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Null Hypothesis (H0): the variances of the differences between all possible pairs of within-subject conditions are equal.

Alternative Hypothesis (Ha): at least one pair of variances is different

Assumption 1. You have a continuous dependent variable.

The dateRating is my continuous dependent variable.

Assumption 2. You have two between-subjects factors (i.e., independent variables) that are both categorical with two or more groups in each factor.

Gender and Personality

Assumption 3. You have one within-subjects factor (i.e., independent variable) that is categorical with two or more levels.

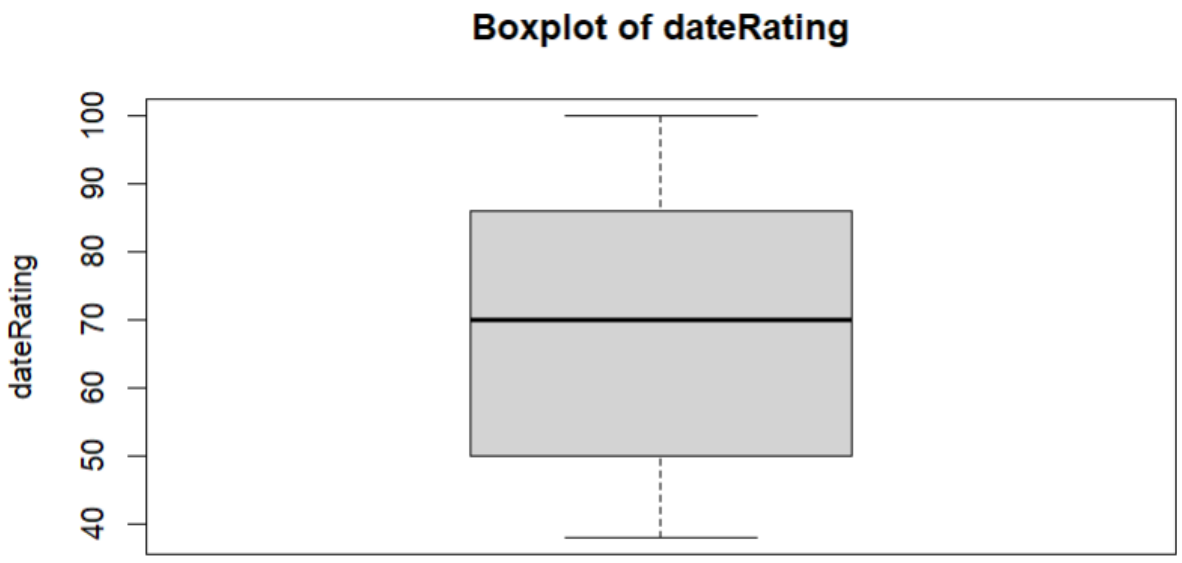
Looks

Assumption 4. There should be no significant outliers in any cell of the design.

```
> # Create a boxplot of 'dateRating'
> boxplot(speedData$dateRating, main = "Boxplot of dateRating", ylab = "dateRating")
```

```
> # Identify potential outliers based on a threshold (e.g., 1.5 times the interquartile range)
> Q1 <- quantile(speedData$dateRating, 0.25)
> Q3 <- quantile(speedData$dateRating, 0.75)
> IQR_value <- Q3 - Q1
> lower_threshold <- Q1 - 1.5 * IQR_value
> upper_threshold <- Q3 + 1.5 * IQR_value
>
> # Identify outliers
> outliers <- which(speedData$dateRating < lower_threshold | speedData$dateRating > upper_threshold)
>
> # Display cases corresponding to identified outliers
> outlierData <- speedData[outliers, c("participant", "looks", "personality", "gender", "dateRating")]
>
> print(outlierData)
[1] participant looks       personality gender      dateRating
<0 rows> (or 0-length row.names)
```

#Outliers



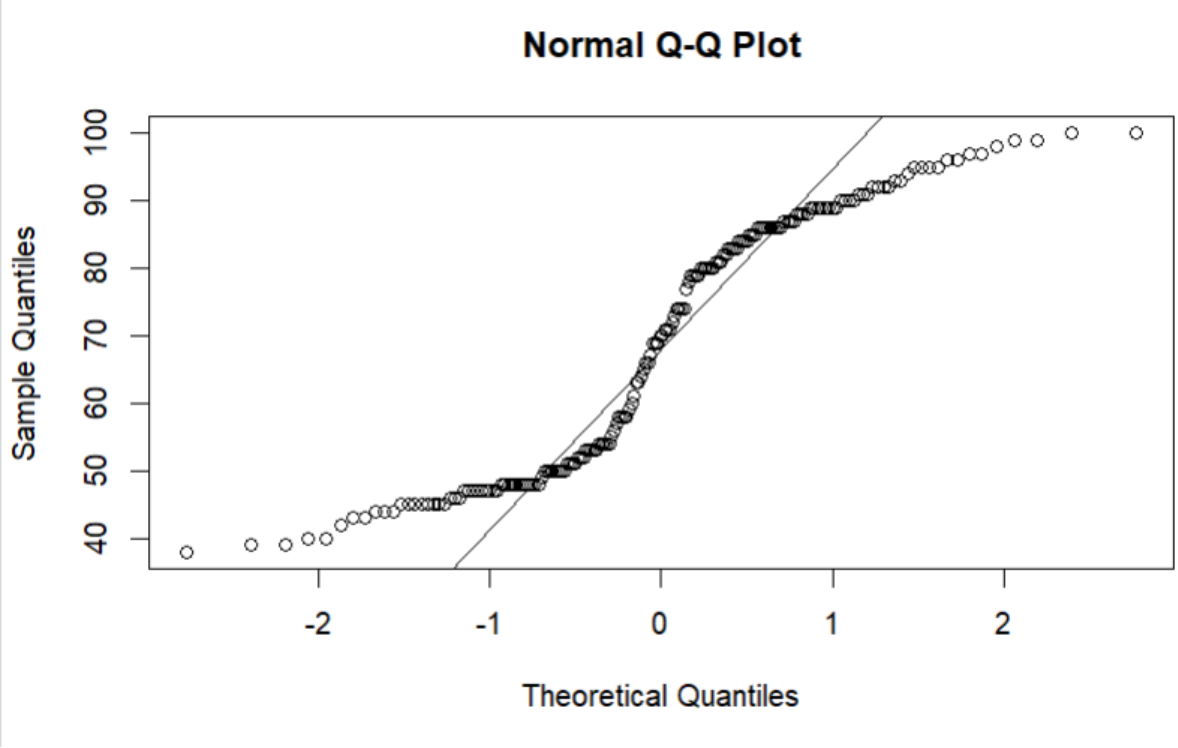
There are no significant outliers in any cell of the design based on the given data and boxplot.

