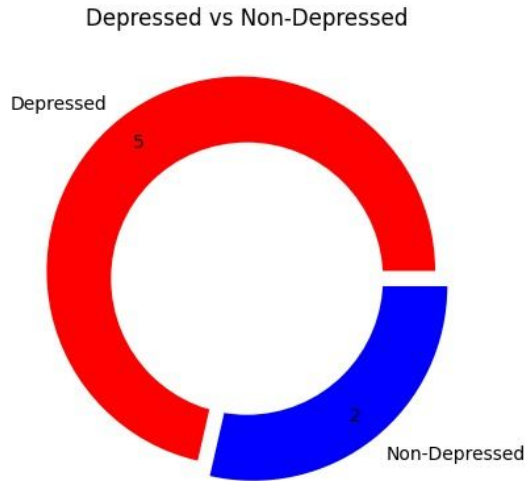
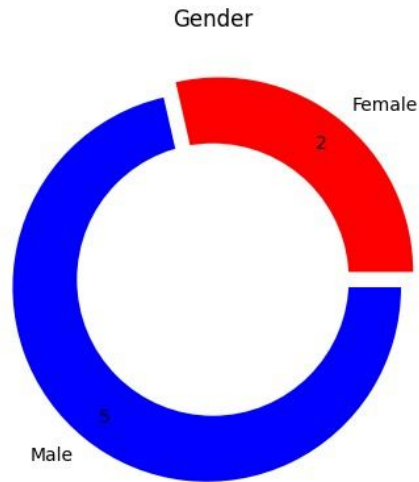
Pseudo-randomization of speech files among 4 sets.



- Almost equal number of files from each emotion in each set
- Ensuring that no two files of the similar rating come together in the set
- 5 files are repeated in end of each set ~ **Intra rater Reliability**

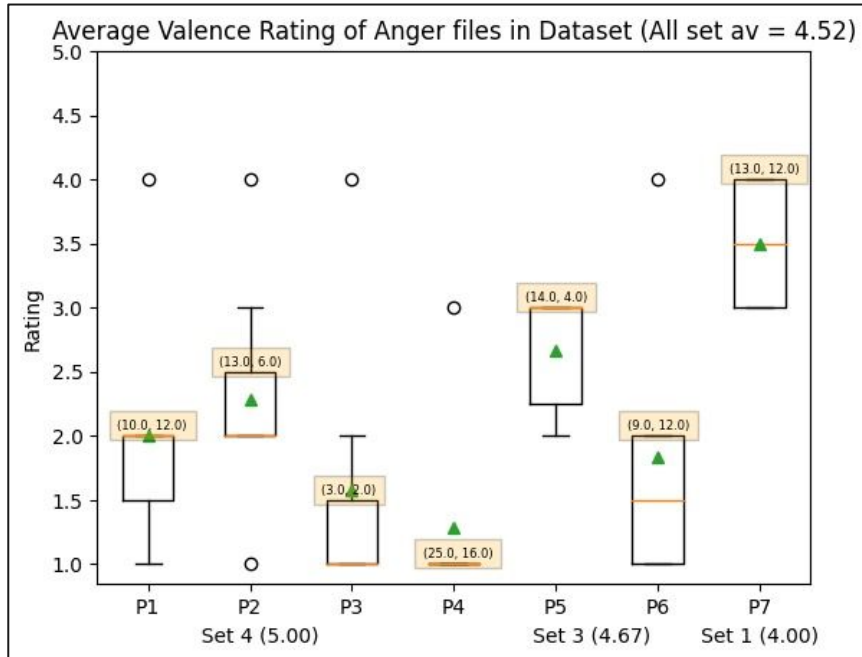


Data Collection : Profile of Participants

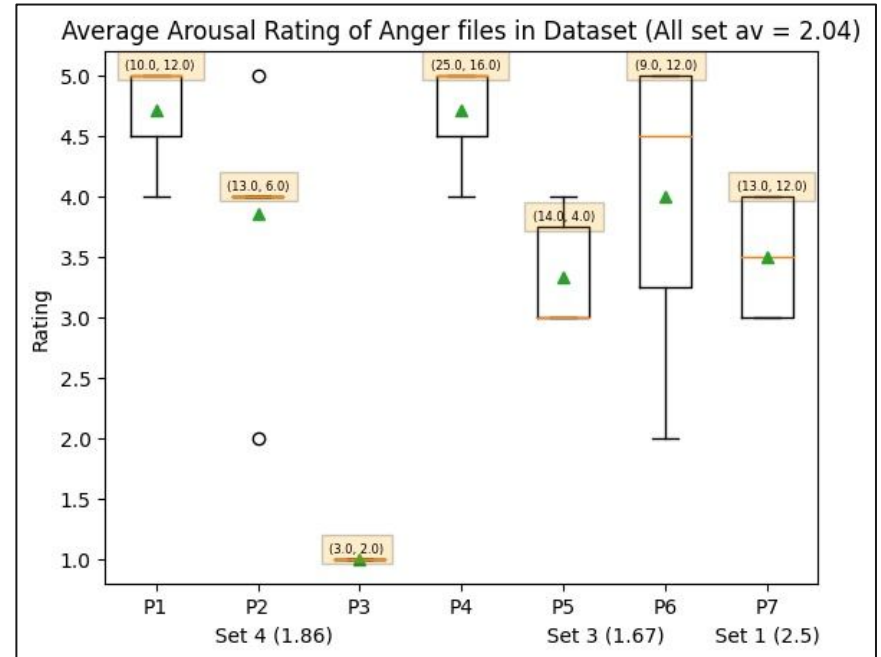


Data Representation (Anger)

