

Understanding Global Happiness: Insights from the World Happiness Report

Group 7 Team Members:

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1. Introduction

Happiness and well-being are crucial for the growth and prosperity of societies. With the rise of data-driven policymaking, understanding what drives happiness has become essential. This project analyzes global happiness data from 2015 to 2020 to uncover how factors like economy, health, social support, freedom, generosity, and trust influence well-being. It also explores how these factors vary across regions and change over time.

1.1 Motivation

Happiness isn't just personal, it is a foundation for stronger societies. By analyzing happiness data, we aim to:

1. Understand why some regions consistently report higher happiness.
2. Explore how economic, social, and governance factors shape well-being.
3. Provide insights for policymakers to design strategies that improve quality of life and reduce inequality.

The goal is to highlight challenges faced by less-happy regions and contribute to global efforts toward equitable and prosperous communities.

1.2 Problem Statement

Despite available happiness data, gaps remain in understanding the factors behind it. This study tackles key questions:

- How much do economic conditions like GDP per capita impact happiness?
- What roles do social support and health play?
- How do freedom and trust influence well-being?
- Why are there large happiness differences across regions?
- How have happiness trends changed over time, especially during global events?

Using visualizations, models, and regional comparisons, this project aims to uncover patterns and offer actionable insights for improving happiness worldwide.

1.3 Challenges

The complexity of relationships between variables, multicollinearity, and non-linear effects make this analysis challenging.

1.4 Individual Contributions

Vineet Patel: Responsible for data cleaning, preparation, and exploratory data analysis, including generating initial summary statistics and the ggpairs plot.

Dhruv Rajeshkumar Patel: Developed the full model and interaction model and tested the significant variables as well as interaction terms.

Dhruv Rameshbhai Patel: Assisted Vineet and Dhruv Rajeshkumar Patel in their work and performed higher order testing for the model.

Utsav Bharatbhai Goti: Coordinated the project and compiled all findings into the final report. Drafted sections on introduction, objectives, methodology, and conclusions while ensuring consistency and proper formatting.

2 Overview of Dataset

2.1 Data Source

“World Happiness Report,” the dataset used in this analysis, was acquired from Kaggle (<https://www.kaggle.com/datasets/sazidthe1/global-happiness-scores-and-factors/data>).

2.2 Data Agency

The data originates from the World Happiness Report, an annual survey published by the United Nations Sustainable Development Solutions Network. This report aggregates global data from sources like the Gallup World Poll and other reputable surveys.

2.3 Observations and Variables

Each row in the dataset represents a specific country, capturing its happiness score and related factors. The dataset includes the following key variables:

- Happiness Score: An aggregated score based on subjective well-being assessments.
- GDP per Capita: The wealth of the country per person, adjusted for population size and living costs.
- Social Support: Availability and quality of social networks.
- Healthy Life Expectancy: Metrics related to health and life span.
- Freedom to Make Life Choices: Perceived personal freedom in decision-making.
- Generosity: Altruistic behavior observed within the population.
- Perceptions of Corruption: Public perceptions regarding corruption in governance.
- Region: A categorical variable indicating the geographic region of each country (e.g., Western Europe, Sub-Saharan Africa). This column provides a valuable contextual layer for understanding how happiness and related factors vary across regions.

2.4 Data Cleaning

The data cleaning process involved several critical steps to ensure the dataset was accurate, consistent, and ready for analysis. First, the “perceptions_of_corruption” column was cleaned by converting non-numeric entries to NA, transforming the column into a numeric format, and imputing missing values with 0. Duplicated rows were identified and removed to maintain the integrity of unique country-year observations. Missing values (NA) and rows containing zeros in key columns were systematically excluded to minimize noise and inaccuracies in the data. Additionally, the “region” column was reclassified to better group countries based on geographic and cultural similarities, such as separating “North America and ANZ” into “North America” and “Oceania.” These efforts ensured a high-quality, reliable dataset for predictive modeling and analysis.

3. Exploratory Data Analysis (EDA)

After completing our data cleaning process, our team performed an Exploratory Data Analysis (EDA) to better understand the distribution and relationships between the variables. We collaboratively visualized the data using histograms, box plots, and scatter plots to identify patterns and outliers. As a group, we calculated descriptive statistics such as means, medians, and standard deviations to comprehensively summarize the data.

3.1 Distribution of the Response variable (Happiness Score):

The first step in EDA was to inspect the distribution of the happiness_score variable. A histogram was plotted to visually assess whether the distribution is roughly normal, as normality is an assumption for linear regression. If the data is skewed, appropriate transformations such as a log transformation may be applied to make it closer to a normal distribution.



From the graph:

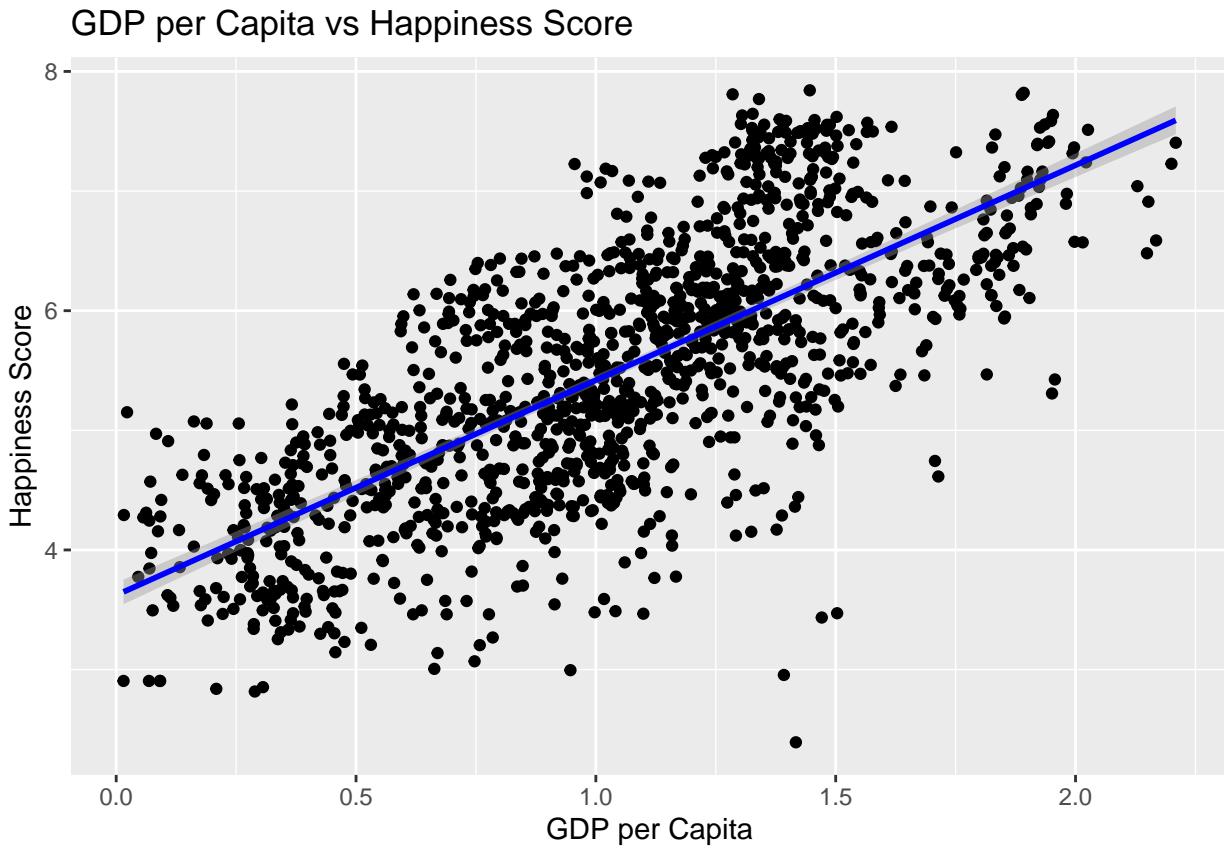
- The distribution appears approximately symmetric, with the peak around scores of 5-6.
- The data has a bell-shaped trend, suggesting a normal or near-normal distribution.

3.2 Visualizing Relationships Between Predictors and Happiness Score:

Next, our team utilized scatter plots to explore the relationships between the happiness_score and various predictor variables, including GDP per Capita and Social Support. We collaboratively analyzed these plots to visually assess whether the relationships exhibited linear patterns. This step was crucial for our group, as it allowed us to check an important assumption of linear regression.

3.2.1 GDP per Capita vs Happiness Score

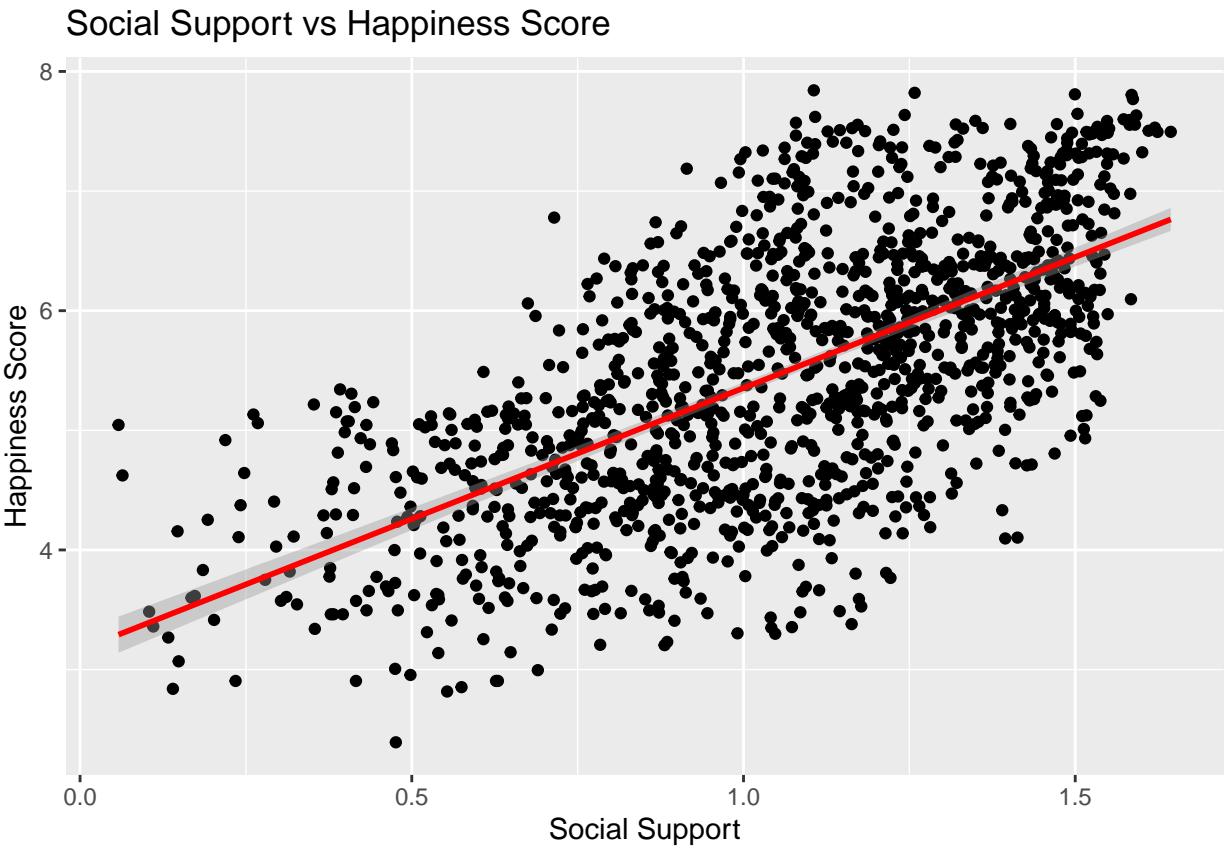
```
## Warning: package 'ggplot2' was built under R version 4.3.3
## `geom_smooth()` using formula = 'y ~ x'
```



- The scatterplot shows a clear positive relationship between GDP per capita and Happiness Score. As economic prosperity increases, so does happiness, though there is variability. Some outliers suggest that higher GDP doesn't always equate to higher happiness, and at higher levels of GDP, the happiness increase slows, indicating diminishing returns. This suggests that while economic factors influence happiness, other variables like social, cultural, and psychological factors play a role.

3.2.2 Social Support vs Happiness Score

```
## `geom_smooth()` using formula = 'y ~ x'
```

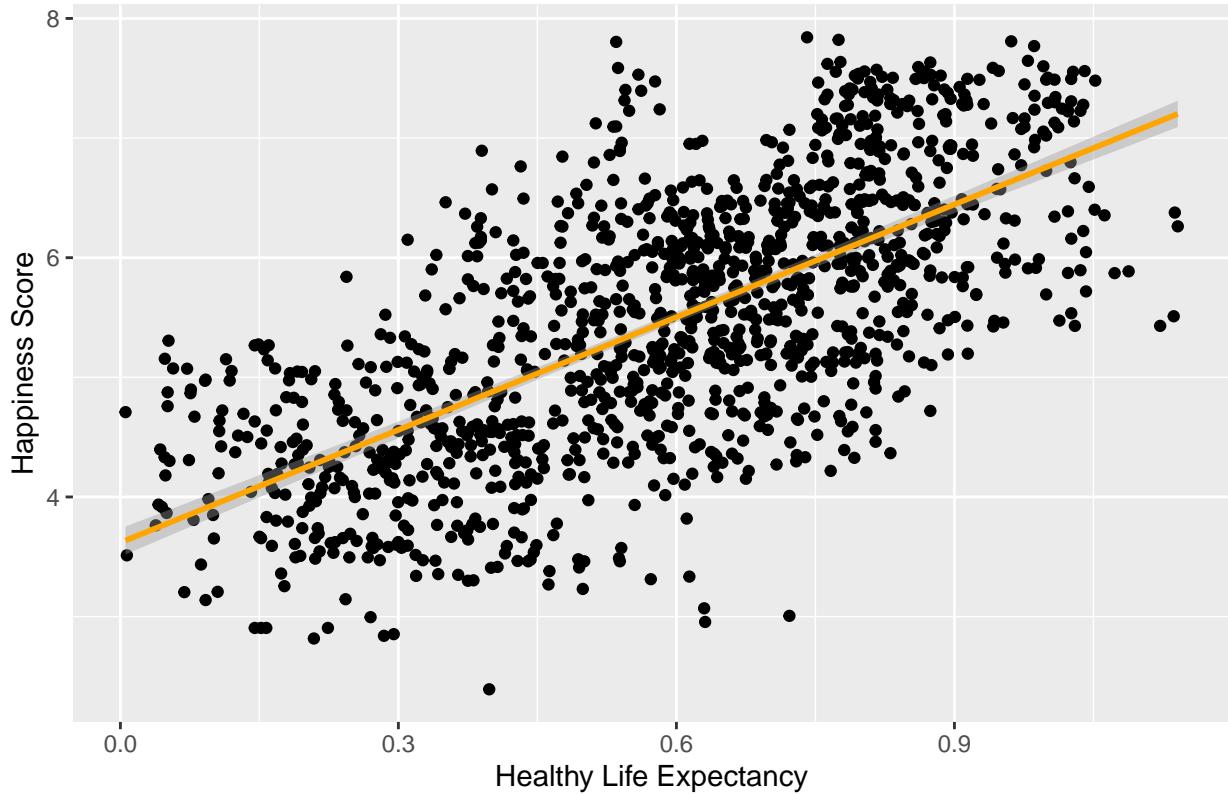


- The scatterplot highlights a strong positive relationship between social support and happiness. As social support increases, happiness scores generally rise, with diminishing returns at higher levels. This suggests that while social support is important for happiness, its impact becomes less pronounced beyond a certain threshold. It emphasizes the importance of strong social connections for well-being.

3.2.3 Healthy Life Expectancy vs Happiness Score

```
## `geom_smooth()` using formula = 'y ~ x'
```

Healthy Life Expectancy vs Happiness Score

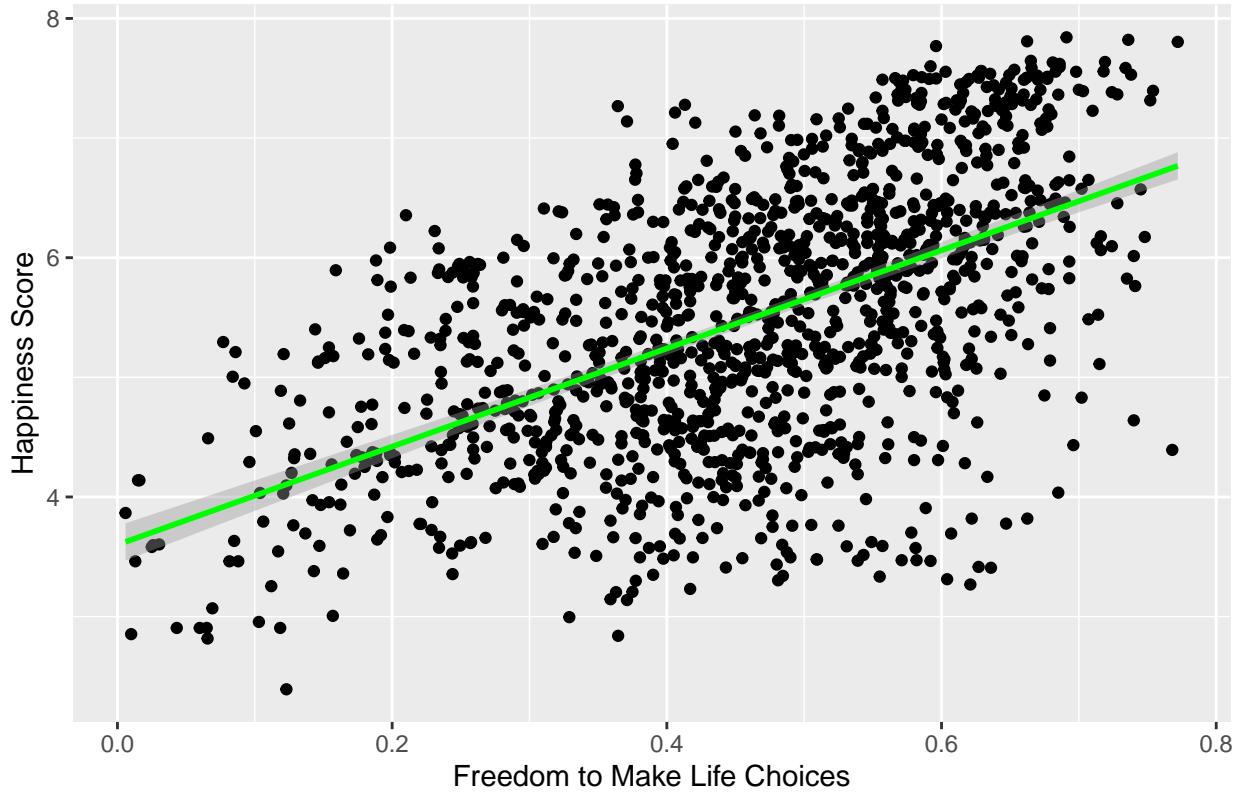


- There is a positive correlation between Healthy Life Expectancy and Happiness Score. As life expectancy increases, happiness tends to rise, though some dispersion exists. This suggests that longer, healthier lives contribute to happiness, but other societal factors are also influential in well-being.

3.2.4 Freedom to Make Life Choices vs Happiness Score

```
## `geom_smooth()` using formula = 'y ~ x'
```

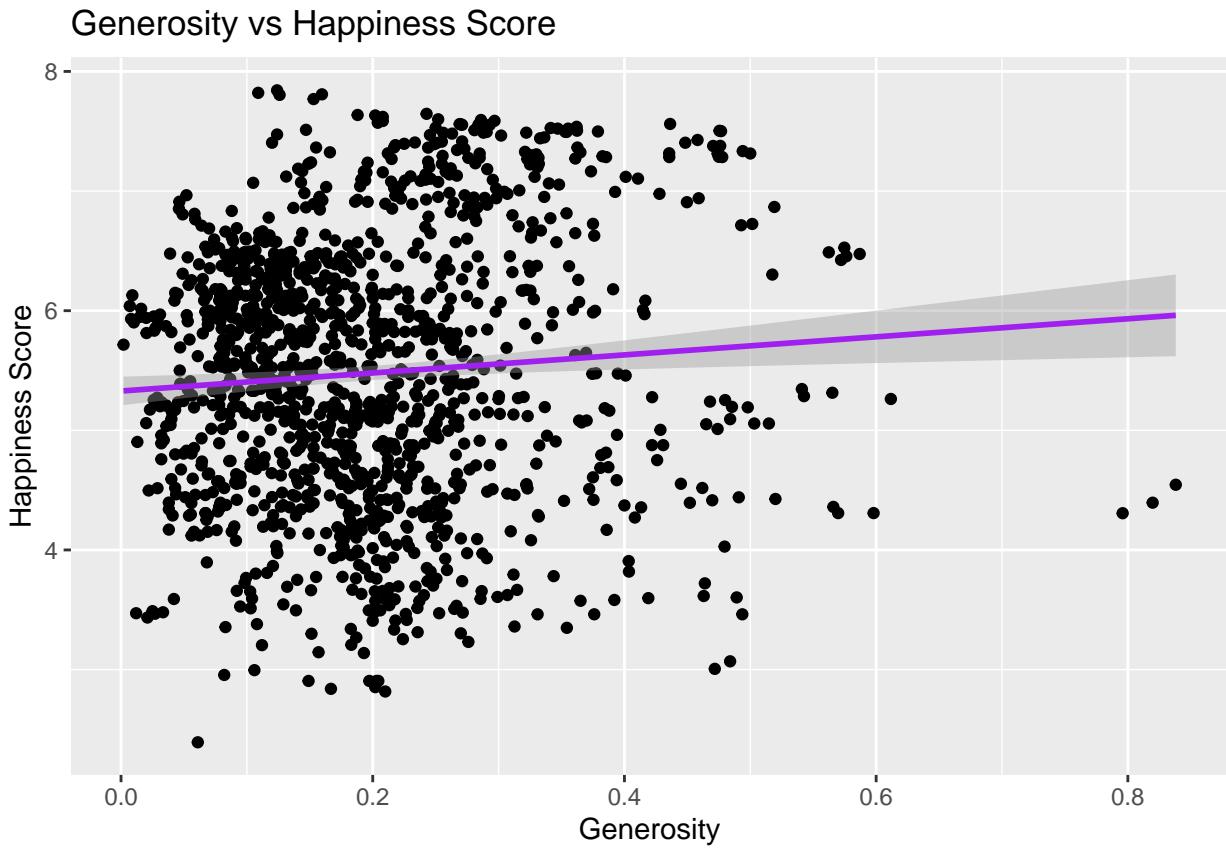
Freedom to Make Life Choices vs Happiness Score



- The scatterplot shows a positive relationship between freedom to make life choices and happiness, but with significant variability in the data points. This suggests that while freedom plays a role in happiness, it is not the only determinant, as other factors influence well-being. It highlights the complexity of happiness beyond personal autonomy.

3.2.5 Generosity vs Happiness Score

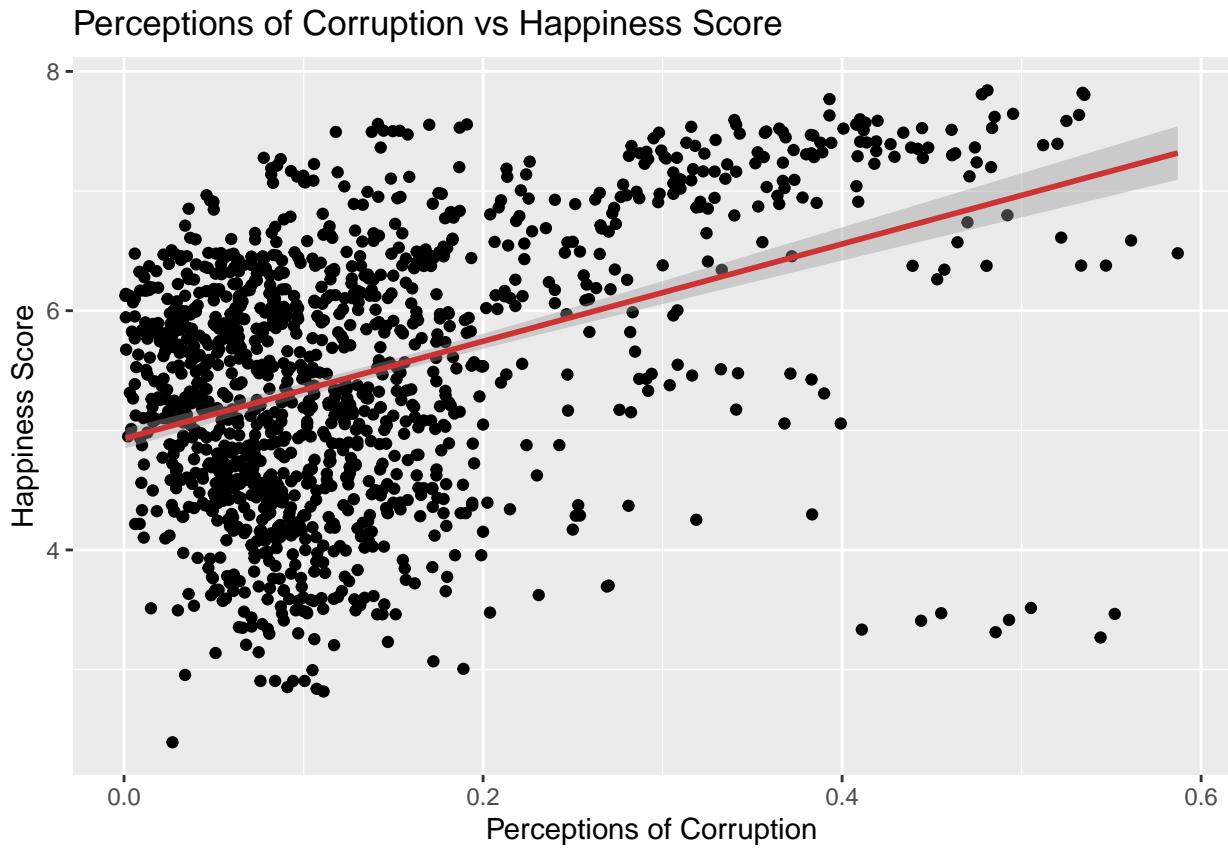
```
## `geom_smooth()` using formula = 'y ~ x'
```



- The scatterplot reveals a very weak positive correlation between generosity and happiness. Generosity has minimal impact on happiness, as indicated by the near-horizontal trend line. This suggests that while generosity may contribute to happiness, its effect is likely overshadowed by other factors.

3.2.6 Perceptions of Corruption vs Happiness Score

```
## `geom_smooth()` using formula = 'y ~ x'
```



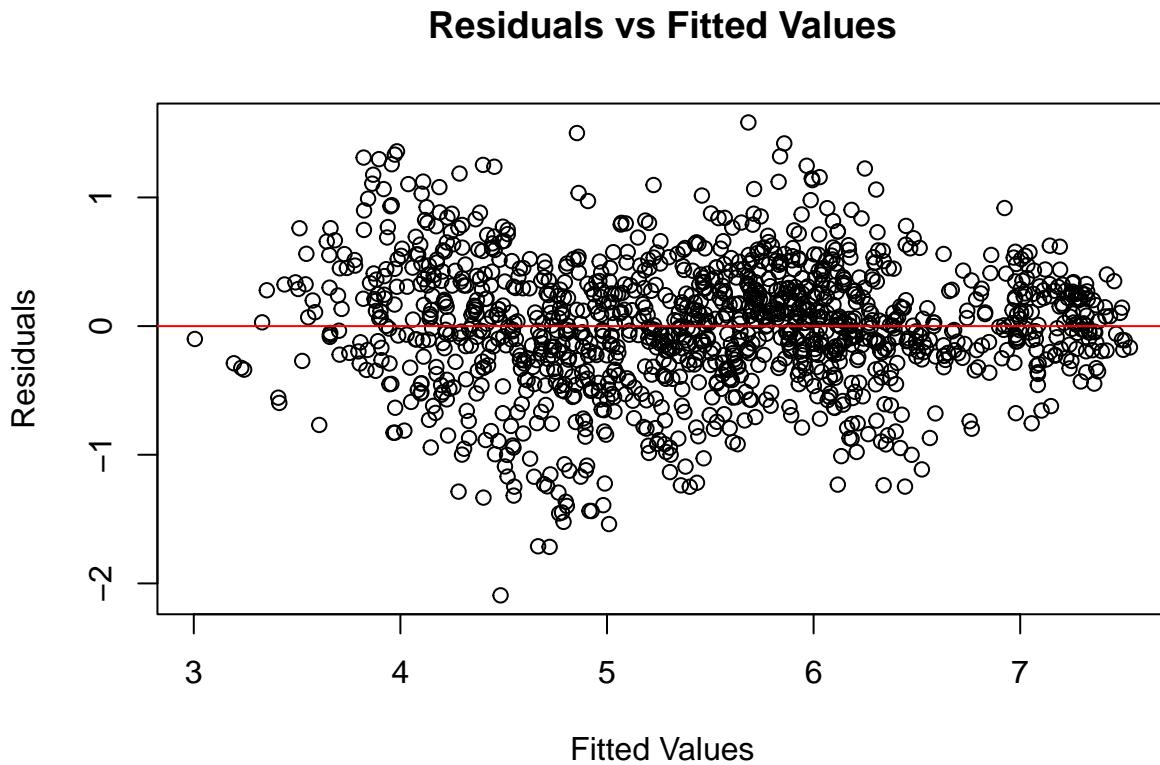
- The relationship between perceptions of corruption and happiness is weak and counter-intuitive. As perceptions of corruption increase, happiness also tends to rise slightly, though the data is widely dispersed. This suggests that perceptions of corruption alone do not directly predict happiness and may reflect underlying societal or cultural nuances.