Assumption 5. Your dependent variable should be approximately normally distributed for each cell of the design.

```
> # Shapiro-Wilk test for normality
> shapiro_test <- shapiro.test(speedData$dateRating)
> print(shapiro_test)

        Shapiro-Wilk normality test

data:  speedData$dateRating
W = 0.89812, p-value = 8.81e-10
```



p-value = 0.000000000881 which suggests that the dateRating is not normally distributed

Assumption 6. The variance of your dependent variable should be equal between the groups of the between-subjects factors.

```
Levene's Test for Homogeneity of Variance (center = median)
       Df F value    Pr(>F)
group   5  8.4075 3.825e-07 ***
      174
```

Using levene's test the p-value is 0.0000003825 which is the assumption of homogeneity of variance is violated

Assumption 7. The variance of the differences between groups should be equal.

```
$ANOVA
                     Effect DFn DFd      SSn  SSd        F        p p<.05      ges
1               (Intercept)   1  18 846249.8  760 2.00e+04 7.01e-29     * 9.94e-01
2                    gender   1  18      0.2  760 4.74e-03 9.46e-01       4.07e-05
3                     looks   2  36  20779.6  883 4.24e+02 9.59e-26     * 8.09e-01
5               personality   2  36  23233.6 1274 3.28e+02 7.69e-24     * 8.26e-01
4              gender:looks   2  36   3944.1  883 8.04e+01 5.23e-14     * 4.45e-01
6       gender:personality   2  36   4420.1 1274 6.24e+01 1.97e-12     * 4.74e-01
7        looks:personality   4  72   4055.3 1993 3.66e+01 1.10e-16     * 4.52e-01
8 gender:looks:personality   4  72   2669.7 1993 2.41e+01 1.11e-12     * 3.52e-01
```

The data above shows the main-effects of each factor and interaction effects and the three-way interaction

```
$`Mauchly's Test for Sphericity`
                    Effect     W     p p<.05
3                    looks 0.960 0.708
4             gender:looks 0.960 0.708
5              personality 0.929 0.536
6       gender:personality 0.929 0.536
7        looks:personality 0.613 0.534
8 gender:looks:personality 0.613 0.534

$`Sphericity Corrections`
                    Effect   GGe    p[GG] p[GG]<.05   HFe    p[HF] p[HF]<.05
3                    looks 0.962 7.62e-25         * 1.074 9.59e-26         *
4             gender:looks 0.962 1.49e-13         * 1.074 5.23e-14         *
5              personality 0.934 2.06e-22         * 1.038 7.69e-24         *
6       gender:personality 0.934 9.44e-12         * 1.038 1.97e-12         *
7        looks:personality 0.799 9.00e-14         * 0.992 1.43e-16         *
8 gender:looks:personality 0.799 1.47e-10         * 0.992 1.34e-12         *
```

For Mauchly's Test

The p-value in each is greater than 0.05. Therefore, the assumption of sphericity is met based on mauchly's test.

For Sphericity Corrections

The Greenhouse-Geisser and Huynh-Feldt corrections are provided but the p-values are very small which violates the assumption of sphericity after corrections in repeated measures ANOVA.

