دانشکده روانشناسی و علوم تربیتی

پژوهشگاه دانش‌های بنیادی IPM

MATLAB for Brain and Cognitive Psychology (Data Analysis)

Presented by:
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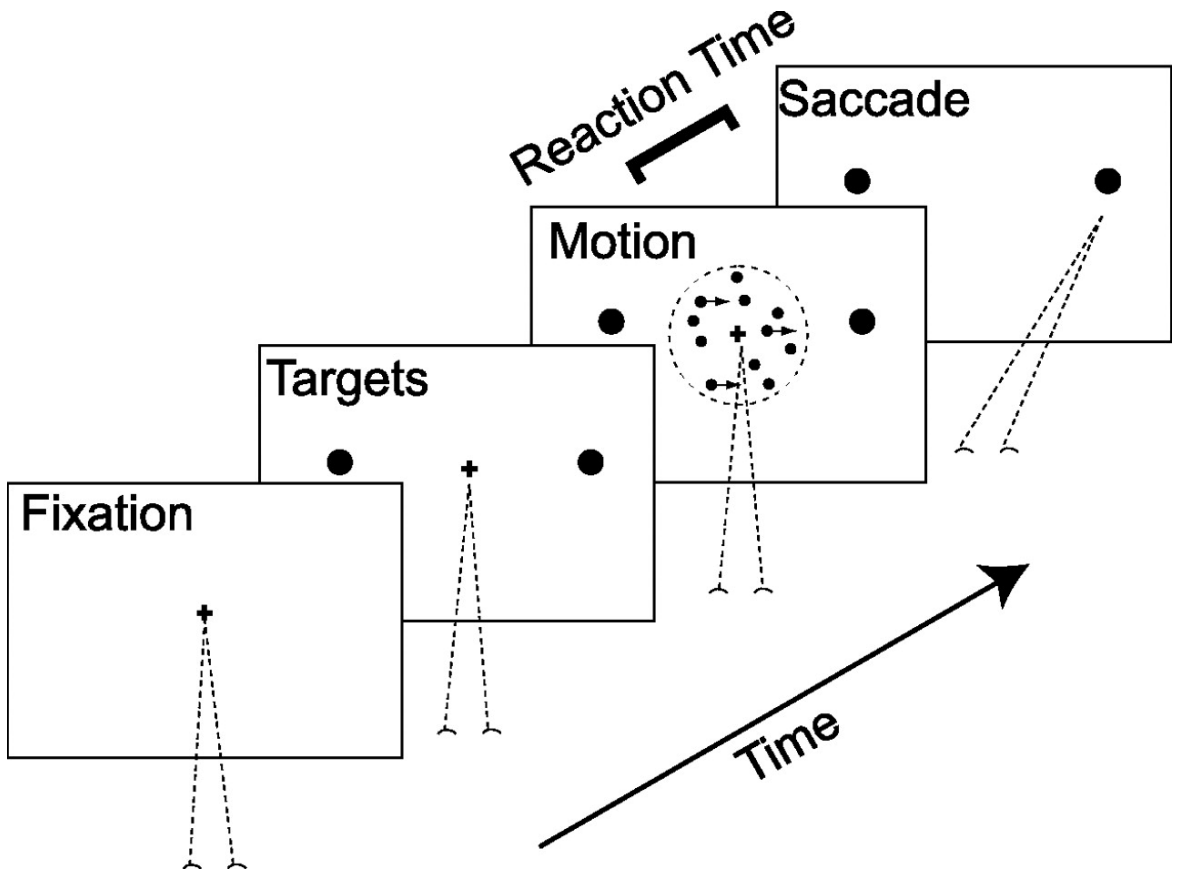
RDM task