4. Fitting Full-model

We have created a full model to check the assumptions for regression.

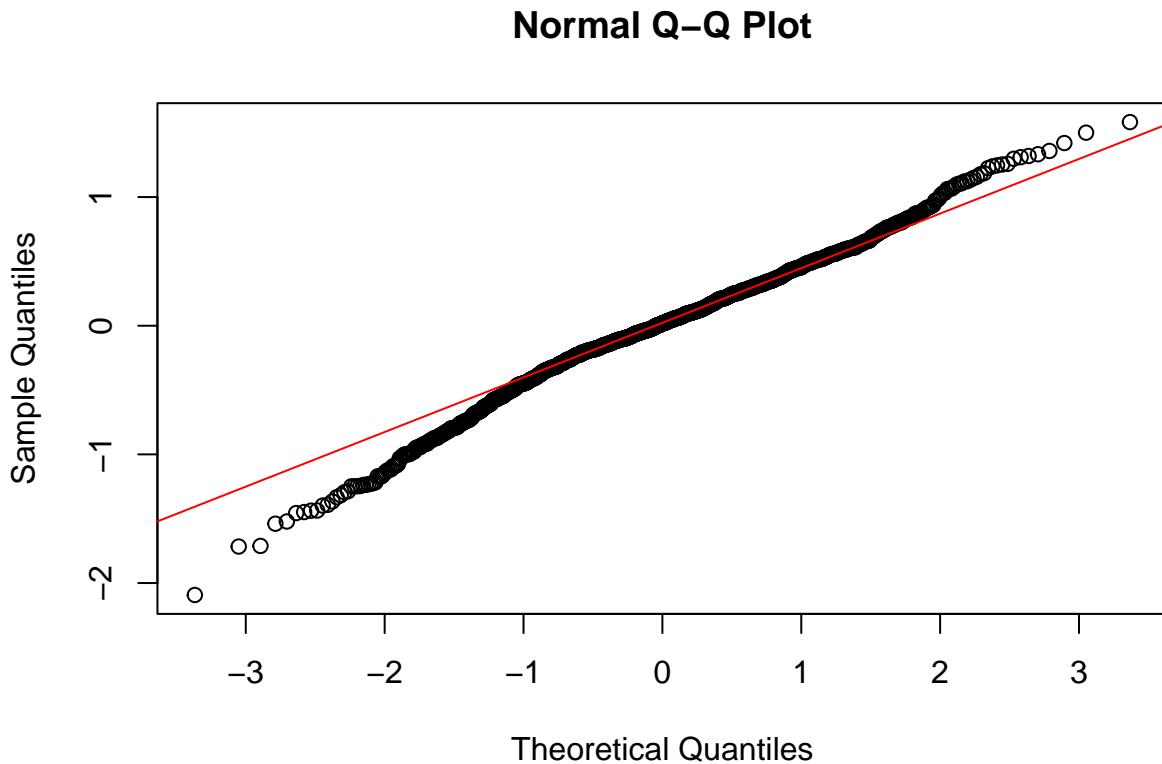
4.1 Assumption Checks

4.1.1 Linearity



- The residuals are randomly scattered around zero, indicating that the linearity assumption is satisfied and there are no systematic patterns in the model.
- The spread of residuals remains consistent across fitted values, suggesting that homoscedasticity (constant variance) holds.
- There are no significant outliers, and no funnel-shaped patterns, confirming that the model is well-specified and the assumptions are likely met.

4.2 Normality of Residuals



- The Q-Q plot shows that most residuals follow the red diagonal line, suggesting the residuals are approximately normally distributed.
- There are slight deviations at the extremes, with points slightly below the line on the left and above it on the right, indicating minor non-normality.
- Despite these minor deviations, the model remains valid for inference and prediction, as small violations of normality do not significantly affect the results.

4.2.1 Shapiro-Wilk test for normality:

Firstly, formed the hypotheses.

Hypotheses:

- Null Hypothesis (H_0): The residuals are normally distributed.
- Alternative Hypothesis (H_1): The residuals are not normally distributed.

```

##  

## Shapiro-Wilk normality test  

##  

## data: residuals(whr_fullmodel)  

## W = 0.98896, p-value = 2.09e-08

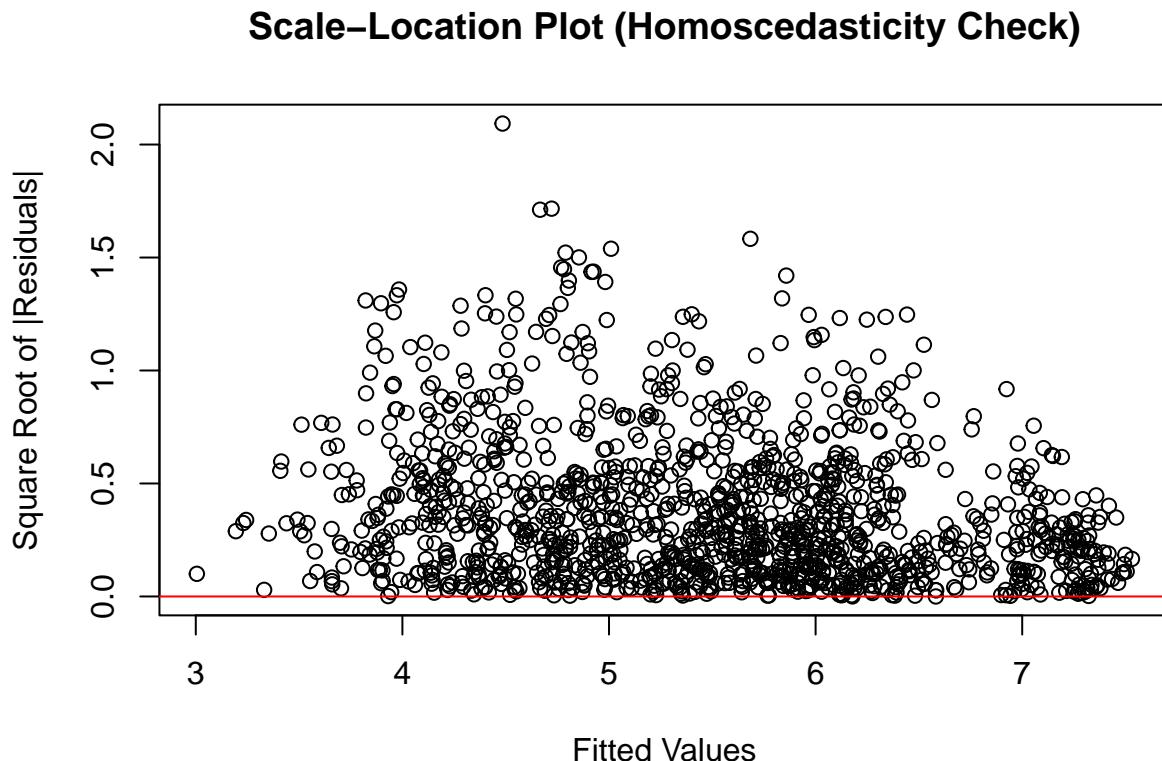
```

From the result:

p-value = 2.09e-08: The very small p-value indicates strong evidence against the null hypothesis.

Since the p-value is much smaller than the typical significance level (e.g., 0.05), we reject the null hypothesis. This means that the residuals are not normally distributed.

4.3 Homoscedasticity



- The plot displays the square root of the absolute residuals (representing the spread of residuals) on the y-axis, against the fitted values on the x-axis.
- The points are randomly scattered around a horizontal line at $y = 0$, without any obvious patterns or trends. This indicates that the residuals' variance remains constant across fitted values.

- The absence of a funnel shape or other patterns suggests that the assumption of homoscedasticity is satisfied, implying that the variance of residuals is constant. This supports the validity of the regression model.

4.4 Heteroscedasticity

4.4.1 The Breusch-Pagan Test

Let's form Hypotheses:

H_0 : The variance of the residuals is constant (homoscedasticity).
 H_1 : The variance of the residuals is not constant (heteroscedasticity).

```
## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
## 
##     as.Date, as.Date.numeric

##
## studentized Breusch-Pagan test
##
## data: whr_fullmodel
## BP = 128.6, df = 18, p-value < 2.2e-16
```

Since the p-value is significantly less than the common significance level (e.g., 0.05), we can reject the null hypothesis . This means that heteroscedasticity is present in model.

4.4.2 Log-transformation

- We identified heteroscedasticity as a significant issue in our initial model. To mitigate this, we implemented a log transformation on the dependent variable, happiness_score, aiming to stabilize the variance and address the non-constant residual variance observed earlier.

```
##
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
```

```

##   healthy_life_expectancy + freedom_to_make_life_choices +
##   generosity + perceptions_of_corruption + factor(region),
##   data = whr)
##
## Residuals:
##       Min      1Q   Median      3Q      Max
## -2.09285 -0.26355  0.01843  0.30909  1.58280
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                  2.97474   0.10433 28.512 < 2e-16
## gdp_per_capita                0.67788   0.05063 13.389 < 2e-16
## social_support                 0.52527   0.05765  9.111 < 2e-16
## healthy_life_expectancy        0.83844   0.09044  9.270 < 2e-16
## freedom_to_make_life_choices  1.46845   0.12131 12.105 < 2e-16
## generosity                      0.81212   0.14914  5.445 6.18e-08
## perceptions_of_corruption      0.58062   0.16423  3.535 0.000422
## factor(region)CIS              -0.31395   0.07050 -4.453 9.18e-06
## factor(region)East Asia          -0.28655   0.09282 -3.087 0.002064
## factor(region)Latin America and Caribbean 0.25392   0.05732  4.430 1.02e-05
## factor(region)Middle East         -0.28001   0.06538 -4.283 1.98e-05
## factor(region)North Africa        -0.24910   0.08883 -2.804 0.005121
## factor(region)North America        0.48559   0.13066  3.716 0.000211
## factor(region)Oceania                   0.40732   0.13738  2.965 0.003084
## factor(region)Other                  -0.25672   0.06846 -3.750 0.000185
## factor(region)South Asia             -0.64293   0.08497 -7.567 7.22e-14
## factor(region)Southeast Asia          -0.56764   0.07834 -7.245 7.37e-13
## factor(region)Sub-Saharan Africa      -0.55401   0.06921 -8.005 2.64e-15
## factor(region)Western Europe           0.37241   0.06847  5.439 6.41e-08
##
## (Intercept)                    ***
## gdp_per_capita                  ***
## social_support                   ***
## healthy_life_expectancy          ***
## freedom_to_make_life_choices    ***
## generosity                       ***
## perceptions_of_corruption        ***
## factor(region)CIS                  ***
## factor(region)East Asia            **
## factor(region)Latin America and Caribbean ***
## factor(region)Middle East          ***
## factor(region)North Africa          **
## factor(region)North America         ***
## factor(region)Oceania                  **
## factor(region)Other                  ***

```

```

## factor(region)South Asia      ***
## factor(region)Southeast Asia   ***
## factor(region)Sub-Saharan Africa ***
## factor(region)Western Europe    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4971 on 1296 degrees of freedom
## Multiple R-squared:  0.7997, Adjusted R-squared:  0.7969
## F-statistic: 287.5 on 18 and 1296 DF,  p-value: < 2.2e-16

```

- Now, again we will perform the Breusch-Pagan test on our new model.

```

##
## studentized Breusch-Pagan test
##
## data: log_model
## BP = 128.6, df = 18, p-value < 2.2e-16

```

- The above results indicate that even after applying the log transformation, the Heteroscedasticity assumption is not met.

4.5 Multicollinearity

```

## Warning: package 'car' was built under R version 4.3.3

## Loading required package: carData

## Warning: package 'carData' was built under R version 4.3.3

##
## Attaching package: 'car'

## The following object is masked from 'package:dplyr':
## 
##     recode

##                                     GVIF Df GVIF^(1/(2*Df))
## gdp_per_capita           2.693188  1     1.641093
## social_support            1.813379  1     1.346618
## healthy_life_expectancy  2.465163  1     1.570084
## freedom_to_make_life_choices 1.786795  1     1.336710
## generosity                 1.518520  1     1.232282
## perceptions_of_corruption 1.834005  1     1.354254
## factor(region)             7.798338 12    1.089348

```

- The GVIF values for most continuous predictors are below 5, suggesting that multicollinearity is not a significant issue.

4.6 Fitting the full model to check the significant predictors

```
##
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + factor(region),
##     data = whr)
##
## Residuals:
##      Min        1Q    Median        3Q       Max
## -2.09285 -0.26355  0.01843  0.30909  1.58280
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                2.97474   0.10433 28.512 < 2e-16
## gdp_per_capita              0.67788   0.05063 13.389 < 2e-16
## social_support              0.52527   0.05765  9.111 < 2e-16
## healthy_life_expectancy    0.83844   0.09044  9.270 < 2e-16
## freedom_to_make_life_choices 1.46845   0.12131 12.105 < 2e-16
## generosity                  0.81212   0.14914  5.445 6.18e-08
## perceptions_of_corruption   0.58062   0.16423  3.535 0.000422
## factor(region)CIS           -0.31395   0.07050 -4.453 9.18e-06
## factor(region)East Asia     -0.28655   0.09282 -3.087 0.002064
## factor(region)Latin America and Caribbean 0.25392   0.05732  4.430 1.02e-05
## factor(region)Middle East    -0.28001   0.06538 -4.283 1.98e-05
## factor(region)North Africa   -0.24910   0.08883 -2.804 0.005121
## factor(region)North America   0.48559   0.13066  3.716 0.000211
## factor(region)Oceania         0.40732   0.13738  2.965 0.003084
## factor(region)Other           -0.25672   0.06846 -3.750 0.000185
## factor(region)South Asia      -0.64293   0.08497 -7.567 7.22e-14
## factor(region)Southeast Asia   -0.56764   0.07834 -7.245 7.37e-13
## factor(region)Sub-Saharan Africa -0.55401   0.06921 -8.005 2.64e-15
## factor(region)Western Europe    0.37241   0.06847  5.439 6.41e-08
##
## (Intercept) ***
## gdp_per_capita ***
## social_support ***
## healthy_life_expectancy ***
## freedom_to_make_life_choices ***
## generosity ***
```

```

## perceptions_of_corruption      ***
## factor(region)CIS              ***
## factor(region)East Asia         **
## factor(region)Latin America and Caribbean ***
## factor(region)Middle East       ***
## factor(region)North Africa     **
## factor(region)North America    ***
## factor(region)Oceania          **
## factor(region)Other            ***
## factor(region)South Asia        ***
## factor(region)Southeast Asia   ***
## factor(region)Sub-Saharan Africa ***
## factor(region)Western Europe   ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4971 on 1296 degrees of freedom
## Multiple R-squared:  0.7997, Adjusted R-squared:  0.7969
## F-statistic: 287.5 on 18 and 1296 DF,  p-value: < 2.2e-16

```

- The overall regression model is statistically significant with an F-statistic of 622.3 and a p-value of $< 2.2\text{e-}16$, indicating that the predictors collectively explain a substantial portion of the variability in happiness scores. Each predictor in the model is highly significant at $\alpha = 0.05$.
- The model explains 74.06% of the variance in happiness scores ($R^2 = 0.7406$), suggesting a strong fit. The adjusted R-squared value of 0.7394 takes into account the number of predictors and still indicates a very good model fit.
- All predictors have positive coefficients, meaning that higher values in GDP per capita, social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption are all associated with higher happiness scores. The largest impact comes from freedom to make life choices (1.534), followed by healthy life expectancy (1.359), and social support (0.738), with generosity and perceptions of corruption also contributing positively.

Therefore the regression equation for this model will be as follow:

Regression Equation

Based on the regression output, the estimated model for `happiness_score` can be written as:

$$happiness_score = \beta_0 + \beta_1 \cdot gdp_per_capita + \beta_2 \cdot social_support + \beta_3 \cdot healthy_life_expectancy + \beta_4 \cdot freedom_to_make_life_choices + \beta_5 \cdot generosity + \beta_6 \cdot perceptions_of_corruption + \beta_7 \cdot factor(region)^2$$

$$\widehat{Y}_{happiness_score} = 2.97474 + 0.67788 * X_{gdp_per_capita} + 0.52527 * X_{social_support} + 0.83844 * X_{healthy_life_exp}$$

5 Creating the interaction model

After finding the significant predictors, we have decided to introduce interaction terms to the model to check if it improves our model's accuracy.

```
##  
## Call:  
## lm(formula = happiness_score ~ (gdp_per_capita + social_support +  
##   healthy_life_expectancy + freedom_to_make_life_choices +  
##   generosity + perceptions_of_corruption + factor(region))^2,  
##   data = whr)  
##  
## Residuals:  
##       Min     1Q Median     3Q    Max  
## -1.35648 -0.24090  0.00686  0.24750  1.31973  
##  
## Coefficients:  
##                               Estimate  
## (Intercept)                  3.13529  
## gdp_per_capita                 0.26830  
## social_support                  1.13686  
## healthy_life_expectancy      -0.58438  
## freedom_to_make_life_choices    4.87691  
## generosity                   -1.17012  
## perceptions_of_corruption      6.43120  
## factor(region)CIS                -1.85968  
## factor(region)East Asia            1.27148  
## factor(region)Latin America and Caribbean -1.51981  
## factor(region)Middle East          -3.45732  
## factor(region)North Africa         -0.71210  
## factor(region)North America        0.06706  
## factor(region)Oceania              -0.52836  
## factor(region)Other                -1.79966  
## factor(region)South Asia             -0.18609  
## factor(region)Southeast Asia        -1.36376
```

## factor(region)Sub-Saharan Africa	-0.39343
## factor(region)Western Europe	-1.66480
## gdp_per_capita:social_support	-0.12251
## gdp_per_capita:healthy_life_expectancy	1.17774
## gdp_per_capita:freedom_to_make_life_choices	-1.21953
## gdp_per_capita:generosity	0.56916
## gdp_per_capita:perceptions_of_corruption	-2.03320
## gdp_per_capita:factor(region)CIS	0.38245
## gdp_per_capita:factor(region)East Asia	0.13718
## gdp_per_capita:factor(region)Latin America and Caribbean	0.49158
## gdp_per_capita:factor(region)Middle East	0.88311
## gdp_per_capita:factor(region)North Africa	-0.22544
## gdp_per_capita:factor(region)North America	0.02115
## gdp_per_capita:factor(region>Oceania	0.25244
## gdp_per_capita:factor(region)Other	0.71991
## gdp_per_capita:factor(region)South Asia	0.03535
## gdp_per_capita:factor(region>Southeast Asia	1.16583
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.59504
## gdp_per_capita:factor(region>Western Europe	0.39654
## social_support:healthy_life_expectancy	-0.11211
## social_support:freedom_to_make_life_choices	-0.53355
## social_support:generosity	-0.86093
## social_support:perceptions_of_corruption	0.10005
## social_support:factor(region)CIS	0.19468
## social_support:factor(region)East Asia	-0.25907
## social_support:factor(region)Latin America and Caribbean	-0.44991
## social_support:factor(region>Middle East	0.58590
## social_support:factor(region>North Africa	-0.47993
## social_support:factor(region>North America	-0.24490
## social_support:factor(region>Oceania	-0.21855
## social_support:factor(region>Other	0.20815
## social_support:factor(region>South Asia	0.33422
## social_support:factor(region>Southeast Asia	0.11651
## social_support:factor(region>Sub-Saharan Africa	-0.53748
## social_support:factor(region>Western Europe	-0.11374
## healthy_life_expectancy:freedom_to_make_life_choices	-1.60532
## healthy_life_expectancy:generosity	1.31714
## healthy_life_expectancy:perceptions_of_corruption	-3.12963
## healthy_life_expectancy:factor(region)CIS	0.92358
## healthy_life_expectancy:factor(region)East Asia	-0.34116
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.14206
## healthy_life_expectancy:factor(region>Middle East	1.08574
## healthy_life_expectancy:factor(region>North Africa	1.46532
## healthy_life_expectancy:factor(region>North America	0.31550
## healthy_life_expectancy:factor(region>Oceania	0.87495

## healthy_life_expectancy:factor(region)Other	0.64508
## healthy_life_expectancy:factor(region)South Asia	0.77716
## healthy_life_expectancy:factor(region>Southeast Asia	1.67451
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.79829
## healthy_life_expectancy:factor(region>Western Europe	1.14684
## freedom_to_make_life_choices:generosity	0.70396
## freedom_to_make_life_choices:perceptions_of_corruption	-1.50349
## freedom_to_make_life_choices:factor(region>CIS	0.06895
## freedom_to_make_life_choices:factor(region>East Asia	-3.10893
## freedom_to_make_life_choices:factor(region>Latin America and Caribbean	-0.17128
## freedom_to_make_life_choices:factor(region>Middle East	0.60442
## freedom_to_make_life_choices:factor(region>North Africa	-1.13640
## freedom_to_make_life_choices:factor(region>North America	-0.10931
## freedom_to_make_life_choices:factor(region>Oceania	-0.35823
## freedom_to_make_life_choices:factor(region>Other	-0.09639
## freedom_to_make_life_choices:factor(region>South Asia	-4.85644
## freedom_to_make_life_choices:factor(region>Southeast Asia	-3.02323
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	-2.65273
## freedom_to_make_life_choices:factor(region>Western Europe	-0.04473
## generosity:perceptions_of_corruption	-5.13445
## generosity:factor(region>CIS	1.30410
## generosity:factor(region>East Asia	-0.48181
## generosity:factor(region>Latin America and Caribbean	1.55409
## generosity:factor(region>Middle East	2.78373
## generosity:factor(region>North Africa	3.42595
## generosity:factor(region>North America	2.40460
## generosity:factor(region>Oceania	2.27274
## generosity:factor(region>Other	2.07592
## generosity:factor(region>South Asia	0.41017
## generosity:factor(region>Southeast Asia	0.75824
## generosity:factor(region>Sub-Saharan Africa	2.36327
## generosity:factor(region>Western Europe	1.89607
## perceptions_of_corruption:factor(region>CIS	-0.42753
## perceptions_of_corruption:factor(region>East Asia	3.51599
## perceptions_of_corruption:factor(region>Latin America and Caribbean	1.11881
## perceptions_of_corruption:factor(region>Middle East	0.76908
## perceptions_of_corruption:factor(region>North Africa	0.97028
## perceptions_of_corruption:factor(region>North America	2.28101
## perceptions_of_corruption:factor(region>Oceania	2.06423
## perceptions_of_corruption:factor(region>Other	-2.00222
## perceptions_of_corruption:factor(region>South Asia	7.33038
## perceptions_of_corruption:factor(region>Southeast Asia	0.75197
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-4.32870
## perceptions_of_corruption:factor(region>Western Europe	3.55028
##	Std. Error

## (Intercept)	0.64320
## gdp_per_capita	0.39727
## social_support	0.37948
## healthy_life_expectancy	0.66601
## freedom_to_make_life_choices	0.82034
## generosity	1.05238
## perceptions_of_corruption	1.36320
## factor(region)CIS	0.66112
## factor(region)East Asia	1.49188
## factor(region)Latin America and Caribbean	0.52904
## factor(region)Middle East	0.48860
## factor(region)North Africa	0.88452
## factor(region)North America	3.47452
## factor(region)Oceania	4.30753
## factor(region)Other	0.50675
## factor(region)South Asia	0.58818
## factor(region)Southeast Asia	0.82561
## factor(region)Sub-Saharan Africa	0.55453
## factor(region)Western Europe	0.82850
## gdp_per_capita:social_support	0.19217
## gdp_per_capita:healthy_life_expectancy	0.33479
## gdp_per_capita:freedom_to_make_life_choices	0.39107
## gdp_per_capita:generosity	0.48875
## gdp_per_capita:perceptions_of_corruption	0.53036
## gdp_per_capita:factor(region)CIS	0.29151
## gdp_per_capita:factor(region)East Asia	0.54500
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24546
## gdp_per_capita:factor(region)Middle East	0.26520
## gdp_per_capita:factor(region)North Africa	0.47349
## gdp_per_capita:factor(region)North America	0.95317
## gdp_per_capita:factor(region)Oceania	0.94698
## gdp_per_capita:factor(region)Other	0.25819
## gdp_per_capita:factor(region)South Asia	0.34324
## gdp_per_capita:factor(region)Southeast Asia	0.27326
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.26930
## gdp_per_capita:factor(region)Western Europe	0.32642
## social_support:healthy_life_expectancy	0.36474
## social_support:freedom_to_make_life_choices	0.43304
## social_support:generosity	0.61934
## social_support:perceptions_of_corruption	0.60270
## social_support:factor(region)CIS	0.27380
## social_support:factor(region)East Asia	0.36605
## social_support:factor(region)Latin America and Caribbean	0.22776
## social_support:factor(region)Middle East	0.25998
## social_support:factor(region)North Africa	0.33513

## social_support:factor(region)North America	0.63036
## social_support:factor(region)Oceania	0.62127
## social_support:factor(region)Other	0.26718
## social_support:factor(region)South Asia	0.30648
## social_support:factor(region)Southeast Asia	0.32034
## social_support:factor(region)Sub-Saharan Africa	0.25946
## social_support:factor(region)Western Europe	0.28533
## healthy_life_expectancy:freedom_to_make_life_choices	0.75406
## healthy_life_expectancy:generosity	1.04195
## healthy_life_expectancy:perceptions_of_corruption	0.93467
## healthy_life_expectancy:factor(region)CIS	0.62524
## healthy_life_expectancy:factor(region)East Asia	0.71082
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41693
## healthy_life_expectancy:factor(region)Middle East	0.44717
## healthy_life_expectancy:factor(region)North Africa	0.79602
## healthy_life_expectancy:factor(region)North America	1.38423
## healthy_life_expectancy:factor(region)Oceania	1.40553
## healthy_life_expectancy:factor(region)Other	0.41108
## healthy_life_expectancy:factor(region)South Asia	0.59504
## healthy_life_expectancy:factor(region)Southeast Asia	0.50760
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.45469
## healthy_life_expectancy:factor(region)Western Europe	0.54447
## freedom_to_make_life_choices:generosity	1.39932
## freedom_to_make_life_choices:perceptions_of_corruption	1.41245
## freedom_to_make_life_choices:factor(region)CIS	0.54808
## freedom_to_make_life_choices:factor(region)East Asia	1.23928
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.45392
## freedom_to_make_life_choices:factor(region)Middle East	0.56807
## freedom_to_make_life_choices:factor(region)North Africa	0.65972
## freedom_to_make_life_choices:factor(region)North America	3.98185
## freedom_to_make_life_choices:factor(region)Oceania	3.79134
## freedom_to_make_life_choices:factor(region)Other	0.51865
## freedom_to_make_life_choices:factor(region)South Asia	0.73267
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.86285
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	0.54533
## freedom_to_make_life_choices:factor(region)Western Europe	0.55756
## generosity:perceptions_of_corruption	1.70084
## generosity:factor(region)CIS	0.91923
## generosity:factor(region)East Asia	1.55212
## generosity:factor(region)Latin America and Caribbean	0.75357
## generosity:factor(region)Middle East	0.81640
## generosity:factor(region)North Africa	1.82557
## generosity:factor(region)North America	1.68171
## generosity:factor(region)Oceania	1.79821
## generosity:factor(region)Other	0.83993

## generosity:factor(region)South Asia	0.92191
## generosity:factor(region)Southeast Asia	0.78744
## generosity:factor(region)Sub-Saharan Africa	0.82141
## generosity:factor(region)Western Europe	0.75409
## perceptions_of_corruption:factor(region)CIS	0.99183
## perceptions_of_corruption:factor(region)East Asia	2.95180
## perceptions_of_corruption:factor(region)Latin America and Caribbean	1.02323
## perceptions_of_corruption:factor(region)Middle East	0.98430
## perceptions_of_corruption:factor(region)North Africa	1.72247
## perceptions_of_corruption:factor(region)North America	2.91730
## perceptions_of_corruption:factor(region)Oceania	2.01139
## perceptions_of_corruption:factor(region)Other	0.97354
## perceptions_of_corruption:factor(region)South Asia	1.87020
## perceptions_of_corruption:factor(region)Southeast Asia	1.01131
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	1.08128
## perceptions_of_corruption:factor(region)Western Europe	0.94153
##	t value
## (Intercept)	4.875
## gdp_per_capita	0.675
## social_support	2.996
## healthy_life_expectancy	-0.877
## freedom_to_make_life_choices	5.945
## generosity	-1.112
## perceptions_of_corruption	4.718
## factor(region)CIS	-2.813
## factor(region)East Asia	0.852
## factor(region)Latin America and Caribbean	-2.873
## factor(region)Middle East	-7.076
## factor(region)North Africa	-0.805
## factor(region)North America	0.019
## factor(region)Oceania	-0.123
## factor(region)Other	-3.551
## factor(region)South Asia	-0.316
## factor(region)Southeast Asia	-1.652
## factor(region)Sub-Saharan Africa	-0.709
## factor(region)Western Europe	-2.009
## gdp_per_capita:social_support	-0.638
## gdp_per_capita:healthy_life_expectancy	3.518
## gdp_per_capita:freedom_to_make_life_choices	-3.118
## gdp_per_capita:generosity	1.165
## gdp_per_capita:perceptions_of_corruption	-3.834
## gdp_per_capita:factor(region)CIS	1.312
## gdp_per_capita:factor(region)East Asia	0.252
## gdp_per_capita:factor(region)Latin America and Caribbean	2.003
## gdp_per_capita:factor(region)Middle East	3.330

