STATISTICAL THEORY

APM1111

Formative Assessment 9

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2021016541

The study involved participants speed dating a set of potential dating partners and rating how much they would like to go on a real date with them at the end of the night. The attractiveness and personality of the dating partners was manipulated. Gender was also examined as a potential moderator. There are three independent variables—looks (attractive, average, ugly), personality (high charisma, some charisma, no charisma), and gender (male versus female).

gender	att_high	av_high	ug_high	att_some	av_some	ug_some	att_none	av_none	ug_none
Male	86	84	67	88	69	50	97	48	47
Male	91	83	53	83	74	48	86	50	46
Male	89	88	48	99	70	48	90	45	48
Male	89	69	58	86	77	40	87	47	53
Male	80	81	57	88	71	50	82	50	45
Male	80	84	51	96	63	42	92	48	43
Male	89	85	61	87	79	44	86	50	45
Male	100	94	56	86	71	54	84	54	47
Male	90	74	54	92	71	58	78	38	45
Male	89	86	63	80	73	49	91	48	39
Female	89	91	93	88	65	54	55	48	52
Female	84	90	85	95	70	60	50	44	45
Female	99	100	89	80	79	53	51	48	44
Female	86	89	83	86	74	58	52	48	47
Female	89	87	80	83	74	43	58	50	48
Female	80	81	79	86	59	47	51	47	40
Female	82	92	85	81	66	47	50	45	47
Female	97	69	87	95	72	51	45	48	46
Female	95	92	90	98	64	53	54	53	45
Female	95	93	96	79	66	46	52	39	47

looksorpersonality.csv

1. Analyze the dataset using mixed-design ANOVA and check if there is a three-way interaction between gender, looks and personality.

ANOVA - att_high

Cases	Sum of Squares	df	Mean Square	F	p
Gender	8.450	1	8.450	0.221	0.644
Residuals	688.500	18	38.250		

Note. Type III Sum of Squares

ANOVA - ug_high

Cases	Sum of Squares	df	Mean Square	F	p
Gender	4470.050	1	4470.050	143.245	< .001
Residuals	561.700	18	31.206		

Note. Type III Sum of Squares

ANOVA - att_some ▼

Cases	Sum of Squares	df	Mean Square	F	p
Gender	9.800	1	9.800	0.247	0.625
Residuals	713.400	18	39.633		

Note. Type III Sum of Squares

ANOVA - av_some

Cases	Sum of Squares	df	Mean Square	F	p
Gender	42.050	1	42.050	1.531	0.232
Residuals	494.500	18	27.472		

Note. Type III Sum of Squares

ANOVA - ug_some

Cases	Sum of Squares	df	Mean Square	F	p
Gender	42.050	1	42.050	1.434	0.247
Residuals	527.700	18	29.317		

Note. Type III Sum of Squares

ANOVA - att_none

Cases	Sum of Squares	df	Mean Square	F	p
Gender	6301.250	1	6301.250	303.512	< .001
Residuals	373.700	18	20.761		

Note. Type III Sum of Squares

ANOVA - av_none ▼

Cases	Sum of Squares	df	Mean Square	F	p
Gender	3.200	1	3.200	0.203	0.658
Residuals	283.600	18	15.756		

Note. Type III Sum of Squares

ANOVA - ug_none

Cases	Sum of Squares	df	Mean Square	F	p
Gender	0.450	1	0.450	0.040	0.843
Residuals	200.500	18	11.139		

Note. Type III Sum of Squares

These tables display the results of various ANOVA tests analyzing different factors ('ug_none', 'av_high', 'att_some', 'ug_some', 'att_none', 'av_none', 'ug_none') in relation to the 'Gender' variable. The tables show the Sum of Squares, degrees of freedom (df), Mean Square, F-statistic (F), and p-values.