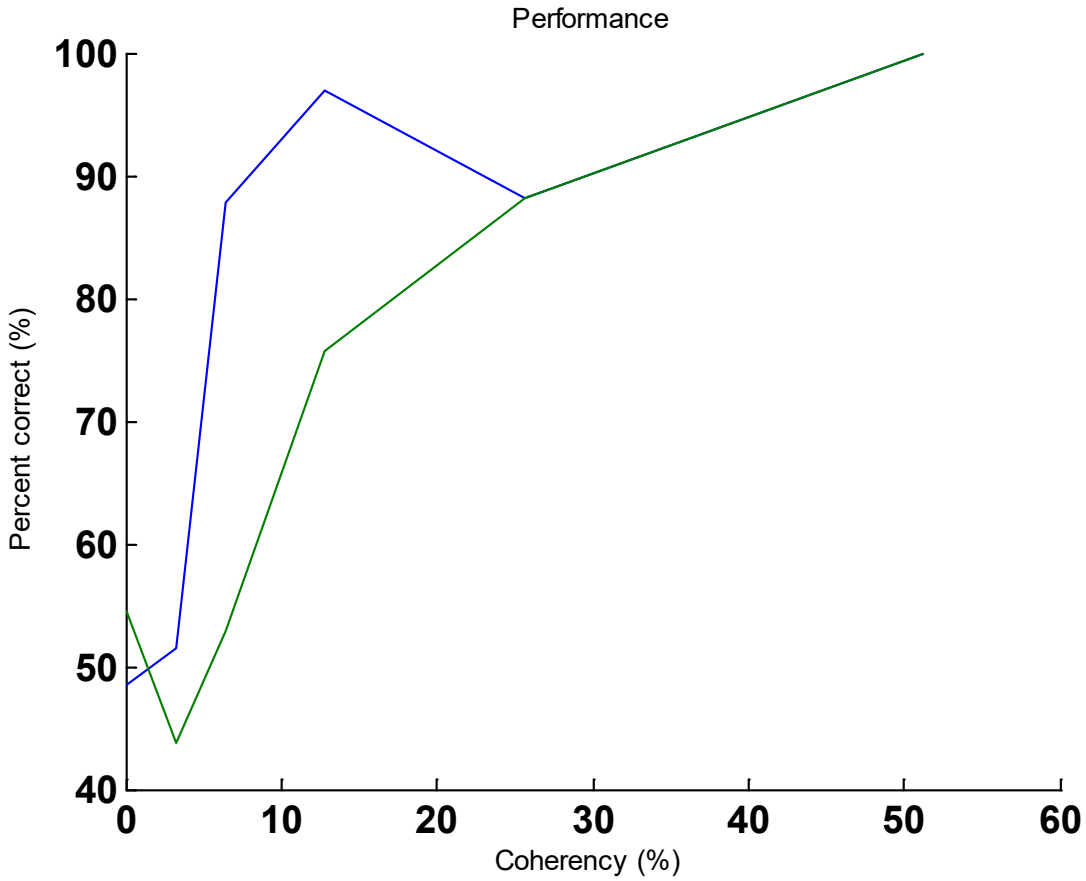
Dataset Structure

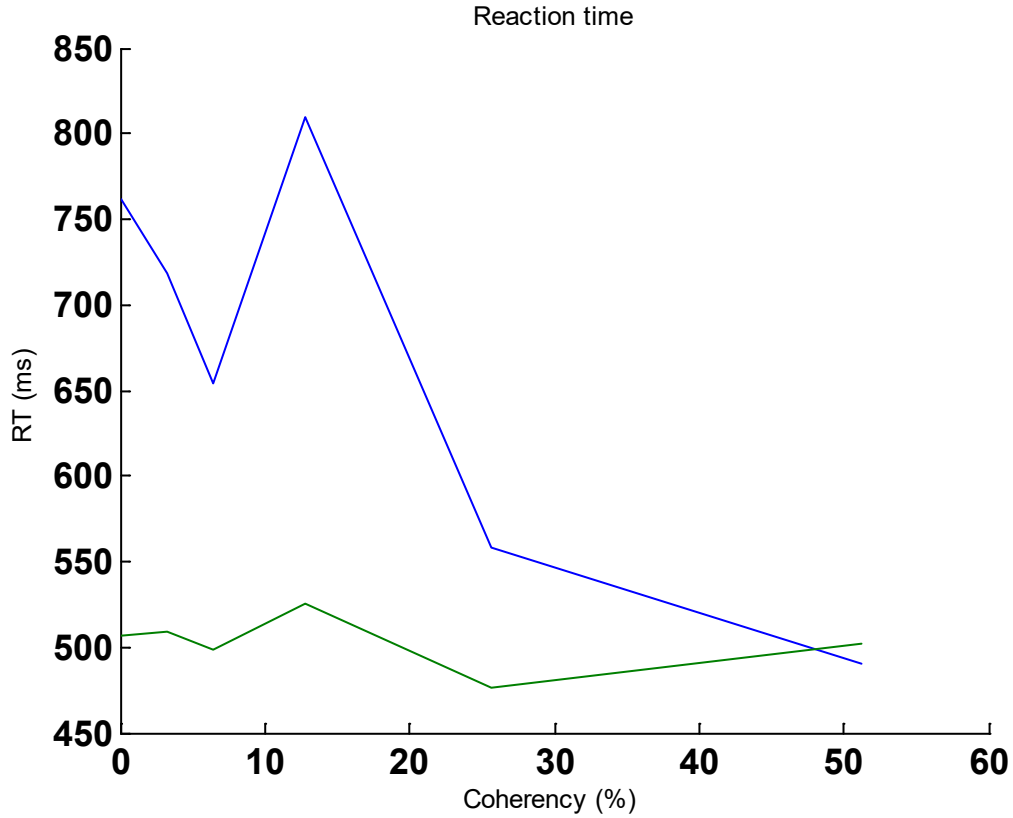
RespData_Saj_Self_Sub2_Ses1_Block1

1x1 struct with 20 fields

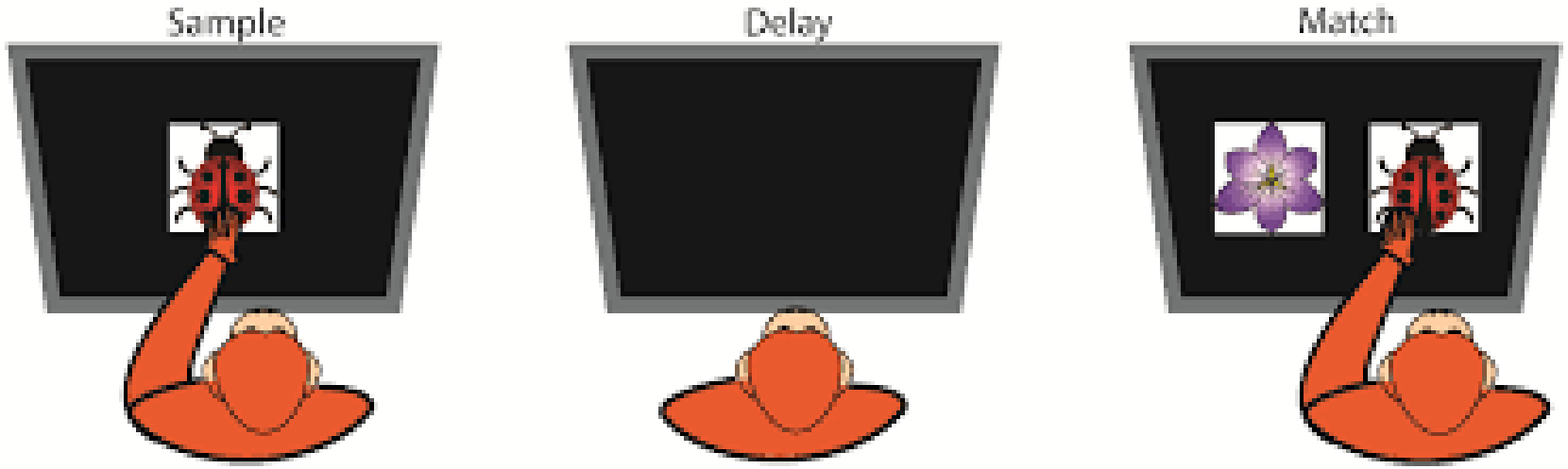
Field	Value	Min	Max
Task	'Self'		
Hand	'r'		
Name	'Saj'		
Age	29	29	29
Gender	'm'		
SubjectNumber	2	2	2
SessionNum	1	1	1
Eval_answer	'ttttfttttttftfttttftttttft...		
Coh	*1x100 double*	0	51.2000
Motion	'rrlrrrlrllllrrllllrrlrlrrrlrlr...		
Answer	'rrlrlrlrlllrllrlrlrrrlrrrlrlrlr...		
Delay	*100x1 double*	200.06...	499.54...
Efficiency	85.7143	85.7143	85.7143
TrialRT	*1x100 cell*		
Date	'11.4.95'		

Performance and Reaction time





Delay match to sample task (DMS)