## gdp_per_capita:factor(region)North Africa	-0.476
## gdp_per_capita:factor(region)North America	0.022
## gdp_per_capita:factor(region)Oceania	0.267
## gdp_per_capita:factor(region)Other	2.788
## gdp_per_capita:factor(region)South Asia	0.103
## gdp_per_capita:factor(region)Southeast Asia	4.266
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.210
## gdp_per_capita:factor(region)Western Europe	1.215
## social_support:healthy_life_expectancy	-0.307
## social_support:freedom_to_make_life_choices	-1.232
## social_support:generosity	-1.390
## social_support:perceptions_of_corruption	0.166
## social_support:factor(region)CIS	0.711
## social_support:factor(region)East Asia	-0.708
## social_support:factor(region)Latin America and Caribbean	-1.975
## social_support:factor(region)Middle East	2.254
## social_support:factor(region)North Africa	-1.432
## social_support:factor(region)North America	-0.389
## social_support:factor(region)Oceania	-0.352
## social_support:factor(region)Other	0.779
## social_support:factor(region)South Asia	1.091
## social_support:factor(region)Southeast Asia	0.364
## social_support:factor(region)Sub-Saharan Africa	-2.072
## social_support:factor(region)Western Europe	-0.399
## healthy_life_expectancy:freedom_to_make_life_choices	-2.129
## healthy_life_expectancy:generosity	1.264
## healthy_life_expectancy:perceptions_of_corruption	-3.348
## healthy_life_expectancy:factor(region)CIS	1.477
## healthy_life_expectancy:factor(region)East Asia	-0.480
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.138
## healthy_life_expectancy:factor(region)Middle East	2.428
## healthy_life_expectancy:factor(region)North Africa	1.841
## healthy_life_expectancy:factor(region)North America	0.228
## healthy_life_expectancy:factor(region)Oceania	0.623
## healthy_life_expectancy:factor(region)Other	1.569
## healthy_life_expectancy:factor(region)South Asia	1.306
## healthy_life_expectancy:factor(region)Southeast Asia	3.299
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.756
## healthy_life_expectancy:factor(region)Western Europe	2.106
## freedom_to_make_life_choices:generosity	0.503
## freedom_to_make_life_choices:perceptions_of_corruption	-1.064
## freedom_to_make_life_choices:factor(region)CIS	0.126
## freedom_to_make_life_choices:factor(region)East Asia	-2.509
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.377
## freedom_to_make_life_choices:factor(region)Middle East	1.064

## freedom_to_make_life_choices:factor(region)North Africa	-1.723
## freedom_to_make_life_choices:factor(region)North America	-0.027
## freedom_to_make_life_choices:factor(region)Oceania	-0.094
## freedom_to_make_life_choices:factor(region)Other	-0.186
## freedom_to_make_life_choices:factor(region)South Asia	-6.628
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.504
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-4.864
## freedom_to_make_life_choices:factor(region)Western Europe	-0.080
## generosity:perceptions_of_corruption	-3.019
## generosity:factor(region)CIS	1.419
## generosity:factor(region)East Asia	-0.310
## generosity:factor(region)Latin America and Caribbean	2.062
## generosity:factor(region)Middle East	3.410
## generosity:factor(region)North Africa	1.877
## generosity:factor(region)North America	1.430
## generosity:factor(region)Oceania	1.264
## generosity:factor(region)Other	2.472
## generosity:factor(region)South Asia	0.445
## generosity:factor(region)Southeast Asia	0.963
## generosity:factor(region)Sub-Saharan Africa	2.877
## generosity:factor(region)Western Europe	2.514
## perceptions_of_corruption:factor(region)CIS	-0.431
## perceptions_of_corruption:factor(region)East Asia	1.191
## perceptions_of_corruption:factor(region)Latin America and Caribbean	1.093
## perceptions_of_corruption:factor(region)Middle East	0.781
## perceptions_of_corruption:factor(region)North Africa	0.563
## perceptions_of_corruption:factor(region)North America	0.782
## perceptions_of_corruption:factor(region)Oceania	1.026
## perceptions_of_corruption:factor(region)Other	-2.057
## perceptions_of_corruption:factor(region)South Asia	3.920
## perceptions_of_corruption:factor(region)Southeast Asia	0.744
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.003
## perceptions_of_corruption:factor(region)Western Europe	3.771
##	Pr(> t)
## (Intercept)	1.24e-06
## gdp_per_capita	0.499582
## social_support	0.002793
## healthy_life_expectancy	0.380423
## freedom_to_make_life_choices	3.61e-09
## generosity	0.266412
## perceptions_of_corruption	2.66e-06
## factor(region)CIS	0.004989
## factor(region)East Asia	0.394236
## factor(region)Latin America and Caribbean	0.004140
## factor(region)Middle East	2.51e-12

## factor(region)North Africa	0.420936
## factor(region)North America	0.984604
## factor(region)Oceania	0.902396
## factor(region)Other	0.000398
## factor(region)South Asia	0.751766
## factor(region)Southeast Asia	0.098832
## factor(region)Sub-Saharan Africa	0.478161
## factor(region)Western Europe	0.044714
## gdp_per_capita:social_support	0.523919
## gdp_per_capita:healthy_life_expectancy	0.000451
## gdp_per_capita:freedom_to_make_life_choices	0.001861
## gdp_per_capita:generosity	0.244436
## gdp_per_capita:perceptions_of_corruption	0.000133
## gdp_per_capita:factor(region)CIS	0.189784
## gdp_per_capita:factor(region)East Asia	0.801309
## gdp_per_capita:factor(region)Latin America and Caribbean	0.045433
## gdp_per_capita:factor(region)Middle East	0.000895
## gdp_per_capita:factor(region)North Africa	0.634068
## gdp_per_capita:factor(region)North America	0.982298
## gdp_per_capita:factor(region)Oceania	0.789844
## gdp_per_capita:factor(region)Other	0.005382
## gdp_per_capita:factor(region)South Asia	0.917993
## gdp_per_capita:factor(region)Southeast Asia	2.14e-05
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.027320
## gdp_per_capita:factor(region)Western Europe	0.224671
## social_support:healthy_life_expectancy	0.758611
## social_support:freedom_to_make_life_choices	0.218147
## social_support:generosity	0.164766
## social_support:perceptions_of_corruption	0.868182
## social_support:factor(region)CIS	0.477220
## social_support:factor(region)East Asia	0.479235
## social_support:factor(region)Latin America and Caribbean	0.048452
## social_support:factor(region)Middle East	0.024398
## social_support:factor(region)North Africa	0.152386
## social_support:factor(region)North America	0.697707
## social_support:factor(region)Oceania	0.725063
## social_support:factor(region)Other	0.436105
## social_support:factor(region)South Asia	0.275709
## social_support:factor(region)Southeast Asia	0.716134
## social_support:factor(region)Sub-Saharan Africa	0.038517
## social_support:factor(region)Western Europe	0.690248
## healthy_life_expectancy:freedom_to_make_life_choices	0.033464
## healthy_life_expectancy:generosity	0.206433
## healthy_life_expectancy:perceptions_of_corruption	0.000838
## healthy_life_expectancy:factor(region)CIS	0.139895

## healthy_life_expectancy:factor(region)East Asia	0.631349
## healthy_life_expectancy:factor(region)Latin America and Caribbean	3.24e-07
## healthy_life_expectancy:factor(region)Middle East	0.015327
## healthy_life_expectancy:factor(region)North Africa	0.065895
## healthy_life_expectancy:factor(region)North America	0.819744
## healthy_life_expectancy:factor(region)Oceania	0.533730
## healthy_life_expectancy:factor(region)Other	0.116855
## healthy_life_expectancy:factor(region)South Asia	0.191781
## healthy_life_expectancy:factor(region)Southeast Asia	0.000999
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.079397
## healthy_life_expectancy:factor(region)Western Europe	0.035382
## freedom_to_make_life_choices:generosity	0.615003
## freedom_to_make_life_choices:perceptions_of_corruption	0.287337
## freedom_to_make_life_choices:factor(region)CIS	0.899905
## freedom_to_make_life_choices:factor(region)East Asia	0.012249
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.705994
## freedom_to_make_life_choices:factor(region)Middle East	0.287545
## freedom_to_make_life_choices:factor(region)North Africa	0.085226
## freedom_to_make_life_choices:factor(region)North America	0.978104
## freedom_to_make_life_choices:factor(region)Oceania	0.924738
## freedom_to_make_life_choices:factor(region)Other	0.852599
## freedom_to_make_life_choices:factor(region)South Asia	5.10e-11
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.000475
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	1.30e-06
## freedom_to_make_life_choices:factor(region)Western Europe	0.936072
## generosity:perceptions_of_corruption	0.002591
## generosity:factor(region)CIS	0.156245
## generosity:factor(region)East Asia	0.756296
## generosity:factor(region)Latin America and Caribbean	0.039393
## generosity:factor(region)Middle East	0.000672
## generosity:factor(region)North Africa	0.060807
## generosity:factor(region)North America	0.153018
## generosity:factor(region)Oceania	0.206512
## generosity:factor(region)Other	0.013590
## generosity:factor(region)South Asia	0.656464
## generosity:factor(region)Southeast Asia	0.335783
## generosity:factor(region)Sub-Saharan Africa	0.004084
## generosity:factor(region)Western Europe	0.012053
## perceptions_of_corruption:factor(region)CIS	0.666509
## perceptions_of_corruption:factor(region)East Asia	0.233834
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.274431
## perceptions_of_corruption:factor(region)Middle East	0.434751
## perceptions_of_corruption:factor(region)North Africa	0.573329
## perceptions_of_corruption:factor(region)North America	0.434432
## perceptions_of_corruption:factor(region)Oceania	0.304969

## perceptions_of_corruption:factor(region)Other	0.039935
## perceptions_of_corruption:factor(region)South Asia	9.37e-05
## perceptions_of_corruption:factor(region>Southeast Asia	0.457290
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	6.63e-05
## perceptions_of_corruption:factor(region>Western Europe	0.000171
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	**
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region>CIS	**
## factor(region>East Asia	
## factor(region>Latin America and Caribbean	**
## factor(region>Middle East	***
## factor(region>North Africa	
## factor(region>North America	
## factor(region>Oceania	
## factor(region>Other	***
## factor(region>South Asia	
## factor(region>Southeast Asia	.
## factor(region>Sub-Saharan Africa	
## factor(region>Western Europe	*
## gdp_per_capita:social_support	
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	**
## gdp_per_capita:generosity	
## gdp_per_capita:perceptions_of_corruption	***
## gdp_per_capita:factor(region>CIS	
## gdp_per_capita:factor(region>East Asia	
## gdp_per_capita:factor(region>Latin America and Caribbean	*
## gdp_per_capita:factor(region>Middle East	***
## gdp_per_capita:factor(region>North Africa	
## gdp_per_capita:factor(region>North America	
## gdp_per_capita:factor(region>Oceania	
## gdp_per_capita:factor(region>Other	**
## gdp_per_capita:factor(region>South Asia	
## gdp_per_capita:factor(region>Southeast Asia	***
## gdp_per_capita:factor(region>Sub-Saharan Africa	*
## gdp_per_capita:factor(region>Western Europe	
## social_support:healthy_life_expectancy	
## social_support:freedom_to_make_life_choices	
## social_support:generosity	

```

## social_support:perceptions_of_corruption
## social_support:factor(region)CIS
## social_support:factor(region)East Asia
## social_support:factor(region)Latin America and Caribbean *
## social_support:factor(region)Middle East *
## social_support:factor(region)North Africa
## social_support:factor(region)North America
## social_support:factor(region)Oceania
## social_support:factor(region)Other
## social_support:factor(region)South Asia
## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa *
## social_support:factor(region)Western Europe
## healthy_life_expectancy:freedom_to_make_life_choices *
## healthy_life_expectancy:generosity
## healthy_life_expectancy:perceptions_of_corruption ***
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean ***

## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia ***

## healthy_life_expectancy:factor(region)Sub-Saharan Africa .
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:generosity
## freedom_to_make_life_choices:perceptions_of_corruption
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa .
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia ***

## freedom_to_make_life_choices:factor(region)Southeast Asia ***
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption **
## generosity:factor(region)CIS
## generosity:factor(region)East Asia

```

```

## generosity:factor(region)Latin America and Caribbean *
## generosity:factor(region)Middle East ***
## generosity:factor(region)North Africa .
## generosity:factor(region)North America
## generosity:factor(region)Oceania
## generosity:factor(region)Other *
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa ***
## generosity:factor(region)Western Europe *
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other *
## perceptions_of_corruption:factor(region)South Asia ***
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***
## perceptions_of_corruption:factor(region)Western Europe ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.42 on 1209 degrees of freedom
## Multiple R-squared: 0.8666, Adjusted R-squared: 0.8551
## F-statistic: 74.83 on 105 and 1209 DF, p-value: < 2.2e-16

```

Now, we will test the Hypotheses for Interaction terms:

H_0 : The coefficients of all the interaction terms is zero.

H_1 : The coefficients of at least one of the interaction terms is not zero.

Here, the F-statistic of the interaction model is 74.83 on 105 and 1209 DF with p-value less than 2.2e-16, which is less than $\alpha = 0.05$ indicating that we can reject the Null Hypothesis.

This means that, the coefficient of at least one of the interaction term is not equal to zero.

Now, we will check which interaction terms are significant at $\alpha = 0.05$.

Based on the output from summary, gdp_per_capita:generosity, social_support:perceptions_of_corruption, healthy_life_expectancy:freedom_to_make_life_choices, and healthy_life_expectancy:generosity are the only interaction terms which are significant at $\alpha = 0.05$ as they have p-value less than 0.05.

Therefore, we have removed all the non-significant interaction terms from our model.

```

## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + factor(region) +
##     (gdp_per_capita * healthy_life_expectancy) + (gdp_per_capita *
##     freedom_to_make_life_choices) + (gdp_per_capita * perceptions_of_corruption) +
##     (gdp_per_capita * factor(region)) + (social_support * factor(region)) +
##     (healthy_life_expectancy * freedom_to_make_life_choices) +
##     (healthy_life_expectancy * perceptions_of_corruption) + (healthy_life_expectancy *
##     factor(region)) + (freedom_to_make_life_choices * factor(region)) +
##     (generosity * perceptions_of_corruption) + (generosity *
##     factor(region)) + (perceptions_of_corruption * factor(region)),
##     data = whr)
##
## Residuals:
##      Min        1Q    Median        3Q       Max
## -1.34436 -0.24416  0.00955  0.24863  1.32098
##
## Coefficients:
##                               Estimate
## (Intercept)                      3.19120
## gdp_per_capita                    0.41375
## social_support                   0.57952
## healthy_life_expectancy          -0.21223
## freedom_to_make_life_choices     4.94649
## generosity                       -0.37436
## perceptions_of_corruption        5.30010
## factor(region)CIS                -1.74083
## factor(region)East Asia           1.26156
## factor(region)Latin America and Caribbean -1.50952
## factor(region)Middle East         -3.40556
## factor(region)North Africa        -0.66540
## factor(region)North America       0.33928
## factor(region)Oceania             0.04485
## factor(region)Other               -1.68364
## factor(region)South Asia           -0.25806
## factor(region)Southeast Asia      -1.15272
## factor(region)Sub-Saharan Africa   -0.30375
## factor(region)Western Europe      -1.53632
## gdp_per_capita:healthy_life_expectancy 1.05992
## gdp_per_capita:freedom_to_make_life_choices -1.55492
## gdp_per_capita:perceptions_of_corruption -1.84158
## gdp_per_capita:factor(region)CIS      0.40220
## gdp_per_capita:factor(region)East Asia 0.18271

```

## gdp_per_capita:factor(region)Latin America and Caribbean	0.53778
## gdp_per_capita:factor(region)Middle East	0.81398
## gdp_per_capita:factor(region)North Africa	-0.26601
## gdp_per_capita:factor(region)North America	0.08978
## gdp_per_capita:factor(region)Oceania	0.33842
## gdp_per_capita:factor(region)Other	0.72395
## gdp_per_capita:factor(region)South Asia	0.13254
## gdp_per_capita:factor(region)Southeast Asia	1.30590
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.60001
## gdp_per_capita:factor(region)Western Europe	0.44545
## social_support:factor(region)CIS	0.21121
## social_support:factor(region)East Asia	-0.31997
## social_support:factor(region)Latin America and Caribbean	-0.47733
## social_support:factor(region)Middle East	0.59152
## social_support:factor(region)North Africa	-0.34928
## social_support:factor(region)North America	-0.49871
## social_support:factor(region)Oceania	-0.53084
## social_support:factor(region)Other	0.19384
## social_support:factor(region)South Asia	0.26829
## social_support:factor(region)Southeast Asia	-0.11634
## social_support:factor(region)Sub-Saharan Africa	-0.43870
## social_support:factor(region)Western Europe	-0.31500
## healthy_life_expectancy:freedom_to_make_life_choices	-2.01117
## healthy_life_expectancy:perceptions_of_corruption	-2.50372
## healthy_life_expectancy:factor(region)CIS	0.81630
## healthy_life_expectancy:factor(region)East Asia	-0.33383
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.19384
## healthy_life_expectancy:factor(region)Middle East	1.06753
## healthy_life_expectancy:factor(region)North Africa	1.30020
## healthy_life_expectancy:factor(region)North America	0.37137
## healthy_life_expectancy:factor(region)Oceania	0.92406
## healthy_life_expectancy:factor(region)Other	0.69640
## healthy_life_expectancy:factor(region)South Asia	0.87184
## healthy_life_expectancy:factor(region)Southeast Asia	1.85858
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.72886
## healthy_life_expectancy:factor(region)Western Europe	1.19355
## freedom_to_make_life_choices:factor(region)CIS	-0.04831
## freedom_to_make_life_choices:factor(region)East Asia	-3.07759
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.22647
## freedom_to_make_life_choices:factor(region)Middle East	0.73699
## freedom_to_make_life_choices:factor(region)North Africa	-1.24844
## freedom_to_make_life_choices:factor(region)North America	-0.35762
## freedom_to_make_life_choices:factor(region)Oceania	-0.82154
## freedom_to_make_life_choices:factor(region)Other	-0.35035
## freedom_to_make_life_choices:factor(region)South Asia	-4.78164

## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.18597
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-2.87322
## freedom_to_make_life_choices:factor(region)Western Europe	-0.05354
## generosity:perceptions_of_corruption	-4.90466
## generosity:factor(region)CIS	1.01556
## generosity:factor(region)East Asia	-0.41648
## generosity:factor(region)Latin America and Caribbean	1.41633
## generosity:factor(region)Middle East	2.86785
## generosity:factor(region)North Africa	3.27103
## generosity:factor(region)North America	2.78522
## generosity:factor(region)Oceania	2.53639
## generosity:factor(region)Other	2.10864
## generosity:factor(region)South Asia	0.29822
## generosity:factor(region)Southeast Asia	0.53184
## generosity:factor(region)Sub-Saharan Africa	1.91517
## generosity:factor(region)Western Europe	2.30002
## perceptions_of_corruption:factor(region)CIS	-0.64621
## perceptions_of_corruption:factor(region)East Asia	3.06527
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.82176
## perceptions_of_corruption:factor(region)Middle East	0.57172
## perceptions_of_corruption:factor(region)North Africa	1.14942
## perceptions_of_corruption:factor(region)North America	1.91691
## perceptions_of_corruption:factor(region)Oceania	1.49658
## perceptions_of_corruption:factor(region)Other	-2.22936
## perceptions_of_corruption:factor(region)South Asia	6.98011
## perceptions_of_corruption:factor(region)Southeast Asia	0.07582
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.24701
## perceptions_of_corruption:factor(region)Western Europe	3.03120
##	Std. Error
## (Intercept)	0.51312
## gdp_per_capita	0.31832
## social_support	0.15359
## healthy_life_expectancy	0.53024
## freedom_to_make_life_choices	0.64903
## generosity	0.58712
## perceptions_of_corruption	1.17205
## factor(region)CIS	0.65310
## factor(region)East Asia	1.48643
## factor(region)Latin America and Caribbean	0.52330
## factor(region)Middle East	0.48224
## factor(region)North Africa	0.86700
## factor(region)North America	3.46038
## factor(region)Oceania	4.28756
## factor(region)Other	0.49244
## factor(region)South Asia	0.56795

## factor(region)Southeast Asia	0.78167
## factor(region)Sub-Saharan Africa	0.50214
## factor(region)Western Europe	0.80139
## gdp_per_capita:healthy_life_expectancy	0.30272
## gdp_per_capita:freedom_to_make_life_choices	0.32723
## gdp_per_capita:perceptions_of_corruption	0.47638
## gdp_per_capita:factor(region)CIS	0.28711
## gdp_per_capita:factor(region)East Asia	0.54308
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24385
## gdp_per_capita:factor(region)Middle East	0.26027
## gdp_per_capita:factor(region)North Africa	0.46584
## gdp_per_capita:factor(region)North America	0.95124
## gdp_per_capita:factor(region)Oceania	0.94304
## gdp_per_capita:factor(region)Other	0.25337
## gdp_per_capita:factor(region)South Asia	0.33401
## gdp_per_capita:factor(region)Southeast Asia	0.26158
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.25382
## gdp_per_capita:factor(region)Western Europe	0.31818
## social_support:factor(region)CIS	0.25202
## social_support:factor(region)East Asia	0.36376
## social_support:factor(region)Latin America and Caribbean	0.21674
## social_support:factor(region)Middle East	0.24944
## social_support:factor(region)North Africa	0.32320
## social_support:factor(region)North America	0.60805
## social_support:factor(region)Oceania	0.57645
## social_support:factor(region)Other	0.25093
## social_support:factor(region)South Asia	0.28020
## social_support:factor(region)Southeast Asia	0.28233
## social_support:factor(region)Sub-Saharan Africa	0.18242
## social_support:factor(region)Western Europe	0.24059
## healthy_life_expectancy:freedom_to_make_life_choices	0.70735
## healthy_life_expectancy:perceptions_of_corruption	0.88054
## healthy_life_expectancy:factor(region)CIS	0.61818
## healthy_life_expectancy:factor(region)East Asia	0.70900
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41335
## healthy_life_expectancy:factor(region)Middle East	0.44172
## healthy_life_expectancy:factor(region)North Africa	0.77992
## healthy_life_expectancy:factor(region)North America	1.37894
## healthy_life_expectancy:factor(region)Oceania	1.39560
## healthy_life_expectancy:factor(region)Other	0.40861
## healthy_life_expectancy:factor(region)South Asia	0.57980
## healthy_life_expectancy:factor(region)Southeast Asia	0.49275
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.44170
## healthy_life_expectancy:factor(region)Western Europe	0.53387
## freedom_to_make_life_choices:factor(region)CIS	0.53830

## freedom_to_make_life_choices:factor(region)East Asia	1.23549
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44564
## freedom_to_make_life_choices:factor(region)Middle East	0.54778
## freedom_to_make_life_choices:factor(region)North Africa	0.63083
## freedom_to_make_life_choices:factor(region)North America	3.96516
## freedom_to_make_life_choices:factor(region>Oceania	3.75580
## freedom_to_make_life_choices:factor(region)Other	0.48982
## freedom_to_make_life_choices:factor(region)South Asia	0.71043
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.81132
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	0.51873
## freedom_to_make_life_choices:factor(region>Western Europe	0.54404
## generosity:perceptions_of_corruption	1.62330
## generosity:factor(region>CIS	0.89571
## generosity:factor(region)East Asia	1.54774
## generosity:factor(region)Latin America and Caribbean	0.74334
## generosity:factor(region>Middle East	0.79396
## generosity:factor(region>North Africa	1.81701
## generosity:factor(region>North America	1.66806
## generosity:factor(region>Oceania	1.78338
## generosity:factor(region>Other	0.82611
## generosity:factor(region>South Asia	0.88997
## generosity:factor(region>Southeast Asia	0.70218
## generosity:factor(region>Sub-Saharan Africa	0.71421
## generosity:factor(region>Western Europe	0.71996
## perceptions_of_corruption:factor(region>CIS	0.95004
## perceptions_of_corruption:factor(region>East Asia	2.93539
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.98026
## perceptions_of_corruption:factor(region>Middle East	0.96177
## perceptions_of_corruption:factor(region>North Africa	1.71339
## perceptions_of_corruption:factor(region>North America	2.89810
## perceptions_of_corruption:factor(region>Oceania	1.97958
## perceptions_of_corruption:factor(region>Other	0.94918
## perceptions_of_corruption:factor(region>South Asia	1.81550
## perceptions_of_corruption:factor(region>Southeast Asia	0.94795
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	0.94757
## perceptions_of_corruption:factor(region>Western Europe	0.87269
##	t value
## (Intercept)	6.219
## gdp_per_capita	1.300
## social_support	3.773
## healthy_life_expectancy	-0.400
## freedom_to_make_life_choices	7.621
## generosity	-0.638
## perceptions_of_corruption	4.522
## factor(region>CIS	-2.665

## factor(region)East Asia	0.849
## factor(region)Latin America and Caribbean	-2.885
## factor(region)Middle East	-7.062
## factor(region)North Africa	-0.767
## factor(region)North America	0.098
## factor(region)Oceania	0.010
## factor(region)Other	-3.419
## factor(region)South Asia	-0.454
## factor(region)Southeast Asia	-1.475
## factor(region)Sub-Saharan Africa	-0.605
## factor(region)Western Europe	-1.917
## gdp_per_capita:healthy_life_expectancy	3.501
## gdp_per_capita:freedom_to_make_life_choices	-4.752
## gdp_per_capita:perceptions_of_corruption	-3.866
## gdp_per_capita:factor(region)CIS	1.401
## gdp_per_capita:factor(region)East Asia	0.336
## gdp_per_capita:factor(region)Latin America and Caribbean	2.205
## gdp_per_capita:factor(region)Middle East	3.127
## gdp_per_capita:factor(region)North Africa	-0.571
## gdp_per_capita:factor(region)North America	0.094
## gdp_per_capita:factor(region)Oceania	0.359
## gdp_per_capita:factor(region)Other	2.857
## gdp_per_capita:factor(region)South Asia	0.397
## gdp_per_capita:factor(region)Southeast Asia	4.992
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.364
## gdp_per_capita:factor(region)Western Europe	1.400
## social_support:factor(region)CIS	0.838
## social_support:factor(region)East Asia	-0.880
## social_support:factor(region)Latin America and Caribbean	-2.202
## social_support:factor(region)Middle East	2.371
## social_support:factor(region)North Africa	-1.081
## social_support:factor(region)North America	-0.820
## social_support:factor(region)Oceania	-0.921
## social_support:factor(region)Other	0.772
## social_support:factor(region)South Asia	0.957
## social_support:factor(region)Southeast Asia	-0.412
## social_support:factor(region)Sub-Saharan Africa	-2.405
## social_support:factor(region)Western Europe	-1.309
## healthy_life_expectancy:freedom_to_make_life_choices	-2.843
## healthy_life_expectancy:perceptions_of_corruption	-2.843
## healthy_life_expectancy:factor(region)CIS	1.320
## healthy_life_expectancy:factor(region)East Asia	-0.471
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.307
## healthy_life_expectancy:factor(region)Middle East	2.417
## healthy_life_expectancy:factor(region)North Africa	1.667

## healthy_life_expectancy:factor(region)North America	0.269
## healthy_life_expectancy:factor(region)Oceania	0.662
## healthy_life_expectancy:factor(region)Other	1.704
## healthy_life_expectancy:factor(region)South Asia	1.504
## healthy_life_expectancy:factor(region)Southeast Asia	3.772
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.650
## healthy_life_expectancy:factor(region)Western Europe	2.236
## freedom_to_make_life_choices:factor(region)CIS	-0.090
## freedom_to_make_life_choices:factor(region)East Asia	-2.491
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.508
## freedom_to_make_life_choices:factor(region)Middle East	1.345
## freedom_to_make_life_choices:factor(region)North Africa	-1.979
## freedom_to_make_life_choices:factor(region)North America	-0.090
## freedom_to_make_life_choices:factor(region)Oceania	-0.219
## freedom_to_make_life_choices:factor(region)Other	-0.715
## freedom_to_make_life_choices:factor(region)South Asia	-6.731
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.927
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.539
## freedom_to_make_life_choices:factor(region)Western Europe	-0.098
## generosity:perceptions_of_corruption	-3.021
## generosity:factor(region)CIS	1.134
## generosity:factor(region)East Asia	-0.269
## generosity:factor(region)Latin America and Caribbean	1.905
## generosity:factor(region)Middle East	3.612
## generosity:factor(region)North Africa	1.800
## generosity:factor(region)North America	1.670
## generosity:factor(region)Oceania	1.422
## generosity:factor(region)Other	2.553
## generosity:factor(region)South Asia	0.335
## generosity:factor(region)Southeast Asia	0.757
## generosity:factor(region)Sub-Saharan Africa	2.682
## generosity:factor(region)Western Europe	3.195
## perceptions_of_corruption:factor(region)CIS	-0.680
## perceptions_of_corruption:factor(region)East Asia	1.044
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.838
## perceptions_of_corruption:factor(region)Middle East	0.594
## perceptions_of_corruption:factor(region)North Africa	0.671
## perceptions_of_corruption:factor(region)North America	0.661
## perceptions_of_corruption:factor(region)Oceania	0.756
## perceptions_of_corruption:factor(region)Other	-2.349
## perceptions_of_corruption:factor(region)South Asia	3.845
## perceptions_of_corruption:factor(region)Southeast Asia	0.080
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.482
## perceptions_of_corruption:factor(region)Western Europe	3.473
##	Pr(> t)