Summary of ANOVA Results:

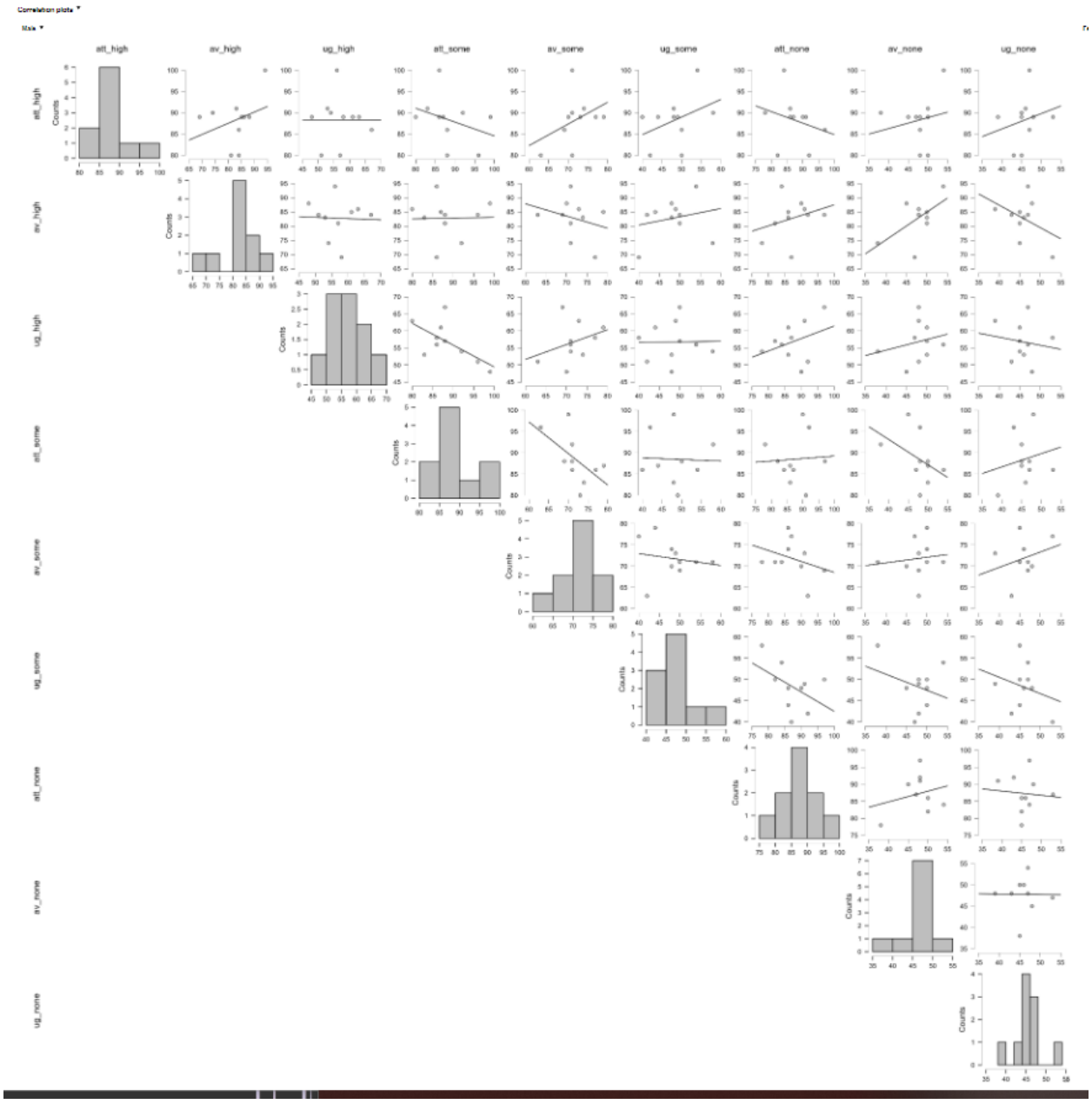
- Among the factors analyzed, only 'att_none' exhibits a significant association with Gender. Gender seems to play a significant role in determining 'att_none'.