Dataset config

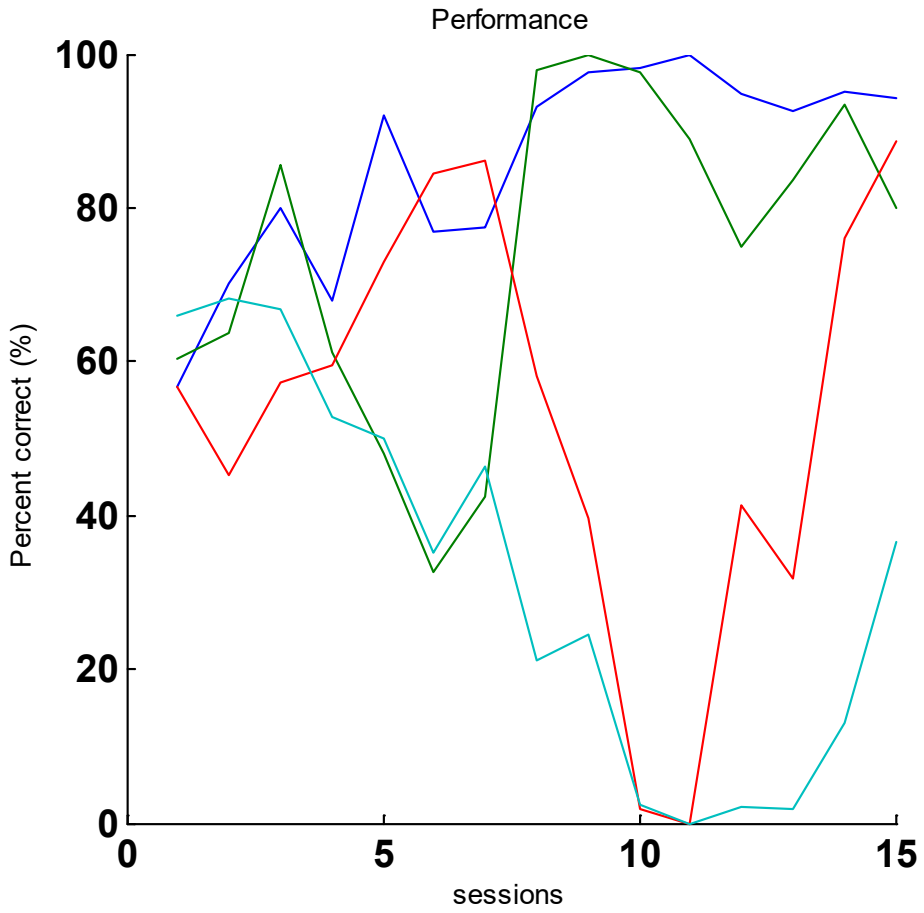
Variables - response

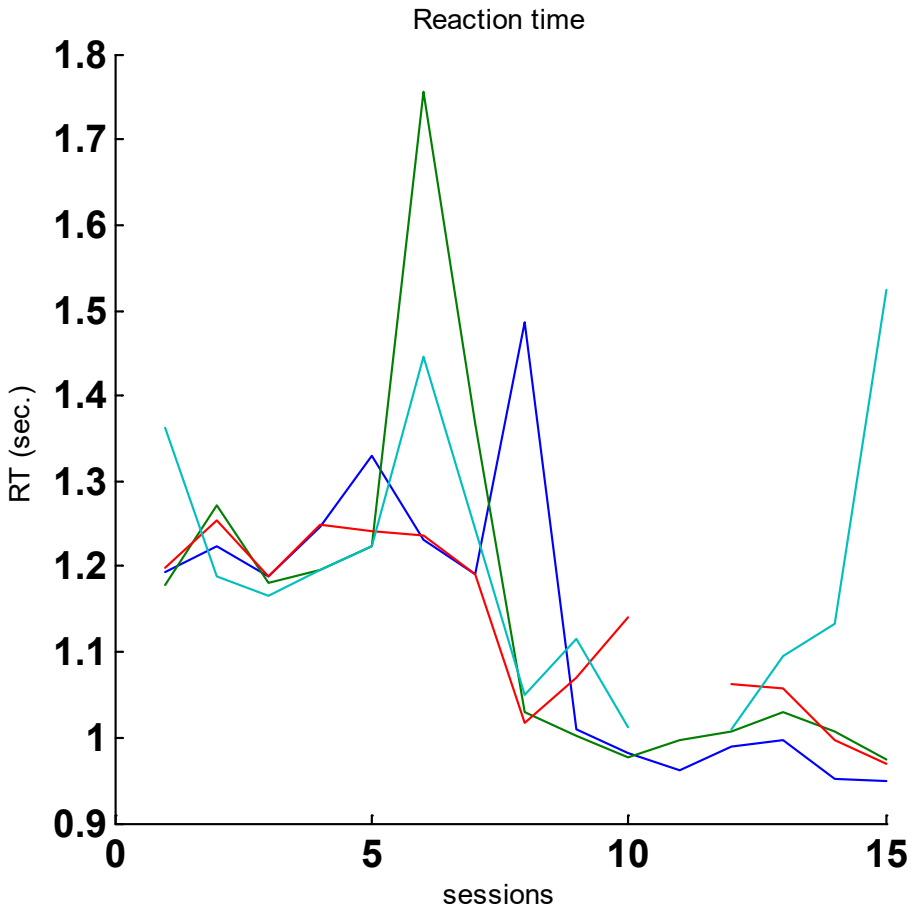
response

1x200 struct with 15 fields

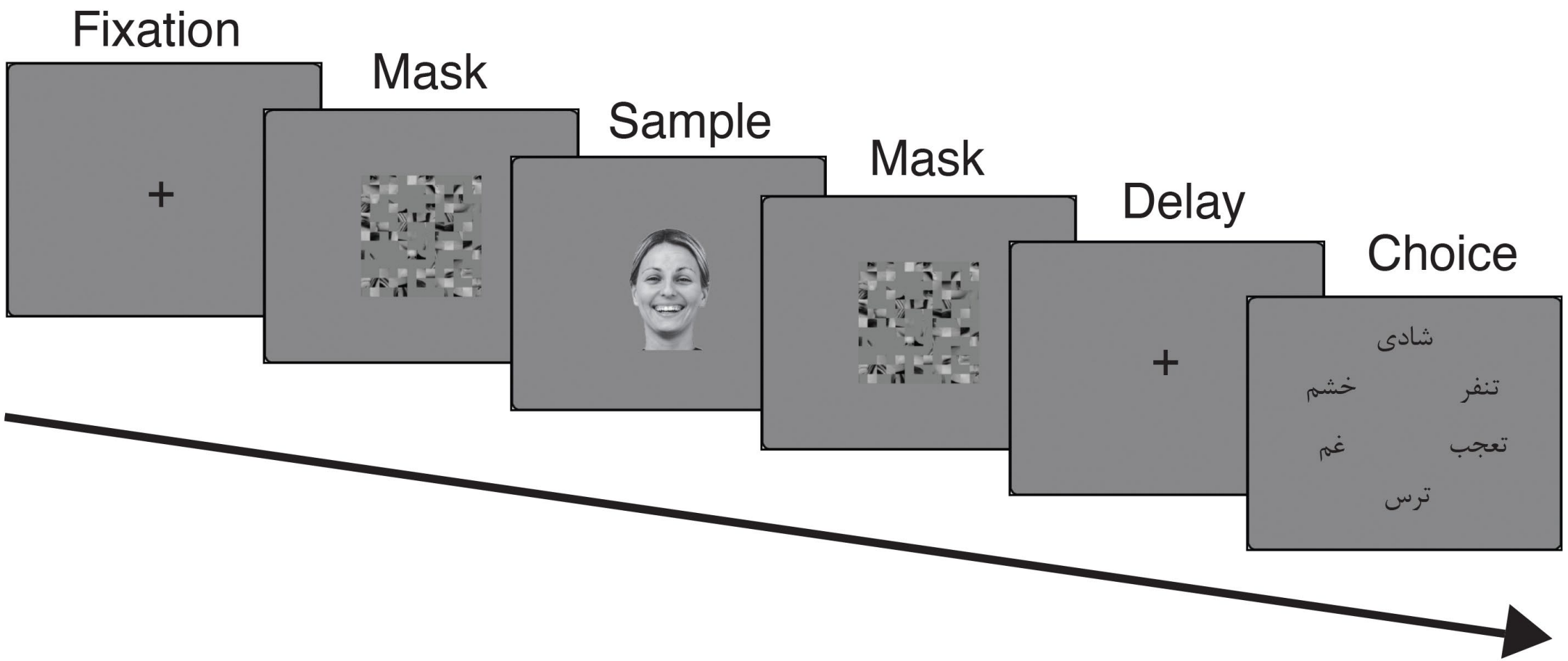
Fields	cond	stim_onset_cen	response_time_cen	respons_cen_correct	correct_location_center	reaction_time_Sample_cen	respons	responses_step1	stim_onset_Match	r
1	3	3.0175e+03	3.0242e+03	1	[514,386,766,638]	6.7106	2	1	3.0242e+03	
2	3	3.0273e+03	3.0285e+03	1	[514,386,766,638]	1.1825	2	2	3.0285e+03	
3	1	3.0315e+03	3.0326e+03	1	[514,386,766,638]	1.1501	2	3	3.0326e+03	
4	2	3.0356e+03	3.0368e+03	1	[514,386,766,638]	1.1101	2	4	3.0368e+03	
5	3	3.0396e+03	3.0409e+03	1	[514,386,766,638]	1.2925	2	5	3.0409e+03	
6	3	3.0439e+03	3.0450e+03	1	[514,386,766,638]	1.1124	2	6	3.0450e+03	
7	3	3.0479e+03	3.0491e+03	1	[514,386,766,638]	1.2059	2	7	3.0491e+03	
8	4	3.0520e+03	3.0534e+03	1	[514,386,766,638]	1.4162	2	8	3.0534e+03	
9	2	3.0563e+03	3.0591e+03	1	[514,386,766,638]	2.8403	2	9	3.0591e+03	
10	3	3.0620e+03	3.0639e+03	1	[514,386,766,638]	1.8466	2	10	3.0639e+03	
11	4	3.0668e+03	3.0687e+03	1	[514,386,766,638]	1.8410	2	11	3.0687e+03	
12	1	3.0715e+03	3.0732e+03	1	[514,386,766,638]	1.6105	2	12	3.0732e+03	