## (Intercept)	6.85e-10
## gdp_per_capita	0.193917
## social_support	0.000169
## healthy_life_expectancy	0.689047
## freedom_to_make_life_choices	5.03e-14
## generosity	0.523838
## perceptions_of_corruption	6.72e-06
## factor(region)CIS	0.007790
## factor(region)East Asia	0.396204
## factor(region)Latin America and Caribbean	0.003988
## factor(region)Middle East	2.75e-12
## factor(region)North Africa	0.442947
## factor(region)North America	0.921911
## factor(region)Oceania	0.991656
## factor(region)Other	0.000649
## factor(region)South Asia	0.649646
## factor(region)Southeast Asia	0.140555
## factor(region)Sub-Saharan Africa	0.545352
## factor(region)Western Europe	0.055465
## gdp_per_capita:healthy_life_expectancy	0.000480
## gdp_per_capita:freedom_to_make_life_choices	2.26e-06
## gdp_per_capita:perceptions_of_corruption	0.000117
## gdp_per_capita:factor(region)CIS	0.161516
## gdp_per_capita:factor(region)East Asia	0.736607
## gdp_per_capita:factor(region)Latin America and Caribbean	0.027612
## gdp_per_capita:factor(region)Middle East	0.001805
## gdp_per_capita:factor(region)North Africa	0.568074
## gdp_per_capita:factor(region)North America	0.924820
## gdp_per_capita:factor(region)Oceania	0.719764
## gdp_per_capita:factor(region)Other	0.004346
## gdp_per_capita:factor(region)South Asia	0.691578
## gdp_per_capita:factor(region)Southeast Asia	6.83e-07
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.018240
## gdp_per_capita:factor(region)Western Europe	0.161773
## social_support:factor(region)CIS	0.402146
## social_support:factor(region)East Asia	0.379239
## social_support:factor(region)Latin America and Caribbean	0.027826
## social_support:factor(region)Middle East	0.017878
## social_support:factor(region)North Africa	0.280041
## social_support:factor(region)North America	0.412275
## social_support:factor(region)Oceania	0.357296
## social_support:factor(region)Other	0.439974
## social_support:factor(region)South Asia	0.338506
## social_support:factor(region)Southeast Asia	0.680371
## social_support:factor(region)Sub-Saharan Africa	0.016324

## social_support:factor(region)Western Europe	0.190688
## healthy_life_expectancy:freedom_to_make_life_choices	0.004540
## healthy_life_expectancy:perceptions_of_corruption	0.004538
## healthy_life_expectancy:factor(region)CIS	0.186923
## healthy_life_expectancy:factor(region)East Asia	0.637837
## healthy_life_expectancy:factor(region)Latin America and Caribbean	1.32e-07
## healthy_life_expectancy:factor(region)Middle East	0.015806
## healthy_life_expectancy:factor(region)North Africa	0.095753
## healthy_life_expectancy:factor(region)North America	0.787732
## healthy_life_expectancy:factor(region>Oceania	0.508015
## healthy_life_expectancy:factor(region)Other	0.088575
## healthy_life_expectancy:factor(region)South Asia	0.132916
## healthy_life_expectancy:factor(region>Southeast Asia	0.000170
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.099176
## healthy_life_expectancy:factor(region>Western Europe	0.025554
## freedom_to_make_life_choices:factor(region)CIS	0.928499
## freedom_to_make_life_choices:factor(region)East Asia	0.012872
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.611411
## freedom_to_make_life_choices:factor(region>Middle East	0.178744
## freedom_to_make_life_choices:factor(region>North Africa	0.048038
## freedom_to_make_life_choices:factor(region>North America	0.928150
## freedom_to_make_life_choices:factor(region>Oceania	0.826891
## freedom_to_make_life_choices:factor(region)Other	0.474585
## freedom_to_make_life_choices:factor(region>South Asia	2.59e-11
## freedom_to_make_life_choices:factor(region>Southeast Asia	9.09e-05
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	3.72e-08
## freedom_to_make_life_choices:factor(region>Western Europe	0.921627
## generosity:perceptions_of_corruption	0.002568
## generosity:factor(region)CIS	0.257103
## generosity:factor(region)East Asia	0.787906
## generosity:factor(region)Latin America and Caribbean	0.056967
## generosity:factor(region>Middle East	0.000316
## generosity:factor(region>North Africa	0.072072
## generosity:factor(region>North America	0.095229
## generosity:factor(region>Oceania	0.155213
## generosity:factor(region)Other	0.010816
## generosity:factor(region>South Asia	0.737619
## generosity:factor(region>Southeast Asia	0.448946
## generosity:factor(region>Sub-Saharan Africa	0.007428
## generosity:factor(region>Western Europe	0.001436
## perceptions_of_corruption:factor(region)CIS	0.496507
## perceptions_of_corruption:factor(region)East Asia	0.296579
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.402023
## perceptions_of_corruption:factor(region>Middle East	0.552326
## perceptions_of_corruption:factor(region>North Africa	0.502446

## perceptions_of_corruption:factor(region)North America	0.508457
## perceptions_of_corruption:factor(region)Oceania	0.449789
## perceptions_of_corruption:factor(region)Other	0.018997
## perceptions_of_corruption:factor(region)South Asia	0.000127
## perceptions_of_corruption:factor(region)Southeast Asia	0.936266
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	8.09e-06
## perceptions_of_corruption:factor(region)Western Europe	0.000532
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	***
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region)CIS	**
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region)Middle East	***
## factor(region)North Africa	
## factor(region)North America	
## factor(region)Oceania	
## factor(region)Other	***
## factor(region)South Asia	
## factor(region)Southeast Asia	
## factor(region)Sub-Saharan Africa	
## factor(region)Western Europe	.
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	***
## gdp_per_capita:perceptions_of_corruption	***
## gdp_per_capita:factor(region)CIS	
## gdp_per_capita:factor(region)East Asia	
## gdp_per_capita:factor(region)Latin America and Caribbean	*
## gdp_per_capita:factor(region)Middle East	**
## gdp_per_capita:factor(region)North Africa	
## gdp_per_capita:factor(region)North America	
## gdp_per_capita:factor(region)Oceania	
## gdp_per_capita:factor(region)Other	**
## gdp_per_capita:factor(region)South Asia	
## gdp_per_capita:factor(region)Southeast Asia	***
## gdp_per_capita:factor(region)Sub-Saharan Africa	*
## gdp_per_capita:factor(region)Western Europe	
## social_support:factor(region)CIS	
## social_support:factor(region)East Asia	
## social_support:factor(region)Latin America and Caribbean	*

```

## social_support:factor(region)Middle East *
## social_support:factor(region)North Africa
## social_support:factor(region)North America
## social_support:factor(region)Oceania
## social_support:factor(region)Other
## social_support:factor(region)South Asia
## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa * 
## social_support:factor(region)Western Europe
## healthy_life_expectancy:freedom_to_make_life_choices ** 
## healthy_life_expectancy:perceptions_of_corruption ** 
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean *** 
## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other .
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia *** 
## healthy_life_expectancy:factor(region)Sub-Saharan Africa .
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa *
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia *** 
## freedom_to_make_life_choices:factor(region)Southeast Asia *** 
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa *** 
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption ** 
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East *** 
## generosity:factor(region)North Africa .
## generosity:factor(region)North America .
## generosity:factor(region)Oceania
## generosity:factor(region)Other *
## generosity:factor(region)South Asia

```

```

## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa ** 
## generosity:factor(region)Western Europe ** 
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other *
## perceptions_of_corruption:factor(region)South Asia *** 
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa *** 
## perceptions_of_corruption:factor(region)Western Europe *** 
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.4199 on 1218 degrees of freedom
## Multiple R-squared: 0.8657, Adjusted R-squared: 0.8551
## F-statistic: 81.79 on 96 and 1218 DF, p-value: < 2.2e-16

```

Interpretation:

- Multiple R-squared: 0.0.8657 — About 75.56% of the variation in happiness score is explained by the model, which is considered a strong fit.
- Adjusted R-squared: 0.8551 — Adjusted for the number of predictors in the model, showing that the model still accounts for a large portion of the variance after penalizing for additional variables.
- F-statistic: 81.79 on 96 and 1218 degrees of freedom, p-value < 2.2e-16 — The F-statistic indicates the overall model is significant, meaning that at least one predictor is a significant contributor to explaining happiness scores.

The regression equation can be written as:

$$\begin{aligned}
\widehat{\text{happiness_score}} = & 3.19120 + 0.41375X_{gdp_per_capita} + 0.57952X_{social_support} - 0.21223X_{healthy_life_expectancy} \\
& + 4.94649X_{freedom_to_make_life_choices} - 0.37436X_{generosity} + 5.30010X_{perceptions_of_corruption} \\
& - 1.74083X_{regionCIS} + 1.26156X_{regionEast_Asia} - 1.50952X_{regionLatin_America_and_Caribbean} \\
& - 3.40556X_{regionMiddle_East} - 0.66540X_{regionNorth_Africa} + 0.33928X_{regionNorth_Africa} \\
& + 0.04485X_{regionOceania} - 1.68364X_{regionOther} - 0.25806X_{regionSouth_Asia} \\
& - 1.15272X_{regionSoutheast_Asia} - 0.30375X_{regionSub_Saharan_Africa} - 1.53632X_{regionSub_Saharan_Africa} \\
& + 1.05992X_{gdp_per_capita} \cdot X_{healthy_life_expectancy} - 1.55492X_{gdp_per_capita} \cdot X_{freedom_to_make_life_choices} \\
& - 1.84158X_{gdp_per_capita} \cdot X_{perceptions_of_corruption} + 0.40220X_{gdp_per_capita} \cdot X_{regionCIS} \\
& + 0.18271X_{gdp_per_capita} \cdot X_{regionEast_Asia} + 0.53778X_{gdp_per_capita} \cdot X_{regionLatin_America_and_Caribbean} \\
& + 0.81398X_{gdp_per_capita} \cdot X_{regionMiddle_East} - 0.26601X_{gdp_per_capita} \cdot X_{regionNorth_Africa} \\
& + 0.08978X_{gdp_per_capita} \cdot X_{regionNorth_America} + 0.33842X_{gdp_per_capita} \cdot X_{regionOceania} \\
& + 0.72395X_{gdp_per_capita} \cdot X_{regionOther} + 0.13254X_{gdp_per_capita} \cdot X_{regionSouth_Asia} \\
& + 1.30590X_{gdp_per_capita} \cdot X_{regionSoutheast_Asia} + 0.60001X_{gdp_per_capita} \cdot X_{regionSub_Saharan_Africa} \\
& + 0.44545X_{gdp_per_capita} \cdot X_{regionWestern_Europe} + 0.21121X_{social_support} \cdot X_{regionCIS} \\
& - 0.31997X_{social_support} \cdot X_{regionEast_Asia} - 0.47733X_{social_support} \cdot X_{regionLatin_America_and_Caribbean} \\
& + 0.59152X_{social_support} \cdot X_{regionMiddle_East} - 0.34928X_{social_support} \cdot X_{regionNorth_Africa} \\
& - 0.49871X_{social_support} \cdot X_{regionNorth_America} - 0.53084X_{social_support} \cdot X_{regionOceania} \\
& + 0.19384X_{social_support} \cdot X_{regionOther} + 0.26829X_{social_support} \cdot X_{regionSouth_Asia} \\
& - 0.11634X_{social_support} \cdot X_{regionSoutheast_Asia} - 0.43870X_{social_support} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.31500X_{social_support} \cdot X_{regionWestern_Europe} - 2.01117X_{healthy_life_expectancy} \cdot X_{regionCIS} \\
& - 2.50372X_{healthy_life_expectancy} \cdot X_{perceptions_of_corruption} + 0.81630X_{healthy_life_expectancy} \cdot X_{regionEast_Asia} \\
& + 0.70900X_{healthy_life_expectancy} \cdot X_{regionMiddle_East} + 2.19384X_{healthy_life_expectancy} \cdot X_{regionNorth_Africa} \\
& + 1.06753X_{healthy_life_expectancy} \cdot X_{regionOther} + 1.30020X_{healthy_life_expectancy} \cdot X_{regionSouth_Asia} \\
& + 0.37137X_{healthy_life_expectancy} \cdot X_{regionNorth_America} + 0.92406X_{healthy_life_expectancy} \cdot X_{regionOceania} \\
& + 0.69640X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} + 0.87184X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} \\
& + 1.85858X_{healthy_life_expectancy} \cdot X_{regionSoutheast_Asia} + 0.72886X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} \\
& + 1.19355X_{healthy_life_expectancy} \cdot X_{regionWestern_Europe} - 0.04831X_{freedom_to_make_life_choices} \cdot X_{regionCIS} \\
& - 3.07759X_{freedom_to_make_life_choices} \cdot X_{regionEast_Asia} - 0.22647X_{freedom_to_make_life_choices} \cdot X_{regionMiddle_East} \\
& + 0.73699X_{freedom_to_make_life_choices} \cdot X_{regionOther} - 1.24844X_{freedom_to_make_life_choices} \cdot X_{regionSouth_Asia} \\
& - 0.35762X_{freedom_to_make_life_choices} \cdot X_{regionNorth_America} - 0.82154X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.35035X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} - 4.78164X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 3.18597X_{freedom_to_make_life_choices} \cdot X_{regionSoutheast_Asia} - 2.87322X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.05354X_{freedom_to_make_life_choices} \cdot X_{regionWestern_Europe} - 4.90466X_{generosity} \cdot X_{regionCIS} \\
& + 1.01556X_{generosity} \cdot X_{regionEast_Asia} - 0.41648X_{generosity} \cdot X_{regionMiddle_East} \\
& + 1.41633X_{generosity} \cdot X_{regionOther} + 2.86785X_{generosity} \cdot X_{regionSouth_Asia} \\
& + 3.27103X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 2.78522X_{generosity} \cdot X_{regionSub_Saharan_Africa} \\
& + 2.53639X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 2.10864X_{generosity} \cdot X_{regionSub_Saharan_Africa} \\
& + 0.20822X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 0.52184X_{generosity} \cdot X_{regionSub_Saharan_Africa}
\end{aligned}$$

6 Creating Higher Order Model.

The ggpairs function from the GGally package creates pairwise scatter plots for visualizing relationships among variables.

6.1 Generate ggpairs plot for the main predictors

```
library(GGally)
```

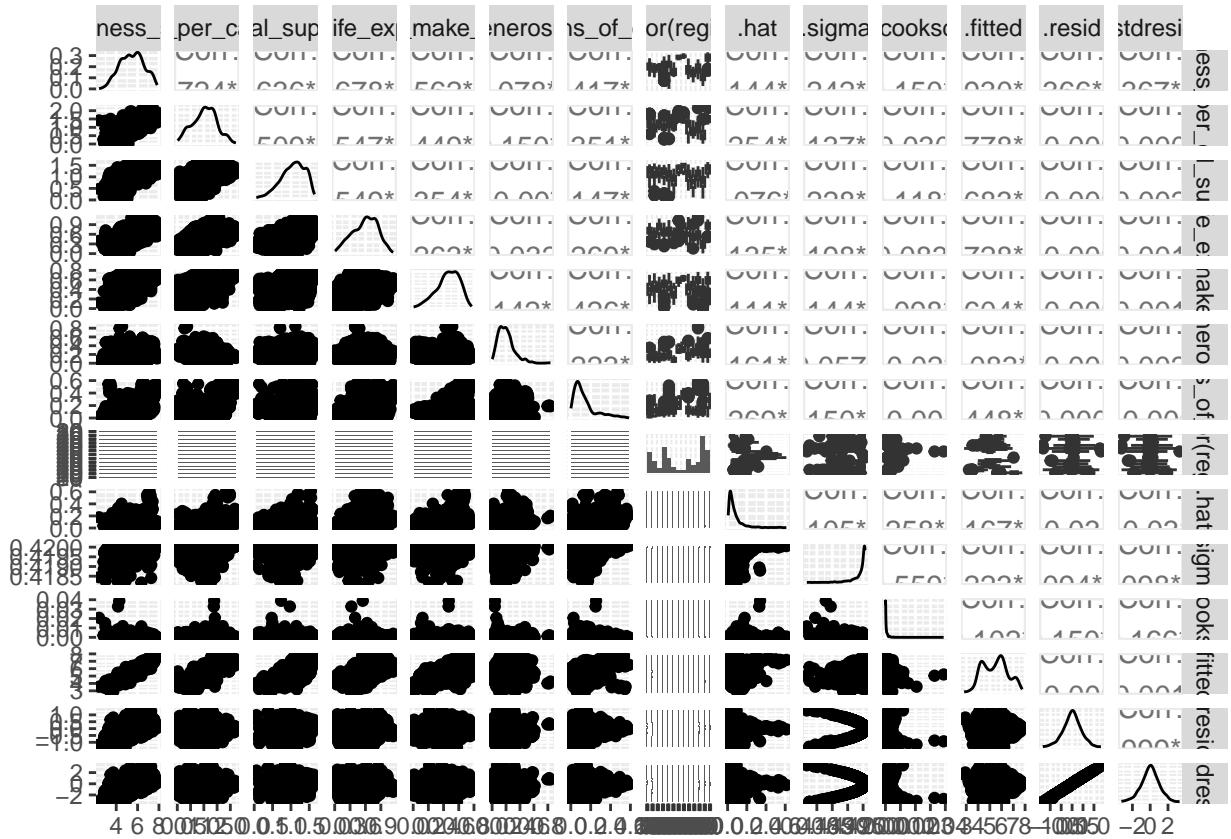
```
## Warning: package 'GGally' was built under R version 4.3.3
```

```
## Registered S3 method overwritten by 'GGally':  
##   method from  
##   +.gg   ggplot2
```

```
ggpairs(whr_reducedinteraction)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



Based on the output, we will try to create higher order for gdp_per_capita

```
whr1 <- lm(happiness_score ~ gdp_per_capita + I(gdp_per_capita^2) +
  social_support +
  healthy_life_expectancy +
  freedom_to_make_life_choices +
  generosity +
  perceptions_of_corruption +
  factor(region) +
  (gdp_per_capita * healthy_life_expectancy) +
  (gdp_per_capita * freedom_to_make_life_choices) +
  (gdp_per_capita * perceptions_of_corruption) +
  (gdp_per_capita * factor(region)) +
  (social_support * factor(region)) +
  (healthy_life_expectancy * freedom_to_make_life_choices) +
  (healthy_life_expectancy * perceptions_of_corruption) +
  (healthy_life_expectancy * factor(region)) +
  (freedom_to_make_life_choices * factor(region)) +
  (generosity * perceptions_of_corruption) +
  (generosity * factor(region)) +
  (perceptions_of_corruption * factor(region)), data = whr)
summary(whr1)
```