Valence

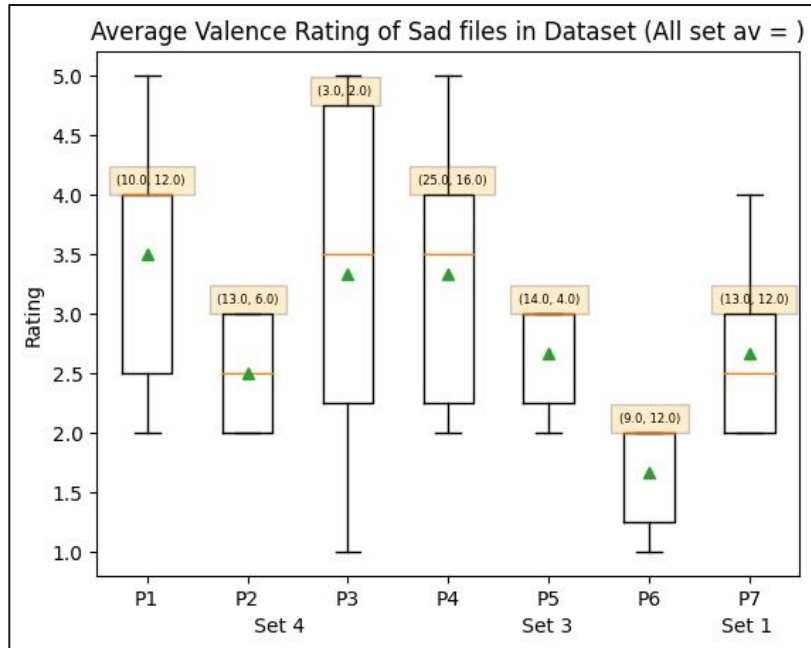


Arousal

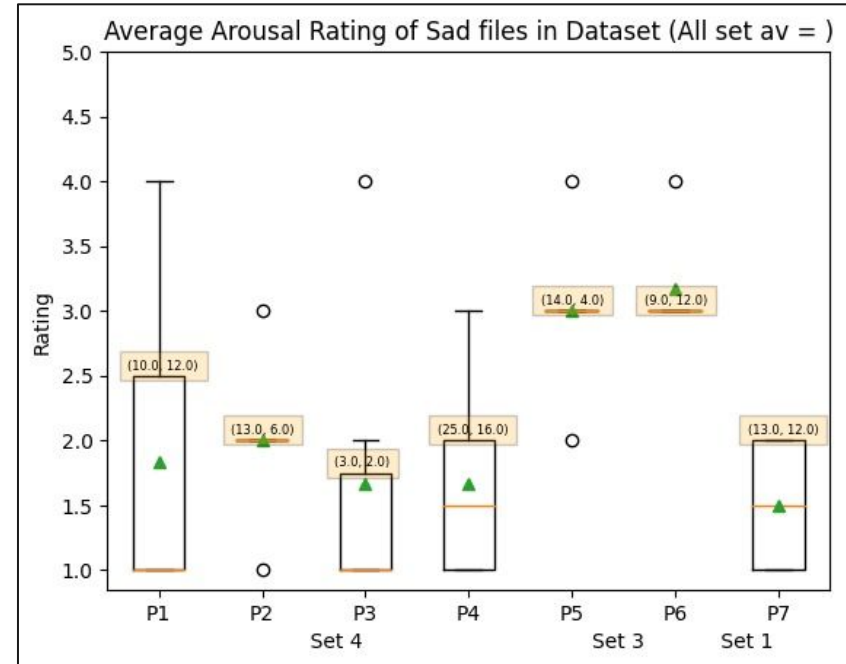


Data Representation (Sad)

Valence



Arousal

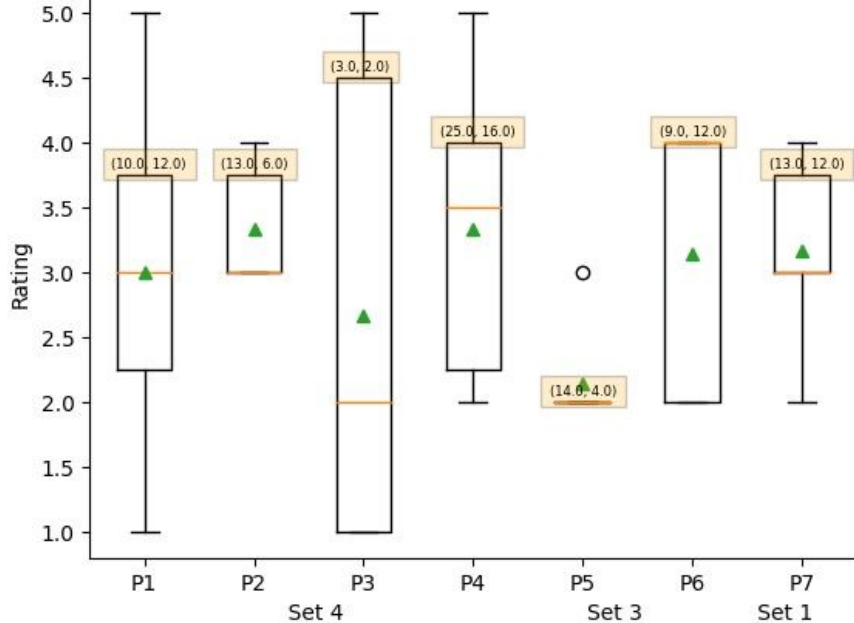


Data Representation (Happy)

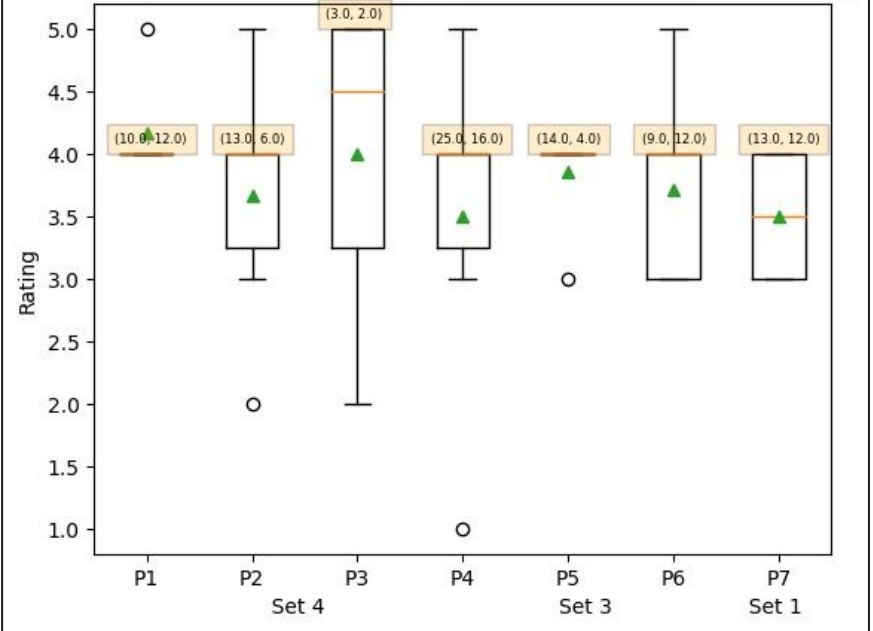
Valence

Arousal

Average Arousal Rating of Happy files in Dataset (All set av =)

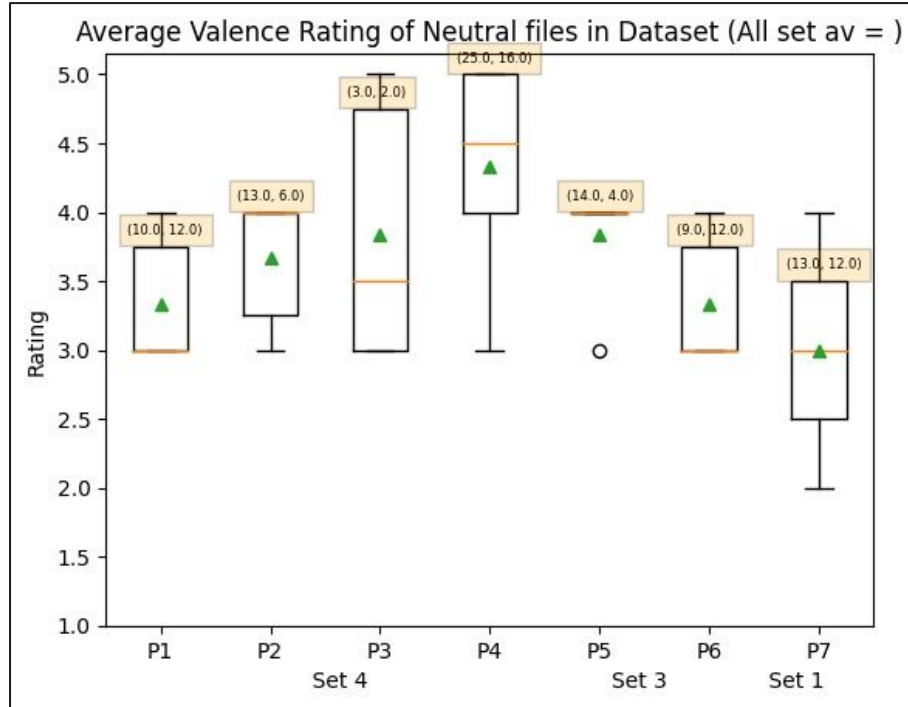


Average Valence Rating of Happy files in Dataset (All set av =)