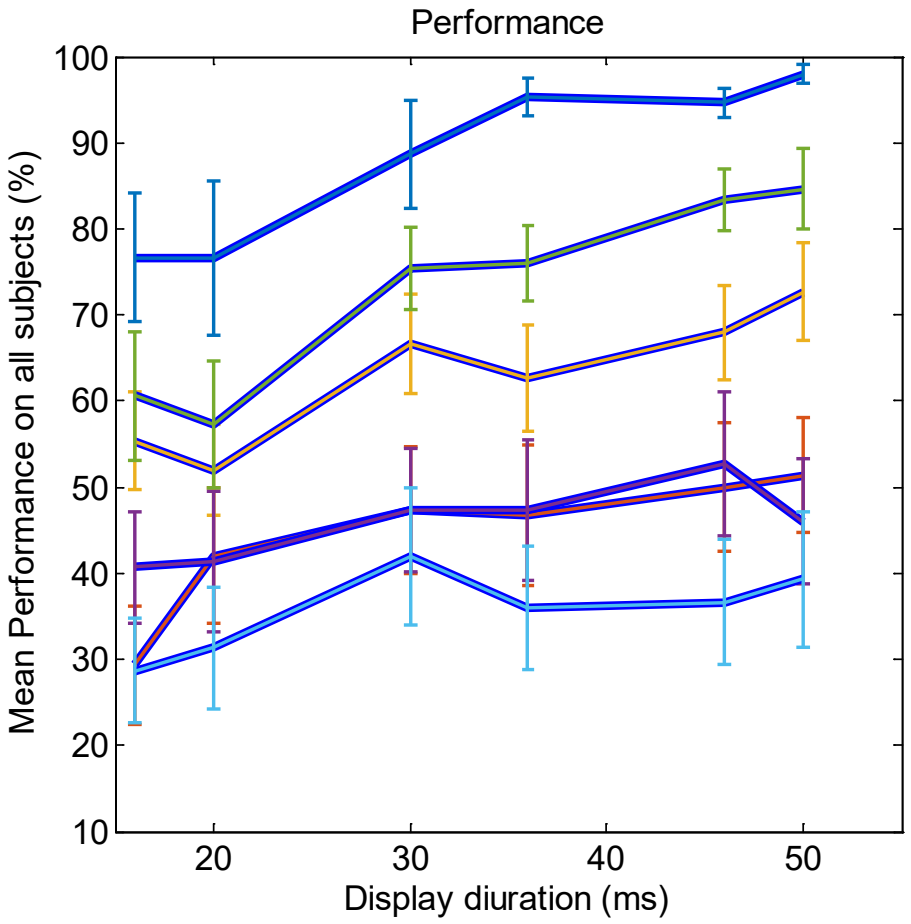
DMS task

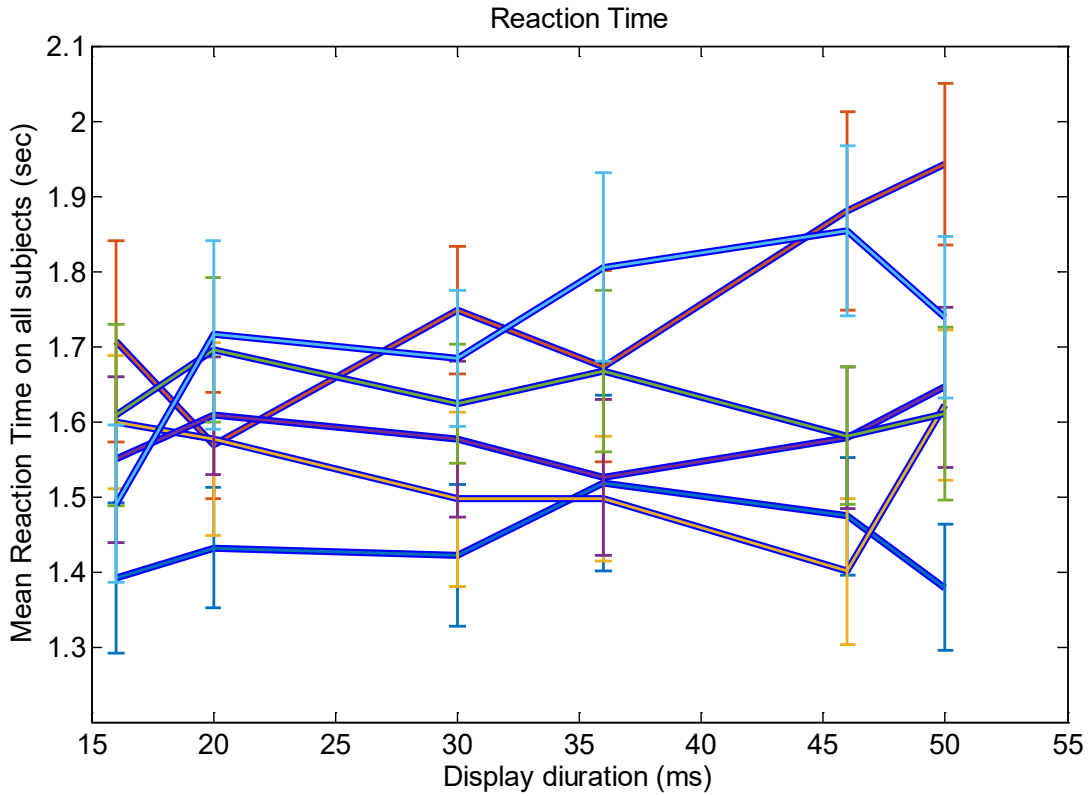

Performance
Percent correct (%)
100
80
60
40
20
0
0
5
10
15
sessions


Reaction time
RT (sec.)
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0
5
10
15
sessions

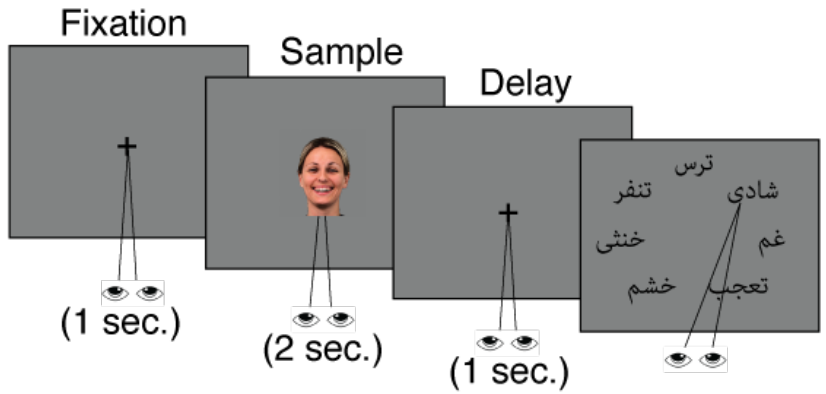
Emotion task

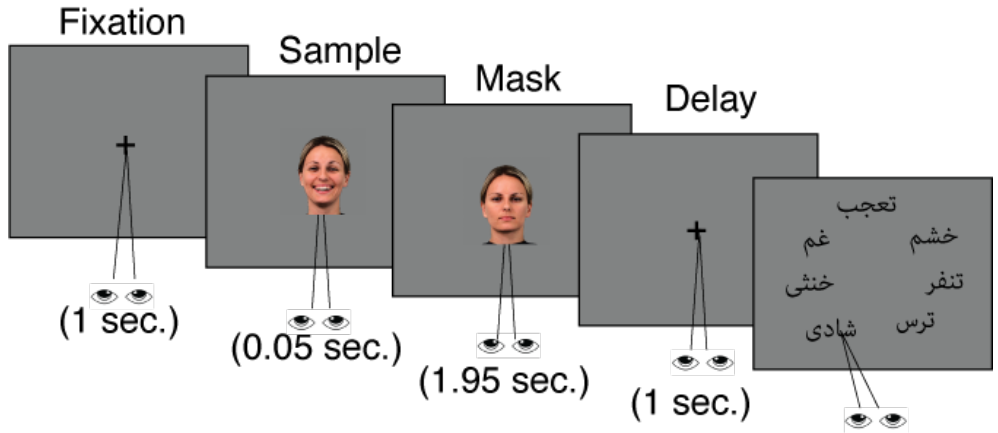



Performance
Mean Performance on all subjects (%)
100
90
80
70
60
50
40
30
20
10
20
30
40
50
Display diuration (ms)

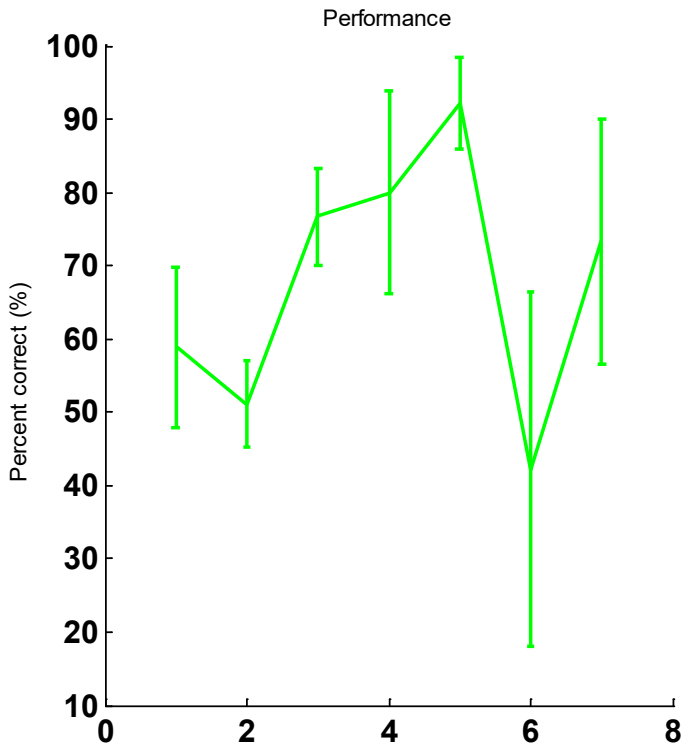

Reaction Time
Mean Reaction Time on all subjects (sec)
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
15
20
25
30
35
40
45
50
55
Display diuration (ms)