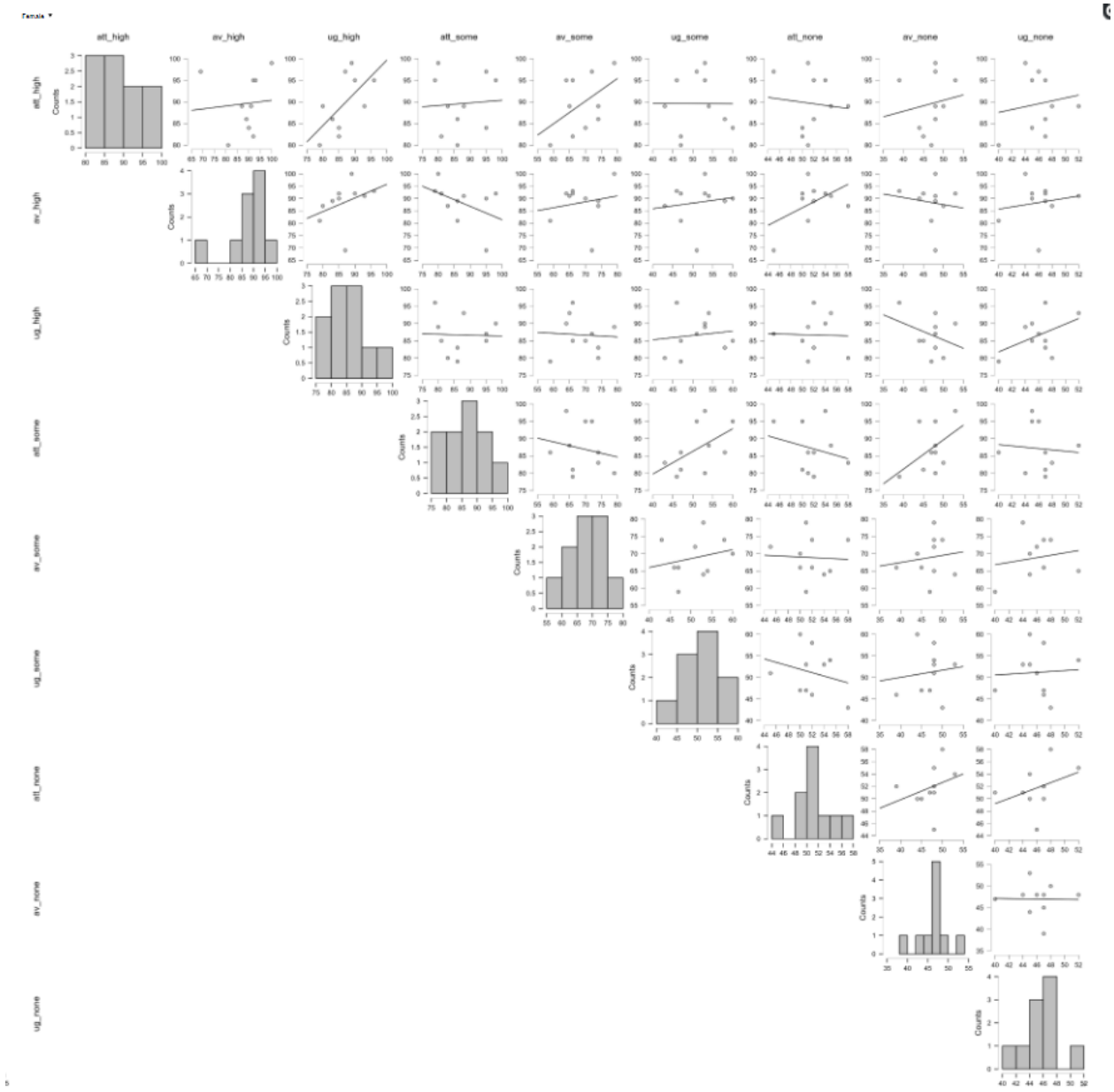
- For the other factors ('ug_none', 'av_high', 'att_some', 'ug_some', 'av_none'), Gender does not appear to have a significant impact.