```

## Call:
## lm(formula = happiness_score ~ gdp_per_capita + I(gdp_per_capita^2) +
##     social_support + healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + factor(region) +
##     (gdp_per_capita * healthy_life_expectancy) + (gdp_per_capita *
##     freedom_to_make_life_choices) + (gdp_per_capita * perceptions_of_corruption) +
##     (gdp_per_capita * factor(region)) + (social_support * factor(region)) +
##     (healthy_life_expectancy * freedom_to_make_life_choices) +
##     (healthy_life_expectancy * perceptions_of_corruption) + (healthy_life_expectancy *
##     factor(region)) + (freedom_to_make_life_choices * factor(region)) +
##     (generosity * perceptions_of_corruption) + (generosity *
##     factor(region)) + (perceptions_of_corruption * factor(region)),
##     data = whr)
##
## Residuals:
##      Min        1Q    Median        3Q       Max
## -1.37275 -0.24519  0.00538  0.24607  1.31740
##
## Coefficients:
##                               Estimate
## (Intercept)                      3.06609
## gdp_per_capita                   0.80068
## I(gdp_per_capita^2)             -0.23426
## social_support                  0.58672
## healthy_life_expectancy          -0.36654
## freedom_to_make_life_choices    4.67610
## generosity                       -0.36187
## perceptions_of_corruption       5.36475
## factor(region)CIS              -1.67685
## factor(region)East Asia          1.26313
## factor(region)Latin America and Caribbean -1.45330
## factor(region)Middle East        -3.35235
## factor(region)North Africa       -0.66206
## factor(region)North America      0.08056
## factor(region)Oceania            -0.19942
## factor(region)Other              -1.59629
## factor(region)South Asia          -0.12900
## factor(region)Southeast Asia     -1.14385
## factor(region)Sub-Saharan Africa -0.18120
## factor(region)Western Europe      -1.70496
## gdp_per_capita:healthy_life_expectancy 1.18132
## gdp_per_capita:freedom_to_make_life_choices -1.28602
## gdp_per_capita:perceptions_of_corruption -1.76488
## gdp_per_capita:factor(region)CIS    0.27894

```

## gdp_per_capita:factor(region)East Asia	0.19735
## gdp_per_capita:factor(region)Latin America and Caribbean	0.44014
## gdp_per_capita:factor(region)Middle East	0.79587
## gdp_per_capita:factor(region)North Africa	-0.31348
## gdp_per_capita:factor(region)North America	0.21293
## gdp_per_capita:factor(region)Oceania	0.39361
## gdp_per_capita:factor(region)Other	0.62329
## gdp_per_capita:factor(region)South Asia	-0.08368
## gdp_per_capita:factor(region)Southeast Asia	1.18516
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.36717
## gdp_per_capita:factor(region)Western Europe	0.54341
## social_support:factor(region)CIS	0.19984
## social_support:factor(region)East Asia	-0.32727
## social_support:factor(region)Latin America and Caribbean	-0.48244
## social_support:factor(region)Middle East	0.60227
## social_support:factor(region)North Africa	-0.35275
## social_support:factor(region)North America	-0.48110
## social_support:factor(region)Oceania	-0.51723
## social_support:factor(region)Other	0.16649
## social_support:factor(region)South Asia	0.27621
## social_support:factor(region)Southeast Asia	-0.12066
## social_support:factor(region)Sub-Saharan Africa	-0.44126
## social_support:factor(region)Western Europe	-0.31157
## healthy_life_expectancy:freedom_to_make_life_choices	-2.06730
## healthy_life_expectancy:perceptions_of_corruption	-2.76651
## healthy_life_expectancy:factor(region)CIS	0.90235
## healthy_life_expectancy:factor(region)East Asia	-0.31907
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.24829
## healthy_life_expectancy:factor(region)Middle East	1.04767
## healthy_life_expectancy:factor(region)North Africa	1.38391
## healthy_life_expectancy:factor(region)North America	0.44211
## healthy_life_expectancy:factor(region)Oceania	1.04897
## healthy_life_expectancy:factor(region)Other	0.72406
## healthy_life_expectancy:factor(region)South Asia	0.96927
## healthy_life_expectancy:factor(region)Southeast Asia	1.94348
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.86594
## healthy_life_expectancy:factor(region)Western Europe	1.27376
## freedom_to_make_life_choices:factor(region)CIS	0.04748
## freedom_to_make_life_choices:factor(region)East Asia	-3.08919
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.18348
## freedom_to_make_life_choices:factor(region)Middle East	0.71973
## freedom_to_make_life_choices:factor(region)North Africa	-1.20250
## freedom_to_make_life_choices:factor(region)North America	-0.29955
## freedom_to_make_life_choices:factor(region)Oceania	-0.74170
## freedom_to_make_life_choices:factor(region)Other	-0.25875

## freedom_to_make_life_choices:factor(region)South Asia	-4.67291
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.07080
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-2.72758
## freedom_to_make_life_choices:factor(region)Western Europe	-0.10548
## generosity:perceptions_of_corruption	-4.73821
## generosity:factor(region)CIS	1.01560
## generosity:factor(region)East Asia	-0.48684
## generosity:factor(region)Latin America and Caribbean	1.44543
## generosity:factor(region)Middle East	2.78206
## generosity:factor(region)North Africa	3.14146
## generosity:factor(region)North America	2.71417
## generosity:factor(region)Oceania	2.46003
## generosity:factor(region)Other	2.04148
## generosity:factor(region)South Asia	0.19433
## generosity:factor(region)Southeast Asia	0.54327
## generosity:factor(region)Sub-Saharan Africa	1.82769
## generosity:factor(region)Western Europe	2.23299
## perceptions_of_corruption:factor(region)CIS	-0.68713
## perceptions_of_corruption:factor(region)East Asia	3.07110
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.83740
## perceptions_of_corruption:factor(region)Middle East	0.57299
## perceptions_of_corruption:factor(region)North Africa	1.10728
## perceptions_of_corruption:factor(region)North America	1.81853
## perceptions_of_corruption:factor(region)Oceania	1.50189
## perceptions_of_corruption:factor(region)Other	-2.00617
## perceptions_of_corruption:factor(region)South Asia	6.94776
## perceptions_of_corruption:factor(region)Southeast Asia	0.22267
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.26505
## perceptions_of_corruption:factor(region)Western Europe	3.00735
##	Std. Error
## (Intercept)	0.51554
## gdp_per_capita	0.36413
## I(gdp_per_capita^2)	0.10757
## social_support	0.15339
## healthy_life_expectancy	0.53415
## freedom_to_make_life_choices	0.65982
## generosity	0.58625
## perceptions_of_corruption	1.17063
## factor(region)CIS	0.65276
## factor(region)East Asia	1.48415
## factor(region)Latin America and Caribbean	0.52313
## factor(region)Middle East	0.48212
## factor(region)North Africa	0.86567
## factor(region)North America	3.45712
## factor(region)Oceania	4.28246

## factor(region)Other	0.49332
## factor(region)South Asia	0.57017
## factor(region)Southeast Asia	0.78048
## factor(region)Sub-Saharan Africa	0.50452
## factor(region)Western Europe	0.80390
## gdp_per_capita:healthy_life_expectancy	0.30735
## gdp_per_capita:freedom_to_make_life_choices	0.34929
## gdp_per_capita:perceptions_of_corruption	0.47695
## gdp_per_capita:factor(region)CIS	0.29221
## gdp_per_capita:factor(region)East Asia	0.54229
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24757
## gdp_per_capita:factor(region)Middle East	0.26000
## gdp_per_capita:factor(region)North Africa	0.46563
## gdp_per_capita:factor(region)North America	0.95147
## gdp_per_capita:factor(region>Oceania	0.94193
## gdp_per_capita:factor(region)Other	0.25717
## gdp_per_capita:factor(region)South Asia	0.34796
## gdp_per_capita:factor(region>Southeast Asia	0.26700
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.27507
## gdp_per_capita:factor(region>Western Europe	0.32086
## social_support:factor(region)CIS	0.25168
## social_support:factor(region)East Asia	0.36322
## social_support:factor(region)Latin America and Caribbean	0.21642
## social_support:factor(region>Middle East	0.24911
## social_support:factor(region>North Africa	0.32271
## social_support:factor(region>North America	0.60717
## social_support:factor(region>Oceania	0.57560
## social_support:factor(region)Other	0.25086
## social_support:factor(region>South Asia	0.27980
## social_support:factor(region>Southeast Asia	0.28191
## social_support:factor(region>Sub-Saharan Africa	0.18214
## social_support:factor(region>Western Europe	0.24023
## healthy_life_expectancy:freedom_to_make_life_choices	0.70673
## healthy_life_expectancy:perceptions_of_corruption	0.88743
## healthy_life_expectancy:factor(region)CIS	0.61850
## healthy_life_expectancy:factor(region)East Asia	0.70795
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41347
## healthy_life_expectancy:factor(region>Middle East	0.44114
## healthy_life_expectancy:factor(region>North Africa	0.77967
## healthy_life_expectancy:factor(region>North America	1.37721
## healthy_life_expectancy:factor(region>Oceania	1.39464
## healthy_life_expectancy:factor(region)Other	0.40818
## healthy_life_expectancy:factor(region>South Asia	0.58063
## healthy_life_expectancy:factor(region>Southeast Asia	0.49353
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.44550

	t value
## healthy_life_expectancy:factor(region)Western Europe	0.53432
## freedom_to_make_life_choices:factor(region)CIS	0.53928
## freedom_to_make_life_choices:factor(region)East Asia	1.23361
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44540
## freedom_to_make_life_choices:factor(region)Middle East	0.54700
## freedom_to_make_life_choices:factor(region)North Africa	0.63022
## freedom_to_make_life_choices:factor(region)North America	3.95918
## freedom_to_make_life_choices:factor(region>Oceania	3.75023
## freedom_to_make_life_choices:factor(region)Other	0.49087
## freedom_to_make_life_choices:factor(region)South Asia	0.71109
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.81180
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	0.52223
## freedom_to_make_life_choices:factor(region>Western Europe	0.54373
## generosity:perceptions_of_corruption	1.62262
## generosity:factor(region)CIS	0.89434
## generosity:factor(region)East Asia	1.54571
## generosity:factor(region)Latin America and Caribbean	0.74232
## generosity:factor(region>Middle East	0.79372
## generosity:factor(region>North Africa	1.81520
## generosity:factor(region>North America	1.66583
## generosity:factor(region>Oceania	1.78099
## generosity:factor(region>Other	0.82542
## generosity:factor(region>South Asia	0.88988
## generosity:factor(region>Southeast Asia	0.70112
## generosity:factor(region>Sub-Saharan Africa	0.71424
## generosity:factor(region>Western Europe	0.71951
## perceptions_of_corruption:factor(region)CIS	0.94877
## perceptions_of_corruption:factor(region)East Asia	2.93089
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.97879
## perceptions_of_corruption:factor(region>Middle East	0.96030
## perceptions_of_corruption:factor(region>North Africa	1.71088
## perceptions_of_corruption:factor(region>North America	2.89401
## perceptions_of_corruption:factor(region>Oceania	1.97654
## perceptions_of_corruption:factor(region>Other	0.95325
## perceptions_of_corruption:factor(region>South Asia	1.81278
## perceptions_of_corruption:factor(region>Southeast Asia	0.94890
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	0.94616
## perceptions_of_corruption:factor(region>Western Europe	0.87142
##	
## (Intercept)	5.947
## gdp_per_capita	2.199
## I(gdp_per_capita^2)	-2.178
## social_support	3.825
## healthy_life_expectancy	-0.686
## freedom_to_make_life_choices	7.087

## generosity	-0.617
## perceptions_of_corruption	4.583
## factor(region)CIS	-2.569
## factor(region)East Asia	0.851
## factor(region)Latin America and Caribbean	-2.778
## factor(region)Middle East	-6.953
## factor(region)North Africa	-0.765
## factor(region)North America	0.023
## factor(region)Oceania	-0.047
## factor(region)Other	-3.236
## factor(region)South Asia	-0.226
## factor(region)Southeast Asia	-1.466
## factor(region)Sub-Saharan Africa	-0.359
## factor(region)Western Europe	-2.121
## gdp_per_capita:healthy_life_expectancy	3.844
## gdp_per_capita:freedom_to_make_life_choices	-3.682
## gdp_per_capita:perceptions_of_corruption	-3.700
## gdp_per_capita:factor(region)CIS	0.955
## gdp_per_capita:factor(region)East Asia	0.364
## gdp_per_capita:factor(region)Latin America and Caribbean	1.778
## gdp_per_capita:factor(region)Middle East	3.061
## gdp_per_capita:factor(region)North Africa	-0.673
## gdp_per_capita:factor(region)North America	0.224
## gdp_per_capita:factor(region)Oceania	0.418
## gdp_per_capita:factor(region)Other	2.424
## gdp_per_capita:factor(region)South Asia	-0.240
## gdp_per_capita:factor(region)Southeast Asia	4.439
## gdp_per_capita:factor(region)Sub-Saharan Africa	1.335
## gdp_per_capita:factor(region)Western Europe	1.694
## social_support:factor(region)CIS	0.794
## social_support:factor(region)East Asia	-0.901
## social_support:factor(region)Latin America and Caribbean	-2.229
## social_support:factor(region)Middle East	2.418
## social_support:factor(region)North Africa	-1.093
## social_support:factor(region)North America	-0.792
## social_support:factor(region)Oceania	-0.899
## social_support:factor(region)Other	0.664
## social_support:factor(region)South Asia	0.987
## social_support:factor(region)Southeast Asia	-0.428
## social_support:factor(region)Sub-Saharan Africa	-2.423
## social_support:factor(region)Western Europe	-1.297
## healthy_life_expectancy:freedom_to_make_life_choices	-2.925
## healthy_life_expectancy:perceptions_of_corruption	-3.117
## healthy_life_expectancy:factor(region)CIS	1.459
## healthy_life_expectancy:factor(region)East Asia	-0.451

## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.438
## healthy_life_expectancy:factor(region)Middle East	2.375
## healthy_life_expectancy:factor(region)North Africa	1.775
## healthy_life_expectancy:factor(region)North America	0.321
## healthy_life_expectancy:factor(region)Oceania	0.752
## healthy_life_expectancy:factor(region)Other	1.774
## healthy_life_expectancy:factor(region)South Asia	1.669
## healthy_life_expectancy:factor(region)Southeast Asia	3.938
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.944
## healthy_life_expectancy:factor(region)Western Europe	2.384
## freedom_to_make_life_choices:factor(region)CIS	0.088
## freedom_to_make_life_choices:factor(region)East Asia	-2.504
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.412
## freedom_to_make_life_choices:factor(region)Middle East	1.316
## freedom_to_make_life_choices:factor(region)North Africa	-1.908
## freedom_to_make_life_choices:factor(region)North America	-0.076
## freedom_to_make_life_choices:factor(region)Oceania	-0.198
## freedom_to_make_life_choices:factor(region)Other	-0.527
## freedom_to_make_life_choices:factor(region)South Asia	-6.571
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.783
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.223
## freedom_to_make_life_choices:factor(region)Western Europe	-0.194
## generosity:perceptions_of_corruption	-2.920
## generosity:factor(region)CIS	1.136
## generosity:factor(region)East Asia	-0.315
## generosity:factor(region)Latin America and Caribbean	1.947
## generosity:factor(region)Middle East	3.505
## generosity:factor(region)North Africa	1.731
## generosity:factor(region)North America	1.629
## generosity:factor(region)Oceania	1.381
## generosity:factor(region)Other	2.473
## generosity:factor(region)South Asia	0.218
## generosity:factor(region)Southeast Asia	0.775
## generosity:factor(region)Sub-Saharan Africa	2.559
## generosity:factor(region)Western Europe	3.103
## perceptions_of_corruption:factor(region)CIS	-0.724
## perceptions_of_corruption:factor(region)East Asia	1.048
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.856
## perceptions_of_corruption:factor(region)Middle East	0.597
## perceptions_of_corruption:factor(region)North Africa	0.647
## perceptions_of_corruption:factor(region)North America	0.628
## perceptions_of_corruption:factor(region)Oceania	0.760
## perceptions_of_corruption:factor(region)Other	-2.105
## perceptions_of_corruption:factor(region)South Asia	3.833
## perceptions_of_corruption:factor(region)Southeast Asia	0.235

## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.508
## perceptions_of_corruption:factor(region)Western Europe	3.451
##	Pr(> t)
## (Intercept)	3.56e-09
## gdp_per_capita	0.028072
## I(gdp_per_capita^2)	0.029625
## social_support	0.000137
## healthy_life_expectancy	0.492713
## freedom_to_make_life_choices	2.32e-12
## generosity	0.537178
## perceptions_of_corruption	5.06e-06
## factor(region)CIS	0.010322
## factor(region)East Asia	0.394891
## factor(region)Latin America and Caribbean	0.005552
## factor(region)Middle East	5.80e-12
## factor(region)North Africa	0.444545
## factor(region)North America	0.981412
## factor(region)Oceania	0.962866
## factor(region)Other	0.001246
## factor(region)South Asia	0.821050
## factor(region)Southeast Asia	0.143024
## factor(region)Sub-Saharan Africa	0.719548
## factor(region)Western Europe	0.034136
## gdp_per_capita:healthy_life_expectancy	0.000128
## gdp_per_capita:freedom_to_make_life_choices	0.000242
## gdp_per_capita:perceptions_of_corruption	0.000225
## gdp_per_capita:factor(region)CIS	0.339979
## gdp_per_capita:factor(region)East Asia	0.715986
## gdp_per_capita:factor(region)Latin America and Caribbean	0.075682
## gdp_per_capita:factor(region)Middle East	0.002254
## gdp_per_capita:factor(region)North Africa	0.500923
## gdp_per_capita:factor(region)North America	0.822959
## gdp_per_capita:factor(region)Oceania	0.676114
## gdp_per_capita:factor(region)Other	0.015511
## gdp_per_capita:factor(region)South Asia	0.810002
## gdp_per_capita:factor(region)Southeast Asia	9.87e-06
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.182187
## gdp_per_capita:factor(region)Western Europe	0.090597
## social_support:factor(region)CIS	0.427338
## social_support:factor(region)East Asia	0.367748
## social_support:factor(region)Latin America and Caribbean	0.025982
## social_support:factor(region)Middle East	0.015766
## social_support:factor(region)North Africa	0.274569
## social_support:factor(region)North America	0.428302
## social_support:factor(region)Oceania	0.369052

## social_support:factor(region)Other	0.507041
## social_support:factor(region)South Asia	0.323752
## social_support:factor(region)Southeast Asia	0.668712
## social_support:factor(region)Sub-Saharan Africa	0.015554
## social_support:factor(region)Western Europe	0.194883
## healthy_life_expectancy:freedom_to_make_life_choices	0.003507
## healthy_life_expectancy:perceptions_of_corruption	0.001867
## healthy_life_expectancy:factor(region)CIS	0.144842
## healthy_life_expectancy:factor(region)East Asia	0.652288
## healthy_life_expectancy:factor(region)Latin America and Caribbean	6.52e-08
## healthy_life_expectancy:factor(region)Middle East	0.017707
## healthy_life_expectancy:factor(region)North Africa	0.076149
## healthy_life_expectancy:factor(region)North America	0.748253
## healthy_life_expectancy:factor(region>Oceania	0.452109
## healthy_life_expectancy:factor(region)Other	0.076334
## healthy_life_expectancy:factor(region)South Asia	0.095310
## healthy_life_expectancy:factor(region>Southeast Asia	8.69e-05
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.052152
## healthy_life_expectancy:factor(region>Western Europe	0.017283
## freedom_to_make_life_choices:factor(region)CIS	0.929860
## freedom_to_make_life_choices:factor(region)East Asia	0.012403
## freedom_to_make_life_choices:factor(region>Latin America and Caribbean	0.680449
## freedom_to_make_life_choices:factor(region>Middle East	0.188495
## freedom_to_make_life_choices:factor(region>North Africa	0.056618
## freedom_to_make_life_choices:factor(region>North America	0.939703
## freedom_to_make_life_choices:factor(region>Oceania	0.843254
## freedom_to_make_life_choices:factor(region)Other	0.598209
## freedom_to_make_life_choices:factor(region>South Asia	7.37e-11
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.000163
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	2.07e-07
## freedom_to_make_life_choices:factor(region>Western Europe	0.846215
## generosity:perceptions_of_corruption	0.003564
## generosity:factor(region)CIS	0.256354
## generosity:factor(region)East Asia	0.752842
## generosity:factor(region>Latin America and Caribbean	0.051743
## generosity:factor(region>Middle East	0.000473
## generosity:factor(region>North Africa	0.083769
## generosity:factor(region>North America	0.103504
## generosity:factor(region>Oceania	0.167448
## generosity:factor(region)Other	0.013524
## generosity:factor(region>South Asia	0.827172
## generosity:factor(region>Southeast Asia	0.438570
## generosity:factor(region>Sub-Saharan Africa	0.010620
## generosity:factor(region>Western Europe	0.001957
## perceptions_of_corruption:factor(region)CIS	0.469058

## perceptions_of_corruption:factor(region)East Asia	0.294922
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.392418
## perceptions_of_corruption:factor(region)Middle East	0.550830
## perceptions_of_corruption:factor(region)North Africa	0.517624
## perceptions_of_corruption:factor(region)North America	0.529876
## perceptions_of_corruption:factor(region>Oceania	0.447488
## perceptions_of_corruption:factor(region)Other	0.035534
## perceptions_of_corruption:factor(region)South Asia	0.000133
## perceptions_of_corruption:factor(region>Southeast Asia	0.814509
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	7.18e-06
## perceptions_of_corruption:factor(region>Western Europe	0.000577
##	
## (Intercept)	***
## gdp_per_capita	*
## I(gdp_per_capita^2)	*
## social_support	***
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region>CIS	*
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region>Middle East	***
## factor(region>North Africa	
## factor(region>North America	
## factor(region>Oceania	
## factor(region>Other	**
## factor(region>South Asia	
## factor(region>Southeast Asia	
## factor(region>Sub-Saharan Africa	
## factor(region>Western Europe	*
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	***
## gdp_per_capita:perceptions_of_corruption	***
## gdp_per_capita:factor(region>CIS	
## gdp_per_capita:factor(region)East Asia	.
## gdp_per_capita:factor(region)Latin America and Caribbean	.
## gdp_per_capita:factor(region>Middle East	**
## gdp_per_capita:factor(region>North Africa	
## gdp_per_capita:factor(region>North America	
## gdp_per_capita:factor(region>Oceania	
## gdp_per_capita:factor(region>Other	*
## gdp_per_capita:factor(region>South Asia	
## gdp_per_capita:factor(region>Southeast Asia	***

```

## gdp_per_capita:factor(region)Sub-Saharan Africa
## gdp_per_capita:factor(region)Western Europe
## social_support:factor(region)CIS
## social_support:factor(region)East Asia
## social_support:factor(region)Latin America and Caribbean *.
## social_support:factor(region)Middle East *
## social_support:factor(region)North Africa
## social_support:factor(region)North America
## social_support:factor(region)Oceania
## social_support:factor(region)Other
## social_support:factor(region)South Asia
## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa *
## social_support:factor(region)Western Europe
## healthy_life_expectancy:freedom_to_make_life_choices **
## healthy_life_expectancy:perceptions_of_corruption **
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean ***.
## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other .
## healthy_life_expectancy:factor(region)South Asia .
## healthy_life_expectancy:factor(region)Southeast Asia ***
## healthy_life_expectancy:factor(region)Sub-Saharan Africa .
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa .
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia ***
## freedom_to_make_life_choices:factor(region)Southeast Asia ***
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption **
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East ***

```

```

## generosity:factor(region)North Africa
## generosity:factor(region)North America
## generosity:factor(region)Oceania
## generosity:factor(region)Other *
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa *
## generosity:factor(region)Western Europe **
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other *
## perceptions_of_corruption:factor(region)South Asia ***
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***
## perceptions_of_corruption:factor(region)Western Europe ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4192 on 1217 degrees of freedom
## Multiple R-squared: 0.8662, Adjusted R-squared: 0.8556
## F-statistic: 81.24 on 97 and 1217 DF, p-value: < 2.2e-16

```

From the result, it is clear that $I(gdp_per_capita^2)$ is insignificant at $\alpha = 0.05$, so we will not include it and move to other variable.

Now, we will try to create higher order for healthy_life_expectancy

```

whr2 <- lm(happiness_score ~ gdp_per_capita +
             social_support +
             healthy_life_expectancy + I(healthy_life_expectancy^2) +
             freedom_to_make_life_choices +
             generosity +
             perceptions_of_corruption +
             factor(region) +
             (gdp_per_capita * healthy_life_expectancy) +
             (gdp_per_capita * freedom_to_make_life_choices) +
             (gdp_per_capita * perceptions_of_corruption) +
             (gdp_per_capita * factor(region)) +
             (social_support * factor(region)) +
             (healthy_life_expectancy * freedom_to_make_life_choices)

```

```

        (healthy_life_expectancy * perceptions_of_corruption) +
        (healthy_life_expectancy * factor(region)) +
        (freedom_to_make_life_choices * factor(region)) +
        (generosity * perceptions_of_corruption) +
        (generosity * factor(region)) +
        (perceptions_of_corruption * factor(region)) , data = whr)
summary(whr2)

##
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     healthy_life_expectancy + I(healthy_life_expectancy^2) +
##     freedom_to_make_life_choices + generosity + perceptions_of_corruption +
##     factor(region) + (gdp_per_capita * healthy_life_expectancy) +
##     (gdp_per_capita * freedom_to_make_life_choices) + (gdp_per_capita *
##     perceptions_of_corruption) + (gdp_per_capita * factor(region)) +
##     (social_support * factor(region)) + (healthy_life_expectancy *
##     freedom_to_make_life_choices) + (healthy_life_expectancy *
##     perceptions_of_corruption) + (healthy_life_expectancy * factor(region)) +
##     (freedom_to_make_life_choices * factor(region)) + (generosity *
##     perceptions_of_corruption) + (generosity * factor(region)) +
##     (perceptions_of_corruption * factor(region)), data = whr)
##
## Residuals:
##      Min      1Q Median      3Q      Max
## -1.35744 -0.24038  0.01134  0.25092  1.31338
##
## 
## Coefficients:
##                               Estimate
## (Intercept)                  2.96337
## gdp_per_capita                 0.36801
## social_support                  0.59906
## healthy_life_expectancy          0.48193
## I(healthy_life_expectancy^2)      -0.55222
## freedom_to_make_life_choices      5.00308
## generosity                      -0.35735
## perceptions_of_corruption         4.93369
## factor(region)CIS                -1.63201
## factor(region)East Asia            1.25618
## factor(region)Latin America and Caribbean -1.44418
## factor(region)Middle East           -3.33306
## factor(region)North Africa           -0.56664
## factor(region)North America            0.52451
## factor(region)Oceania                  0.33812

```

## factor(region)Other	-1.54090
## factor(region)South Asia	-0.09345
## factor(region)Southeast Asia	-1.05619
## factor(region)Sub-Saharan Africa	-0.09757
## factor(region)Western Europe	-1.52502
## gdp_per_capita:healthy_life_expectancy	1.11034
## gdp_per_capita:freedom_to_make_life_choices	-1.53083
## gdp_per_capita:perceptions_of_corruption	-1.80042
## gdp_per_capita:factor(region)CIS	0.39703
## gdp_per_capita:factor(region)East Asia	0.18944
## gdp_per_capita:factor(region)Latin America and Caribbean	0.53461
## gdp_per_capita:factor(region)Middle East	0.80554
## gdp_per_capita:factor(region)North Africa	-0.25997
## gdp_per_capita:factor(region)North America	0.04794
## gdp_per_capita:factor(region)Oceania	0.29656
## gdp_per_capita:factor(region)Other	0.72789
## gdp_per_capita:factor(region)South Asia	0.14487
## gdp_per_capita:factor(region)Southeast Asia	1.29715
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.61993
## gdp_per_capita:factor(region)Western Europe	0.42979
## social_support:factor(region)CIS	0.20524
## social_support:factor(region)East Asia	-0.29576
## social_support:factor(region)Latin America and Caribbean	-0.48547
## social_support:factor(region)Middle East	0.59125
## social_support:factor(region)North Africa	-0.35638
## social_support:factor(region)North America	-0.45817
## social_support:factor(region)Oceania	-0.49732
## social_support:factor(region)Other	0.17770
## social_support:factor(region)South Asia	0.26488
## social_support:factor(region)Southeast Asia	-0.11772
## social_support:factor(region)Sub-Saharan Africa	-0.45008
## social_support:factor(region)Western Europe	-0.28161
## healthy_life_expectancy:freedom_to_make_life_choices	-2.10213
## healthy_life_expectancy:perceptions_of_corruption	-2.08398
## healthy_life_expectancy:factor(region)CIS	0.67941
## healthy_life_expectancy:factor(region)East Asia	-0.30244
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.13493
## healthy_life_expectancy:factor(region)Middle East	1.03003
## healthy_life_expectancy:factor(region)North Africa	1.17668
## healthy_life_expectancy:factor(region)North America	0.30038
## healthy_life_expectancy:factor(region)Oceania	0.88370
## healthy_life_expectancy:factor(region)Other	0.51018
## healthy_life_expectancy:factor(region)South Asia	0.69033
## healthy_life_expectancy:factor(region)Southeast Asia	1.75192
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.31609

## healthy_life_expectancy:factor(region)Western Europe	1.21309
## freedom_to_make_life_choices:factor(region)CIS	-0.07762
## freedom_to_make_life_choices:factor(region)East Asia	-3.14996
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.26739
## freedom_to_make_life_choices:factor(region)Middle East	0.71106
## freedom_to_make_life_choices:factor(region)North Africa	-1.27163
## freedom_to_make_life_choices:factor(region)North America	-0.56811
## freedom_to_make_life_choices:factor(region>Oceania	-1.11221
## freedom_to_make_life_choices:factor(region)Other	-0.38194
## freedom_to_make_life_choices:factor(region)South Asia	-4.83684
## freedom_to_make_life_choices:factor(region>Southeast Asia	-3.21253
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	-2.92570
## freedom_to_make_life_choices:factor(region>Western Europe	-0.10055
## generosity:perceptions_of_corruption	-4.82020
## generosity:factor(region)CIS	0.95938
## generosity:factor(region)East Asia	-0.47653
## generosity:factor(region)Latin America and Caribbean	1.42724
## generosity:factor(region>Middle East	2.84432
## generosity:factor(region>North Africa	3.12999
## generosity:factor(region>North America	2.67189
## generosity:factor(region>Oceania	2.34530
## generosity:factor(region>Other	2.20878
## generosity:factor(region>South Asia	0.21991
## generosity:factor(region>Southeast Asia	0.49818
## generosity:factor(region>Sub-Saharan Africa	1.89209
## generosity:factor(region>Western Europe	2.23604
## perceptions_of_corruption:factor(region)CIS	-0.56377
## perceptions_of_corruption:factor(region)East Asia	3.05476
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.89311
## perceptions_of_corruption:factor(region>Middle East	0.48401
## perceptions_of_corruption:factor(region>North Africa	1.21789
## perceptions_of_corruption:factor(region>North America	2.03626
## perceptions_of_corruption:factor(region>Oceania	1.46897
## perceptions_of_corruption:factor(region>Other	-2.16155
## perceptions_of_corruption:factor(region>South Asia	6.89943
## perceptions_of_corruption:factor(region>Southeast Asia	0.13017
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-4.04876
## perceptions_of_corruption:factor(region>Western Europe	2.97960
##	Std. Error
## (Intercept)	0.53799
## gdp_per_capita	0.31986
## social_support	0.15416
## healthy_life_expectancy	0.72497
## I(healthy_life_expectancy^2)	0.39348
## freedom_to_make_life_choices	0.65002

## generosity	0.58701
## perceptions_of_corruption	1.20032
## factor(region)CIS	0.65743
## factor(region)East Asia	1.48584
## factor(region)Latin America and Caribbean	0.52516
## factor(region)Middle East	0.48480
## factor(region)North Africa	0.86951
## factor(region)North America	3.46152
## factor(region)Oceania	4.29095
## factor(region)Other	0.50264
## factor(region)South Asia	0.57972
## factor(region)Southeast Asia	0.78438
## factor(region)Sub-Saharan Africa	0.52300
## factor(region)Western Europe	0.80112
## gdp_per_capita:healthy_life_expectancy	0.30472
## gdp_per_capita:freedom_to_make_life_choices	0.32755
## gdp_per_capita:perceptions_of_corruption	0.47709
## gdp_per_capita:factor(region)CIS	0.28702
## gdp_per_capita:factor(region)East Asia	0.54289
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24376
## gdp_per_capita:factor(region)Middle East	0.26023
## gdp_per_capita:factor(region)North Africa	0.46567
## gdp_per_capita:factor(region)North America	0.95133
## gdp_per_capita:factor(region)Oceania	0.94313
## gdp_per_capita:factor(region)Other	0.25329
## gdp_per_capita:factor(region)South Asia	0.33399
## gdp_per_capita:factor(region)Southeast Asia	0.26155
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.25412
## gdp_per_capita:factor(region)Western Europe	0.31825
## social_support:factor(region)CIS	0.25195
## social_support:factor(region)East Asia	0.36403
## social_support:factor(region)Latin America and Caribbean	0.21673
## social_support:factor(region)Middle East	0.24934
## social_support:factor(region)North Africa	0.32311
## social_support:factor(region)North America	0.60849
## social_support:factor(region)Oceania	0.57672
## social_support:factor(region)Other	0.25110
## social_support:factor(region)South Asia	0.28010
## social_support:factor(region)Southeast Asia	0.28222
## social_support:factor(region)Sub-Saharan Africa	0.18252
## social_support:factor(region)Western Europe	0.24167
## healthy_life_expectancy:freedom_to_make_life_choices	0.71003
## healthy_life_expectancy:perceptions_of_corruption	0.92961
## healthy_life_expectancy:factor(region)CIS	0.62559
## healthy_life_expectancy:factor(region)East Asia	0.70907

## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41531
## healthy_life_expectancy:factor(region)Middle East	0.44235
## healthy_life_expectancy:factor(region)North Africa	0.78456
## healthy_life_expectancy:factor(region)North America	1.37932
## healthy_life_expectancy:factor(region)Oceania	1.39534
## healthy_life_expectancy:factor(region)Other	0.42946
## healthy_life_expectancy:factor(region)South Asia	0.59382
## healthy_life_expectancy:factor(region)Southeast Asia	0.49838
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.53052
## healthy_life_expectancy:factor(region)Western Europe	0.53384
## freedom_to_make_life_choices:factor(region)CIS	0.53849
## freedom_to_make_life_choices:factor(region)East Asia	1.23608
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44642
## freedom_to_make_life_choices:factor(region)Middle East	0.54788
## freedom_to_make_life_choices:factor(region)North Africa	0.63080
## freedom_to_make_life_choices:factor(region)North America	3.96642
## freedom_to_make_life_choices:factor(region)Oceania	3.76002
## freedom_to_make_life_choices:factor(region)Other	0.49014
## freedom_to_make_life_choices:factor(region)South Asia	0.71123
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.81122
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	0.51987
## freedom_to_make_life_choices:factor(region)Western Europe	0.54486
## generosity:perceptions_of_corruption	1.62377
## generosity:factor(region)CIS	0.89625
## generosity:factor(region)East Asia	1.54772
## generosity:factor(region)Latin America and Caribbean	0.74308
## generosity:factor(region)Middle East	0.79382
## generosity:factor(region)North Africa	1.81906
## generosity:factor(region)North America	1.66935
## generosity:factor(region)Oceania	1.78786
## generosity:factor(region)Other	0.82886
## generosity:factor(region)South Asia	0.89136
## generosity:factor(region)Southeast Asia	0.70231
## generosity:factor(region)Sub-Saharan Africa	0.71411
## generosity:factor(region)Western Europe	0.72111
## perceptions_of_corruption:factor(region)CIS	0.95147
## perceptions_of_corruption:factor(region)East Asia	2.93423
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.98119
## perceptions_of_corruption:factor(region)Middle East	0.96342
## perceptions_of_corruption:factor(region)North Africa	1.71341
## perceptions_of_corruption:factor(region)North America	2.89820
## perceptions_of_corruption:factor(region)Oceania	1.97889
## perceptions_of_corruption:factor(region)Other	0.95003
## perceptions_of_corruption:factor(region)South Asia	1.81569
## perceptions_of_corruption:factor(region)Southeast Asia	0.94836

## perceptions_of_corruption:factor(region)Sub-Saharan Africa	0.95767
## perceptions_of_corruption:factor(region)Western Europe	0.87312
##	t value
## (Intercept)	5.508
## gdp_per_capita	1.151
## social_support	3.886
## healthy_life_expectancy	0.665
## I(healthy_life_expectancy^2)	-1.403
## freedom_to_make_life_choices	7.697
## generosity	-0.609
## perceptions_of_corruption	4.110
## factor(region)CIS	-2.482
## factor(region)East Asia	0.845
## factor(region)Latin America and Caribbean	-2.750
## factor(region)Middle East	-6.875
## factor(region)North Africa	-0.652
## factor(region)North America	0.152
## factor(region)Oceania	0.079
## factor(region)Other	-3.066
## factor(region)South Asia	-0.161
## factor(region)Southeast Asia	-1.347
## factor(region)Sub-Saharan Africa	-0.187
## factor(region)Western Europe	-1.904
## gdp_per_capita:healthy_life_expectancy	3.644
## gdp_per_capita:freedom_to_make_life_choices	-4.674
## gdp_per_capita:perceptions_of_corruption	-3.774
## gdp_per_capita:factor(region)CIS	1.383
## gdp_per_capita:factor(region)East Asia	0.349
## gdp_per_capita:factor(region)Latin America and Caribbean	2.193
## gdp_per_capita:factor(region)Middle East	3.095
## gdp_per_capita:factor(region)North Africa	-0.558
## gdp_per_capita:factor(region)North America	0.050
## gdp_per_capita:factor(region)Oceania	0.314
## gdp_per_capita:factor(region)Other	2.874
## gdp_per_capita:factor(region)South Asia	0.434
## gdp_per_capita:factor(region)Southeast Asia	4.959
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.440
## gdp_per_capita:factor(region)Western Europe	1.350
## social_support:factor(region)CIS	0.815
## social_support:factor(region)East Asia	-0.812
## social_support:factor(region)Latin America and Caribbean	-2.240
## social_support:factor(region)Middle East	2.371
## social_support:factor(region)North Africa	-1.103
## social_support:factor(region)North America	-0.753
## social_support:factor(region)Oceania	-0.862

## social_support:factor(region)Other	0.708
## social_support:factor(region)South Asia	0.946
## social_support:factor(region)Southeast Asia	-0.417
## social_support:factor(region)Sub-Saharan Africa	-2.466
## social_support:factor(region)Western Europe	-1.165
## healthy_life_expectancy:freedom_to_make_life_choices	-2.961
## healthy_life_expectancy:perceptions_of_corruption	-2.242
## healthy_life_expectancy:factor(region)CIS	1.086
## healthy_life_expectancy:factor(region)East Asia	-0.427
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.141
## healthy_life_expectancy:factor(region)Middle East	2.329
## healthy_life_expectancy:factor(region)North Africa	1.500
## healthy_life_expectancy:factor(region)North America	0.218
## healthy_life_expectancy:factor(region>Oceania	0.633
## healthy_life_expectancy:factor(region)Other	1.188
## healthy_life_expectancy:factor(region)South Asia	1.163
## healthy_life_expectancy:factor(region)Southeast Asia	3.515
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.596
## healthy_life_expectancy:factor(region)Western Europe	2.272
## freedom_to_make_life_choices:factor(region)CIS	-0.144
## freedom_to_make_life_choices:factor(region)East Asia	-2.548
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.599
## freedom_to_make_life_choices:factor(region)Middle East	1.298
## freedom_to_make_life_choices:factor(region)North Africa	-2.016
## freedom_to_make_life_choices:factor(region)North America	-0.143
## freedom_to_make_life_choices:factor(region>Oceania	-0.296
## freedom_to_make_life_choices:factor(region)Other	-0.779
## freedom_to_make_life_choices:factor(region)South Asia	-6.801
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.960
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.628
## freedom_to_make_life_choices:factor(region)Western Europe	-0.185
## generosity:perceptions_of_corruption	-2.969
## generosity:factor(region)CIS	1.070
## generosity:factor(region)East Asia	-0.308
## generosity:factor(region)Latin America and Caribbean	1.921
## generosity:factor(region)Middle East	3.583
## generosity:factor(region)North Africa	1.721
## generosity:factor(region)North America	1.601
## generosity:factor(region>Oceania	1.312
## generosity:factor(region)Other	2.665
## generosity:factor(region)South Asia	0.247
## generosity:factor(region)Southeast Asia	0.709
## generosity:factor(region)Sub-Saharan Africa	2.650
## generosity:factor(region)Western Europe	3.101
## perceptions_of_corruption:factor(region)CIS	-0.593

## perceptions_of_corruption:factor(region)East Asia	1.041
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.910
## perceptions_of_corruption:factor(region)Middle East	0.502
## perceptions_of_corruption:factor(region)North Africa	0.711
## perceptions_of_corruption:factor(region)North America	0.703
## perceptions_of_corruption:factor(region>Oceania	0.742
## perceptions_of_corruption:factor(region)Other	-2.275
## perceptions_of_corruption:factor(region)South Asia	3.800
## perceptions_of_corruption:factor(region>Southeast Asia	0.137
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-4.228
## perceptions_of_corruption:factor(region>Western Europe	3.413
##	Pr(> t)
## (Intercept)	4.42e-08
## gdp_per_capita	0.250146
## social_support	0.000107
## healthy_life_expectancy	0.506328
## I(healthy_life_expectancy^2)	0.160744
## freedom_to_make_life_choices	2.87e-14
## generosity	0.542791
## perceptions_of_corruption	4.22e-05
## factor(region)CIS	0.013184
## factor(region)East Asia	0.398034
## factor(region)Latin America and Caribbean	0.006048
## factor(region>Middle East	9.88e-12
## factor(region)North Africa	0.514732
## factor(region)North America	0.879585
## factor(region>Oceania	0.937206
## factor(region)Other	0.002220
## factor(region>South Asia	0.871966
## factor(region>Southeast Asia	0.178384
## factor(region>Sub-Saharan Africa	0.852034
## factor(region>Western Europe	0.057196
## gdp_per_capita:healthy_life_expectancy	0.000280
## gdp_per_capita:freedom_to_make_life_choices	3.29e-06
## gdp_per_capita:perceptions_of_corruption	0.000169
## gdp_per_capita:factor(region)CIS	0.166841
## gdp_per_capita:factor(region)East Asia	0.727191
## gdp_per_capita:factor(region)Latin America and Caribbean	0.028483
## gdp_per_capita:factor(region>Middle East	0.002010
## gdp_per_capita:factor(region>North Africa	0.576763
## gdp_per_capita:factor(region>North America	0.959821
## gdp_per_capita:factor(region>Oceania	0.753238
## gdp_per_capita:factor(region>Other	0.004126
## gdp_per_capita:factor(region>South Asia	0.664541
## gdp_per_capita:factor(region>Southeast Asia	8.07e-07

## gdp_per_capita:factor(region)Sub-Saharan Africa	0.014849
## gdp_per_capita:factor(region)Western Europe	0.177117
## social_support:factor(region)CIS	0.415456
## social_support:factor(region)East Asia	0.416689
## social_support:factor(region)Latin America and Caribbean	0.025272
## social_support:factor(region)Middle East	0.017884
## social_support:factor(region)North Africa	0.270255
## social_support:factor(region)North America	0.451621
## social_support:factor(region)Oceania	0.388671
## social_support:factor(region)Other	0.479260
## social_support:factor(region)South Asia	0.344513
## social_support:factor(region)Southeast Asia	0.676673
## social_support:factor(region)Sub-Saharan Africa	0.013804
## social_support:factor(region)Western Europe	0.244137
## healthy_life_expectancy:freedom_to_make_life_choices	0.003130
## healthy_life_expectancy:perceptions_of_corruption	0.025156
## healthy_life_expectancy:factor(region)CIS	0.277674
## healthy_life_expectancy:factor(region)East Asia	0.669798
## healthy_life_expectancy:factor(region)Latin America and Caribbean	3.19e-07
## healthy_life_expectancy:factor(region)Middle East	0.020047
## healthy_life_expectancy:factor(region)North Africa	0.133927
## healthy_life_expectancy:factor(region)North America	0.827643
## healthy_life_expectancy:factor(region)Oceania	0.526642
## healthy_life_expectancy:factor(region)Other	0.235086
## healthy_life_expectancy:factor(region)South Asia	0.245254
## healthy_life_expectancy:factor(region)Southeast Asia	0.000456
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.551404
## healthy_life_expectancy:factor(region)Western Europe	0.023236
## freedom_to_make_life_choices:factor(region)CIS	0.885406
## freedom_to_make_life_choices:factor(region)East Asia	0.010945
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.549307
## freedom_to_make_life_choices:factor(region)Middle East	0.194583
## freedom_to_make_life_choices:factor(region)North Africa	0.044030
## freedom_to_make_life_choices:factor(region)North America	0.886133
## freedom_to_make_life_choices:factor(region)Oceania	0.767435
## freedom_to_make_life_choices:factor(region)Other	0.435986
## freedom_to_make_life_choices:factor(region)South Asia	1.63e-11
## freedom_to_make_life_choices:factor(region)Southeast Asia	7.93e-05
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	2.26e-08
## freedom_to_make_life_choices:factor(region)Western Europe	0.853621
## generosity:perceptions_of_corruption	0.003051
## generosity:factor(region)CIS	0.284636
## generosity:factor(region)East Asia	0.758218
## generosity:factor(region)Latin America and Caribbean	0.055003
## generosity:factor(region)Middle East	0.000353

## generosity:factor(region)North Africa	0.085567
## generosity:factor(region)North America	0.109735
## generosity:factor(region)Oceania	0.189837
## generosity:factor(region)Other	0.007804
## generosity:factor(region)South Asia	0.805176
## generosity:factor(region)Southeast Asia	0.478248
## generosity:factor(region)Sub-Saharan Africa	0.008164
## generosity:factor(region)Western Europe	0.001974
## perceptions_of_corruption:factor(region)CIS	0.553607
## perceptions_of_corruption:factor(region)East Asia	0.298046
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.362883
## perceptions_of_corruption:factor(region)Middle East	0.615483
## perceptions_of_corruption:factor(region)North Africa	0.477346
## perceptions_of_corruption:factor(region)North America	0.482442
## perceptions_of_corruption:factor(region)Oceania	0.458034
## perceptions_of_corruption:factor(region)Other	0.023065
## perceptions_of_corruption:factor(region)South Asia	0.000152
## perceptions_of_corruption:factor(region)Southeast Asia	0.890853
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	2.54e-05
## perceptions_of_corruption:factor(region)Western Europe	0.000665
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	***
## healthy_life_expectancy	
## I(healthy_life_expectancy^2)	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region)CIS	*
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region)Middle East	***
## factor(region)North Africa	
## factor(region)North America	
## factor(region)Oceania	
## factor(region)Other	**
## factor(region)South Asia	
## factor(region)Southeast Asia	
## factor(region)Sub-Saharan Africa	
## factor(region)Western Europe	.
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	***
## gdp_per_capita:perceptions_of_corruption	***
## gdp_per_capita:factor(region)CIS	

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## gdp_per_capita:factor(region)East Asia
## gdp_per_capita:factor(region)Latin America and Caribbean *
## gdp_per_capita:factor(region)Middle East **
## gdp_per_capita:factor(region)North Africa
## gdp_per_capita:factor(region)North America
## gdp_per_capita:factor(region)Oceania
## gdp_per_capita:factor(region)Other **
## gdp_per_capita:factor(region)South Asia
## gdp_per_capita:factor(region)Southeast Asia ***

## social_support:factor(region)CIS
## social_support:factor(region)East Asia
## social_support:factor(region)Latin America and Caribbean *
## social_support:factor(region)Middle East *
## social_support:factor(region)North Africa
## social_support:factor(region)North America
## social_support:factor(region)Oceania
## social_support:factor(region)Other
## social_support:factor(region)South Asia
## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa *
## social_support:factor(region)Western Europe

## healthy_life_expectancy:freedom_to_make_life_choices **
## healthy_life_expectancy:perceptions_of_corruption *
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean ***
## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia ***
## healthy_life_expectancy:factor(region)Sub-Saharan Africa
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa *
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other

