

Assignment - 3 (Longitudinal Data Analysis)

ID	Name	Course
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Data Preprocessing

- There is no missing value for all samples.
- Day and Sex are Strings.
 - Sex is encoded into Gender.
 - Day is encoded into Day1.
 - Since days are ordinal variable, a new variable "dow" (Days of week) is generated form Day1. Values are rearranged in orderly fashion, from Sunday to Friday.
- BMI groups have no values label, except for 24, 29 and 30. They will be considered Less than 24 kg/m², Less than 29 kg/m² and More than 30 kg/m² respectively.

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Days of Week x Numbers of Steps

Descriptive Analysis

dow	Days of Week	Steps(Median)	Interquartile Range
1	Sunday	7112.5	5110, 13394
2	Monday	8479	4914, 13243
3	Tuesday	9014	5965, 18140
4	Wednesday	8878.5	4793, 14421
5	Thursday	9202.5	6219, 14100
6	Friday	7774	5305, 14932
7	Saturday	8242	4800, 14800

According to Descriptive Statistics, the subjects are more active on Thursday.

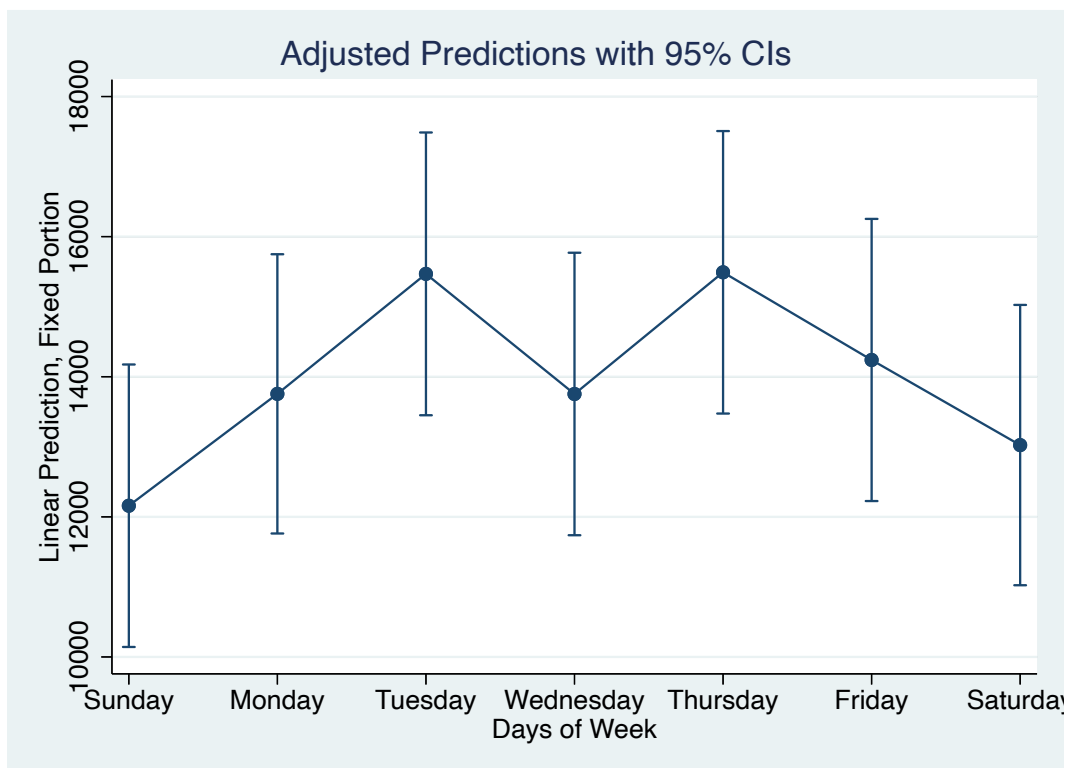
Mixed Linear Model with Random Intercept

dow	Days of Week	Coef	95% Confidence Interval	P-value
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dow	Days of Week	Coef	95% Confidence Interval	P-value
1	Sunday	0		
2	Monday	1596.927	-872.7513, 4066.605	0.205
3	Tuesday	3309.73	819.7576, 5799.702	0.009
4	Wednesday	1595.204	-916.2076, 4106.616	0.213
5	Thursday	3332.352	805.3933, 5859.312	0.010
6	Friday	2080.816	-421.9032, 4583.535	0.103
7	Saturday	865.8674	-1606.302, 3338.037	0.492

dow	Days of Week	Mean Steps	95% Confidence Interval
1	Sunday	12158.62	10142.32, 14174.92
2	Monday	13755.55	11762.27, 15748.83
3	Tuesday	15468.35	13450.07, 17486.64
4	Wednesday	13753.83	11737.4, 15770.25
5	Thursday	15490.97	13474.8, 17507.15
6	Friday	14239.44	12225.67, 16253.2
7	Saturday	13024.49	11023.47, 15025.5

According to Mixed Linear Model, the subjects are more active on Thursday.