2. If there is a three-way interaction between gender, looks and personality, then analyze and interpret the other significant two-way interactions and also include a plot of the means.

Descriptive Statistics

	att_high		av_high		ug_high		att_some		av_some		ug_some		att_none		av_none		ug_none	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Valid	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	88.300	89.600	82.800	88.400	66.800	86.700	88.500	87.100	71.800	68.900	48.300	51.200	87.300	51.800	47.800	47.000	45.800	46.100
Std. Deviation	5.697	6.637	7.005	8.329	5.731	5.438	5.740	6.806	4.417	5.953	5.376	5.453	5.438	3.458	4.185	3.742	3.584	3.071
Minimum	80.000	80.000	69.000	69.000	48.000	79.000	80.000	79.000	63.000	59.000	40.000	43.000	78.000	45.000	38.000	39.000	39.000	40.000
Maximum	100.000	99.000	94.000	100.000	67.000	96.000	99.000	98.000	79.000	79.000	58.000	60.000	97.000	58.000	54.000	53.000	53.000	52.000


Correlation plots
Male
att_high
av_high
ug_high
att_some
av_some
ug_some
att_none
av_none
ug_none
Counts



Since the plot is scattered, it could mean that the relationship between the factors (such as gender, looks, and personality) doesn't follow a clear pattern or association. This means that these factors have no two-way significant factor, and no three-way significant factors.

3. Analyze the remaining combinations of the design and interpret the effects.

The analysis made in number 2 includes all the remaining combinations.