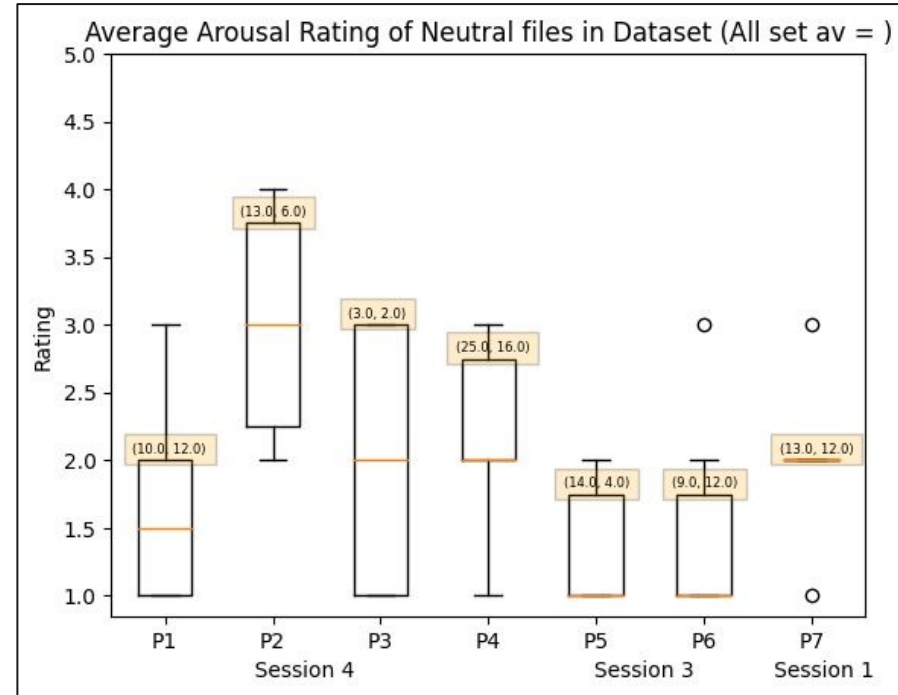


Data Representation (Neutral)

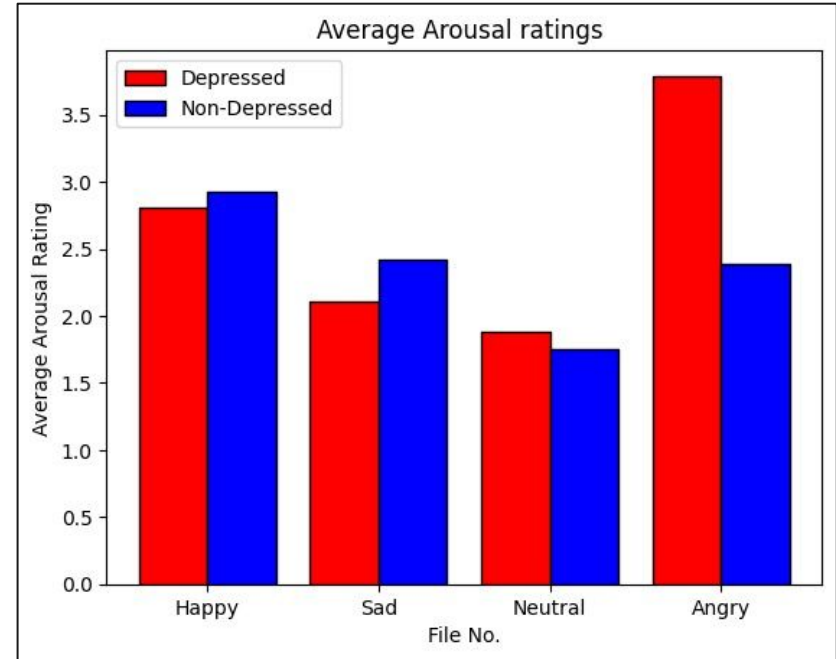
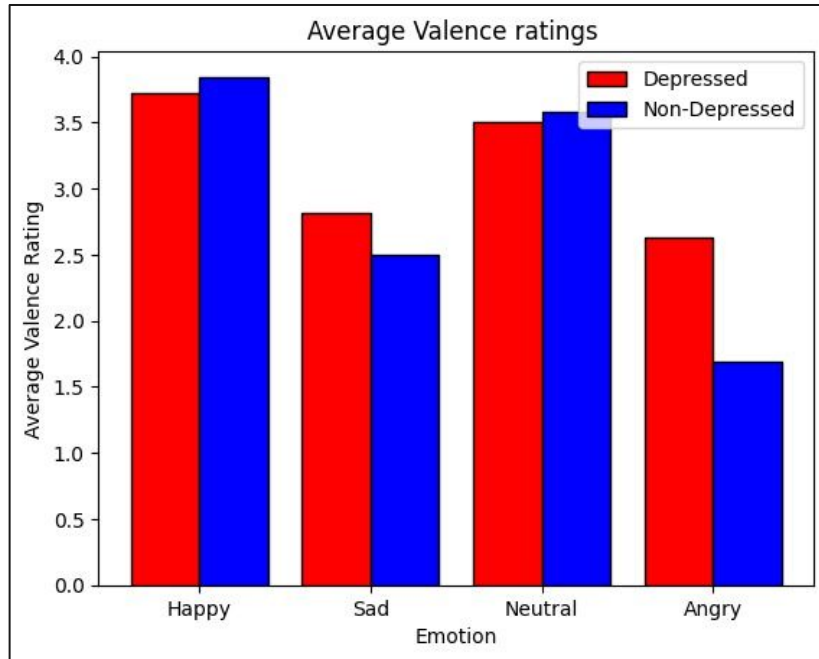
Valence



Arousal



Average Ratings of participants for each emotion





Data for all participants

Emotion	P1	P2	P3	P4	P5	P6	P7
(PHQ, GAD)	(10.0, 12.0)	(13.0, 6.0)	(3.0, 2.0)	(25.0, 16.0)	(14.0, 4.0)	(9.0, 12.0)	(13.0, 12.0)
happy	4.166666666666667	3.666666666666665	4.0	3.5	3.857142857142857	3.7142857142857144	3.5
sad	3.5	2.5	3.333333333333335	3.333333333333335	2.666666666666665	1.666666666666667	2.666666666666665
neutral	3.333333333333335	3.666666666666665	3.833333333333335	4.333333333333333	3.833333333333335	3.333333333333335	3.0
angry	2.0	2.2857142857142856	1.5714285714285714	1.2857142857142858	2.666666666666665	1.8333333333333333	3.5



Data after categorisation (Depressed / Non Depressed)

Valence

For Valence		
Emotion	Depressed	Non Depressed
Happy	3.7192982456140347	3.8461538461538463
Sad	2.814814814814815	2.5
Neutral	3.5087719298245617	3.5833333333333335
Angry	2.6315789473684212	1.6923076923076923

Arousal

For Arousal		
Emotion	Depressed	Non Depressed
Happy	2.807017543859649	2.923076923076923
Sad	2.111111111111111	2.4166666666666665
Neutral	1.8771929824561402	1.75
Angry	3.789473684210526	2.3846153846153846



Data after categorisation (Anxious / Non-Anxious)

Valence

For Valence			
Emotion	Anxious	Non Anxious	
Happy	3.6842105263157894	3.8461538461538463	
Sad	2.5833333333333335	2.7916666666666665	
Neutral	3.3684210526315788	3.7916666666666665	
Angry	2.289473684210526	2.269230769230769	

Arousal

For Arousal			
Emotion	Anxious	Non Anxious	
Happy	3.1578947368421053	2.5384615384615383	
Sad	2.1388888888888889	2.4166666666666665	
Neutral	1.8157894736842106	1.9166666666666667	
Angry	4.105263157894737	2.8461538461538463	



Data in csv files



Left to do

Data Collection

- 1) Analysis on complete data
 - a) Statistical Tests (ANOVA etc.)
 - b) Inferential Statistics