Data Report:

```
> # Descriptive statistics for different levels of 'looks'
> by(speedData$dateRating, speedData$looks, stat.desc, basic = FALSE)
speedData$looks: Attractive
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
       86.00        82.10         1.90         3.81       217.52        14.75         0.18
------------------------------------------------------------------------------
speedData$looks: Average
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      70.000       67.783        2.181        4.364      285.359       16.893        0.249
------------------------------------------------------------------------------
speedData$looks: Ugly
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      50.000       55.817        1.957        3.917      229.881       15.162        0.272
>
> # Descriptive statistics for different levels of 'personality'
> by(speedData$dateRating, speedData$personality, stat.desc, basic = FALSE)
speedData$personality: Charismatic
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      86.000       82.100        1.704        3.409      174.193       13.198        0.161
------------------------------------------------------------------------------
speedData$personality: Average
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
       71.00        69.30         2.15         4.30       276.96        16.64         0.24
------------------------------------------------------------------------------
speedData$personality: Dullard
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      48.000       54.300        2.000        4.002      240.010       15.492        0.285
>
```

```
> # Descriptive statistics for different levels of 'gender'
> by(speedData$dateRating, speedData$gender, stat.desc, basic = FALSE)
speedData$gender: Male
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      71.000       68.600        1.961        3.896      346.018       18.602        0.271
------------------------------------------------------------------------------
speedData$gender: Female
      median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      67.500       68.533        2.036        4.046      373.218       19.319        0.282
>
> # Descriptive statistics for combinations of 'looks' and 'gender'
```

```
> # Descriptive statistics for combinations of 'looks' and 'gender'
> by(speedData$dateRating, list(speedData$looks, speedData$gender), stat.desc, basic = FALSE)
: Attractive
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     88.000       88.033        0.996        2.037       29.757        5.455        0.062
------------------------------------------------------------------------------
: Average
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     71.000       67.467        2.873        5.876      247.637       15.736        0.233
------------------------------------------------------------------------------
: Ugly
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     48.500       50.300        1.239        2.535       46.079        6.788        0.135
------------------------------------------------------------------------------
: Attractive
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     82.500       76.167        3.366        6.885      339.937       18.437        0.242
------------------------------------------------------------------------------
: Average
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     67.500       68.100        3.330        6.811      332.714       18.240        0.268
------------------------------------------------------------------------------
: Ugly
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     52.500       61.333        3.458        7.072      358.644       18.938        0.309
>

> # Descriptive statistics for combinations of 'personality' and 'gender'
> by(speedData$dateRating, list(speedData$personality, speedData$gender), stat.desc, basic = FALSE)
: Charismatic
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      82.00        75.97         2.77         5.67       230.72        15.19         0.20
------------------------------------------------------------------------------
: Average
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     71.000       69.533        3.197        6.538      306.533       17.508        0.252
------------------------------------------------------------------------------
: Dullard
: Male
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
      49.00        60.30         3.63         7.43       396.36        19.91         0.33
------------------------------------------------------------------------------
: Charismatic
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
    89.0000      88.2333       1.2361       2.5282      45.8402       6.7705       0.0767
------------------------------------------------------------------------------
: Average
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
     68.000       69.067        2.926        5.984      256.823       16.026        0.232
------------------------------------------------------------------------------
: Dullard
: Female
     median         mean      SE.mean CI.mean.0.95          var      std.dev     coef.var
    48.0000      48.3000       0.7629       1.5602      17.4586       4.1784       0.0865
>
```

```
> # Descriptive statistics for combinations of 'looks', 'personality', and 'gender'
> by(speedData$dateRating, list(speedData$looks, speedData$personality, speedData$gender), stat.desc,
basic = FALSE)
: Attractive
: Charismatic
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
     89.0000       88.3000        1.8015        4.0754       32.4556        5.6970        0.0645
------------------------------------------------------------------------------
: Average
: Charismatic
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
     84.0000       82.8000        2.2151        5.0109       49.0667        7.0048        0.0846
------------------------------------------------------------------------------
: Ugly
: Charismatic
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
      56.500        56.800          1.812         4.100        32.844         5.731         0.101
------------------------------------------------------------------------------
: Attractive
: Average
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
     87.5000       88.5000        1.8151        4.1060       32.9444        5.7397        0.0649
------------------------------------------------------------------------------
: Average
: Average
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
     71.0000       71.8000        1.3968        3.1598       19.5111        4.4171        0.0615
------------------------------------------------------------------------------
: Ugly
: Average
: Male
      median          mean       SE.mean  CI.mean.0.95           var       std.dev      coef.var
      48.500        48.300          1.700         3.846        28.900         5.376         0.111
------------------------------------------------------------------------------
```

: Attractive
: Dullard
: Male

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
86.5000	87.3000	1.7195	3.8898	29.5667	5.4375	0.0623

: Average
: Dullard
: Male

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
48.0000	47.8000	1.3233	2.9935	17.5111	4.1846	0.0875

: Ugly
: Dullard
: Male

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
45.5000	45.8000	1.1333	2.5638	12.8444	3.5839	0.0783

: Attractive
: Charismatic
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
89.0000	89.6000	2.0987	4.7475	44.0444	6.6366	0.0741

: Average
: Charismatic
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
90.5000	88.4000	2.6340	5.9584	69.3778	8.3293	0.0942

: Ugly
: Charismatic
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
86.0000	86.7000	1.7195	3.8898	29.5667	5.4375	0.0627

: Attractive
: Average
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
86.0000	87.1000	2.1523	4.8687	46.3222	6.8060	0.0781

: Average
: Average
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
68.0000	68.9000	1.8824	4.2582	35.4333	5.9526	0.0864

: Ugly
: Average
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
52.000	51.200	1.724	3.901	29.733	5.453	0.107

: Attractive
: Dullard
: Female

median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
51.5000	51.8000	1.0934	2.4735	11.9556	3.4577	0.0668

: Average
: Dullard
: Female

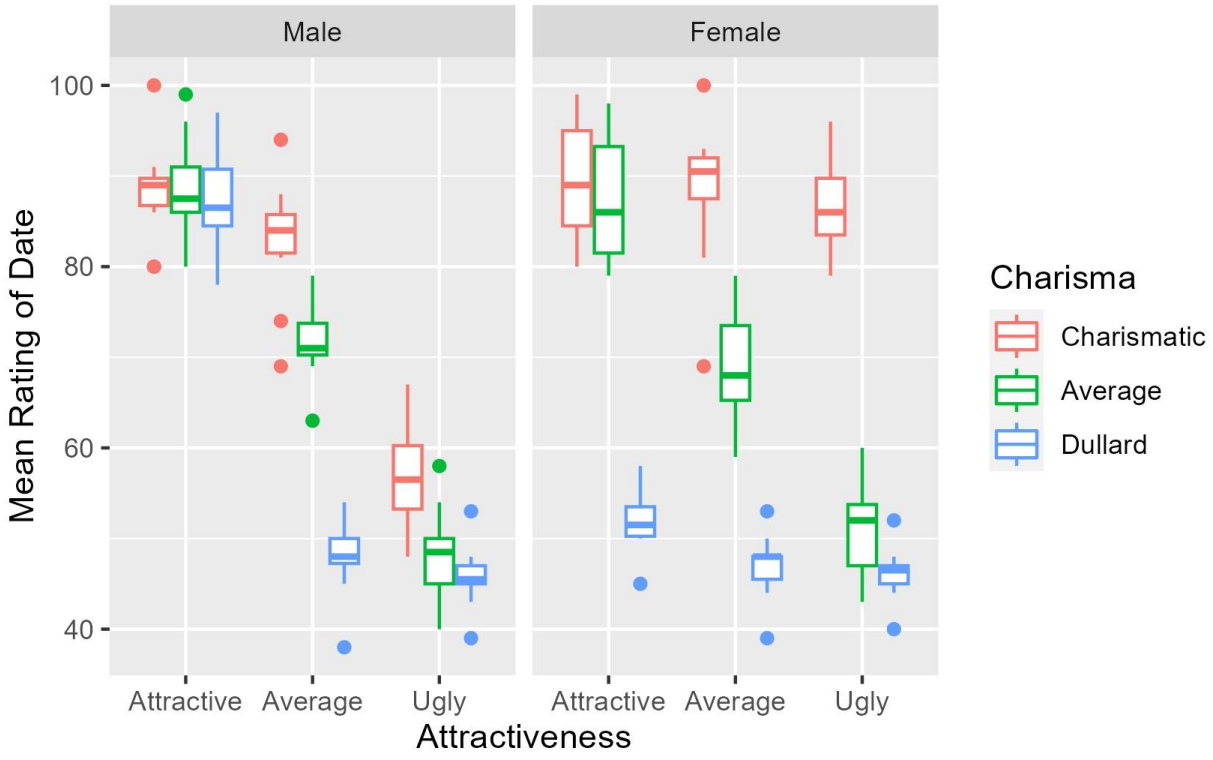
median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
48.0000	47.0000	1.1832	2.6766	14.0000	3.7417	0.0796