4. Make a report of the analysis including the checking of assumption

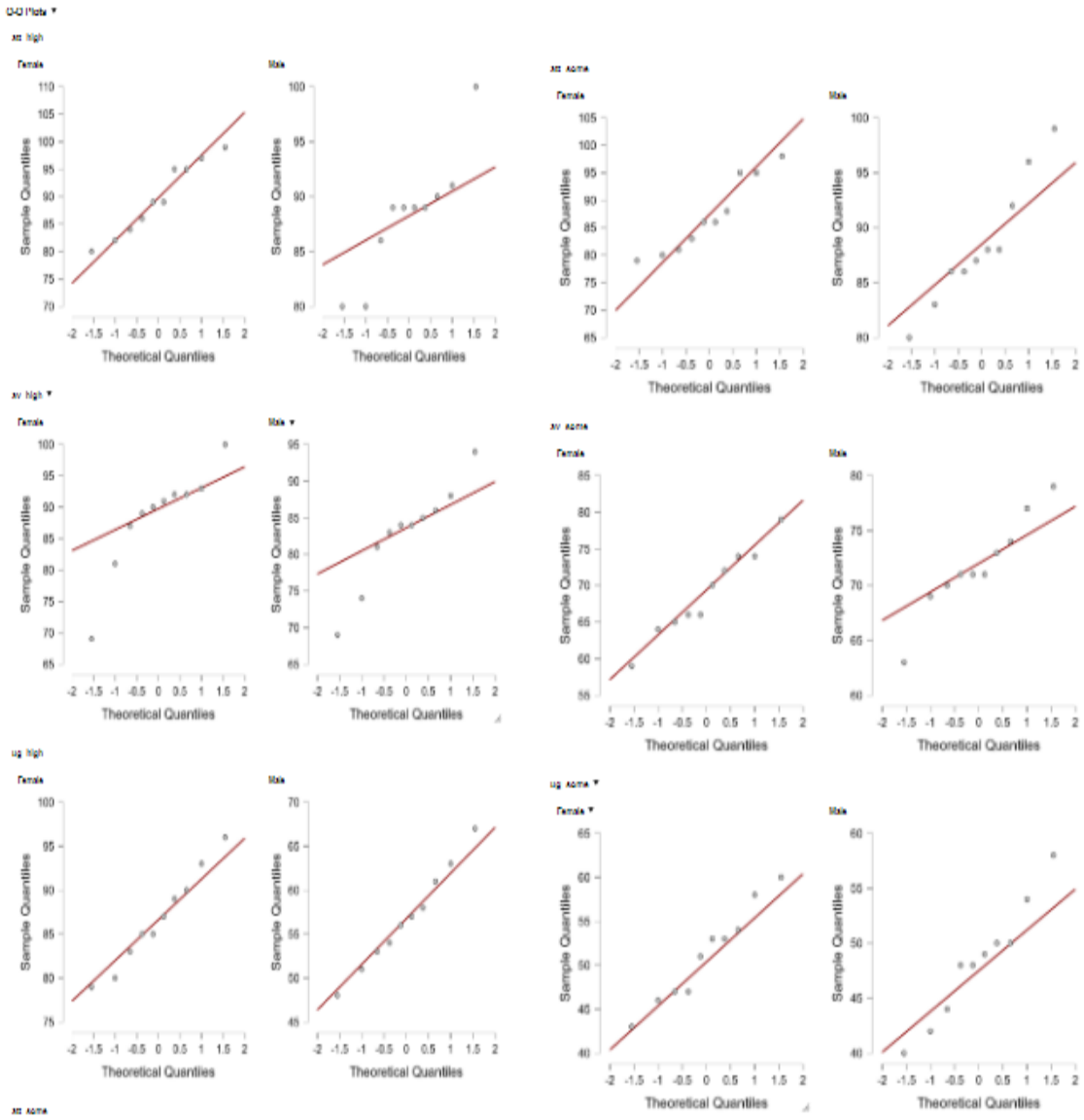
1. Random Sampling

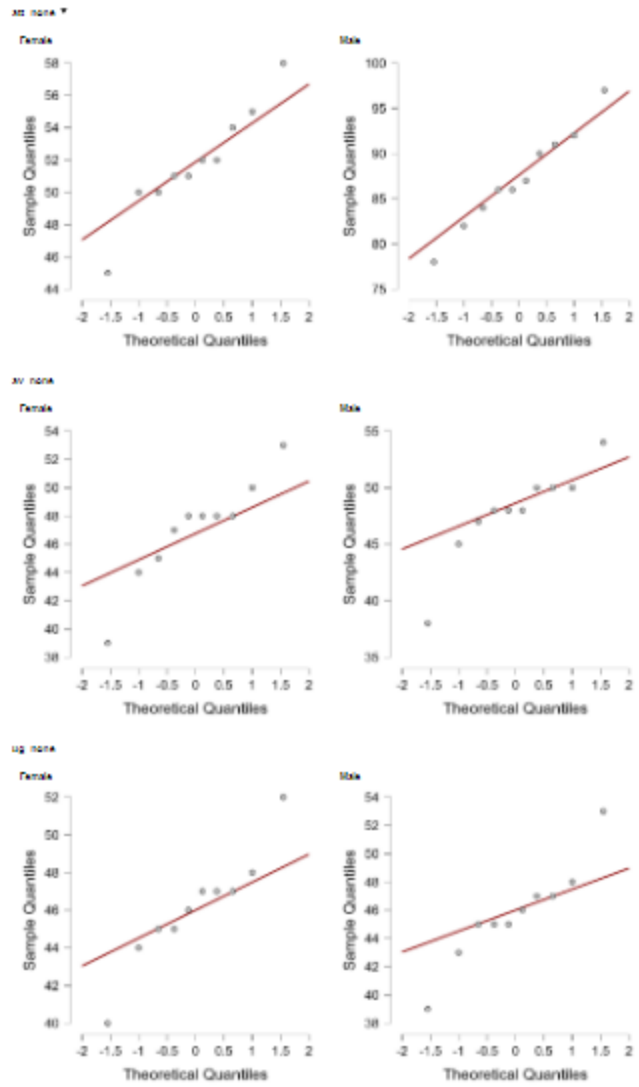
The study assumes that the selection of participants or sampled units is conducted through random sampling. Random sampling involves each member of the population having an equal chance of being selected for the study. This method ensures that the sample represents the population accurately, minimizing bias and allowing for generalization of findings to the larger population.