Paper Writing



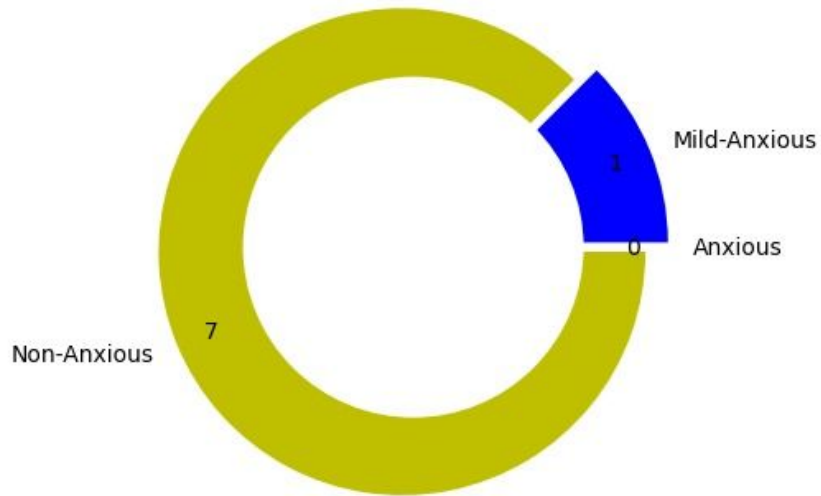
Set - 3 Data

Performed by : 8 Participants

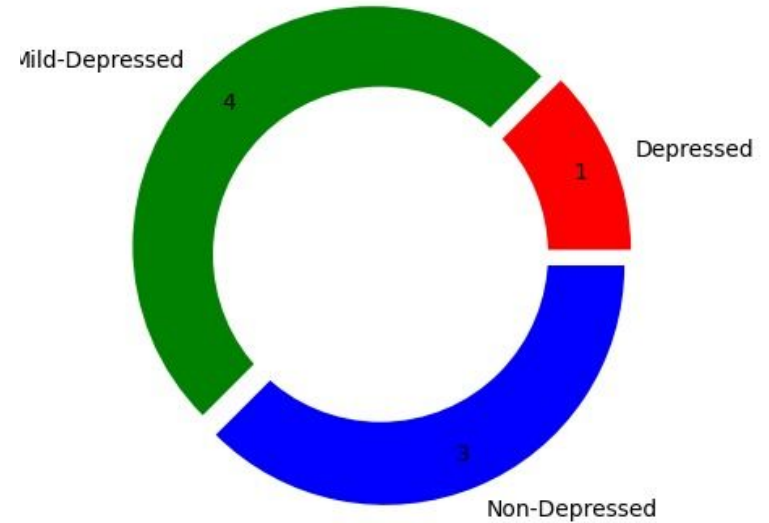
Profile of the Participants



Anxious vs Non-Anxious



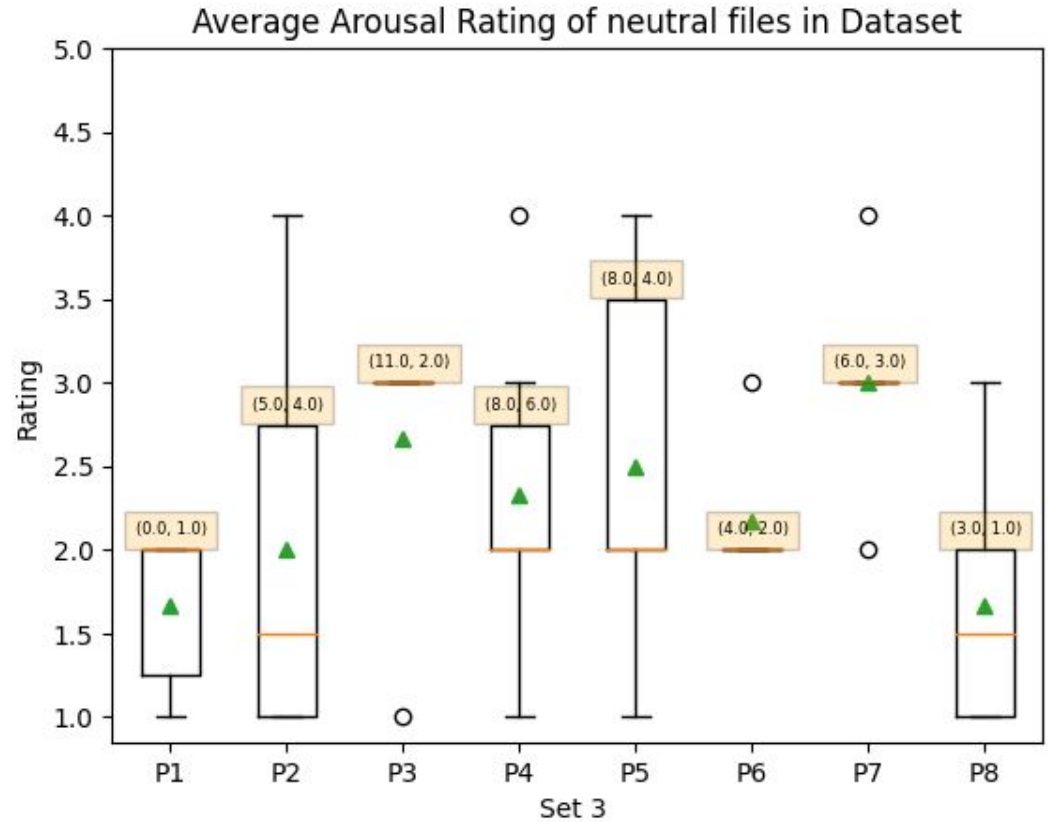
Depressed vs Non-Depressed



Neutral (Arousal)



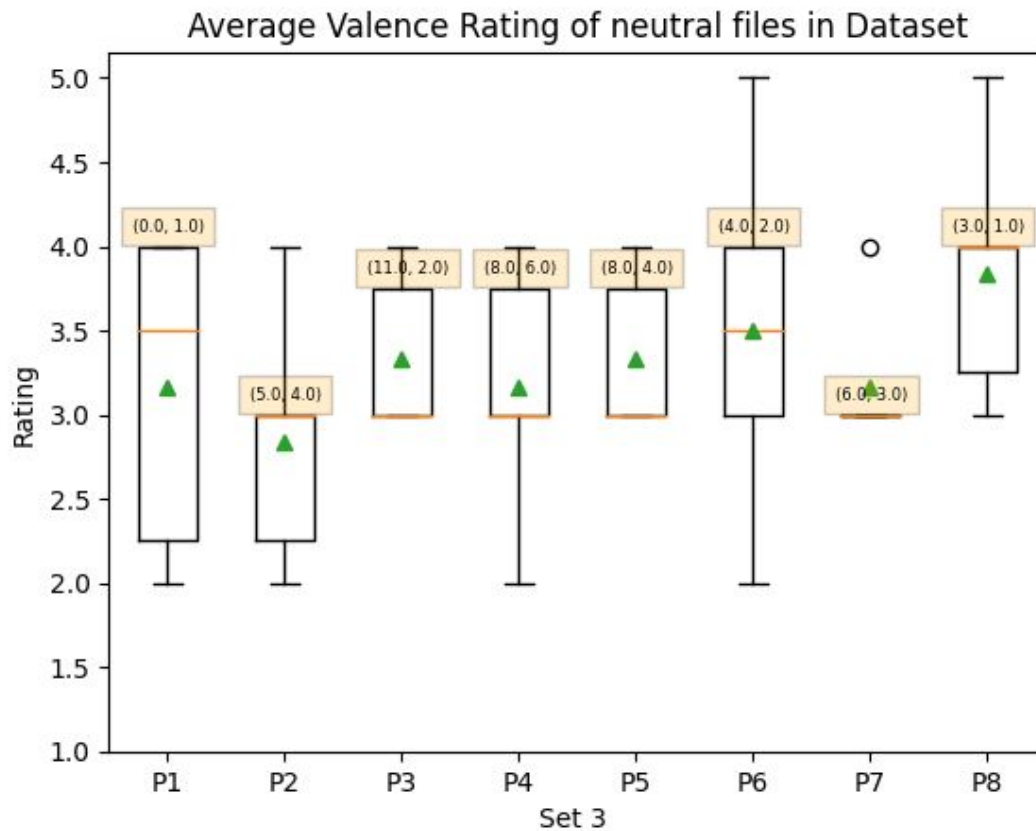
Avg from dataset : 2



Neutral (Valence)