: Ugly
: Dullard
: Female

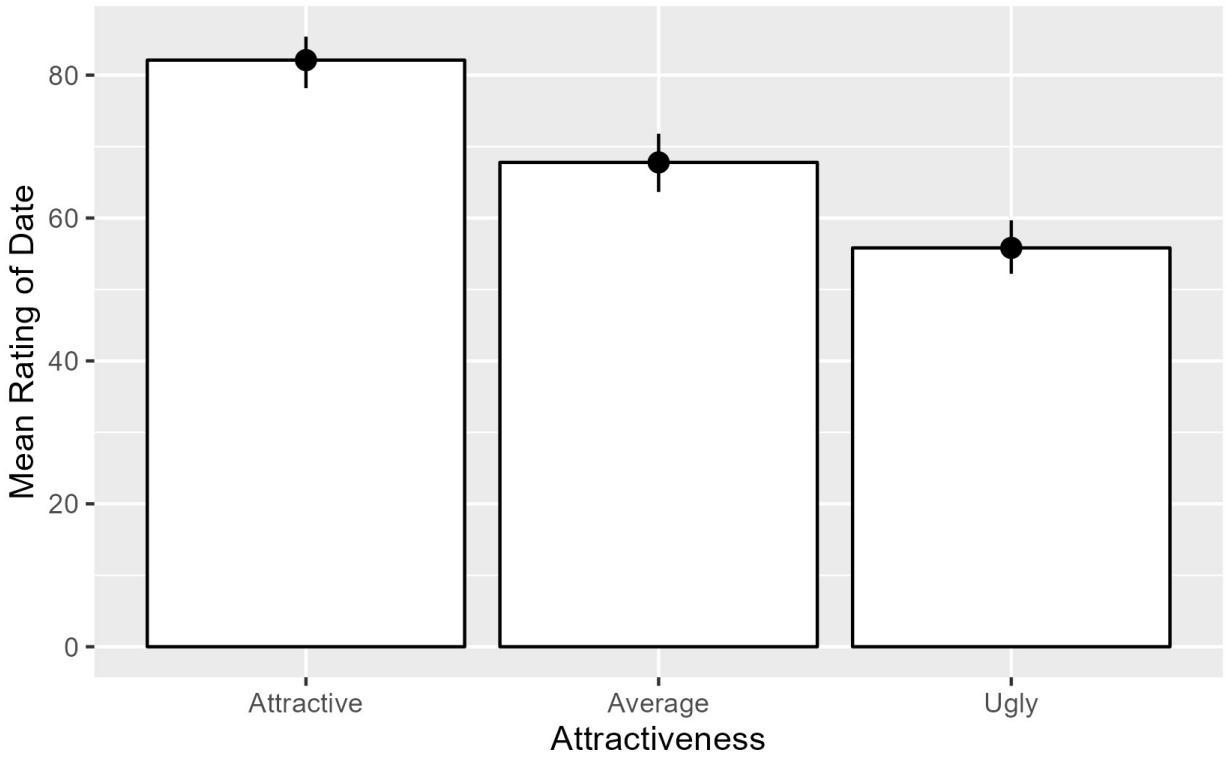
median	mean	SE.mean	CI.mean.0.95	var	std.dev	coef.var
46.5000	46.1000	0.9713	2.1971	9.4333	3.0714	0.0666

The given data above shows the descriptive statistics for each levels of personality, looks, gender and for different combinations of personality, looks, gender.