2. Independence:

The study assumes that observations or data points collected from the sample are independent of each other. Independence of observations signifies that the value or outcome of one observation doesn't influence or affect the value of another. This assumption is crucial for many statistical analyses as dependencies between observations can skew results, leading to inaccurate conclusions.

3. Normality:


Q-Q Plots
xx high
Female
Male
Sample Quantiles
Theoretical Quantiles
xx asma
xv high
xv asma
ug high
ug asma
Female
Male



The dataset exhibits a straight line in a Q-Q plot, it suggests that the data closely follows a normal distribution. The points on the plot align roughly along a diagonal line, indicating that the observed data quantiles match well with the theoretical quantiles expected from a normal distribution.

This result implies that the values in your dataset are distributed in a manner that aligns with a Gaussian distribution, where most of the data clusters around the mean, with fewer values in the tails. It's a good indicator that the dataset's distribution is approximately normal, allowing for the application of statistical methods that assume normality.

4. Homogeneity of Variances:

ANOVA - att_high

Cases	Sum of Squares	df	Mean Square	F	p
gender	8.450	1	8.450	0.221	0.644
Residuals	688.500	18	38.250		

Note. Type III Sum of Squares

Assumption Checks ▼

Test for Equality of Variances (Levene's) ▼

F	df1	df2	p
1.131	1.000	18.000	0.302

ANOVA - av_high

Cases	Sum of Squares	df	Mean Square	F	p
gender	156.800	1	156.800	2.648	0.121
Residuals	1066.000	18	59.222		

Note. Type III Sum of Squares

Assumption Checks ▼

Test for Equality of Variances (Levene's) ▼

F	df1	df2	p
0.102	1.000	18.000	0.753

ANOVA - ug_high

Cases	Sum of Squares	df	Mean Square	F	p
gender	4470.050	1	4470.050	143.245	< .001
Residuals	561.700	18	31.206		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.005	1.000	18.000	0.945

ANOVA - att_some

Cases	Sum of Squares	df	Mean Square	F	p
gender	9.800	1	9.800	0.247	0.625
Residuals	713.400	18	39.633		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.599	1.000	18.000	0.449

ANOVA - av_some

Cases	Sum of Squares	df	Mean Square	F	p
gender	42.050	1	42.050	1.531	0.232
Residuals	494.500	18	27.472		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
1.763	1.000	18.000	0.201

ANOVA - ug_some

Cases	Sum of Squares	df	Mean Square	F	p
gender	42.050	1	42.050	1.434	0.247
Residuals	527.700	18	29.317		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.124	1.000	18.000	0.729

ANOVA - att_none

Cases	Sum of Squares	df	Mean Square	F	p
gender	6301.250	1	6301.250	303.512	< .001
Residuals	373.700	18	20.761		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
1.949	1.000	18.000	0.180

ANOVA - av_none

Cases	Sum of Squares	df	Mean Square	F	p
gender	3.200	1	3.200	0.203	0.658
Residuals	283.600	18	15.756		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.004	1.000	18.000	0.950

ANOVA - av_none

Cases	Sum of Squares	df	Mean Square	F	p
gender	3.200	1	3.200	0.203	0.658
Residuals	283.600	18	15.756		

Note. Type III Sum of Squares

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.004	1.000	18.000	0.950

these results indicates that there might be heterogeneity in variances across genders for the specified cases. It's essential to acknowledge this variance inequality when interpreting the results of the corresponding ANOVA analyses, as it might affect the reliability of the conclusions drawn from these tests.