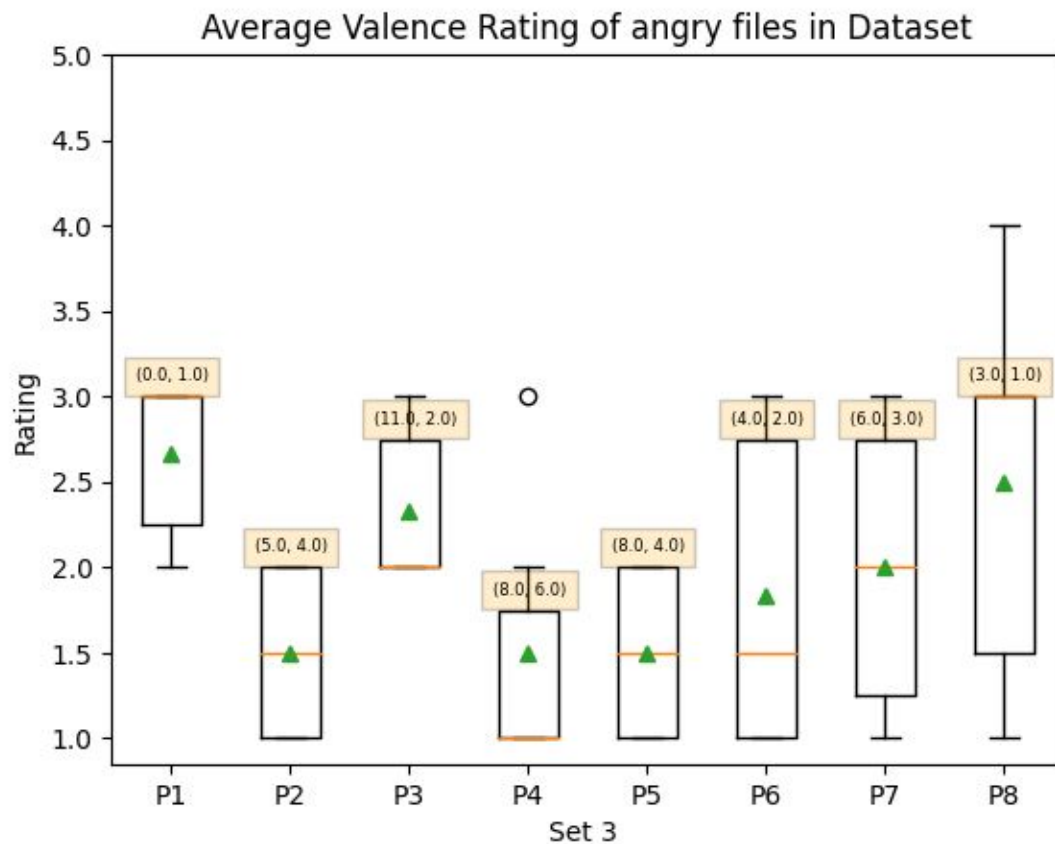
Avg from dataset : 3



Angry (Valence)



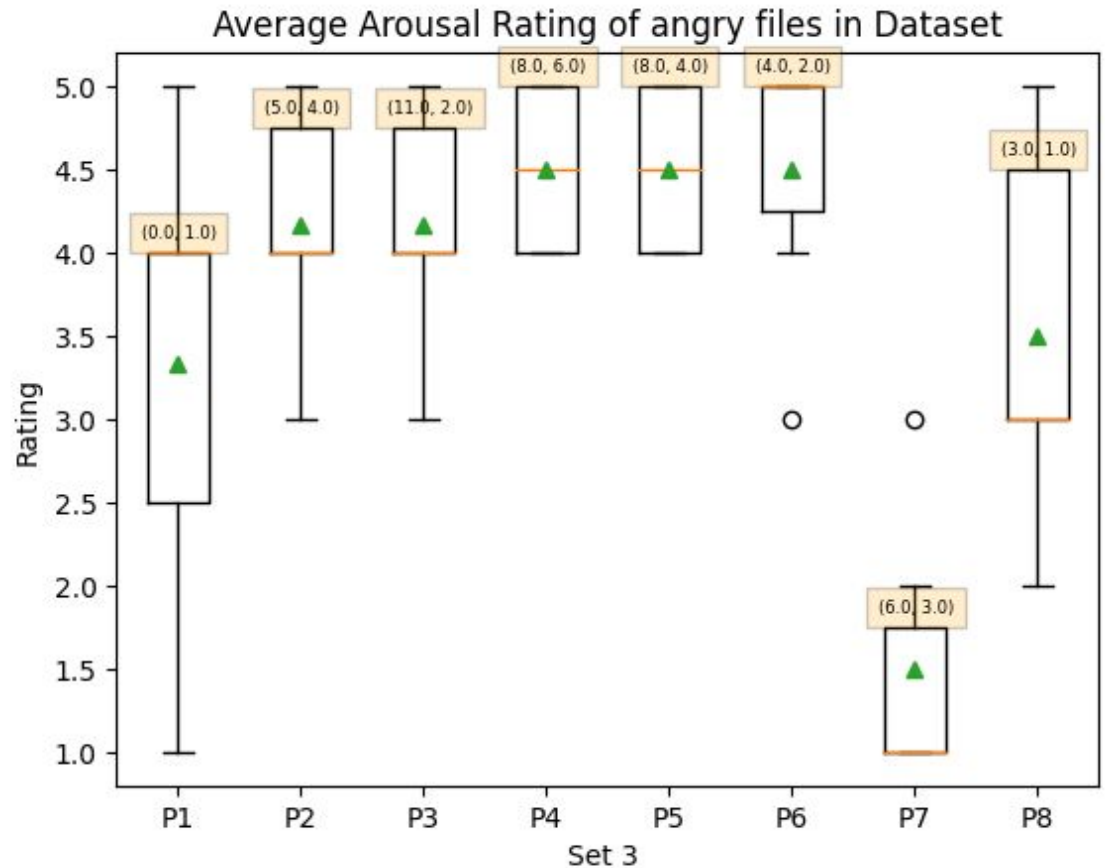
Avg from dataset : 1.33



Angry (Arousal)