Age Groups x Physical Activity

Descriptive Analysis

Age Group	Steps(Median)	Interquartile Range
Younger than 65	9426	6027, 15801
65 to 75	7557	4732, 13394
Older than 75	7087	3725.5, 11125.5

According to Descriptive Statistics, Age group younger than 65 are the most active.

Univariate Analysis

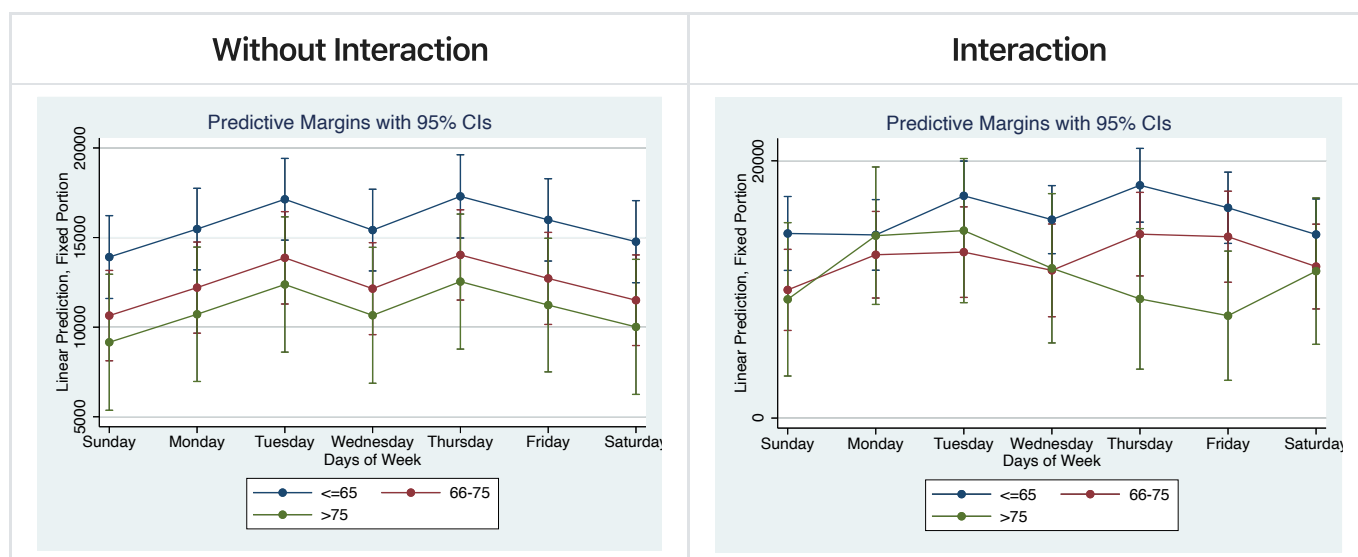
Mixed Linear Model with Random Intercept

Age Group	Coef	95% Confidence Interval	P-value
Younger than 65	0		
65 to 75	-3267.182	-5808.994, -725.3692	0.012
Older than 75	-4755.208	-8519.393, -991.0237	0.013

Age Group	Mean Steps	95% Confidence Interval
Younger than 65	15714.39	14097.15, 17331.62
65 to 75	12447.2	10488.05, 14406.36
Older than 75	10959.18	7560.264, 14358.09

Age group younger than 65 is the reference.
Difference between age group younger than 65 and age group between 65 to 75 is statistically significant. (p=0.012)
Difference between age group younger than 65 and age group older than 75 is statistically significant. (p=0.013)

Without Interaction	Interaction
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According to Univariate Analysis, Age groups are associated with physical activity on each day.

Gender x Physical Activity

Descriptive Analysis

Gender	Steps(Median)	Interquartile Range
Female	8617.5	5145, 14338
Male	8466	5179, 14342.5

According to Descriptive Statistics, Female are more active.