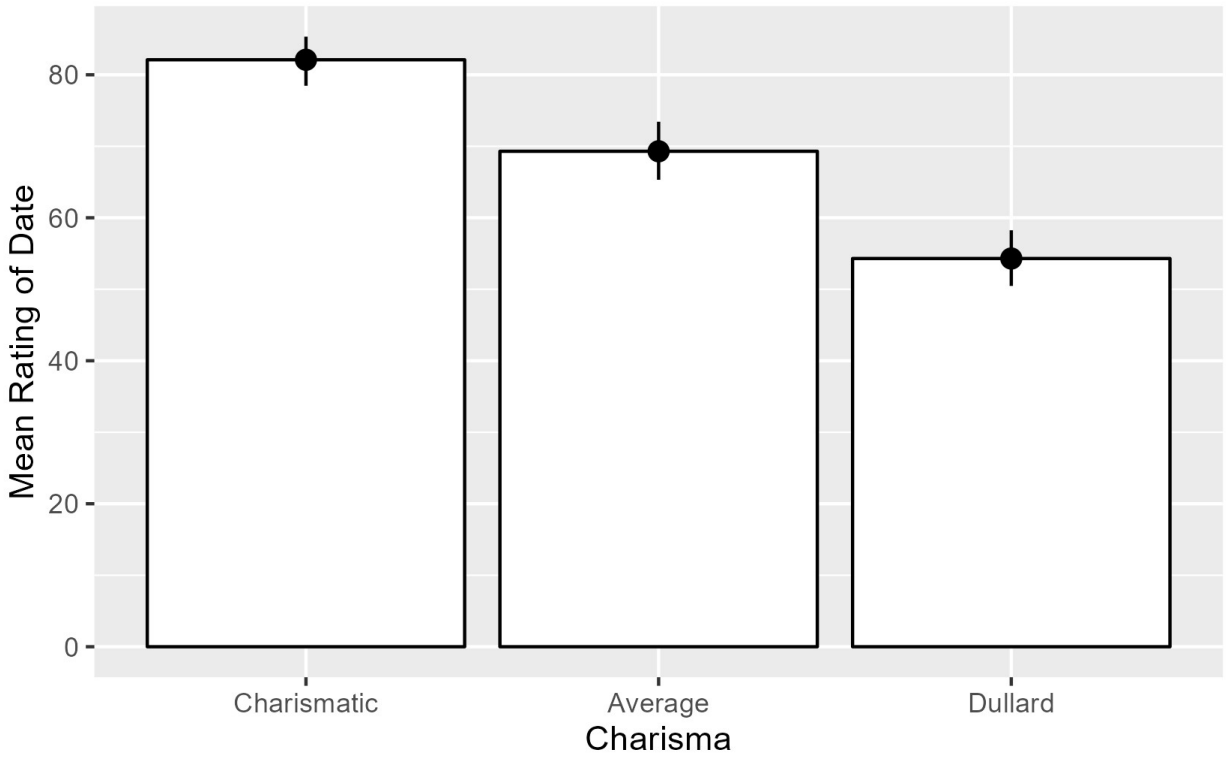
```
#Examining the Main Effects
>
> # Create and save boxplot for attractiveness, colored by personality, facet
ed by gender
> dateBoxplot <- ggplot(speedData, aes(looks, dateRating, colour = personalit
y))
> dateBoxplot + geom_boxplot() + labs(x = "Attractiveness", y = "Mean Rating
of Date", colour = "Charisma") + facet_wrap(~gender)
> imageFile <- paste(imageDirectory,"Speed Date Boxplot.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



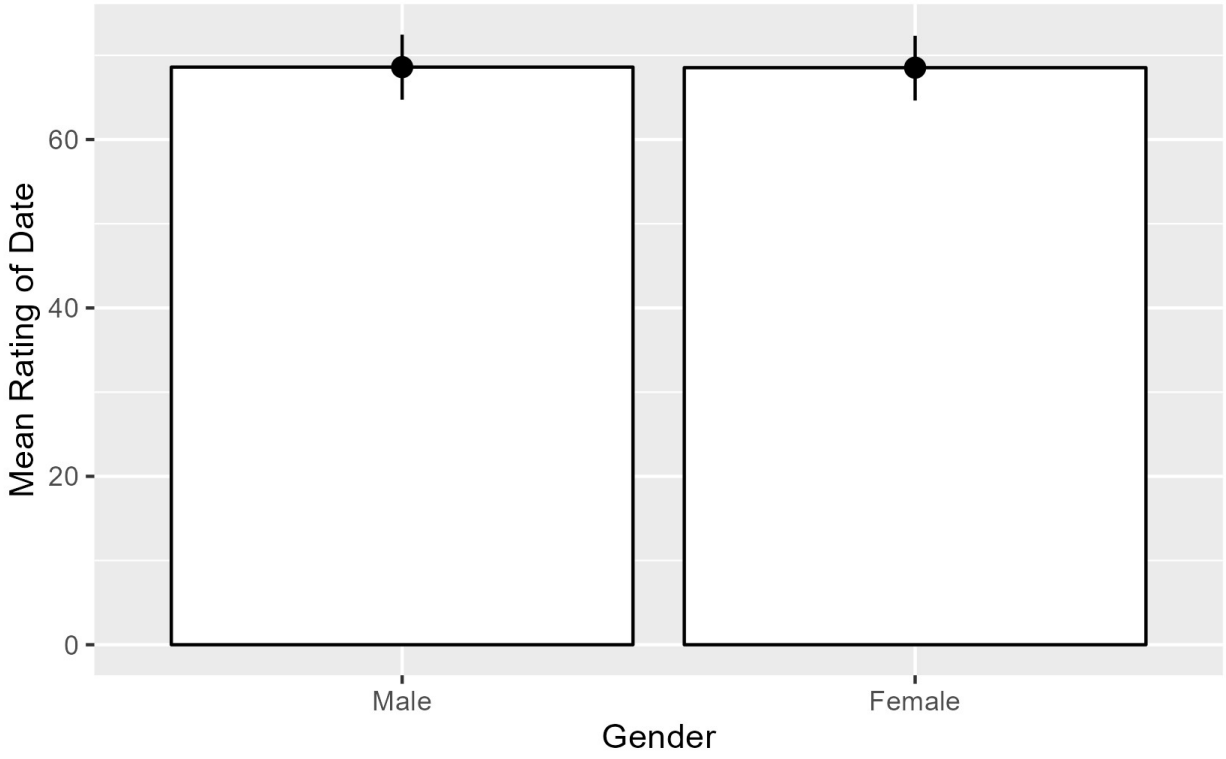

```
>
> # Create a bar plot for 'Attractiveness' (looks) and save the image
> looksBar <- ggplot(speedData, aes(looks, dateRating))
> looksBar + stat_summary(fun = mean, geom = "bar", fill = "White", colour =
"Black") + stat_summary(fun.data = mean_cl_boot, geom = "pointrange") + labs(
x = "Attractiveness", y = "Mean Rating of Date")
> imageFile <- paste(imageDirectory,"Speed Date Looks.png",sep="/")
> ggsave(file = imageFile)
```