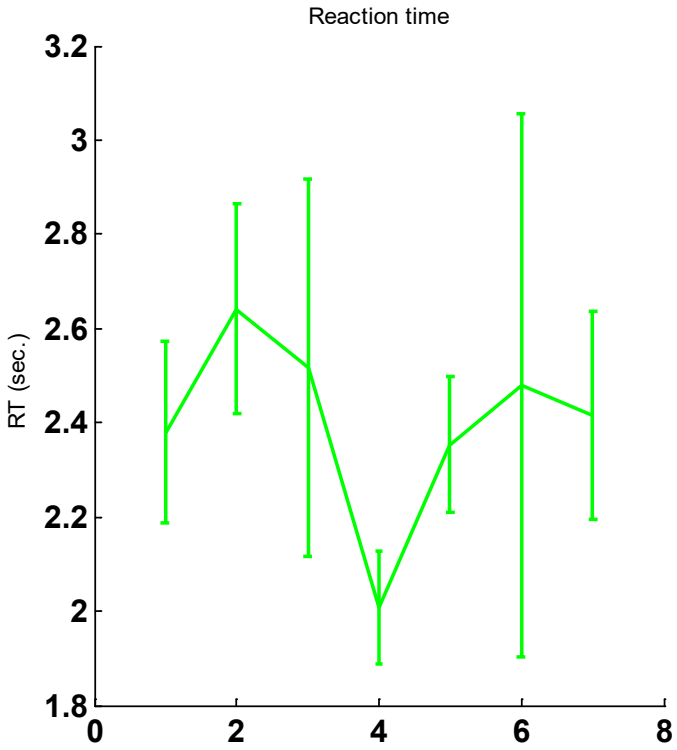
Emotion task





Behavioral data





One way Anova

$$F = \frac{\text{Variability between groups}}{\text{Variability within groups}}$$

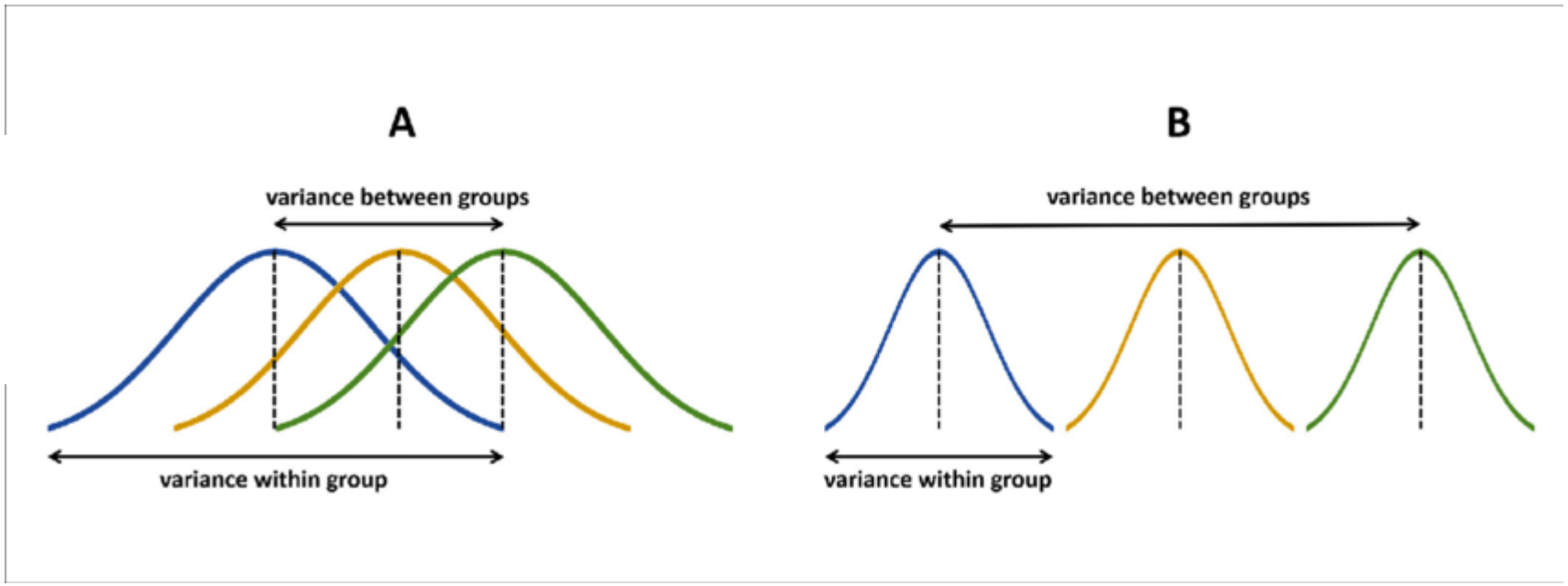
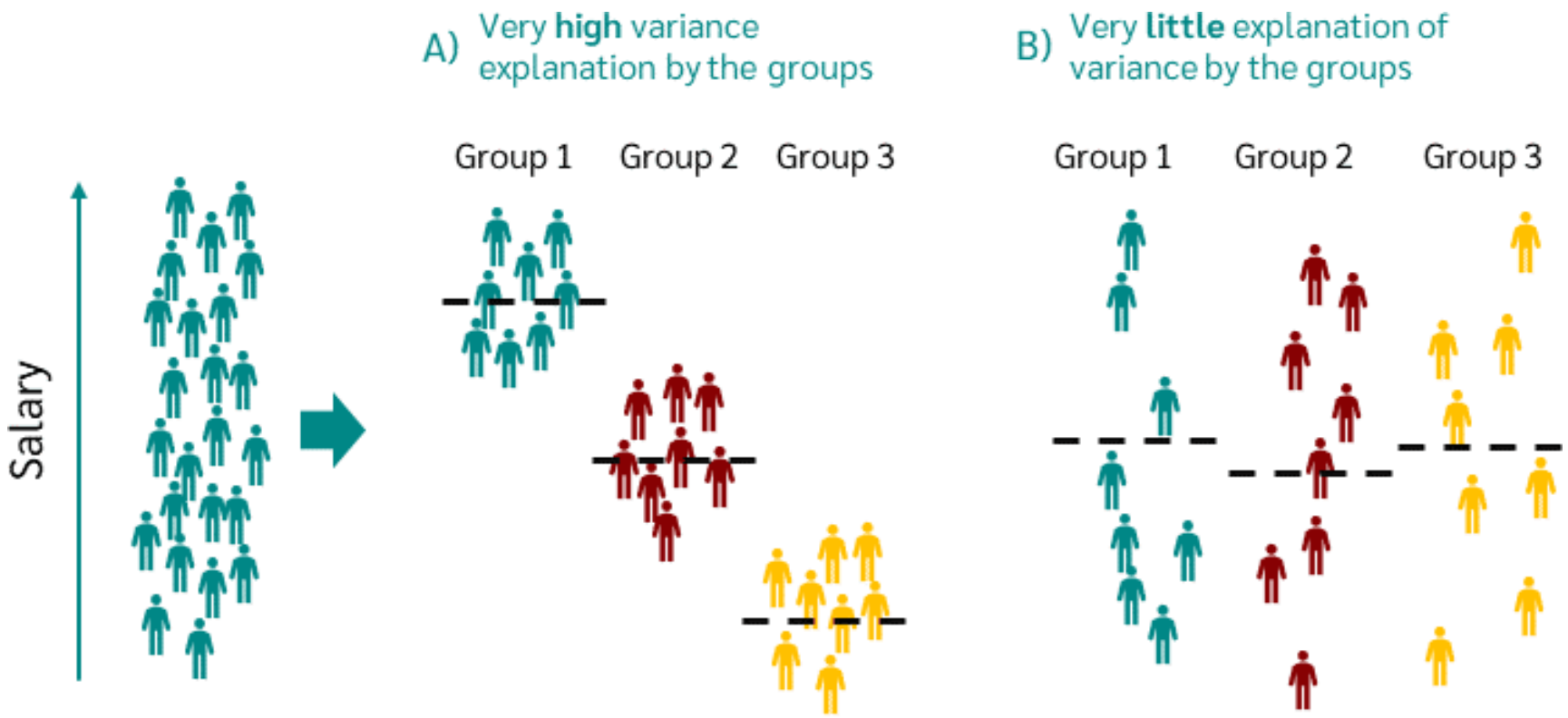