Univariate Analysis

Mixed Linear Model with Random Intercept

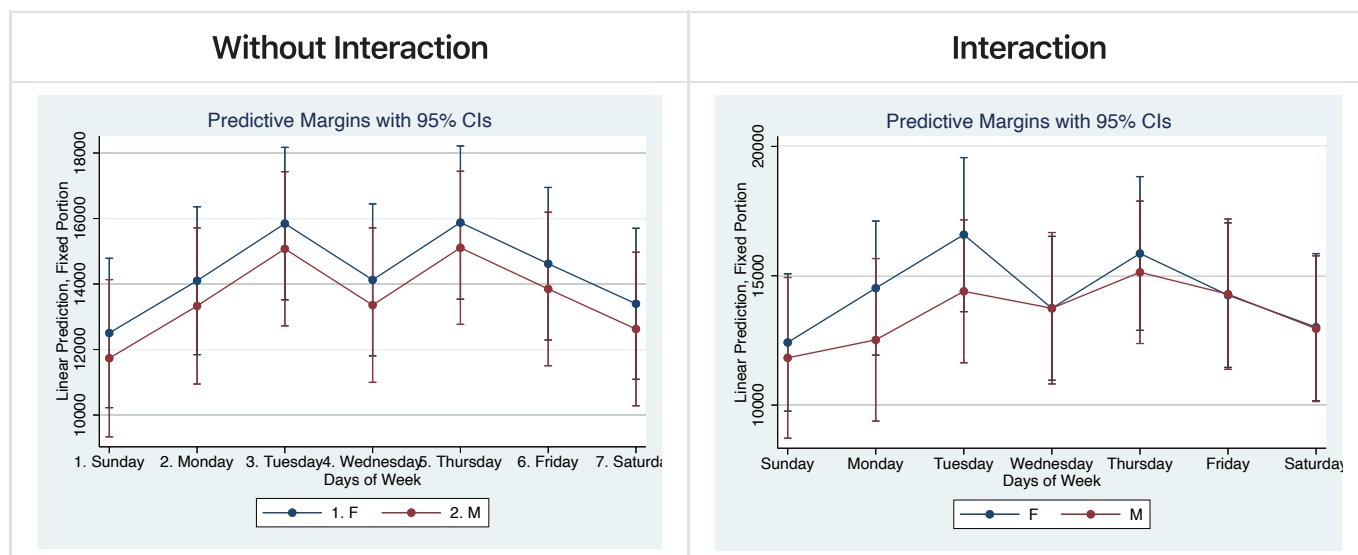
Gender	Coef	95% Confidence Interval	P-value
Female	0		
Male	-770.6161	-3138.738, 1597.505	0.524

Gender	Mean Steps	95% Confidence Interval
Female	14353.12	12716.99, 15989.25
Male	13582.5	11874.1, 15290.91

Female are the reference.

Difference between Female and Male is not statistically significant. ($p=0.524$)

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According to Univariate Analysis, Gender is not associated with physical activity on each day.

BMI Group x Physical Activity

Descriptive Analysis

BMI Group	Steps(Median)	Interquartile Range
Less than 24 kg/m ²	9744	6435, 15073
Less than 29 kg/m ²	8951	5754, 15988
More than 30 kg/m ²	7060	4428, 11770

According to Descriptive Statistics, BMI group less than 24 kg/m² is the most active.

Univariate Analysis

Mixed Linear Model with Random Intercept

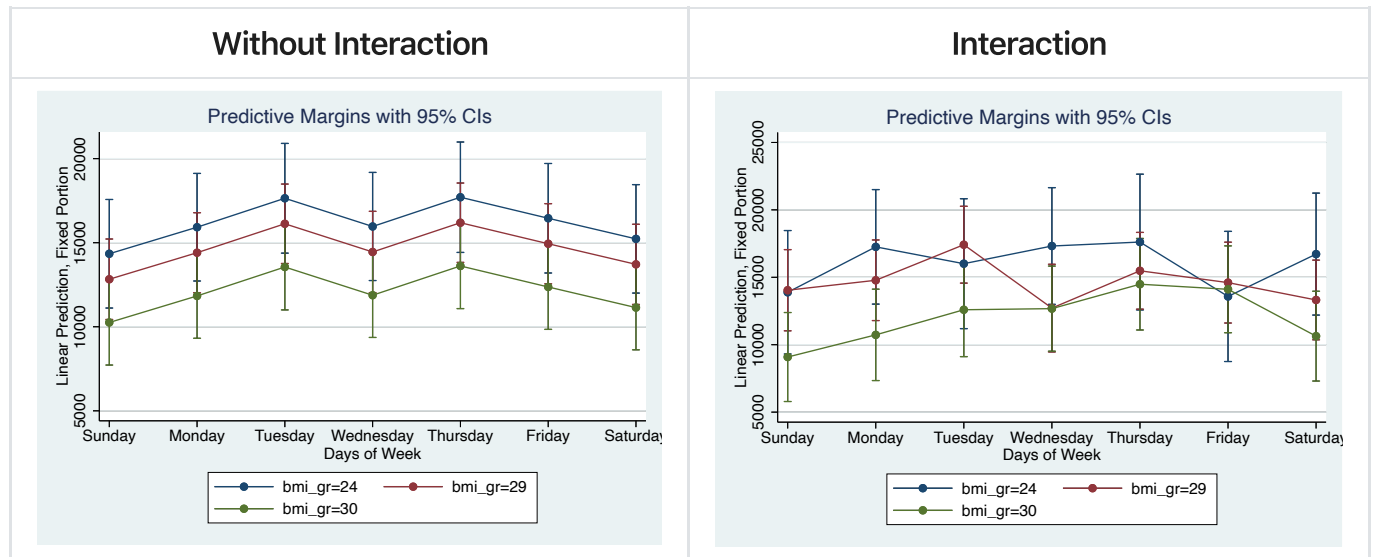
BMI Group	Coef	95% Confidence Interval	P-value
Less than 24 kg/m ²	0		
Less than 29 kg/m ²	-1515.998	-4816.287, 1784.291	0.368
More than 30 kg/m ²	-4087.906	-7491.459, -684.3534	0.019