```
>
>
> # Create a bar plot for 'Charisma' (personality) and save the image
> charismaBar <- ggplot(speedData, aes(personality, dateRating))
> charismaBar + stat_summary(fun = mean, geom = "bar", fill = "White", colour
= "Black") + stat_summary(fun.data = mean_cl_boot, geom = "pointrange") + lab
s(x = "Charisma", y = "Mean Rating of Date")
> imageFile <- paste(imageDirectory,"Speed Date Charisma.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



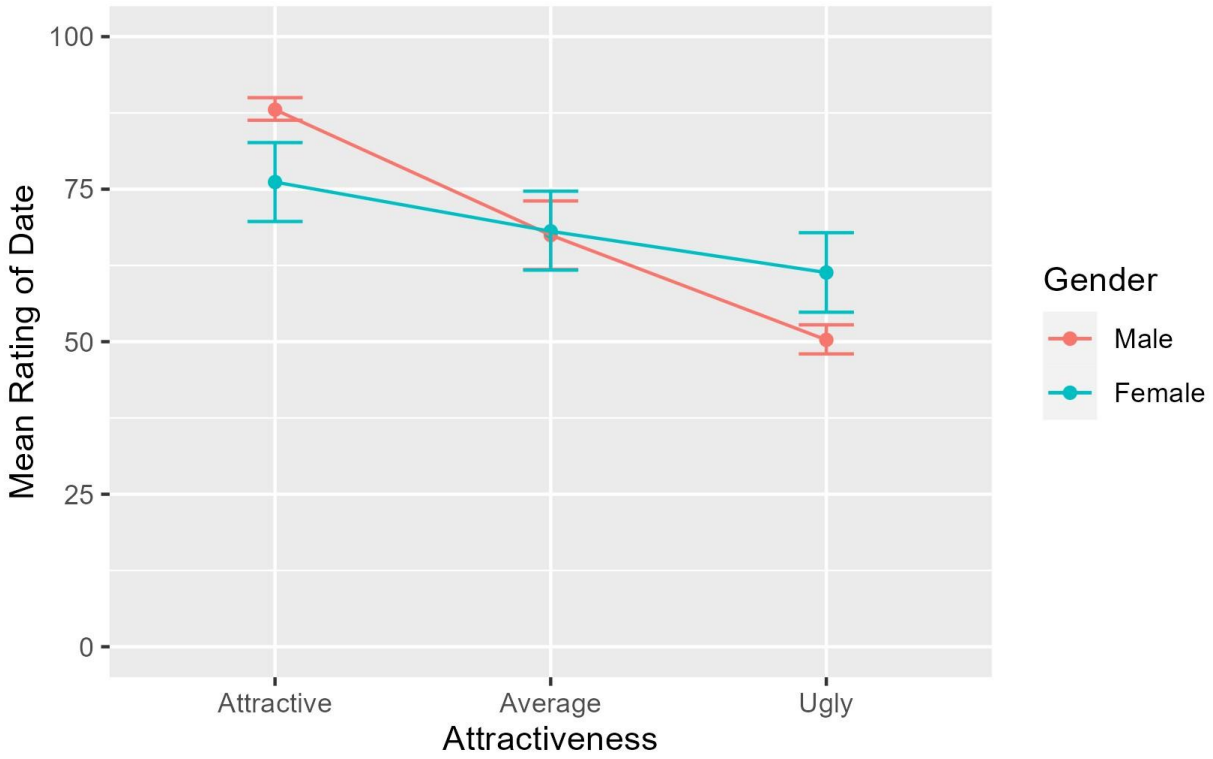

```
>
> # Create a bar plot for 'Gender' and save the image
> genderBar <- ggplot(speedData, aes(gender, dateRating))
> genderBar + stat_summary(fun = mean, geom = "bar", fill = "White", colour =
"Black") + stat_summary(fun.data = mean_cl_boot, geom = "pointrange") + labs(
x = "Gender", y = "Mean Rating of Date")
> imageFile <- paste(imageDirectory,"Speed Date Gender.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



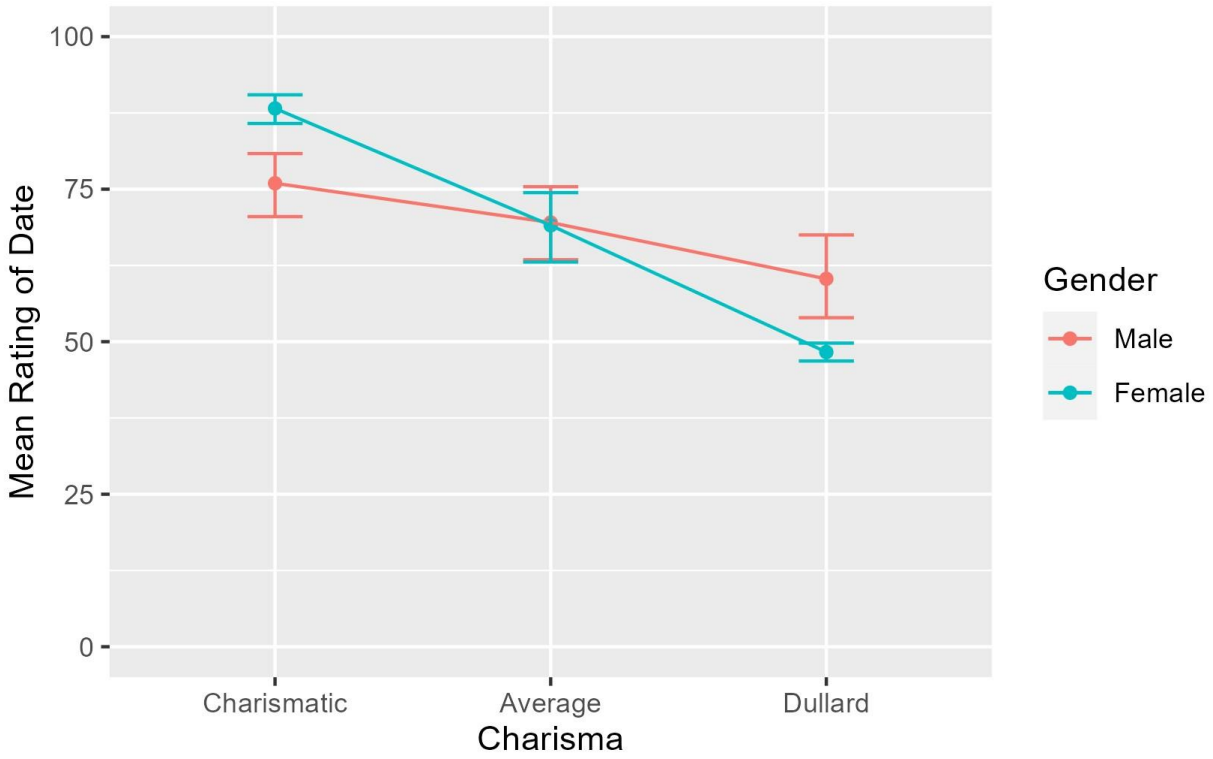