```

```

## freedom_to_make_life_choices:factor(region)South Asia      ***
## freedom_to_make_life_choices:factor(region)Southeast Asia   ***
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***
## freedom_to_make_life_choices:factor(region)Western Europe    **
## generosity:perceptions_of_corruption                      **
## generosity:factor(region)CIS                            . .
## generosity:factor(region)East Asia                      ***
## generosity:factor(region)Latin America and Caribbean     .
## generosity:factor(region)Middle East                     ***
## generosity:factor(region)North Africa                   .
## generosity:factor(region)North America                 .
## generosity:factor(region)Oceania                       **
## generosity:factor(region)Other                         **
## generosity:factor(region)South Asia                    **
## generosity:factor(region)Southeast Asia               ***
## generosity:factor(region)Sub-Saharan Africa           ** **
## generosity:factor(region)Western Europe                **
## perceptions_of_corruption:factor(region)CIS            *
## perceptions_of_corruption:factor(region)East Asia       ***
## perceptions_of_corruption:factor(region)Latin America and Caribbean ***
## perceptions_of_corruption:factor(region)Middle East     *
## perceptions_of_corruption:factor(region)North Africa    ***
## perceptions_of_corruption:factor(region)North America   ***
## perceptions_of_corruption:factor(region)Oceania          *
## perceptions_of_corruption:factor(region)Other             ***
## perceptions_of_corruption:factor(region)South Asia       ***
## perceptions_of_corruption:factor(region)Southeast Asia   ***
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***
## perceptions_of_corruption:factor(region)Western Europe    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.4197 on 1217 degrees of freedom
## Multiple R-squared:  0.8659, Adjusted R-squared:  0.8552
## F-statistic: 81.03 on 97 and 1217 DF,  p-value: < 2.2e-16

```

$I(\text{healthy_life_expectancy}^2)$ is insignificant at $\alpha = 0.05$, so we will not include it and move to other variable.

Now, we will try to create higher order for social_support

```

whr3 <- lm(happiness_score ~ gdp_per_capita +
            social_support + I(social_support^2) +
            healthy_life_expectancy +
            freedom_to_make_life_choices +

```

```

generosity +
perceptions_of_corruption +
factor(region) +
(gdp_per_capita * healthy_life_expectancy) +
(gdp_per_capita * freedom_to_make_life_choices) +
(gdp_per_capita * perceptions_of_corruption) +
(gdp_per_capita * factor(region)) +
(social_support * factor(region)) +
(healthy_life_expectancy * freedom_to_make_life_choices) +
(healthy_life_expectancy * perceptions_of_corruption) +
(healthy_life_expectancy * factor(region)) +
(freedom_to_make_life_choices * factor(region)) +
(generosity * perceptions_of_corruption) +
(generosity * factor(region)) +
(perceptions_of_corruption * factor(region)) , data = whr
summary(whr3)

```

```

##
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     I(social_support^2) + healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + factor(region) +
##     (gdp_per_capita * healthy_life_expectancy) + (gdp_per_capita *
##     freedom_to_make_life_choices) + (gdp_per_capita * perceptions_of_corruption) +
##     (gdp_per_capita * factor(region)) + (social_support * factor(region)) +
##     (healthy_life_expectancy * freedom_to_make_life_choices) +
##     (healthy_life_expectancy * perceptions_of_corruption) + (healthy_life_expectancy *
##     factor(region)) + (freedom_to_make_life_choices * factor(region)) +
##     (generosity * perceptions_of_corruption) + (generosity *
##     factor(region)) + (perceptions_of_corruption * factor(region)),
##     data = whr)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.36088 -0.24778  0.01069  0.25216  1.30861
##
## Coefficients:
##                               Estimate
## (Intercept)                  3.01775
## gdp_per_capita                0.38398
## social_support                 1.01054
## I(social_support^2)            -0.19207
## healthy_life_expectancy        -0.26982
## freedom_to_make_life_choices  4.87649
```

## generosity	-0.39343
## perceptions_of_corruption	5.40969
## factor(region)CIS	-1.75315
## factor(region)East Asia	1.27965
## factor(region)Latin America and Caribbean	-1.49588
## factor(region)Middle East	-3.37366
## factor(region)North Africa	-0.58198
## factor(region)North America	0.31930
## factor(region)Oceania	0.01960
## factor(region)Other	-1.68284
## factor(region)South Asia	-0.18083
## factor(region)Southeast Asia	-1.15830
## factor(region)Sub-Saharan Africa	-0.20892
## factor(region)Western Europe	-1.61950
## gdp_per_capita:healthy_life_expectancy	1.09032
## gdp_per_capita:freedom_to_make_life_choices	-1.52395
## gdp_per_capita:perceptions_of_corruption	-1.90532
## gdp_per_capita:factor(region)CIS	0.41302
## gdp_per_capita:factor(region)East Asia	0.17466
## gdp_per_capita:factor(region)Latin America and Caribbean	0.53098
## gdp_per_capita:factor(region)Middle East	0.82975
## gdp_per_capita:factor(region)North Africa	-0.25973
## gdp_per_capita:factor(region)North America	0.07237
## gdp_per_capita:factor(region)Oceania	0.32445
## gdp_per_capita:factor(region)Other	0.73002
## gdp_per_capita:factor(region)South Asia	0.14645
## gdp_per_capita:factor(region)Southeast Asia	1.30522
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.61402
## gdp_per_capita:factor(region)Western Europe	0.44412
## social_support:factor(region)CIS	0.18206
## social_support:factor(region)East Asia	-0.31208
## social_support:factor(region)Latin America and Caribbean	-0.48230
## social_support:factor(region)Middle East	0.53711
## social_support:factor(region)North Africa	-0.46301
## social_support:factor(region)North America	-0.43539
## social_support:factor(region)Oceania	-0.44616
## social_support:factor(region)Other	0.15729
## social_support:factor(region)South Asia	0.13928
## social_support:factor(region)Southeast Asia	-0.15457
## social_support:factor(region)Sub-Saharan Africa	-0.58376
## social_support:factor(region)Western Europe	-0.24526
## healthy_life_expectancy:freedom_to_make_life_choices	-1.96970
## healthy_life_expectancy:perceptions_of_corruption	-2.56217
## healthy_life_expectancy:factor(region)CIS	0.85796
## healthy_life_expectancy:factor(region)East Asia	-0.34677

## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.18557
## healthy_life_expectancy:factor(region)Middle East	1.06496
## healthy_life_expectancy:factor(region)North Africa	1.30758
## healthy_life_expectancy:factor(region)North America	0.34195
## healthy_life_expectancy:factor(region)Oceania	0.89820
## healthy_life_expectancy:factor(region)Other	0.71215
## healthy_life_expectancy:factor(region)South Asia	0.90462
## healthy_life_expectancy:factor(region)Southeast Asia	1.88627
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.76396
## healthy_life_expectancy:factor(region)Western Europe	1.18548
## freedom_to_make_life_choices:factor(region)CIS	-0.05860
## freedom_to_make_life_choices:factor(region)East Asia	-3.10825
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.23325
## freedom_to_make_life_choices:factor(region)Middle East	0.69770
## freedom_to_make_life_choices:factor(region)North Africa	-1.20908
## freedom_to_make_life_choices:factor(region)North America	-0.40547
## freedom_to_make_life_choices:factor(region)Oceania	-0.88601
## freedom_to_make_life_choices:factor(region)Other	-0.29296
## freedom_to_make_life_choices:factor(region)South Asia	-4.77470
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.15262
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-2.82221
## freedom_to_make_life_choices:factor(region)Western Europe	-0.06495
## generosity:perceptions_of_corruption	-5.00130
## generosity:factor(region)CIS	1.08051
## generosity:factor(region)East Asia	-0.41304
## generosity:factor(region)Latin America and Caribbean	1.45322
## generosity:factor(region)Middle East	2.99256
## generosity:factor(region)North Africa	3.31801
## generosity:factor(region)North America	2.80331
## generosity:factor(region)Oceania	2.55194
## generosity:factor(region)Other	2.09201
## generosity:factor(region)South Asia	0.38361
## generosity:factor(region)Southeast Asia	0.56452
## generosity:factor(region)Sub-Saharan Africa	1.89443
## generosity:factor(region)Western Europe	2.33380
## perceptions_of_corruption:factor(region)CIS	-0.58022
## perceptions_of_corruption:factor(region)East Asia	3.12330
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.84148
## perceptions_of_corruption:factor(region)Middle East	0.60891
## perceptions_of_corruption:factor(region)North Africa	1.14724
## perceptions_of_corruption:factor(region)North America	2.01838
## perceptions_of_corruption:factor(region)Oceania	1.54431
## perceptions_of_corruption:factor(region)Other	-2.21395
## perceptions_of_corruption:factor(region)South Asia	6.99151
## perceptions_of_corruption:factor(region)Southeast Asia	0.13052

## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.27377
## perceptions_of_corruption:factor(region)Western Europe	3.08579
## Std. Error	
## (Intercept)	0.53010
## gdp_per_capita	0.31905
## social_support	0.36594
## I(social_support^2)	0.14802
## healthy_life_expectancy	0.53195
## freedom_to_make_life_choices	0.65108
## generosity	0.58714
## perceptions_of_corruption	1.17476
## factor(region)CIS	0.65299
## factor(region)East Asia	1.48607
## factor(region)Latin America and Caribbean	0.52326
## factor(region)Middle East	0.48273
## factor(region)North Africa	0.86914
## factor(region)North America	3.45944
## factor(region)Oceania	4.28640
## factor(region)Other	0.49230
## factor(region)South Asia	0.57091
## factor(region)Southeast Asia	0.78146
## factor(region)Sub-Saharan Africa	0.50729
## factor(region)Western Europe	0.80373
## gdp_per_capita:healthy_life_expectancy	0.30354
## gdp_per_capita:freedom_to_make_life_choices	0.32801
## gdp_per_capita:perceptions_of_corruption	0.47877
## gdp_per_capita:factor(region)CIS	0.28715
## gdp_per_capita:factor(region)East Asia	0.54297
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24384
## gdp_per_capita:factor(region)Middle East	0.26048
## gdp_per_capita:factor(region)North Africa	0.46573
## gdp_per_capita:factor(region)North America	0.95107
## gdp_per_capita:factor(region)Oceania	0.94283
## gdp_per_capita:factor(region)Other	0.25334
## gdp_per_capita:factor(region)South Asia	0.33409
## gdp_per_capita:factor(region)Southeast Asia	0.26151
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.25398
## gdp_per_capita:factor(region)Western Europe	0.31809
## social_support:factor(region)CIS	0.25295
## social_support:factor(region)East Asia	0.36371
## social_support:factor(region)Latin America and Caribbean	0.21671
## social_support:factor(region)Middle East	0.25287
## social_support:factor(region)North Africa	0.33478
## social_support:factor(region)North America	0.60983
## social_support:factor(region)Oceania	0.57997

## social_support:factor(region)Other	0.25244
## social_support:factor(region)South Asia	0.29725
## social_support:factor(region>Southeast Asia	0.28379
## social_support:factor(region>Sub-Saharan Africa	0.21390
## social_support:factor(region>Western Europe	0.24646
## healthy_life_expectancy:freedom_to_make_life_choices	0.70787
## healthy_life_expectancy:perceptions_of_corruption	0.88144
## healthy_life_expectancy:factor(region>CIS	0.61884
## healthy_life_expectancy:factor(region>East Asia	0.70887
## healthy_life_expectancy:factor(region>Latin America and Caribbean	0.41328
## healthy_life_expectancy:factor(region>Middle East	0.44160
## healthy_life_expectancy:factor(region>North Africa	0.77972
## healthy_life_expectancy:factor(region>North America	1.37874
## healthy_life_expectancy:factor(region>Oceania	1.39535
## healthy_life_expectancy:factor(region>Other	0.40867
## healthy_life_expectancy:factor(region>South Asia	0.58018
## healthy_life_expectancy:factor(region>Southeast Asia	0.49307
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.44241
## healthy_life_expectancy:factor(region>Western Europe	0.53375
## freedom_to_make_life_choices:factor(region>CIS	0.53821
## freedom_to_make_life_choices:factor(region>East Asia	1.23537
## freedom_to_make_life_choices:factor(region>Latin America and Caribbean	0.44555
## freedom_to_make_life_choices:factor(region>Middle East	0.54847
## freedom_to_make_life_choices:factor(region>North Africa	0.63139
## freedom_to_make_life_choices:factor(region>North America	3.96422
## freedom_to_make_life_choices:factor(region>Oceania	3.75508
## freedom_to_make_life_choices:factor(region>Other	0.49167
## freedom_to_make_life_choices:factor(region>South Asia	0.71025
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.81150
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	0.52007
## freedom_to_make_life_choices:factor(region>Western Europe	0.54396
## generosity:perceptions_of_corruption	1.62455
## generosity:factor(region>CIS	0.89686
## generosity:factor(region>East Asia	1.54731
## generosity:factor(region>Latin America and Caribbean	0.74367
## generosity:factor(region>Middle East	0.79953
## generosity:factor(region>North Africa	1.81686
## generosity:factor(region>North America	1.66765
## generosity:factor(region>Oceania	1.78292
## generosity:factor(region>Other	0.82598
## generosity:factor(region>South Asia	0.89215
## generosity:factor(region>Southeast Asia	0.70243
## generosity:factor(region>Sub-Saharan Africa	0.71418
## generosity:factor(region>Western Europe	0.72022
## perceptions_of_corruption:factor(region>CIS	0.95113

## perceptions_of_corruption:factor(region)East Asia	2.93491
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.98011
## perceptions_of_corruption:factor(region)Middle East	0.96193
## perceptions_of_corruption:factor(region)North Africa	1.71291
## perceptions_of_corruption:factor(region)North America	2.89834
## perceptions_of_corruption:factor(region>Oceania	1.97936
## perceptions_of_corruption:factor(region)Other	0.94899
## perceptions_of_corruption:factor(region)South Asia	1.81501
## perceptions_of_corruption:factor(region>Southeast Asia	0.94862
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	0.94753
## perceptions_of_corruption:factor(region>Western Europe	0.87346
##	t value
## (Intercept)	5.693
## gdp_per_capita	1.204
## social_support	2.761
## I(social_support^2)	-1.298
## healthy_life_expectancy	-0.507
## freedom_to_make_life_choices	7.490
## generosity	-0.670
## perceptions_of_corruption	4.605
## factor(region>CIS	-2.685
## factor(region)East Asia	0.861
## factor(region)Latin America and Caribbean	-2.859
## factor(region>Middle East	-6.989
## factor(region>North Africa	-0.670
## factor(region>North America	0.092
## factor(region>Oceania	0.005
## factor(region)Other	-3.418
## factor(region>South Asia	-0.317
## factor(region>Southeast Asia	-1.482
## factor(region>Sub-Saharan Africa	-0.412
## factor(region>Western Europe	-2.015
## gdp_per_capita:healthy_life_expectancy	3.592
## gdp_per_capita:freedom_to_make_life_choices	-4.646
## gdp_per_capita:perceptions_of_corruption	-3.980
## gdp_per_capita:factor(region>CIS	1.438
## gdp_per_capita:factor(region)East Asia	0.322
## gdp_per_capita:factor(region)Latin America and Caribbean	2.178
## gdp_per_capita:factor(region>Middle East	3.185
## gdp_per_capita:factor(region>North Africa	-0.558
## gdp_per_capita:factor(region>North America	0.076
## gdp_per_capita:factor(region>Oceania	0.344
## gdp_per_capita:factor(region>Other	2.882
## gdp_per_capita:factor(region>South Asia	0.438
## gdp_per_capita:factor(region>Southeast Asia	4.991

## gdp_per_capita:factor(region)Sub-Saharan Africa	2.418
## gdp_per_capita:factor(region)Western Europe	1.396
## social_support:factor(region)CIS	0.720
## social_support:factor(region)East Asia	-0.858
## social_support:factor(region)Latin America and Caribbean	-2.226
## social_support:factor(region)Middle East	2.124
## social_support:factor(region)North Africa	-1.383
## social_support:factor(region)North America	-0.714
## social_support:factor(region)Oceania	-0.769
## social_support:factor(region)Other	0.623
## social_support:factor(region)South Asia	0.469
## social_support:factor(region)Southeast Asia	-0.545
## social_support:factor(region)Sub-Saharan Africa	-2.729
## social_support:factor(region)Western Europe	-0.995
## healthy_life_expectancy:freedom_to_make_life_choices	-2.783
## healthy_life_expectancy:perceptions_of_corruption	-2.907
## healthy_life_expectancy:factor(region)CIS	1.386
## healthy_life_expectancy:factor(region)East Asia	-0.489
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.288
## healthy_life_expectancy:factor(region)Middle East	2.412
## healthy_life_expectancy:factor(region)North Africa	1.677
## healthy_life_expectancy:factor(region)North America	0.248
## healthy_life_expectancy:factor(region)Oceania	0.644
## healthy_life_expectancy:factor(region)Other	1.743
## healthy_life_expectancy:factor(region)South Asia	1.559
## healthy_life_expectancy:factor(region)Southeast Asia	3.826
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.727
## healthy_life_expectancy:factor(region)Western Europe	2.221
## freedom_to_make_life_choices:factor(region)CIS	-0.109
## freedom_to_make_life_choices:factor(region)East Asia	-2.516
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.524
## freedom_to_make_life_choices:factor(region)Middle East	1.272
## freedom_to_make_life_choices:factor(region)North Africa	-1.915
## freedom_to_make_life_choices:factor(region)North America	-0.102
## freedom_to_make_life_choices:factor(region)Oceania	-0.236
## freedom_to_make_life_choices:factor(region)Other	-0.596
## freedom_to_make_life_choices:factor(region)South Asia	-6.723
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.885
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.427
## freedom_to_make_life_choices:factor(region)Western Europe	-0.119
## generosity:perceptions_of_corruption	-3.079
## generosity:factor(region)CIS	1.205
## generosity:factor(region)East Asia	-0.267
## generosity:factor(region)Latin America and Caribbean	1.954
## generosity:factor(region)Middle East	3.743

## generosity:factor(region)North Africa	1.826
## generosity:factor(region)North America	1.681
## generosity:factor(region)Oceania	1.431
## generosity:factor(region)Other	2.533
## generosity:factor(region)South Asia	0.430
## generosity:factor(region)Southeast Asia	0.804
## generosity:factor(region)Sub-Saharan Africa	2.653
## generosity:factor(region)Western Europe	3.240
## perceptions_of_corruption:factor(region)CIS	-0.610
## perceptions_of_corruption:factor(region)East Asia	1.064
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.859
## perceptions_of_corruption:factor(region)Middle East	0.633
## perceptions_of_corruption:factor(region)North Africa	0.670
## perceptions_of_corruption:factor(region)North America	0.696
## perceptions_of_corruption:factor(region)Oceania	0.780
## perceptions_of_corruption:factor(region)Other	-2.333
## perceptions_of_corruption:factor(region)South Asia	3.852
## perceptions_of_corruption:factor(region)Southeast Asia	0.138
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.510
## perceptions_of_corruption:factor(region)Western Europe	3.533
##	Pr(> t)
## (Intercept)	1.57e-08
## gdp_per_capita	0.229016
## social_support	0.005840
## I(social_support^2)	0.194663
## healthy_life_expectancy	0.612089
## freedom_to_make_life_choices	1.32e-13
## generosity	0.502934
## perceptions_of_corruption	4.56e-06
## factor(region)CIS	0.007356
## factor(region)East Asia	0.389358
## factor(region)Latin America and Caribbean	0.004325
## factor(region)Middle East	4.56e-12
## factor(region)North Africa	0.503239
## factor(region)North America	0.926477
## factor(region)Oceania	0.996353
## factor(region)Other	0.000651
## factor(region)South Asia	0.751500
## factor(region)Southeast Asia	0.138541
## factor(region)Sub-Saharan Africa	0.680532
## factor(region)Western Europe	0.044126
## gdp_per_capita:healthy_life_expectancy	0.000341
## gdp_per_capita:freedom_to_make_life_choices	3.75e-06
## gdp_per_capita:perceptions_of_corruption	7.31e-05
## gdp_per_capita:factor(region)CIS	0.150605

## gdp_per_capita:factor(region)East Asia	0.747757
## gdp_per_capita:factor(region)Latin America and Caribbean	0.029625
## gdp_per_capita:factor(region)Middle East	0.001482
## gdp_per_capita:factor(region)North Africa	0.577161
## gdp_per_capita:factor(region)North America	0.939358
## gdp_per_capita:factor(region)Oceania	0.730813
## gdp_per_capita:factor(region)Other	0.004027
## gdp_per_capita:factor(region)South Asia	0.661195
## gdp_per_capita:factor(region)Southeast Asia	6.88e-07
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.015770
## gdp_per_capita:factor(region)Western Europe	0.162912
## social_support:factor(region)CIS	0.471810
## social_support:factor(region)East Asia	0.391042
## social_support:factor(region)Latin America and Caribbean	0.026227
## social_support:factor(region)Middle East	0.033868
## social_support:factor(region)North Africa	0.166915
## social_support:factor(region)North America	0.475397
## social_support:factor(region)Oceania	0.441883
## social_support:factor(region)Other	0.533361
## social_support:factor(region)South Asia	0.639464
## social_support:factor(region)Southeast Asia	0.586089
## social_support:factor(region)Sub-Saharan Africa	0.006442
## social_support:factor(region)Western Europe	0.319874
## healthy_life_expectancy:freedom_to_make_life_choices	0.005476
## healthy_life_expectancy:perceptions_of_corruption	0.003718
## healthy_life_expectancy:factor(region)CIS	0.165880
## healthy_life_expectancy:factor(region)East Asia	0.624799
## healthy_life_expectancy:factor(region)Latin America and Caribbean	1.46e-07
## healthy_life_expectancy:factor(region)Middle East	0.016031
## healthy_life_expectancy:factor(region)North Africa	0.093803
## healthy_life_expectancy:factor(region)North America	0.804166
## healthy_life_expectancy:factor(region)Oceania	0.519885
## healthy_life_expectancy:factor(region)Other	0.081657
## healthy_life_expectancy:factor(region)South Asia	0.119210
## healthy_life_expectancy:factor(region)Southeast Asia	0.000137
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.084450
## healthy_life_expectancy:factor(region)Western Europe	0.026532
## freedom_to_make_life_choices:factor(region)CIS	0.913314
## freedom_to_make_life_choices:factor(region)East Asia	0.011996
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.600716
## freedom_to_make_life_choices:factor(region)Middle East	0.203584
## freedom_to_make_life_choices:factor(region)North Africa	0.055731
## freedom_to_make_life_choices:factor(region)North America	0.918550
## freedom_to_make_life_choices:factor(region)Oceania	0.813511
## freedom_to_make_life_choices:factor(region)Other	0.551392