Table one way Anova

- F = Anova Coefficient
- MSB = Mean sum of squares between the groups
- MSW = Mean sum of squares within the groups
- MSE = Mean sum of squares due to error
- SST = total Sum of squares
- p = Total number of populations
- n = The total number of samples in a population
- SSW = Sum of squares within the groups
- SSB = Sum of squares between the groups
- SSE = Sum of squares due to error
- s = Standard deviation of the samples
- N = Total number of observations

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares (MS)	F
Within	$SSW = \sum_{j=1}^{k}\sum_{j=1}^{l}(X-\bar{X}_j)^2$	$df_w = k-1$	$MSW = \frac{SSW}{df_w}$	$F = \frac{MSB}{MSW}$
Between	$SSB = \sum_{j=1}^{k}(\bar{X}_j - \bar{X})^2$	$df_b = n-k$	$MSB = \frac{SSB}{df_b}$	
Total	$SST = \sum_{j=1}^{n}(\bar{X}_j - \bar{X})^2$	$df_t = n-1$		

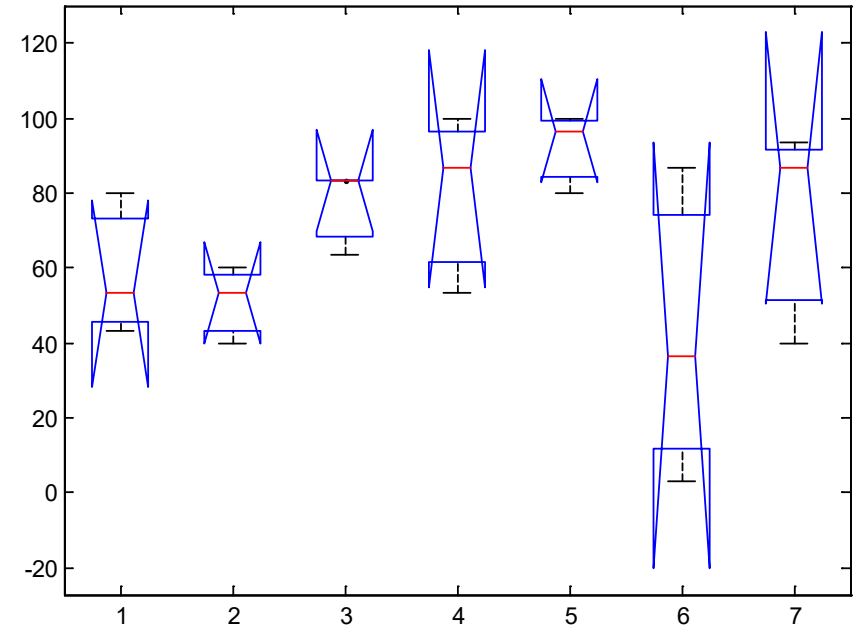
Example


Salary
A) Very high variance explanation by the groups
Group 1
Group 2
Group 3
B) Very little explanation of variance by the groups
Group 1
Group 2
Group 3

Anova on performance

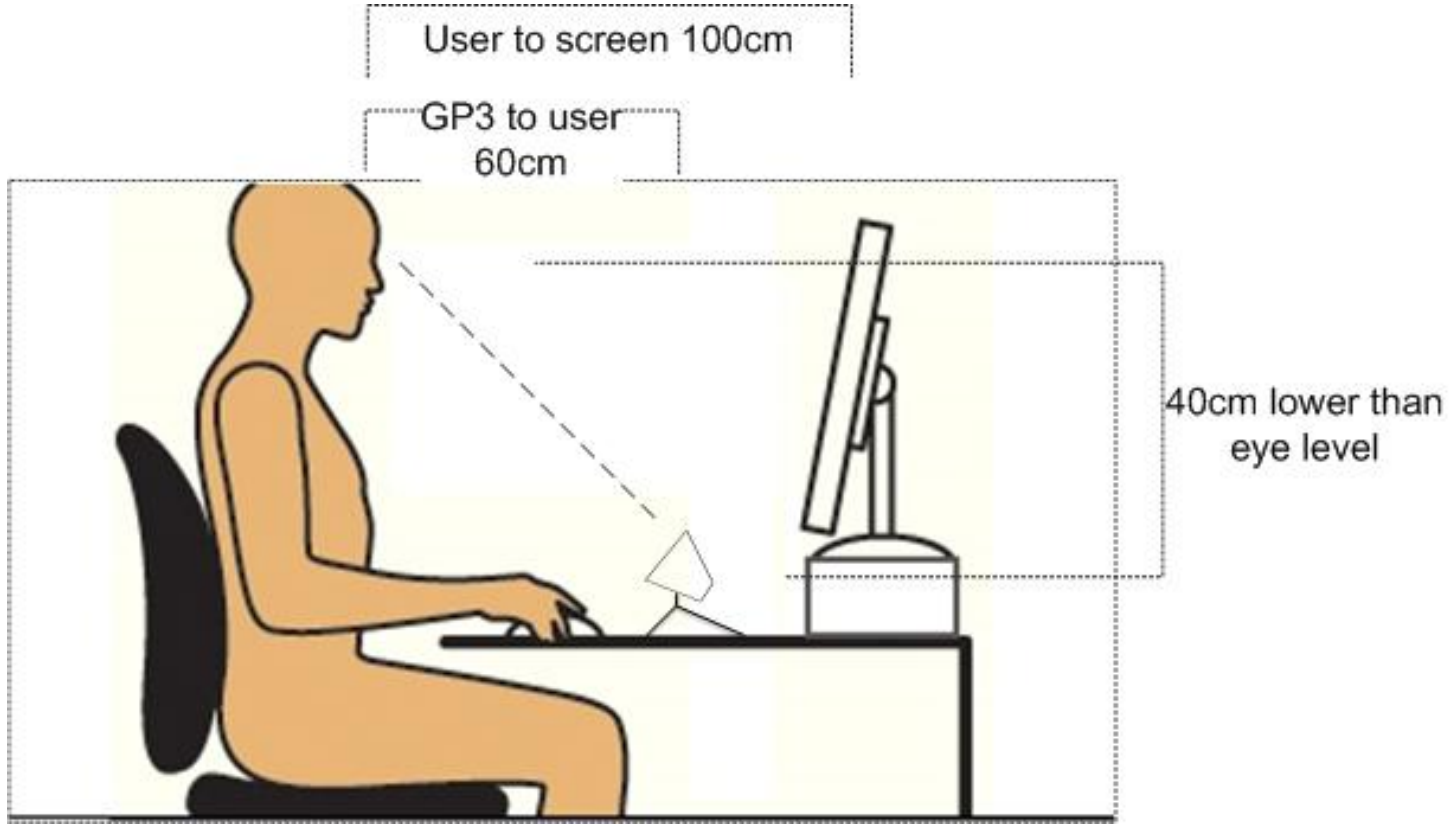
ANOVA Table

Source	SS	df	MS	F	Prob>F
Columns	5600	6	933.333	1.68	0.1988
Error	7785.2	14	556.085		
Total	13385.2	20			