```
>
> # Create a plot for the interaction between 'Attractiveness' and 'Gender' a
nd save the image
> genderLooks <- ggplot(speedData, aes(looks, dateRating, colour = gender))
> genderLooks + stat_summary(fun = mean, geom = "point") + stat_summary(fun =
mean, geom = "line", aes(group= gender)) + stat_summary(fun.data = mean_cl_bo
ot, geom = "errorbar", width = 0.2) + labs(x = "Attractiveness", y = "Mean Ra
ting of Date", colour = "Gender") + scale_y_continuous(limits = c(0,100))
> imageFile <- paste(imageDirectory,"looks gender.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```

With the given boxplots for the following data above:
Charisma
Gender
Attractiveness and Gender
Barplot for the attractiveness, charisma, gender

This implies that they are significantly different each other.

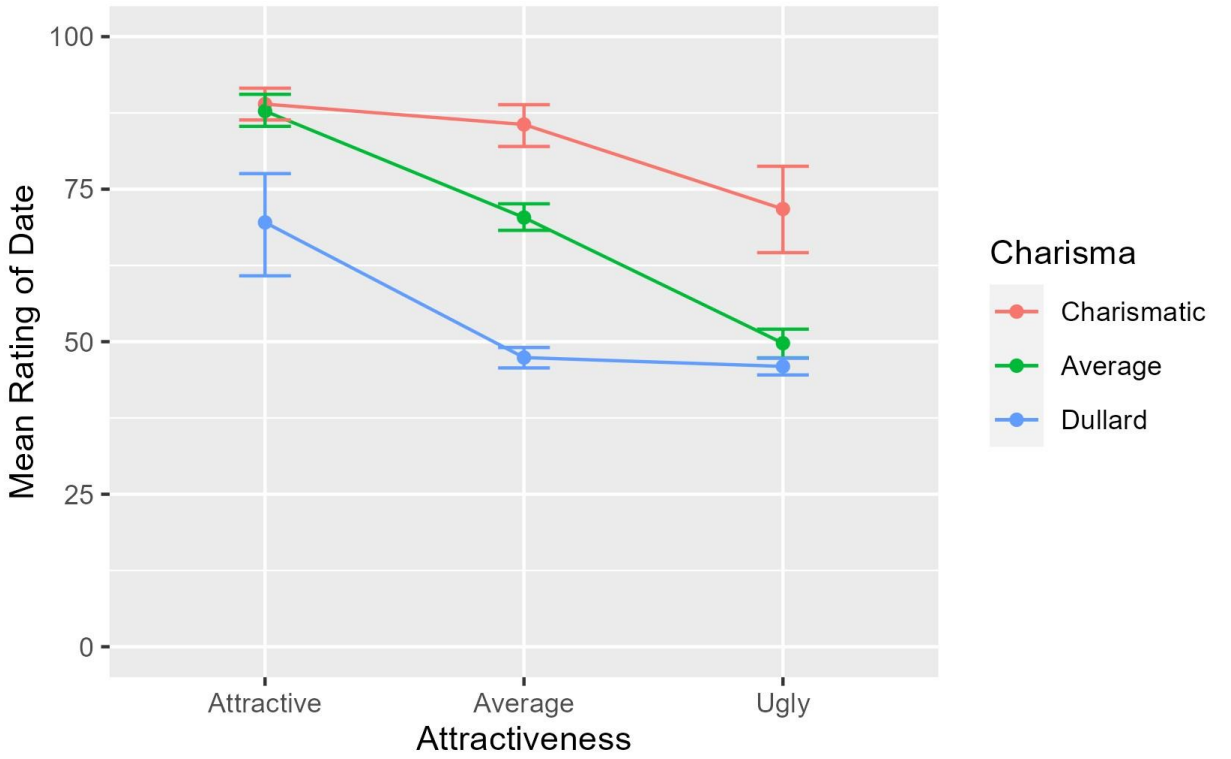



```
The information provided indicates a two-way relationship between attractiven
ess and gender. Men tended to rate dates that were appealing higher than wome
n did. On the other hand, women rated dates more than men did when they were
described as ugly. Nonetheless, there was no appreciable variation in the eva
luations given by men and women when the date was aesthetically pleasing. Thi
s implies that different genders have different opinions on how attractive a
date is, with men and women judging dates differently depending on how gorgeo
us they are.
>
> # Create a plot for the interaction between 'Charisma' and 'Gender' and sav
e the image
> genderCharisma <- ggplot(speedData, aes(personality, dateRating, colour = g
ender))
> genderCharisma + stat_summary(fun = mean, geom = "point") + stat_summary(fu
n = mean, geom = "line", aes(group= gender)) + stat_summary(fun.data = mean_c
l_boot, geom = "errorbar", width = 0.2) + labs(x = "Charisma", y = "Mean Rati
ng of Date", colour = "Gender") + scale_y_continuous(limits = c(0,100))
> imageFile <- paste(imageDirectory,"personality gender.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



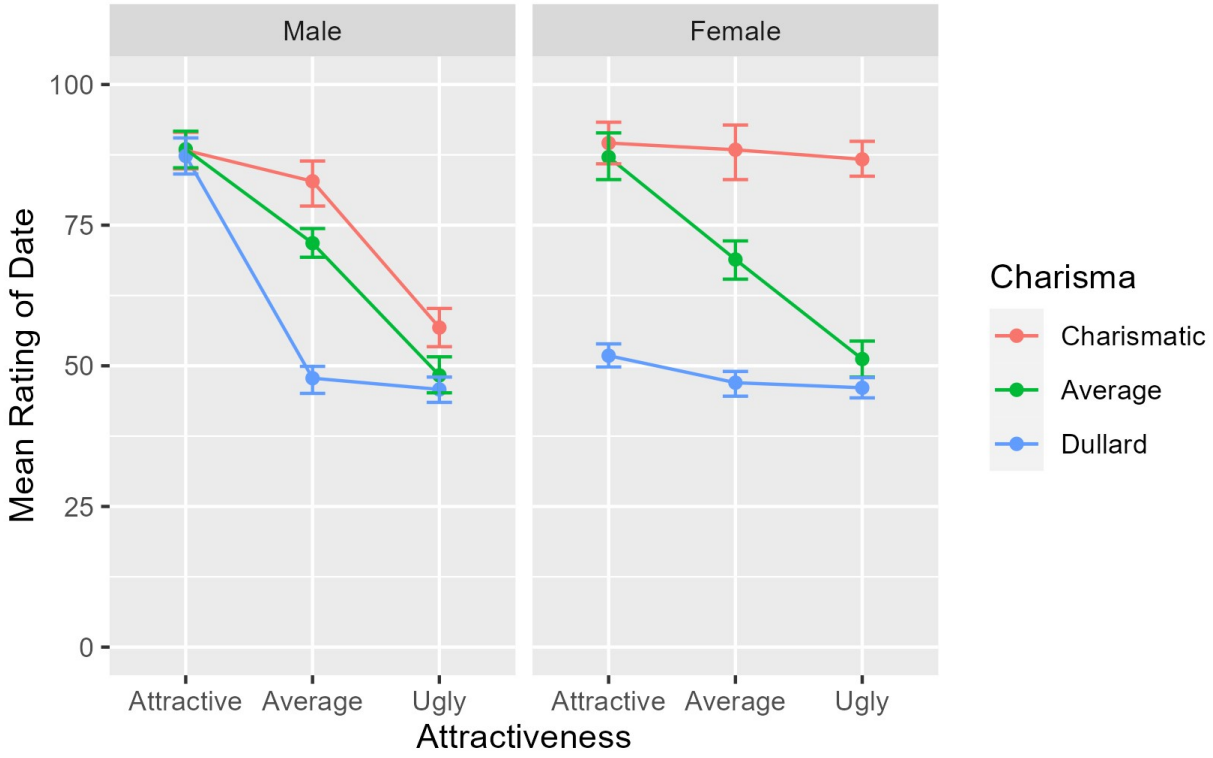
The information provided indicates a two-way relationship between charisma and gender. Men tended to give charismatic dates a higher rating than women did. On the other hand, women rated dates more than men did when they were described as ugly. Nonetheless, there was no appreciable variation in the evaluations given by men and women when the date possessed an average degree of charisma. This implies that different genders have different opinions about how charismatic a date is, with men and women judging dates differently depending on how charismatic they are.