BMI Group	Mean Steps	95% Confidence Interval
Less than 24 kg/m ²	16180.62	13379.4, 18981.84
Less than 29 kg/m ²	14664.62	12923.86, 16405.39
More than 30 kg/m ²	12092.72	10158.82, 14026.61

BMI group less than 24 kg/m² is the reference.

Difference between BMI group less than 24 kg/m² and BMI group less than 29 kg/m² is not statistically significant. (p=0.368)

Difference between BMI group less than 24 kg/m² and BMI group more than 30 kg/m² is statistically significant. (p=0.019)



According to Univariate Analysis, BMI groups are associated with physical activity on each day.

Multivariate Analysis

The models applied are Mixed Linear Model with Random Intercept.

Step 0 : Days of Week are included in the model.

Factor	Est store	LR test	P-value
Age Group	B	9.71	0.0078
Gender	C	0.41	0.5237
BMI Group	D	6.59	0.0370

Step 1 : Age Groups are included in the model.

Factor	Est store	LR test	P-value
Gender	C1	0.46	0.4970
BMI Group	D1	7.35	0.0253

Step 2 : BMI Groups are included in the model,

Factor	Est store	LR test	P-value
Gender	C2	0.36	0.5462

Gender is not included in the model.

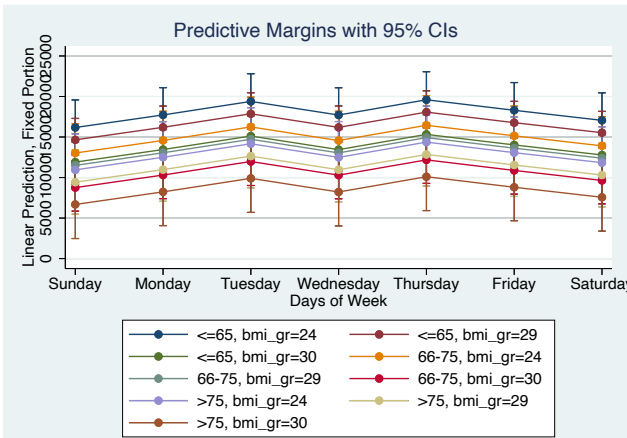
Features	Coef	95% Confidence Interval	P-value
Age Group			
Younger than 65	0		
65 to 75	-3146.31	-5673.469, -619.1509	0.015
Older than 75	-4688.669	-8978.219, -1468.648	0.006
BMI Group			
Less than 24 kg/m ²	0		
Less than 29 kg/m ²	-1523.369	-4793.35, 1746.612	0.361
More than 30 kg/m ²	-4269.418	-7655.588, -883.2489	0.013
Days of Week			
Sunday	0		
Monday	1550.88	-913.5948, 4015.354	0.217
Tuesday	3218.808	733.2281, 5704.387	0.011
Wednesday	1537.478	-968.3976, 4043.353	0.229
Thursday	3421.161	900.1665, 5942.155	0.008
Friday	2121.766	-376.3686, 4619.901	0.096
Saturday	884.3713	-1581.709, 3350.452	0.482

According to Multivariate Analysis,

- Age groups are associated with physical activity on each day.
- Gender is not associated with physical activity on each day.
- BMI groups are associated with physical activity on each day.

Without Interaction	Interaction
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Without Interaction



Interaction