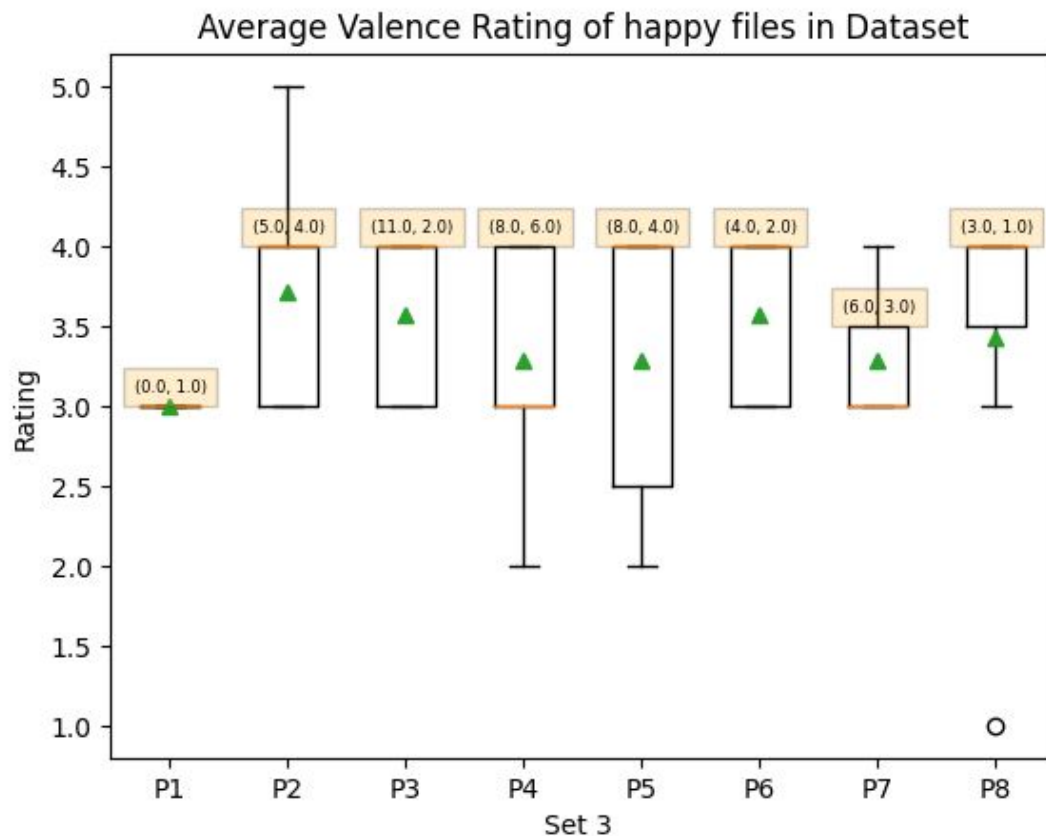
Avg from dataset : 3.5



Happy (Valence)



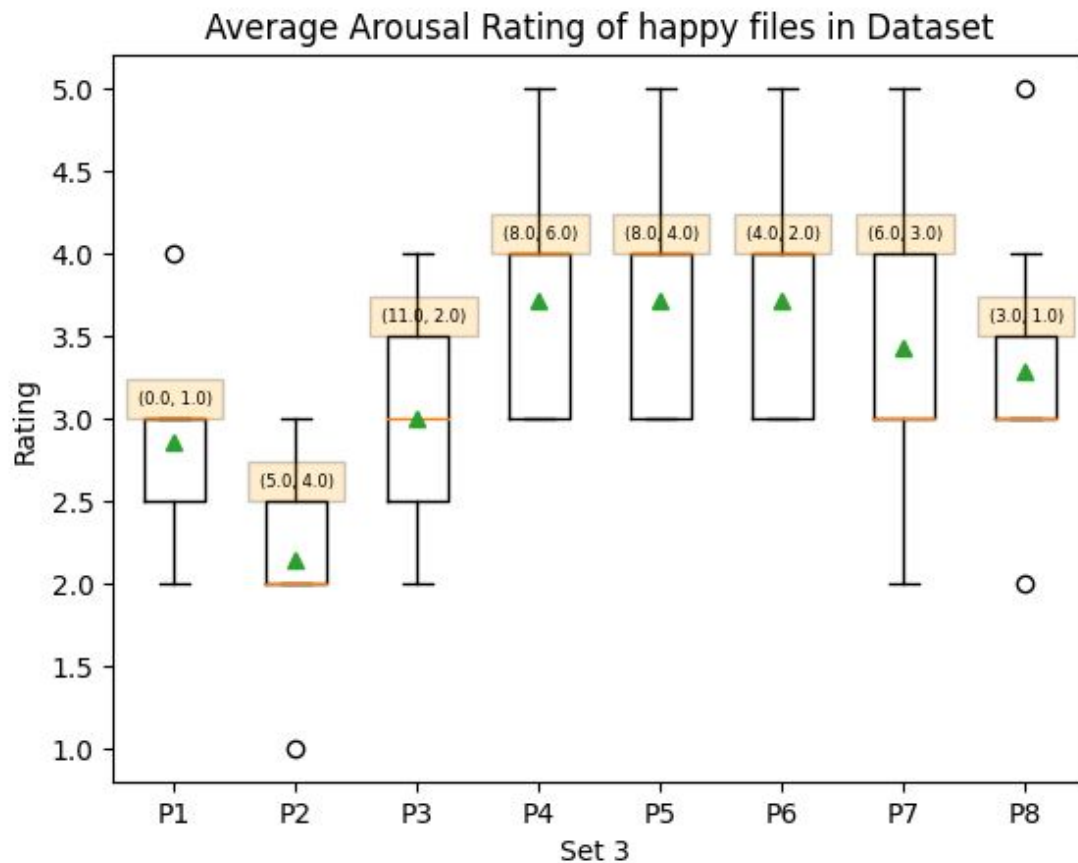
Avg from dataset : 4



Happy (Arousal)



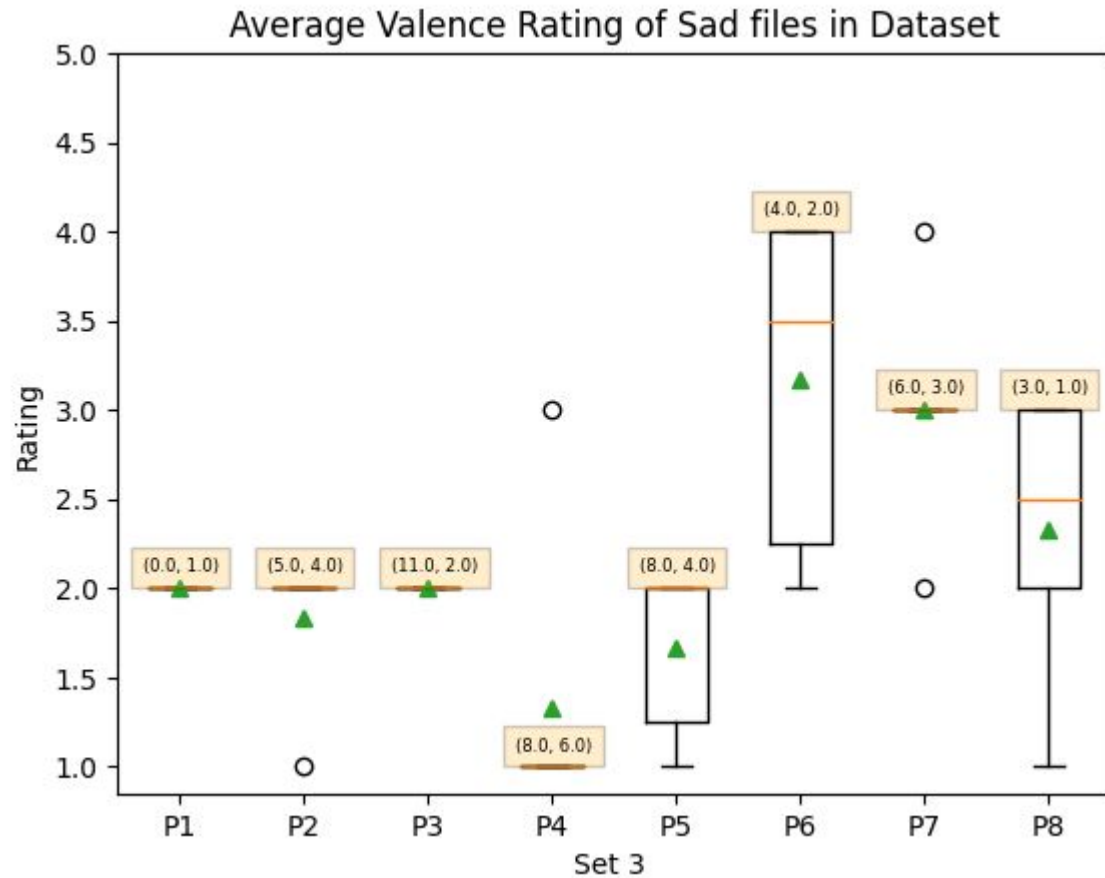
Avg from dataset : 3



Sad (Valence)