## freedom_to_make_life_choices:factor(region)South Asia	2.74e-11
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.000108
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	6.93e-08
## freedom_to_make_life_choices:factor(region)Western Europe	0.904981
## generosity:perceptions_of_corruption	0.002127
## generosity:factor(region)CIS	0.228525
## generosity:factor(region)East Asia	0.789562
## generosity:factor(region)Latin America and Caribbean	0.050916
## generosity:factor(region)Middle East	0.000190
## generosity:factor(region)North Africa	0.068060
## generosity:factor(region)North America	0.093021
## generosity:factor(region)Oceania	0.152594
## generosity:factor(region)Other	0.011441
## generosity:factor(region)South Asia	0.667280
## generosity:factor(region)Southeast Asia	0.421747
## generosity:factor(region)Sub-Saharan Africa	0.008092
## generosity:factor(region)Western Europe	0.001226
## perceptions_of_corruption:factor(region)CIS	0.541952
## perceptions_of_corruption:factor(region)East Asia	0.287453
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.390753
## perceptions_of_corruption:factor(region)Middle East	0.526848
## perceptions_of_corruption:factor(region)North Africa	0.503137
## perceptions_of_corruption:factor(region)North America	0.486317
## perceptions_of_corruption:factor(region)Oceania	0.435420
## perceptions_of_corruption:factor(region)Other	0.019812
## perceptions_of_corruption:factor(region)South Asia	0.000123
## perceptions_of_corruption:factor(region)Southeast Asia	0.890586
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	7.10e-06
## perceptions_of_corruption:factor(region)Western Europe	0.000427
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	**
## I(social_support^2)	
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region)CIS	**
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region)Middle East	***
## factor(region)North Africa	
## factor(region)North America	
## factor(region)Oceania	

```

## factor(region)Other ***

## factor(region)South Asia

## factor(region)Southeast Asia

## factor(region)Sub-Saharan Africa

## factor(region)Western Europe * 

## gdp_per_capita:healthy_life_expectancy ***

## gdp_per_capita:freedom_to_make_life_choices ***

## gdp_per_capita:perceptions_of_corruption ***

## gdp_per_capita:factor(region)CIS

## gdp_per_capita:factor(region)East Asia

## gdp_per_capita:factor(region)Latin America and Caribbean *

## gdp_per_capita:factor(region)Middle East **

## gdp_per_capita:factor(region)North Africa

## gdp_per_capita:factor(region)North America

## gdp_per_capita:factor(region)Oceania

## gdp_per_capita:factor(region)Other **

## gdp_per_capita:factor(region)South Asia

## gdp_per_capita:factor(region)Southeast Asia ***

## gdp_per_capita:factor(region)Sub-Saharan Africa *

## gdp_per_capita:factor(region)Western Europe

## social_support:factor(region)CIS

## social_support:factor(region)East Asia

## social_support:factor(region)Latin America and Caribbean *

## social_support:factor(region)Middle East *

## social_support:factor(region)North Africa

## social_support:factor(region)North America

## social_support:factor(region)Oceania

## social_support:factor(region)Other

## social_support:factor(region)South Asia

## social_support:factor(region)Southeast Asia

## social_support:factor(region)Sub-Saharan Africa **

## social_support:factor(region)Western Europe

## healthy_life_expectancy:freedom_to_make_life_choices **

## healthy_life_expectancy:perceptions_of_corruption **

## healthy_life_expectancy:factor(region)CIS

## healthy_life_expectancy:factor(region)East Asia

## healthy_life_expectancy:factor(region)Latin America and Caribbean ***

## healthy_life_expectancy:factor(region)Middle East *

## healthy_life_expectancy:factor(region)North Africa .

## healthy_life_expectancy:factor(region)North America

## healthy_life_expectancy:factor(region)Oceania .

## healthy_life_expectancy:factor(region)Other .

## healthy_life_expectancy:factor(region)South Asia

## healthy_life_expectancy:factor(region)Southeast Asia ***

## healthy_life_expectancy:factor(region)Sub-Saharan Africa .

```

```

## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa .
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia ***

## freedom_to_make_life_choices:factor(region)Southeast Asia ***
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***
## freedom_to_make_life_choices:factor(region)Western Europe **

## generosity:perceptions_of_corruption
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East ***
## generosity:factor(region)North Africa .
## generosity:factor(region)North America .
## generosity:factor(region)Oceania
## generosity:factor(region)Other *
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa **
## generosity:factor(region)Western Europe **

## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other *
## perceptions_of_corruption:factor(region)South Asia ***
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***
## perceptions_of_corruption:factor(region)Western Europe ***

## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Residual standard error: 0.4198 on 1217 degrees of freedom
## Multiple R-squared: 0.8659, Adjusted R-squared: 0.8552
## F-statistic: 81.01 on 97 and 1217 DF, p-value: < 2.2e-16

```

$I(social_support^2)$ is insignificant at $\alpha = 0.05$, so we will not include it and move to other variable.

Now, we will try to create higher order for freedom_to_make_life_choices

```
whr4 <- lm(happiness_score ~ gdp_per_capita +
             social_support +
             healthy_life_expectancy +
             freedom_to_make_life_choices + I(freedom_to_make_life_choices^2) +
             generosity +
             perceptions_of_corruption +
             factor(region) +
             (gdp_per_capita * healthy_life_expectancy) +
             (gdp_per_capita * freedom_to_make_life_choices) +
             (gdp_per_capita * perceptions_of_corruption) +
             (gdp_per_capita * factor(region)) +
             (social_support * factor(region)) +
             (healthy_life_expectancy * freedom_to_make_life_choices) +
             (healthy_life_expectancy * perceptions_of_corruption) +
             (healthy_life_expectancy * factor(region)) +
             (freedom_to_make_life_choices * factor(region)) +
             (generosity * perceptions_of_corruption) +
             (generosity * factor(region)) +
             (perceptions_of_corruption * factor(region)) , data = whr)
summary(whr4)
```

```
##  
## Call:  
## lm(formula = happiness_score ~ gdp_per_capita + social_support +  
##       healthy_life_expectancy + freedom_to_make_life_choices +  
##       I(freedom_to_make_life_choices^2) + generosity + perceptions_of_corruption +  
##       factor(region) + (gdp_per_capita * healthy_life_expectancy) +  
##       (gdp_per_capita * freedom_to_make_life_choices) + (gdp_per_capita *  
##       perceptions_of_corruption) + (gdp_per_capita * factor(region)) +  
##       (social_support * factor(region)) + (healthy_life_expectancy *  
##       freedom_to_make_life_choices) + (healthy_life_expectancy *  
##       perceptions_of_corruption) + (healthy_life_expectancy * factor(region)) +  
##       (freedom_to_make_life_choices * factor(region)) + (generosity *  
##       perceptions_of_corruption) + (generosity * factor(region)) +  
##       (perceptions_of_corruption * factor(region)), data = whr)  
##  
## Residuals:  
##      Min      1Q  Median      3Q     Max  
## -1.36694 -0.24563  0.00995  0.24889  1.30097  
##
```

```

## Coefficients:
##                                     Estimate
## (Intercept)                      3.12590
## gdp_per_capita                    0.25195
## social_support                   0.57724
## healthy_life_expectancy        -0.23132
## freedom_to_make_life_choices    5.82078
## I(freedom_to_make_life_choices^2) -1.82901
## generosity                       -0.29690
## perceptions_of_corruption       5.44812
## factor(region)CIS                -1.79834
## factor(region)East Asia          1.15149
## factor(region)Latin America and Caribbean -1.46638
## factor(region)Middle East        -3.36907
## factor(region)North Africa       -0.60369
## factor(region)North America      0.26122
## factor(region)Oceania            -0.15921
## factor(region)Other              -1.68031
## factor(region)South Asia         -0.26393
## factor(region)Southeast Asia     -1.32084
## factor(region)Sub-Saharan Africa -0.33893
## factor(region)Western Europe     -1.49545
## gdp_per_capita:healthy_life_expectancy 1.05898
## gdp_per_capita:freedom_to_make_life_choices -1.12086
## gdp_per_capita:perceptions_of_corruption -1.90986
## gdp_per_capita:factor(region)CIS 0.36123
## gdp_per_capita:factor(region)East Asia 0.21345
## gdp_per_capita:factor(region)Latin America and Caribbean 0.48289
## gdp_per_capita:factor(region)Middle East 0.84571
## gdp_per_capita:factor(region)North Africa -0.24774
## gdp_per_capita:factor(region)North America 0.00599
## gdp_per_capita:factor(region)Oceania 0.24352
## gdp_per_capita:factor(region)Other 0.73164
## gdp_per_capita:factor(region)South Asia 0.11283
## gdp_per_capita:factor(region)Southeast Asia 1.23936
## gdp_per_capita:factor(region)Sub-Saharan Africa 0.61473
## gdp_per_capita:factor(region)Western Europe 0.37956
## social_support:factor(region)CIS 0.21413
## social_support:factor(region)East Asia -0.35214
## social_support:factor(region)Latin America and Caribbean -0.45873
## social_support:factor(region)Middle East 0.55659
## social_support:factor(region)North Africa -0.34668
## social_support:factor(region)North America -0.49409
## social_support:factor(region)Oceania -0.52958
## social_support:factor(region)Other 0.21206

```

## social_support:factor(region)South Asia	0.25561
## social_support:factor(region)Southeast Asia	-0.12516
## social_support:factor(region)Sub-Saharan Africa	-0.43402
## social_support:factor(region)Western Europe	-0.29670
## healthy_life_expectancy:freedom_to_make_life_choices	-1.92454
## healthy_life_expectancy:perceptions_of_corruption	-2.58935
## healthy_life_expectancy:factor(region)CIS	0.80720
## healthy_life_expectancy:factor(region)East Asia	-0.24599
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.09725
## healthy_life_expectancy:factor(region)Middle East	0.99731
## healthy_life_expectancy:factor(region)North Africa	1.31400
## healthy_life_expectancy:factor(region)North America	0.36297
## healthy_life_expectancy:factor(region>Oceania	0.91728
## healthy_life_expectancy:factor(region)Other	0.65731
## healthy_life_expectancy:factor(region)South Asia	0.82649
## healthy_life_expectancy:factor(region>Southeast Asia	1.83702
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.71526
## healthy_life_expectancy:factor(region>Western Europe	1.13321
## freedom_to_make_life_choices:factor(region)CIS	0.21262
## freedom_to_make_life_choices:factor(region)East Asia	-2.87844
## freedom_to_make_life_choices:factor(region>Latin America and Caribbean	-0.03359
## freedom_to_make_life_choices:factor(region>Middle East	0.74764
## freedom_to_make_life_choices:factor(region>North Africa	-1.50005
## freedom_to_make_life_choices:factor(region>North America	0.05598
## freedom_to_make_life_choices:factor(region>Oceania	-0.14249
## freedom_to_make_life_choices:factor(region)Other	-0.31012
## freedom_to_make_life_choices:factor(region>South Asia	-4.56872
## freedom_to_make_life_choices:factor(region>Southeast Asia	-2.55206
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	-2.84081
## freedom_to_make_life_choices:factor(region>Western Europe	0.15964
## generosity:perceptions_of_corruption	-4.70137
## generosity:factor(region)CIS	1.06553
## generosity:factor(region)East Asia	-0.45026
## generosity:factor(region>Latin America and Caribbean	1.25744
## generosity:factor(region>Middle East	2.88710
## generosity:factor(region>North Africa	3.14543
## generosity:factor(region>North America	2.63335
## generosity:factor(region>Oceania	2.37494
## generosity:factor(region)Other	1.94210
## generosity:factor(region>South Asia	0.15896
## generosity:factor(region>Southeast Asia	0.37309
## generosity:factor(region>Sub-Saharan Africa	1.84418
## generosity:factor(region>Western Europe	2.14314
## perceptions_of_corruption:factor(region)CIS	-0.71097
## perceptions_of_corruption:factor(region>East Asia	2.66773

## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.86988
## perceptions_of_corruption:factor(region)Middle East	0.52037
## perceptions_of_corruption:factor(region)North Africa	1.26257
## perceptions_of_corruption:factor(region)North America	1.92757
## perceptions_of_corruption:factor(region>Oceania	1.45343
## perceptions_of_corruption:factor(region)Other	-2.23168
## perceptions_of_corruption:factor(region)South Asia	6.98789
## perceptions_of_corruption:factor(region>Southeast Asia	-0.01681
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-4.08301
## perceptions_of_corruption:factor(region>Western Europe	3.05673
## Std. Error	
## (Intercept)	0.51219
## gdp_per_capita	0.32258
## social_support	0.15316
## healthy_life_expectancy	0.52879
## freedom_to_make_life_choices	0.71788
## I(freedom_to_make_life_choices^2)	0.64985
## generosity	0.58610
## perceptions_of_corruption	1.16992
## factor(region>CIS	0.65158
## factor(region>East Asia	1.48274
## factor(region>Latin America and Caribbean	0.52204
## factor(region>Middle East	0.48105
## factor(region>North Africa	0.86483
## factor(region>North America	3.45070
## factor(region>Oceania	4.27604
## factor(region>Other	0.49105
## factor(region>South Asia	0.56635
## factor(region>Southeast Asia	0.78175
## factor(region>Sub-Saharan Africa	0.50087
## factor(region>Western Europe	0.79926
## gdp_per_capita:healthy_life_expectancy	0.30186
## gdp_per_capita:freedom_to_make_life_choices	0.36092
## gdp_per_capita:perceptions_of_corruption	0.47565
## gdp_per_capita:factor(region>CIS	0.28667
## gdp_per_capita:factor(region>East Asia	0.54166
## gdp_per_capita:factor(region>Latin America and Caribbean	0.24394
## gdp_per_capita:factor(region>Middle East	0.25978
## gdp_per_capita:factor(region>North Africa	0.46457
## gdp_per_capita:factor(region>North America	0.94902
## gdp_per_capita:factor(region>Oceania	0.94097
## gdp_per_capita:factor(region>Other	0.25267
## gdp_per_capita:factor(region>South Asia	0.33314
## gdp_per_capita:factor(region>Southeast Asia	0.26191
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.25316

## gdp_per_capita:factor(region)Western Europe	0.31814
## social_support:factor(region)CIS	0.25131
## social_support:factor(region)East Asia	0.36291
## social_support:factor(region)Latin America and Caribbean	0.21622
## social_support:factor(region)Middle East	0.24905
## social_support:factor(region)North Africa	0.32229
## social_support:factor(region)North America	0.60633
## social_support:factor(region)Oceania	0.57482
## social_support:factor(region)Other	0.25031
## social_support:factor(region)South Asia	0.27945
## social_support:factor(region)Southeast Asia	0.28155
## social_support:factor(region)Sub-Saharan Africa	0.18191
## social_support:factor(region)Western Europe	0.24000
## healthy_life_expectancy:freedom_to_make_life_choices	0.70602
## healthy_life_expectancy:perceptions_of_corruption	0.87857
## healthy_life_expectancy:factor(region)CIS	0.61644
## healthy_life_expectancy:factor(region)East Asia	0.70769
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41361
## healthy_life_expectancy:factor(region)Middle East	0.44118
## healthy_life_expectancy:factor(region)North Africa	0.77773
## healthy_life_expectancy:factor(region)North America	1.37504
## healthy_life_expectancy:factor(region)Oceania	1.39165
## healthy_life_expectancy:factor(region)Other	0.40769
## healthy_life_expectancy:factor(region)South Asia	0.57838
## healthy_life_expectancy:factor(region)Southeast Asia	0.49141
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.44048
## healthy_life_expectancy:factor(region)Western Europe	0.53279
## freedom_to_make_life_choices:factor(region)CIS	0.54473
## freedom_to_make_life_choices:factor(region)East Asia	1.23403
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44964
## freedom_to_make_life_choices:factor(region)Middle East	0.54624
## freedom_to_make_life_choices:factor(region)North Africa	0.63537
## freedom_to_make_life_choices:factor(region)North America	3.95668
## freedom_to_make_life_choices:factor(region)Oceania	3.75294
## freedom_to_make_life_choices:factor(region)Other	0.48864
## freedom_to_make_life_choices:factor(region)South Asia	0.71244
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.83979
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	0.51739
## freedom_to_make_life_choices:factor(region)Western Europe	0.54776
## generosity:perceptions_of_corruption	1.62032
## generosity:factor(region)CIS	0.89336
## generosity:factor(region)East Asia	1.54341
## generosity:factor(region)Latin America and Caribbean	0.74338
## generosity:factor(region)Middle East	0.79174
## generosity:factor(region)North Africa	1.81242

## generosity:factor(region)North America	1.66422
## generosity:factor(region)Oceania	1.77926
## generosity:factor(region)Other	0.82589
## generosity:factor(region)South Asia	0.88883
## generosity:factor(region)Southeast Asia	0.70246
## generosity:factor(region)Sub-Saharan Africa	0.71263
## generosity:factor(region)Western Europe	0.72008
## perceptions_of_corruption:factor(region)CIS	0.94763
## perceptions_of_corruption:factor(region)East Asia	2.93049
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.97764
## perceptions_of_corruption:factor(region)Middle East	0.95922
## perceptions_of_corruption:factor(region)North Africa	1.70902
## perceptions_of_corruption:factor(region)North America	2.88991
## perceptions_of_corruption:factor(region)Oceania	1.97403
## perceptions_of_corruption:factor(region)Other	0.94649
## perceptions_of_corruption:factor(region)South Asia	1.81037
## perceptions_of_corruption:factor(region)Southeast Asia	0.94584
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	0.94669
## perceptions_of_corruption:factor(region)Western Europe	0.87027
##	t value
## (Intercept)	6.103
## gdp_per_capita	0.781
## social_support	3.769
## healthy_life_expectancy	-0.437
## freedom_to_make_life_choices	8.108
## I(freedom_to_make_life_choices^2)	-2.815
## generosity	-0.507
## perceptions_of_corruption	4.657
## factor(region)CIS	-2.760
## factor(region)East Asia	0.777
## factor(region)Latin America and Caribbean	-2.809
## factor(region)Middle East	-7.004
## factor(region)North Africa	-0.698
## factor(region)North America	0.076
## factor(region)Oceania	-0.037
## factor(region)Other	-3.422
## factor(region)South Asia	-0.466
## factor(region)Southeast Asia	-1.690
## factor(region)Sub-Saharan Africa	-0.677
## factor(region)Western Europe	-1.871
## gdp_per_capita:healthy_life_expectancy	3.508
## gdp_per_capita:freedom_to_make_life_choices	-3.106
## gdp_per_capita:perceptions_of_corruption	-4.015
## gdp_per_capita:factor(region)CIS	1.260
## gdp_per_capita:factor(region)East Asia	0.394

## gdp_per_capita:factor(region)Latin America and Caribbean	1.980
## gdp_per_capita:factor(region)Middle East	3.256
## gdp_per_capita:factor(region)North Africa	-0.533
## gdp_per_capita:factor(region)North America	0.006
## gdp_per_capita:factor(region)Oceania	0.259
## gdp_per_capita:factor(region)Other	2.896
## gdp_per_capita:factor(region)South Asia	0.339
## gdp_per_capita:factor(region)Southeast Asia	4.732
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.428
## gdp_per_capita:factor(region)Western Europe	1.193
## social_support:factor(region)CIS	0.852
## social_support:factor(region)East Asia	-0.970
## social_support:factor(region)Latin America and Caribbean	-2.122
## social_support:factor(region)Middle East	2.235
## social_support:factor(region)North Africa	-1.076
## social_support:factor(region)North America	-0.815
## social_support:factor(region)Oceania	-0.921
## social_support:factor(region)Other	0.847
## social_support:factor(region)South Asia	0.915
## social_support:factor(region)Southeast Asia	-0.445
## social_support:factor(region)Sub-Saharan Africa	-2.386
## social_support:factor(region)Western Europe	-1.236
## healthy_life_expectancy:freedom_to_make_life_choices	-2.726
## healthy_life_expectancy:perceptions_of_corruption	-2.947
## healthy_life_expectancy:factor(region)CIS	1.309
## healthy_life_expectancy:factor(region)East Asia	-0.348
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.071
## healthy_life_expectancy:factor(region)Middle East	2.261
## healthy_life_expectancy:factor(region)North Africa	1.690
## healthy_life_expectancy:factor(region)North America	0.264
## healthy_life_expectancy:factor(region)Oceania	0.659
## healthy_life_expectancy:factor(region)Other	1.612
## healthy_life_expectancy:factor(region)South Asia	1.429
## healthy_life_expectancy:factor(region)Southeast Asia	3.738
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.624
## healthy_life_expectancy:factor(region)Western Europe	2.127
## freedom_to_make_life_choices:factor(region)CIS	0.390
## freedom_to_make_life_choices:factor(region)East Asia	-2.333
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.075
## freedom_to_make_life_choices:factor(region)Middle East	1.369
## freedom_to_make_life_choices:factor(region)North Africa	-2.361
## freedom_to_make_life_choices:factor(region)North America	0.014
## freedom_to_make_life_choices:factor(region)Oceania	-0.038
## freedom_to_make_life_choices:factor(region)Other	-0.635
## freedom_to_make_life_choices:factor(region)South Asia	-6.413

## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.039
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.491
## freedom_to_make_life_choices:factor(region)Western Europe	0.291
## generosity:perceptions_of_corruption	-2.902
## generosity:factor(region)CIS	1.193
## generosity:factor(region)East Asia	-0.292
## generosity:factor(region)Latin America and Caribbean	1.692
## generosity:factor(region)Middle East	3.647
## generosity:factor(region)North Africa	1.735
## generosity:factor(region)North America	1.582
## generosity:factor(region)Oceania	1.335
## generosity:factor(region)Other	2.352
## generosity:factor(region)South Asia	0.179
## generosity:factor(region)Southeast Asia	0.531
## generosity:factor(region)Sub-Saharan Africa	2.588
## generosity:factor(region)Western Europe	2.976
## perceptions_of_corruption:factor(region)CIS	-0.750
## perceptions_of_corruption:factor(region)East Asia	0.910
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.890
## perceptions_of_corruption:factor(region)Middle East	0.542
## perceptions_of_corruption:factor(region)North Africa	0.739
## perceptions_of_corruption:factor(region)North America	0.667
## perceptions_of_corruption:factor(region)Oceania	0.736
## perceptions_of_corruption:factor(region)Other	-2.358
## perceptions_of_corruption:factor(region)South Asia	3.860
## perceptions_of_corruption:factor(region)Southeast Asia	-0.018
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.313
## perceptions_of_corruption:factor(region)Western Europe	3.512
##	Pr(> t)
## (Intercept)	1.40e-09
## gdp_per_capita	0.434932
## social_support	0.000172
## healthy_life_expectancy	0.661860
## freedom_to_make_life_choices	1.24e-15
## I(freedom_to_make_life_choices^2)	0.004963
## generosity	0.612559
## perceptions_of_corruption	3.56e-06
## factor(region)CIS	0.005867
## factor(region)East Asia	0.437548
## factor(region)Latin America and Caribbean	0.005050
## factor(region)Middle East	4.12e-12
## factor(region)North Africa	0.485283
## factor(region)North America	0.939671
## factor(region)Oceania	0.970305
## factor(region)Other	0.000643

## factor(region)South Asia	0.641289
## factor(region)Southeast Asia	0.091360
## factor(region)Sub-Saharan Africa	0.498740
## factor(region)Western Europe	0.061579
## gdp_per_capita:healthy_life_expectancy	0.000468
## gdp_per_capita:freedom_to_make_life_choices	0.001943
## gdp_per_capita:perceptions_of_corruption	6.30e-05
## gdp_per_capita:factor(region)CIS	0.207880
## gdp_per_capita:factor(region)East Asia	0.693603
## gdp_per_capita:factor(region)Latin America and Caribbean	0.047978
## gdp_per_capita:factor(region)Middle East	0.001163
## gdp_per_capita:factor(region)North Africa	0.593949
## gdp_per_capita:factor(region)North America	0.994965
## gdp_per_capita:factor(region)Oceania	0.795833
## gdp_per_capita:factor(region)Other	0.003852
## gdp_per_capita:factor(region)South Asia	0.734904
## gdp_per_capita:factor(region)Southeast Asia	2.48e-06
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.015317
## gdp_per_capita:factor(region)Western Europe	0.233080
## social_support:factor(region)CIS	0.394332
## social_support:factor(region)East Asia	0.332076
## social_support:factor(region)Latin America and Caribbean	0.034077
## social_support:factor(region)Middle East	0.025606
## social_support:factor(region)North Africa	0.282286
## social_support:factor(region)North America	0.415295
## social_support:factor(region)Oceania	0.357077
## social_support:factor(region)Other	0.397060
## social_support:factor(region)South Asia	0.360522
## social_support:factor(region)Southeast Asia	0.656745
## social_support:factor(region)Sub-Saharan Africa	0.017187
## social_support:factor(region)Western Europe	0.216603
## healthy_life_expectancy:freedom_to_make_life_choices	0.006505
## healthy_life_expectancy:perceptions_of_corruption	0.003268
## healthy_life_expectancy:factor(region)CIS	0.190627
## healthy_life_expectancy:factor(region)East Asia	0.728201
## healthy_life_expectancy:factor(region)Latin America and Caribbean	4.58e-07
## healthy_life_expectancy:factor(region)Middle East	0.023961
## healthy_life_expectancy:factor(region)North Africa	0.091373
## healthy_life_expectancy:factor(region)North America	0.791848
## healthy_life_expectancy:factor(region)Oceania	0.509937
## healthy_life_expectancy:factor(region)Other	0.107161
## healthy_life_expectancy:factor(region)South Asia	0.153267
## healthy_life_expectancy:factor(region)Southeast Asia	0.000194
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.104674
## healthy_life_expectancy:factor(region)Western Europe	0.033626

## freedom_to_make_life_choices:factor(region)CIS	0.696365
## freedom_to_make_life_choices:factor(region)East Asia	0.019834
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.940452
## freedom_to_make_life_choices:factor(region)Middle East	0.171348
## freedom_to_make_life_choices:factor(region)North Africa	0.018387
## freedom_to_make_life_choices:factor(region)North America	0.988714
## freedom_to_make_life_choices:factor(region)Oceania	0.969721
## freedom_to_make_life_choices:factor(region)Other	0.525773
## freedom_to_make_life_choices:factor(region)South Asia	2.04e-10
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.002425
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	4.87e-08
## freedom_to_make_life_choices:factor(region)Western Europe	0.770764
## generosity:perceptions_of_corruption	0.003781
## generosity:factor(region)CIS	0.233209
## generosity:factor(region)East Asia	0.770543
## generosity:factor(region)Latin America and Caribbean	0.090995
## generosity:factor(region)Middle East	0.000277
## generosity:factor(region)North Africa	0.082907
## generosity:factor(region)North America	0.113833
## generosity:factor(region)Oceania	0.182193
## generosity:factor(region)Other	0.018856
## generosity:factor(region)South Asia	0.858095
## generosity:factor(region)Southeast Asia	0.595434
## generosity:factor(region)Sub-Saharan Africa	0.009773
## generosity:factor(region)Western Europe	0.002976
## perceptions_of_corruption:factor(region)CIS	0.453244
## perceptions_of_corruption:factor(region)East Asia	0.362826
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.373764
## perceptions_of_corruption:factor(region)Middle East	0.587578
## perceptions_of_corruption:factor(region)North Africa	0.460190
## perceptions_of_corruption:factor(region)North America	0.504898
## perceptions_of_corruption:factor(region)Oceania	0.461705
## perceptions_of_corruption:factor(region)Other	0.018539
## perceptions_of_corruption:factor(region)South Asia	0.000119
## perceptions_of_corruption:factor(region)Southeast Asia	0.985824
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	1.74e-05
## perceptions_of_corruption:factor(region)Western Europe	0.000460
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	***
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## I(freedom_to_make_life_choices^2)	**
## generosity	

```

## perceptions_of_corruption ***  

## factor(region)CIS **  

## factor(region)East Asia  

## factor(region)Latin America and Caribbean **  

## factor(region)Middle East ***  

## factor(region)North Africa  

## factor(region)North America  

## factor(region)Oceania  

## factor(region)Other ***  

## factor(region)South Asia  

## factor(region)Southeast Asia .  

## factor(region)Sub-Saharan Africa  

## factor(region)Western Europe .  

## gdp_per_capita:healthy_life_expectancy ***  

## gdp_per_capita:freedom_to_make_life_choices **  

## gdp_per_capita:perceptions_of_corruption ***  

## gdp_per_capita:factor(region)CIS  

## gdp_per_capita:factor(region)East Asia  

## gdp_per_capita:factor(region)Latin America and Caribbean *  

## gdp_per_capita:factor(region)Middle East **  

## gdp_per_capita:factor(region)North Africa  

## gdp_per_capita:factor(region)North America  

## gdp_per_capita:factor(region)Oceania  

## gdp_per_capita:factor(region)Other **  

## gdp_per_capita:factor(region)South Asia  

## gdp_per_capita:factor(region)Southeast Asia ***  

## gdp_per_capita:factor(region)Sub-Saharan Africa *  

## gdp_per_capita:factor(region)Western Europe  

## social_support:factor(region)CIS  

## social_support:factor(region)East Asia  

## social_support:factor(region)Latin America and Caribbean *  

## social_support:factor(region)Middle East *  

## social_support:factor(region)North Africa  

## social_support:factor(region)North America  

## social_support:factor(region)Oceania  

## social_support:factor(region)Other  

## social_support:factor(region)South Asia  

## social_support:factor(region)Southeast Asia  

## social_support:factor(region)Sub-Saharan Africa *  

## social_support:factor(region)Western Europe  

## healthy_life_expectancy:freedom_to_make_life_choices **  

## healthy_life_expectancy:perceptions_of_corruption **  

## healthy_life_expectancy:factor(region)CIS  

## healthy_life_expectancy:factor(region)East Asia  

## healthy_life_expectancy:factor(region)Latin America and Caribbean ***  


```

```

## healthy_life_expectancy:factor(region)Middle East *.
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia ***.
## healthy_life_expectancy:factor(region)Sub-Saharan Africa
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa *
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia ***.
## freedom_to_make_life_choices:factor(region)Southeast Asia **.
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***.
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption **.
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East ***.
## generosity:factor(region)North Africa .
## generosity:factor(region)North America
## generosity:factor(region)Oceania
## generosity:factor(region)Other *
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa **.
## generosity:factor(region)Western Europe **.
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other *
## perceptions_of_corruption:factor(region)South Asia ***.
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***.