```
>
> # Create a plot for the interaction between 'Attractiveness' and 'Charisma' and save the image
> looksCharisma <- ggplot(speedData, aes(looks, dateRating, colour = personality))
> looksCharisma + stat_summary(fun = mean, geom = "point") + stat_summary(fun = mean, geom = "line", aes(group= personality)) + stat_summary(fun.data = mean_cl_boot, geom = "errorbar", width = 0.2) + labs(x = "Attractiveness", y = "Mean Rating of Date", colour = "Charisma") + scale_y_continuous(limits = c(0, 100))
> imageFile <- paste(imageDirectory,"personality looks.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



Based on the given data, it shows two-way interaction between Attractiveness and Charisma which indicates the charismatic are consistently higher than the given below.

```
>
> # Create a plot for the interaction between 'Attractiveness', 'Charisma', a
nd 'Gender' and save the image
> looksCharismaGender <- ggplot(speedData, aes(looks, dateRating, colour = pe
rsonality))
> looksCharismaGender + stat_summary(fun = mean, geom = "point") + stat_summa
ry(fun = mean, geom = "line", aes(group= personality)) + stat_summary(fun.dat
a = mean_cl_boot, geom = "errorbar", width = 0.2) + labs(x = "Attractiveness"
, y = "Mean Rating of Date", colour = "Charisma") + scale_y_continuous(limits
= c(0,100)) + facet_wrap(~gender)
> imageFile <- paste(imageDirectory,"three way interaction.png",sep="/")
> ggsave(file = imageFile)
Saving 5.55 x 3.48 in image
```



This graph is for the three-way interaction.

The graph makes it clear that men and women interact differently when it comes to looks and personality. It appears that there are no appreciable variations in the personality judgments between attractive and ugly dates for guys. On the other hand, mean assessments for dates that are averagely attractive differ based on the personality type. Furthermore, there seems to be a general downward tendency between personality and beauty, suggesting that the assessments of the date decline in tandem with a decline in charisma and attractiveness.

Conversely, appearance seems to have the biggest impact on women when their charisma level is mediocre. In this instance, when beauty declines, so do the date's mean ratings. It's interesting to note that evaluations for women with captivating or uninteresting personalities do not appear to be significantly impacted by appearance. Notably, scores for the charismatic personality are generally higher than those for the dullard type.