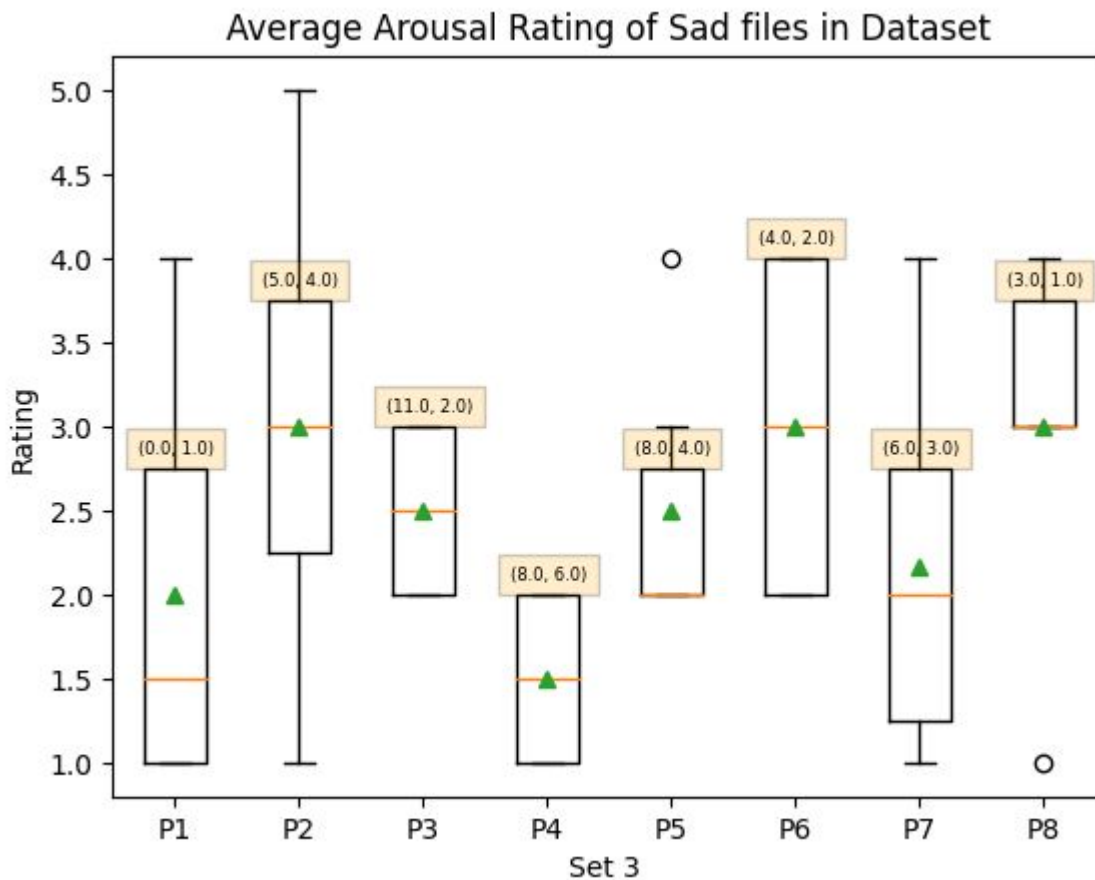
Avg from dataset : 2.1



Sad (Arousal)



Avg from dataset : 1.833





DATA in CSV format

Raw data obtained from the Labvanced

The CSV file of compiled data



Participants

43 Participants

Set A - 14

Set B - 15

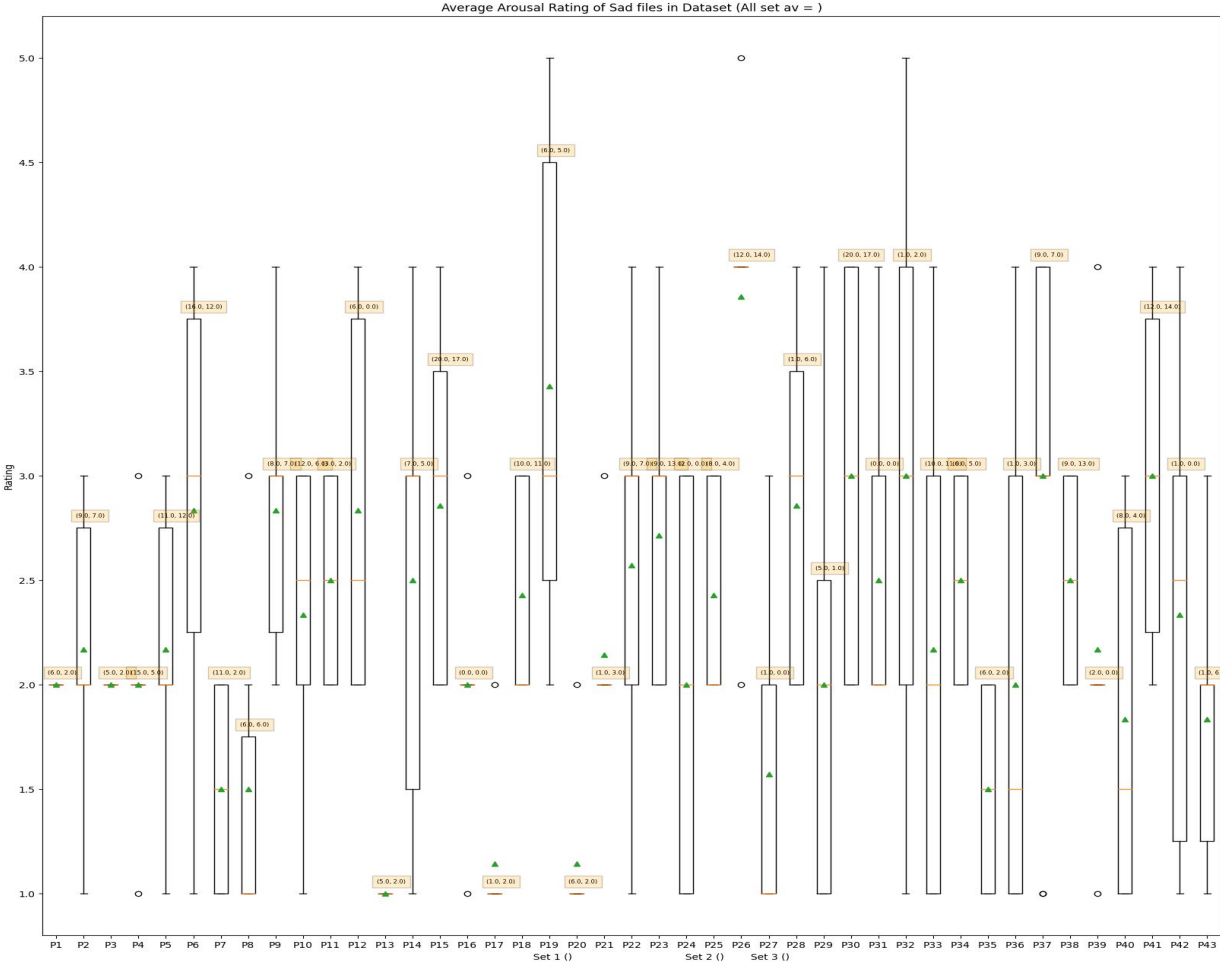
Set C - 8

Sec D - 6

SAD labelled files (Arousal ratings)



Dataset Avg = 1.833



SAD labelled files (Valence ratings)



Avg from dataset : 2.1

Angry labelled files (Valence ratings)



Avg from dataset : 1.33

Angry labelled files (Arousal ratings)