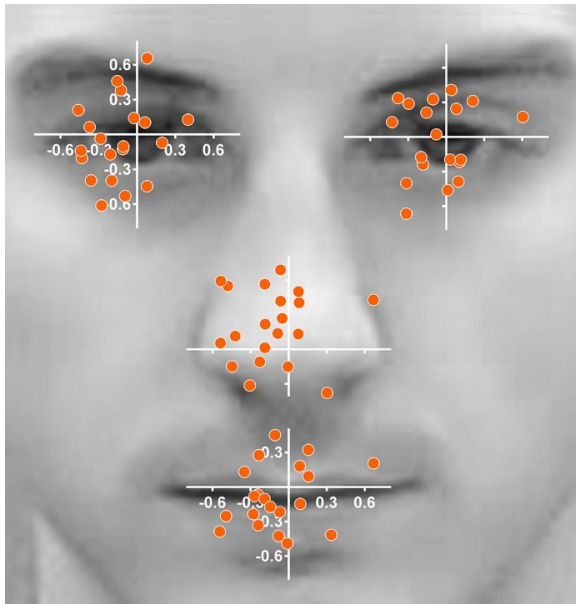
Eye data

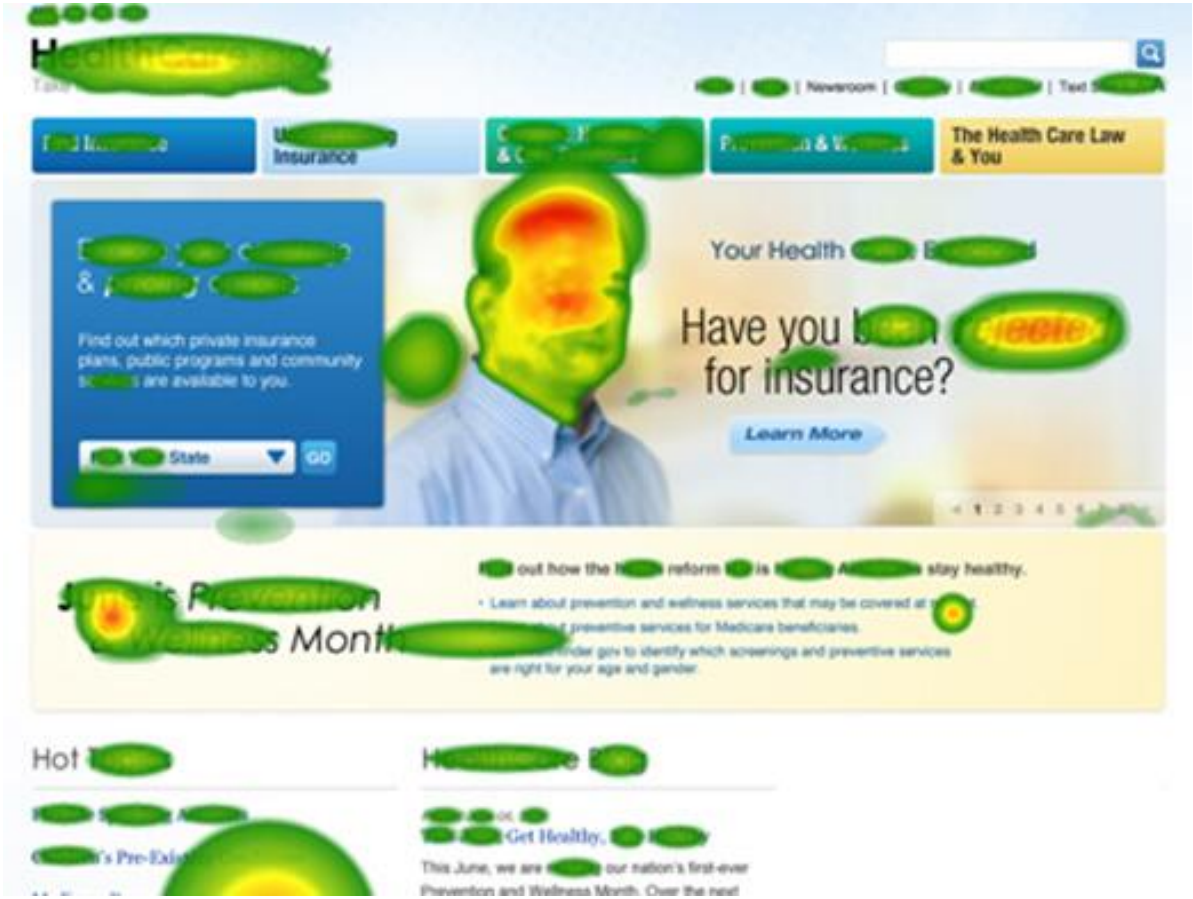
- Gaze point
- Gaze trace
- Pupil size



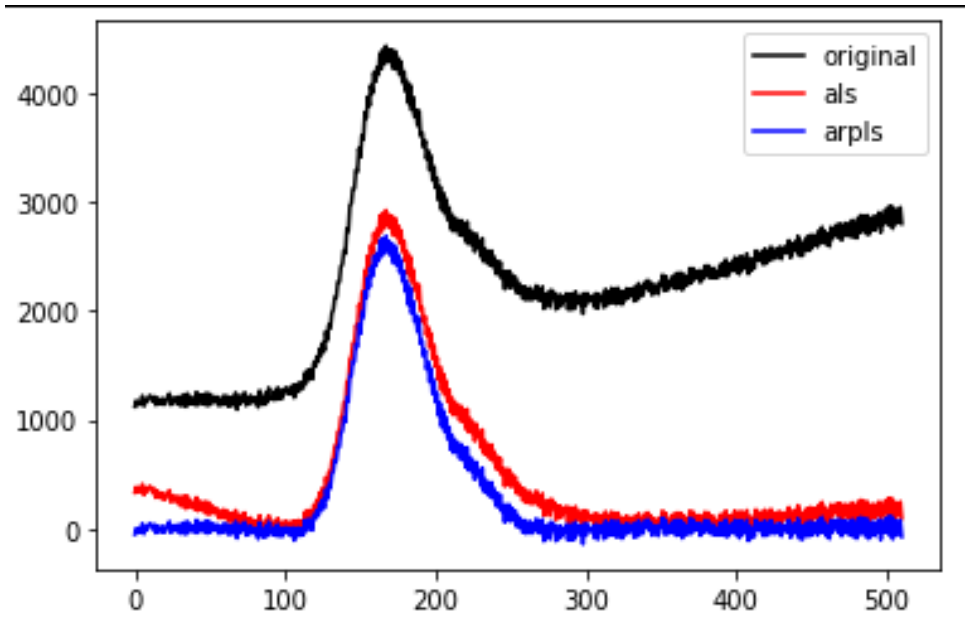
Data analysis

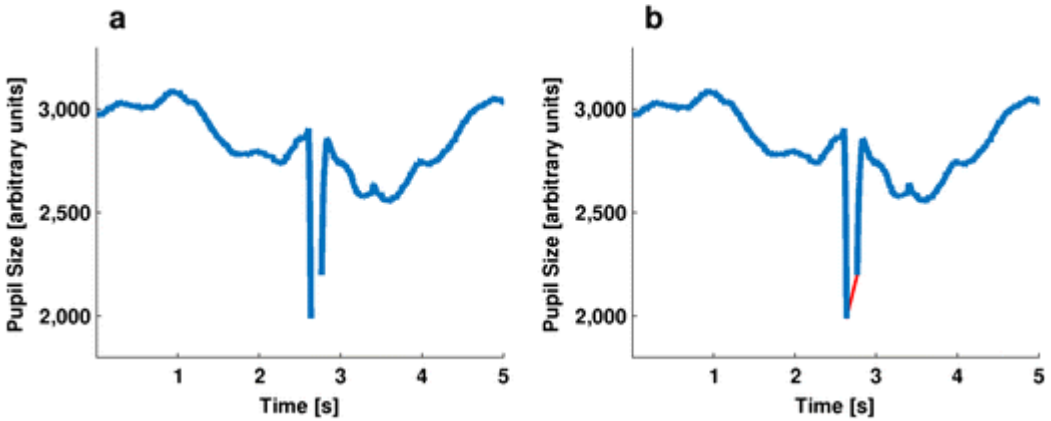
- Gaze direction
- Gaze point
- Gaze time
- Microsaccade rate
- Saccade rate
- Pupil size

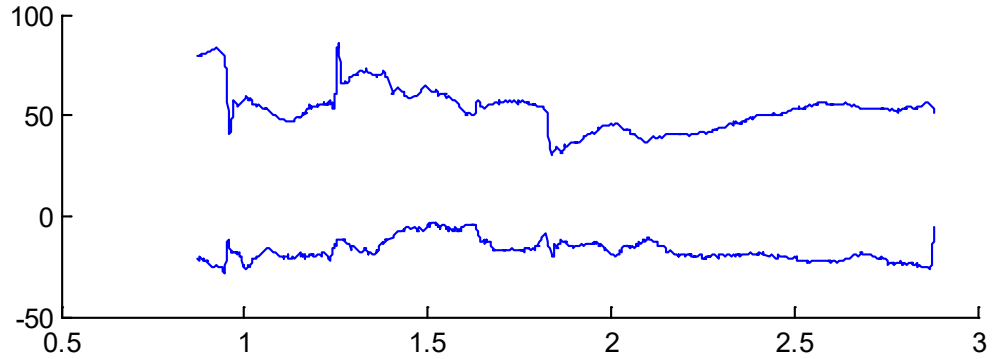


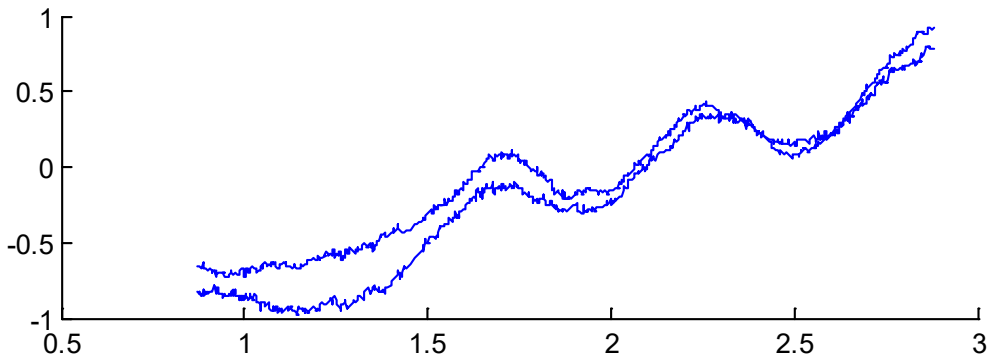


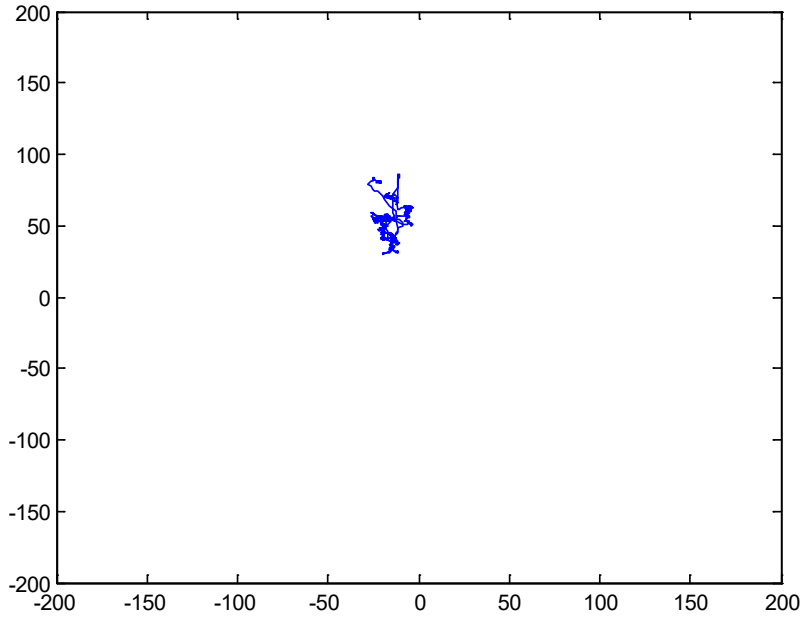
Preprocessing Data



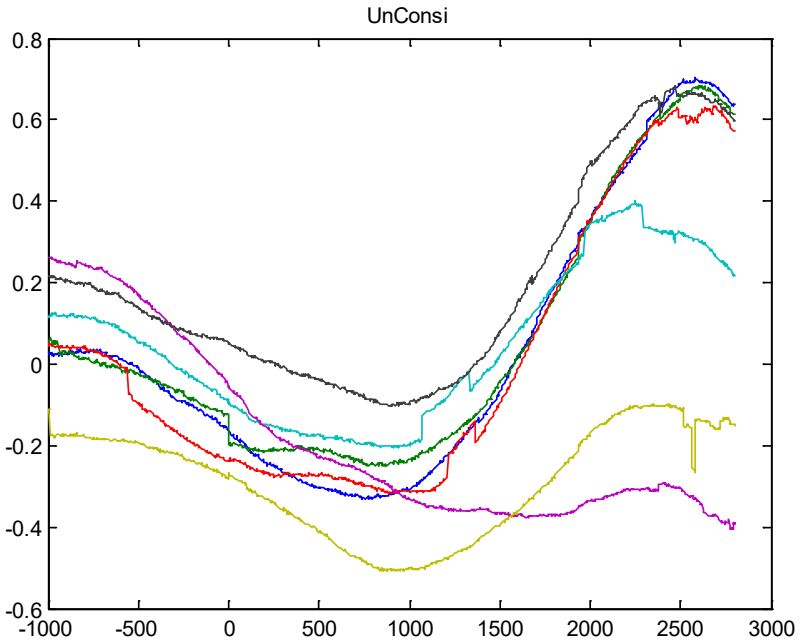



100
50
0
-50
0.5
1
1.5
2
2.5
3

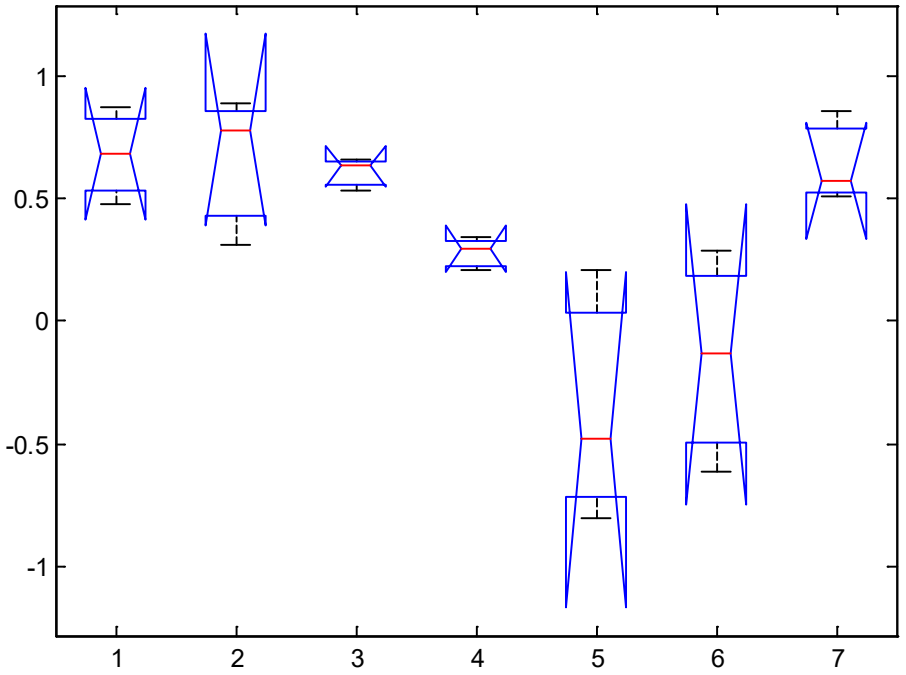

1
0.5
0
-0.5
-1
0.5
1
1.5
2
2.5
3


200
150
100
50
0
-50
-100
-150
-200
-200
-150
-100
-50
0
50
100
150
200

Pupil size


UnConsi
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-1000
-500
0
500
1000
1500
2000
2500
3000

Anova on Emotion and Pupil size



Assignment#13

- On Emotion task
- Plot Compare both left and right eye pupil for each emotion
- Calculate the time the pupil size is significantly different from baseline