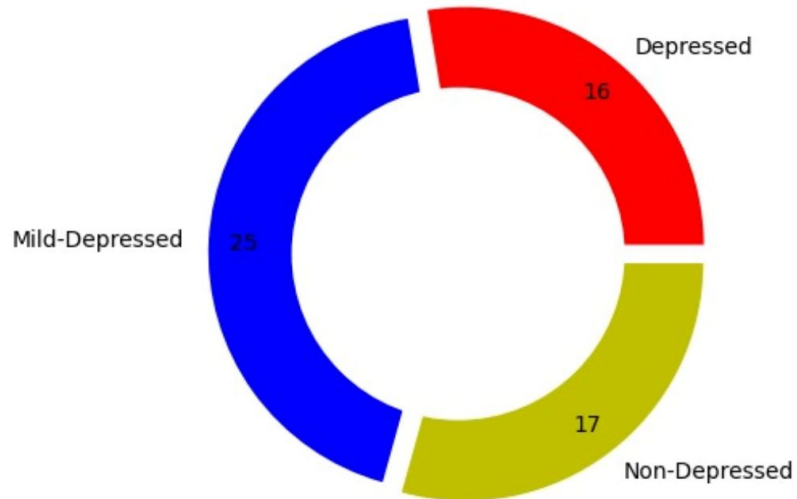
Avg from dataset : 3.5



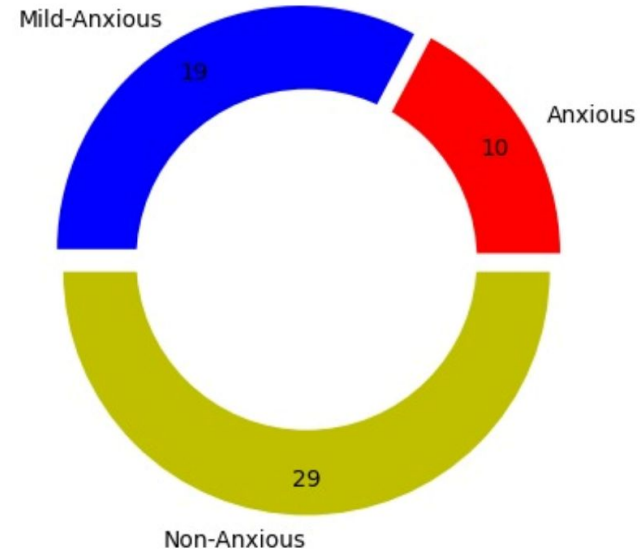
Profile of Participants

Total Participants = 58

Depressed vs Non-Depressed



Anxious vs Non-Anxious



Arousal Ratings

Dataset

	Set 1	Set 2	Set 3	Set 4
Happy	3	3.16	3	3
Sad	1.83	1.43	1.833	2.33
Angry	3.5	3.83	3.5	4.42
Neutral	2	2.5	2	2.5

Cumulative avg

3.04
1.85
3.81
2.25

Data Collected

Emotion	Session 1	Session 2	Session 3	Session 4
Happy	3.63	3.22	3.21	3.33
Sad	2.13	2.34	2.55	2.31
Angry	2.98	3.72	3.81	4.07
Neutral	2.17	2.24	2.24	2.51

Cumulative avg

3.34
2.33
3.64
2.30

Valence Ratings

Dataset

	Set 1	Set 2	Set 3	Set 4
Happy	4	4.16	4	4.167
Sad	2.16	2.42	2.1	2
Angry	2	1.67	1.33	1
Neutral	3	3	3	3.5

Cumulative avg

4.08

2.17

1.5

3.125

Data Collected

Emotion	Session 1	Session 2	Session 3	Session 4
Happy	3.89	4.0	3.46	3.63
Sad	2.42	2.73	2.08	2.91
Angry	2.99	2.19	1.77	2.05
Neutral	2.69	3.19	3.29	3.64

Cumulative avg

3.74


2.53

2.25

3.20

Set - 1 (Self Reported Depression Categorization)

Valence (Data Collected)



Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.77	3.88	4.25
Sad	2.5	2.38	2.42
Angry	3.0	3.02	2.83
Neutral	2.6	2.73	2.71

Arousal (Data Collected)

Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.33	3.58	4.58
Sad	2.17	2.1	2.17
Angry	2.97	2.98	3.0
Neutral	2.17	2.18	2.14

From the Dataset

Set 1
4
2.16
2
3

Cumulative avg

3.04

1.85

3.81

2.25

Set - 1 (Self Reported Anxiety Categorization)

Valence (Data Collected)



Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.42	3.94	3.98
Sad	2.58	2.39	2.4
Angry	3.25	2.89	3.0
Neutral	2.64	2.57	2.8

Cumulative avg

4.08
2.17
1.5
3.125

Arousal (Data Collected)


Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.33	3.89	3.5
Sad	2.5	2.22	1.95
Angry	3.42	3.19	2.67
Neutral	2.21	2.26	2.08

Cumulative avg

3.04
1.85
3.81
2.25

Set - 2 (Self Reported Depression Categorization)

Valence (Data Collected)



Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	4.44	4.08	3.69
Sad	2.38	3.1	2.55
Angry	1.89	2.25	2.28
Neutral	2.83	3.39	3.17

Arousal (Data Collected)

Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.44	3.28	3.06
Sad	3.05	2.38	1.95
Angry	4.06	3.61	3.67
Neutral	2.61	2.39	1.92

Cumulative avg

4.08
2.17
1.5
3.125

Cumulative avg

3.04
1.85
3.81
2.25

Set - 2 (Self Reported Anxiety Categorization)

Valence (Data Collected)



Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	4.38	4.22	3.73
Sad	2.54	3.05	2.71
Angry	1.88	2.33	2.29
Neutral	2.92	3.39	3.25

Cumulative avg

4.08
2.17
1.5
3.125

Arousal (Data Collected)

Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.5	2.83	3.23
Sad	2.96	2.95	1.8
Angry	4.17	3.22	3.69
Neutral	2.46	2.94	1.88

Cumulative avg

3.04
1.85
3.81
2.25

Set - 3 (Self Reported Depression Categorization)

Valence (Data Collected)



Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.71	3.48	3.25
Sad	1.67	1.97	2.54
Angry	1.83	1.56	2.04
Neutral	2.94	3.39	3.42

Arousal (Data Collected)

Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.29	3.14	3.25
Sad	2.28	2.67	2.58
Angry	3.72	3.81	3.88
Neutral	2.61	2.36	1.79

Cumulative avg

4.08
2.17
1.5
3.125

Cumulative avg

3.04
1.85
3.81
2.25

Set - 3 (Self Reported Anxiety Categorization)

Valence (Data Collected)



Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.86	3.25	3.52
Sad	1.33	1.79	2.31
Angry	1.67	1.29	2.02
Neutral	2.67	3.17	3.44

Arousal (Data Collected)

Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.43	3.36	3.11
Sad	2.0	2.54	2.62
Angry	3.83	4.0	3.71
Neutral	2.83	2.25	2.17

Cumulative avg

4.08
2.17
1.5
3.125

Cumulative avg

3.04
1.85
3.81
2.25

Set - 4 (Self Reported Depression Categorization)

Valence (Data Collected)



Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.7	3.53	3.67
Sad	2.67	3.17	2.9
Angry	2.11	1.97	2.06
Neutral	3.6	3.8	3.53

Arousal (Data Collected)

Emotion	Depressed	Mild - Depressed	Non - Depressed
Happy	3.17	3.33	3.5
Sad	2.23	2.03	2.67
Angry	3.77	4.4	4.03
Neutral	2.23	2.5	2.8

Cumulative avg

4.08
2.17
1.5
3.125

Cumulative avg

3.04
1.85
3.81
2.25

Set - 4 (Self Reported Anxiety Categorization)

Valence (Data Collected)



Arousal (Data Collected)

Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.5	3.67	3.67
Sad	2.67	2.83	3.11
Angry	2.29	1.95	2.02
Neutral	3.5	3.61	3.75

Emotion	Anxiety	Mild - Anxiety	Non - Anxiety
Happy	3.11	3.44	3.33
Sad	2.28	2.11	2.53
Angry	3.9	4.14	4.07
Neutral	2.39	2.33	2.75

Cumulative avg

4.08
2.17
1.5
3.125

Cumulative avg

3.04
1.85
3.81
2.25