```

```

## perceptions_of_corruption:factor(region)Western Europe ***

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4187 on 1217 degrees of freedom
## Multiple R-squared:  0.8666, Adjusted R-squared:  0.8559
## F-statistic: 81.48 on 97 and 1217 DF,  p-value: < 2.2e-16

```

$I(freedom_to_make_life_choices^2)$ is significant at $\alpha = 0.05$, so we can include it, but here the R^2_{adj} remains same. Therefore,, we will not include this term.

Now, we will try to create higher order for perceptions_of_corruption.

```

whr5 <- lm(happiness_score ~ gdp_per_capita +
             social_support +
             healthy_life_expectancy +
             freedom_to_make_life_choices +
             generosity +
             perceptions_of_corruption + I(perceptions_of_corruption^2) +
             factor(region) +
             (gdp_per_capita * healthy_life_expectancy) +
             (gdp_per_capita * freedom_to_make_life_choices) +
             (gdp_per_capita * perceptions_of_corruption) +
             (gdp_per_capita * factor(region)) +
             (social_support * factor(region)) +
             (healthy_life_expectancy * freedom_to_make_life_choices) +
             (healthy_life_expectancy * perceptions_of_corruption) +
             (healthy_life_expectancy * factor(region)) +
             (freedom_to_make_life_choices * factor(region)) +
             (generosity * perceptions_of_corruption) +
             (generosity * factor(region)) +
             (perceptions_of_corruption * factor(region)) , data = whr)

summary(whr5)

```

```

##
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + I(perceptions_of_corruption^2) +
##     factor(region) + (gdp_per_capita * healthy_life_expectancy) +
##     (gdp_per_capita * freedom_to_make_life_choices) + (gdp_per_capita *
##     perceptions_of_corruption) + (gdp_per_capita * factor(region)) +
##     (social_support * factor(region)) + (healthy_life_expectancy *
##     freedom_to_make_life_choices) + (healthy_life_expectancy *
##     perceptions_of_corruption) + (healthy_life_expectancy * factor(region)) +
##     (perceptions_of_corruption * factor(region)) +
##     (perceptions_of_corruption * factor(region)))

```

```

## (freedom_to_make_life_choices * factor(region)) + (generosity *
## perceptions_of_corruption) + (generosity * factor(region)) +
## (perceptions_of_corruption * factor(region)), data = whr)
##
## Residuals:
##      Min       1Q    Median       3Q      Max
## -1.35374 -0.24632  0.01092  0.25054  1.32025
##
## Coefficients:
##                               Estimate
## (Intercept)                  3.21189
## gdp_per_capita                 0.39808
## social_support                  0.57817
## healthy_life_expectancy      -0.20150
## freedom_to_make_life_choices     4.96229
## generosity                   -0.41669
## perceptions_of_corruption        5.10523
## I(perceptions_of_corruption^2)   -1.91758
## factor(region)CIS                -1.72214
## factor(region)East Asia           1.27588
## factor(region)Latin America and Caribbean -1.52492
## factor(region)Middle East          -3.43182
## factor(region)North Africa          -0.68046
## factor(region)North America          0.40817
## factor(region)Oceania                  0.02620
## factor(region)Other                  -1.72192
## factor(region)South Asia               -0.27264
## factor(region)Southeast Asia          -1.31715
## factor(region)Sub-Saharan Africa      -0.39472
## factor(region)Western Europe          -1.36841
## gdp_per_capita:healthy_life_expectancy  1.04809
## gdp_per_capita:freedom_to_make_life_choices -1.55594
## gdp_per_capita:perceptions_of_corruption -1.52297
## gdp_per_capita:factor(region)CIS          0.38080
## gdp_per_capita:factor(region)East Asia      0.16728
## gdp_per_capita:factor(region)Latin America and Caribbean 0.53604
## gdp_per_capita:factor(region)Middle East      0.81097
## gdp_per_capita:factor(region)North Africa      -0.26333
## gdp_per_capita:factor(region)North America      0.03964
## gdp_per_capita:factor(region)Oceania          0.24856
## gdp_per_capita:factor(region)Other            0.70258
## gdp_per_capita:factor(region)South Asia         0.12401
## gdp_per_capita:factor(region)Southeast Asia      1.33437
## gdp_per_capita:factor(region)Sub-Saharan Africa 0.58932
## gdp_per_capita:factor(region)Western Europe      0.34192

```

## social_support:factor(region)CIS	0.20945
## social_support:factor(region)East Asia	-0.31573
## social_support:factor(region)Latin America and Caribbean	-0.47585
## social_support:factor(region)Middle East	0.58528
## social_support:factor(region)North Africa	-0.34611
## social_support:factor(region)North America	-0.50070
## social_support:factor(region>Oceania	-0.52796
## social_support:factor(region)Other	0.21327
## social_support:factor(region)South Asia	0.26948
## social_support:factor(region>Southeast Asia	-0.10745
## social_support:factor(region>Sub-Saharan Africa	-0.42074
## social_support:factor(region>Western Europe	-0.31320
## healthy_life_expectancy:freedom_to_make_life_choices	-2.03731
## healthy_life_expectancy:perceptions_of_corruption	-2.32461
## healthy_life_expectancy:factor(region)CIS	0.79195
## healthy_life_expectancy:factor(region)East Asia	-0.34021
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.18860
## healthy_life_expectancy:factor(region)Middle East	1.10132
## healthy_life_expectancy:factor(region)North Africa	1.28638
## healthy_life_expectancy:factor(region)North America	0.35966
## healthy_life_expectancy:factor(region>Oceania	0.87679
## healthy_life_expectancy:factor(region)Other	0.64994
## healthy_life_expectancy:factor(region)South Asia	0.88079
## healthy_life_expectancy:factor(region>Southeast Asia	1.92093
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.73001
## healthy_life_expectancy:factor(region>Western Europe	1.11447
## freedom_to_make_life_choices:factor(region)CIS	-0.06852
## freedom_to_make_life_choices:factor(region)East Asia	-3.08932
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.22569
## freedom_to_make_life_choices:factor(region>Middle East	0.67217
## freedom_to_make_life_choices:factor(region>North Africa	-1.24707
## freedom_to_make_life_choices:factor(region>North America	-0.41965
## freedom_to_make_life_choices:factor(region>Oceania	-0.85293
## freedom_to_make_life_choices:factor(region)Other	-0.34760
## freedom_to_make_life_choices:factor(region>South Asia	-4.78593
## freedom_to_make_life_choices:factor(region>Southeast Asia	-3.12131
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	-2.86018
## freedom_to_make_life_choices:factor(region>Western Europe	-0.04114
## generosity:perceptions_of_corruption	-4.57565
## generosity:factor(region)CIS	1.04060
## generosity:factor(region)East Asia	-0.41540
## generosity:factor(region)Latin America and Caribbean	1.45088
## generosity:factor(region>Middle East	2.85164
## generosity:factor(region>North Africa	3.22095
## generosity:factor(region>North America	2.71196

## generosity:factor(region)Oceania	2.43248
## generosity:factor(region)Other	2.24931
## generosity:factor(region)South Asia	0.30051
## generosity:factor(region)Southeast Asia	0.60410
## generosity:factor(region)Sub-Saharan Africa	1.94151
## generosity:factor(region)Western Europe	2.13290
## perceptions_of_corruption:factor(region)CIS	-0.30002
## perceptions_of_corruption:factor(region)East Asia	3.12436
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.95384
## perceptions_of_corruption:factor(region)Middle East	0.94060
## perceptions_of_corruption:factor(region)North Africa	1.32948
## perceptions_of_corruption:factor(region)North America	2.34670
## perceptions_of_corruption:factor(region)Oceania	2.42269
## perceptions_of_corruption:factor(region)Other	-1.84822
## perceptions_of_corruption:factor(region)South Asia	7.16164
## perceptions_of_corruption:factor(region)Southeast Asia	0.47876
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-3.39933
## perceptions_of_corruption:factor(region)Western Europe	3.56537
##	Std. Error
## (Intercept)	0.51290
## gdp_per_capita	0.31823
## social_support	0.15349
## healthy_life_expectancy	0.52990
## freedom_to_make_life_choices	0.64863
## generosity	0.58725
## perceptions_of_corruption	1.17709
## I(perceptions_of_corruption^2)	1.15643
## factor(region)CIS	0.65273
## factor(region)East Asia	1.48539
## factor(region)Latin America and Caribbean	0.52300
## factor(region)Middle East	0.48215
## factor(region)North Africa	0.86643
## factor(region)North America	3.45815
## factor(region)Oceania	4.28450
## factor(region)Other	0.49263
## factor(region)South Asia	0.56762
## factor(region)Southeast Asia	0.78738
## factor(region)Sub-Saharan Africa	0.50477
## factor(region)Western Europe	0.80719
## gdp_per_capita:healthy_life_expectancy	0.30258
## gdp_per_capita:freedom_to_make_life_choices	0.32700
## gdp_per_capita:perceptions_of_corruption	0.51335
## gdp_per_capita:factor(region)CIS	0.28720
## gdp_per_capita:factor(region)East Asia	0.54277
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24368

## gdp_per_capita:factor(region)Middle East	0.26009
## gdp_per_capita:factor(region)North Africa	0.46551
## gdp_per_capita:factor(region)North America	0.95104
## gdp_per_capita:factor(region>Oceania	0.94392
## gdp_per_capita:factor(region)Other	0.25352
## gdp_per_capita:factor(region)South Asia	0.33381
## gdp_per_capita:factor(region>Southeast Asia	0.26196
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.25372
## gdp_per_capita:factor(region>Western Europe	0.32402
## social_support:factor(region)CIS	0.25184
## social_support:factor(region)East Asia	0.36351
## social_support:factor(region)Latin America and Caribbean	0.21658
## social_support:factor(region>Middle East	0.24929
## social_support:factor(region>North Africa	0.32297
## social_support:factor(region>North America	0.60761
## social_support:factor(region>Oceania	0.57604
## social_support:factor(region>Other	0.25103
## social_support:factor(region>South Asia	0.28000
## social_support:factor(region>Southeast Asia	0.28218
## social_support:factor(region>Sub-Saharan Africa	0.18261
## social_support:factor(region>Western Europe	0.24042
## healthy_life_expectancy:freedom_to_make_life_choices	0.70702
## healthy_life_expectancy:perceptions_of_corruption	0.88651
## healthy_life_expectancy:factor(region)CIS	0.61791
## healthy_life_expectancy:factor(region)East Asia	0.70851
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41307
## healthy_life_expectancy:factor(region>Middle East	0.44187
## healthy_life_expectancy:factor(region>North Africa	0.77941
## healthy_life_expectancy:factor(region>North America	1.37797
## healthy_life_expectancy:factor(region>Oceania	1.39489
## healthy_life_expectancy:factor(region>Other	0.40928
## healthy_life_expectancy:factor(region>South Asia	0.57941
## healthy_life_expectancy:factor(region>Southeast Asia	0.49383
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.44139
## healthy_life_expectancy:factor(region>Western Europe	0.53561
## freedom_to_make_life_choices:factor(region)CIS	0.53805
## freedom_to_make_life_choices:factor(region)East Asia	1.23463
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44532
## freedom_to_make_life_choices:factor(region>Middle East	0.54878
## freedom_to_make_life_choices:factor(region>North Africa	0.63038
## freedom_to_make_life_choices:factor(region>North America	3.96250
## freedom_to_make_life_choices:factor(region>Oceania	3.75316
## freedom_to_make_life_choices:factor(region>Other	0.48947
## freedom_to_make_life_choices:factor(region>South Asia	0.70992
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.81168

## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	0.51842
## freedom_to_make_life_choices:factor(region)Western Europe	0.54370
## generosity:perceptions_of_corruption	1.63423
## generosity:factor(region)CIS	0.89520
## generosity:factor(region)East Asia	1.54663
## generosity:factor(region)Latin America and Caribbean	0.74310
## generosity:factor(region)Middle East	0.79345
## generosity:factor(region)North Africa	1.81596
## generosity:factor(region)North America	1.66745
## generosity:factor(region>Oceania	1.78320
## generosity:factor(region)Other	0.82986
## generosity:factor(region)South Asia	0.88933
## generosity:factor(region>Southeast Asia	0.70303
## generosity:factor(region>Sub-Saharan Africa	0.71387
## generosity:factor(region>Western Europe	0.72646
## perceptions_of_corruption:factor(region)CIS	0.97204
## perceptions_of_corruption:factor(region)East Asia	2.93350
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.98279
## perceptions_of_corruption:factor(region>Middle East	0.98649
## perceptions_of_corruption:factor(region>North Africa	1.71560
## perceptions_of_corruption:factor(region>North America	2.90760
## perceptions_of_corruption:factor(region>Oceania	2.05549
## perceptions_of_corruption:factor(region)Other	0.97595
## perceptions_of_corruption:factor(region>South Asia	1.81750
## perceptions_of_corruption:factor(region>Southeast Asia	0.97794
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	1.07608
## perceptions_of_corruption:factor(region>Western Europe	0.92966
##	
## (Intercept)	6.262
## gdp_per_capita	1.251
## social_support	3.767
## healthy_life_expectancy	-0.380
## freedom_to_make_life_choices	7.650
## generosity	-0.710
## perceptions_of_corruption	4.337
## I(perceptions_of_corruption^2)	-1.658
## factor(region)CIS	-2.638
## factor(region)East Asia	0.859
## factor(region)Latin America and Caribbean	-2.916
## factor(region>Middle East	-7.118
## factor(region>North Africa	-0.785
## factor(region>North America	0.118
## factor(region>Oceania	0.006
## factor(region>Other	-3.495
## factor(region>South Asia	-0.480

## factor(region)Southeast Asia	-1.673
## factor(region)Sub-Saharan Africa	-0.782
## factor(region)Western Europe	-1.695
## gdp_per_capita:healthy_life_expectancy	3.464
## gdp_per_capita:freedom_to_make_life_choices	-4.758
## gdp_per_capita:perceptions_of_corruption	-2.967
## gdp_per_capita:factor(region)CIS	1.326
## gdp_per_capita:factor(region)East Asia	0.308
## gdp_per_capita:factor(region)Latin America and Caribbean	2.200
## gdp_per_capita:factor(region)Middle East	3.118
## gdp_per_capita:factor(region)North Africa	-0.566
## gdp_per_capita:factor(region)North America	0.042
## gdp_per_capita:factor(region)Oceania	0.263
## gdp_per_capita:factor(region)Other	2.771
## gdp_per_capita:factor(region)South Asia	0.372
## gdp_per_capita:factor(region)Southeast Asia	5.094
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.323
## gdp_per_capita:factor(region)Western Europe	1.055
## social_support:factor(region)CIS	0.832
## social_support:factor(region)East Asia	-0.869
## social_support:factor(region)Latin America and Caribbean	-2.197
## social_support:factor(region)Middle East	2.348
## social_support:factor(region)North Africa	-1.072
## social_support:factor(region)North America	-0.824
## social_support:factor(region)Oceania	-0.917
## social_support:factor(region)Other	0.850
## social_support:factor(region)South Asia	0.962
## social_support:factor(region)Southeast Asia	-0.381
## social_support:factor(region)Sub-Saharan Africa	-2.304
## social_support:factor(region)Western Europe	-1.303
## healthy_life_expectancy:freedom_to_make_life_choices	-2.882
## healthy_life_expectancy:perceptions_of_corruption	-2.622
## healthy_life_expectancy:factor(region)CIS	1.282
## healthy_life_expectancy:factor(region)East Asia	-0.480
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.298
## healthy_life_expectancy:factor(region)Middle East	2.492
## healthy_life_expectancy:factor(region)North Africa	1.650
## healthy_life_expectancy:factor(region)North America	0.261
## healthy_life_expectancy:factor(region)Oceania	0.629
## healthy_life_expectancy:factor(region)Other	1.588
## healthy_life_expectancy:factor(region)South Asia	1.520
## healthy_life_expectancy:factor(region)Southeast Asia	3.890
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.654
## healthy_life_expectancy:factor(region)Western Europe	2.081
## freedom_to_make_life_choices:factor(region)CIS	-0.127

## freedom_to_make_life_choices:factor(region)East Asia	-2.502
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.507
## freedom_to_make_life_choices:factor(region)Middle East	1.225
## freedom_to_make_life_choices:factor(region)North Africa	-1.978
## freedom_to_make_life_choices:factor(region)North America	-0.106
## freedom_to_make_life_choices:factor(region>Oceania	-0.227
## freedom_to_make_life_choices:factor(region)Other	-0.710
## freedom_to_make_life_choices:factor(region>South Asia	-6.741
## freedom_to_make_life_choices:factor(region>Southeast Asia	-3.846
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	-5.517
## freedom_to_make_life_choices:factor(region>Western Europe	-0.076
## generosity:perceptions_of_corruption	-2.800
## generosity:factor(region>CIS	1.162
## generosity:factor(region>East Asia	-0.269
## generosity:factor(region>Latin America and Caribbean	1.952
## generosity:factor(region>Middle East	3.594
## generosity:factor(region>North Africa	1.774
## generosity:factor(region>North America	1.626
## generosity:factor(region>Oceania	1.364
## generosity:factor(region>Other	2.710
## generosity:factor(region>South Asia	0.338
## generosity:factor(region>Southeast Asia	0.859
## generosity:factor(region>Sub-Saharan Africa	2.720
## generosity:factor(region>Western Europe	2.936
## perceptions_of_corruption:factor(region>CIS	-0.309
## perceptions_of_corruption:factor(region>East Asia	1.065
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.971
## perceptions_of_corruption:factor(region>Middle East	0.953
## perceptions_of_corruption:factor(region>North Africa	0.775
## perceptions_of_corruption:factor(region>North America	0.807
## perceptions_of_corruption:factor(region>Oceania	1.179
## perceptions_of_corruption:factor(region>Other	-1.894
## perceptions_of_corruption:factor(region>South Asia	3.940
## perceptions_of_corruption:factor(region>Southeast Asia	0.490
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-3.159
## perceptions_of_corruption:factor(region>Western Europe	3.835
##	Pr(> t)
## (Intercept)	5.25e-10
## gdp_per_capita	0.211201
## social_support	0.000173
## healthy_life_expectancy	0.703813
## freedom_to_make_life_choices	4.06e-14
## generosity	0.478116
## perceptions_of_corruption	1.56e-05
## I(perceptions_of_corruption^2)	0.097538

## factor(region)CIS	0.008437
## factor(region)East Asia	0.390536
## factor(region)Latin America and Caribbean	0.003614
## factor(region)Middle East	1.87e-12
## factor(region)North Africa	0.432393
## factor(region)North America	0.906061
## factor(region)Oceania	0.995121
## factor(region)Other	0.000490
## factor(region)South Asia	0.631082
## factor(region)Southeast Asia	0.094619
## factor(region)Sub-Saharan Africa	0.434380
## factor(region)Western Europe	0.090280
## gdp_per_capita:healthy_life_expectancy	0.000551
## gdp_per_capita:freedom_to_make_life_choices	2.19e-06
## gdp_per_capita:perceptions_of_corruption	0.003069
## gdp_per_capita:factor(region)CIS	0.185115
## gdp_per_capita:factor(region)East Asia	0.757988
## gdp_per_capita:factor(region)Latin America and Caribbean	0.028008
## gdp_per_capita:factor(region)Middle East	0.001863
## gdp_per_capita:factor(region)North Africa	0.571708
## gdp_per_capita:factor(region)North America	0.966761
## gdp_per_capita:factor(region)Oceania	0.792342
## gdp_per_capita:factor(region)Other	0.005668
## gdp_per_capita:factor(region)South Asia	0.710319
## gdp_per_capita:factor(region)Southeast Asia	4.06e-07
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.020361
## gdp_per_capita:factor(region)Western Europe	0.291537
## social_support:factor(region)CIS	0.405747
## social_support:factor(region)East Asia	0.385262
## social_support:factor(region)Latin America and Caribbean	0.028204
## social_support:factor(region)Middle East	0.019046
## social_support:factor(region)North Africa	0.284098
## social_support:factor(region)North America	0.410077
## social_support:factor(region)Oceania	0.359566
## social_support:factor(region)Other	0.395719
## social_support:factor(region)South Asia	0.336027
## social_support:factor(region)Southeast Asia	0.703440
## social_support:factor(region)Sub-Saharan Africa	0.021387
## social_support:factor(region)Western Europe	0.192920
## healthy_life_expectancy:freedom_to_make_life_choices	0.004026
## healthy_life_expectancy:perceptions_of_corruption	0.008846
## healthy_life_expectancy:factor(region)CIS	0.200208
## healthy_life_expectancy:factor(region)East Asia	0.631182
## healthy_life_expectancy:factor(region)Latin America and Caribbean	1.39e-07
## healthy_life_expectancy:factor(region)Middle East	0.012821

## healthy_life_expectancy:factor(region)North Africa	0.099106
## healthy_life_expectancy:factor(region)North America	0.794132
## healthy_life_expectancy:factor(region)Oceania	0.529748
## healthy_life_expectancy:factor(region)Other	0.112538
## healthy_life_expectancy:factor(region)South Asia	0.128729
## healthy_life_expectancy:factor(region)Southeast Asia	0.000106
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.098407
## healthy_life_expectancy:factor(region)Western Europe	0.037666
## freedom_to_make_life_choices:factor(region)CIS	0.898681
## freedom_to_make_life_choices:factor(region)East Asia	0.012472
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.612389
## freedom_to_make_life_choices:factor(region)Middle East	0.220876
## freedom_to_make_life_choices:factor(region)North Africa	0.048123
## freedom_to_make_life_choices:factor(region)North America	0.915674
## freedom_to_make_life_choices:factor(region)Oceania	0.820262
## freedom_to_make_life_choices:factor(region)Other	0.477749
## freedom_to_make_life_choices:factor(region)South Asia	2.42e-11
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.000127
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	4.21e-08
## freedom_to_make_life_choices:factor(region)Western Europe	0.939703
## generosity:perceptions_of_corruption	0.005193
## generosity:factor(region)CIS	0.245290
## generosity:factor(region)East Asia	0.788294
## generosity:factor(region)Latin America and Caribbean	0.051109
## generosity:factor(region)Middle East	0.000339
## generosity:factor(region)North Africa	0.076363
## generosity:factor(region)North America	0.104121
## generosity:factor(region)Oceania	0.172785
## generosity:factor(region)Other	0.006813
## generosity:factor(region)South Asia	0.735492
## generosity:factor(region)Southeast Asia	0.390351
## generosity:factor(region)Sub-Saharan Africa	0.006627
## generosity:factor(region)Western Europe	0.003387
## perceptions_of_corruption:factor(region)CIS	0.757644
## perceptions_of_corruption:factor(region)East Asia	0.287060
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.331969
## perceptions_of_corruption:factor(region)Middle East	0.340536
## perceptions_of_corruption:factor(region)North Africa	0.438529
## perceptions_of_corruption:factor(region)North America	0.419770
## perceptions_of_corruption:factor(region)Oceania	0.238769
## perceptions_of_corruption:factor(region)Other	0.058494
## perceptions_of_corruption:factor(region)South Asia	8.60e-05
## perceptions_of_corruption:factor(region)Southeast Asia	0.624533
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	0.001622
## perceptions_of_corruption:factor(region)Western Europe	0.000132

```

##                                     ***
## (Intercept)                                ***
## gdp_per_capita                            ***
## social_support                             ***
## healthy_life_expectancy                   ***
## freedom_to_make_life_choices             ***
## generosity                                ***
## perceptions_of_corruption                ***
## I(perceptions_of_corruption^2)           .
## factor(region)CIS                         **
## factor(region)East Asia                    ***
## factor(region)Latin America and Caribbean **
## factor(region)Middle East                  ***
## factor(region)North Africa                 *
## factor(region)North America                ***
## factor(region)Oceania                      ***
## factor(region)Other                        ***
## factor(region)South Asia                   .*
## factor(region)Southeast Asia              .*
## factor(region)Sub-Saharan Africa          .*
## factor(region)Western Europe               .*
## gdp_per_capita:healthy_life_expectancy    ***
## gdp_per_capita:freedom_to_make_life_choices ***
## gdp_per_capita:perceptions_of_corruption   **
## gdp_per_capita:factor(region)CIS           **
## gdp_per_capita:factor(region)East Asia     *
## gdp_per_capita:factor(region)Latin America and Caribbean *
## gdp_per_capita:factor(region)Middle East    **
## gdp_per_capita:factor(region)North Africa   *
## gdp_per_capita:factor(region)North America  *
## gdp_per_capita:factor(region)Oceania         *
## gdp_per_capita:factor(region)Other           **
## gdp_per_capita:factor(region)South Asia      ***
## gdp_per_capita:factor(region)Southeast Asia  *
## gdp_per_capita:factor(region)Sub-Saharan Africa *
## gdp_per_capita:factor(region)Western Europe   *
## social_support:factor(region)CIS            *
## social_support:factor(region)East Asia       *
## social_support:factor(region)Latin America and Caribbean *
## social_support:factor(region)Middle East      *
## social_support:factor(region)North Africa     *
## social_support:factor(region)North America    *
## social_support:factor(region)Oceania          *
## social_support:factor(region)Other            *
## social_support:factor(region)South Asia        *

```

```

## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa * 
## social_support:factor(region)Western Europe
## healthy_life_expectancy:freedom_to_make_life_choices ** 
## healthy_life_expectancy:perceptions_of_corruption ** 
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean *** 
## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia *** 
## healthy_life_expectancy:factor(region)Sub-Saharan Africa .
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa *
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia *** 
## freedom_to_make_life_choices:factor(region)Southeast Asia *** 
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa *** 
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption **
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East *** 
## generosity:factor(region)North Africa .
## generosity:factor(region)North America
## generosity:factor(region)Oceania
## generosity:factor(region)Other **
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa ** 
## generosity:factor(region)Western Europe ** 
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean

```

```

## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other
## perceptions_of_corruption:factor(region)South Asia *** .
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ** 
## perceptions_of_corruption:factor(region)Western Europe ***

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4196 on 1217 degrees of freedom
## Multiple R-squared:  0.866, Adjusted R-squared:  0.8553
## F-statistic: 81.09 on 97 and 1217 DF, p-value: < 2.2e-16

```

$I(\text{perceptions_of_corruption}^2)$ is significant at $\alpha = 0.05$, so we can include it, but here the R^2_{adj} remains same. Therefore,, we will not include this term.

Now, we will try to create higher order for generosity.

```

whr6 <- lm(happiness_score ~ gdp_per_capita +
             social_support +
             healthy_life_expectancy +
             freedom_to_make_life_choices +
             generosity + I(generosity^2) +
             perceptions_of_corruption +
             factor(region) +
             (gdp_per_capita * healthy_life_expectancy) +
             (gdp_per_capita * freedom_to_make_life_choices) +
             (gdp_per_capita * perceptions_of_corruption) +
             (gdp_per_capita * factor(region)) +
             (social_support * factor(region)) +
             (healthy_life_expectancy * freedom_to_make_life_choices) +
             (healthy_life_expectancy * perceptions_of_corruption) +
             (healthy_life_expectancy * factor(region)) +
             (freedom_to_make_life_choices * factor(region)) +
             (generosity * perceptions_of_corruption) +
             (generosity * factor(region)) +
             (perceptions_of_corruption * factor(region)) , data = whr5)

summary(whr5)

```

```

## 
## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +

```

```

## healthy_life_expectancy + freedom_to_make_life_choices +
## generosity + perceptions_of_corruption + I(perceptions_of_corruption^2) +
## factor(region) + (gdp_per_capita * healthy_life_expectancy) +
## (gdp_per_capita * freedom_to_make_life_choices) + (gdp_per_capita *
## perceptions_of_corruption) + (gdp_per_capita * factor(region)) +
## (social_support * factor(region)) + (healthy_life_expectancy *
## freedom_to_make_life_choices) + (healthy_life_expectancy *
## perceptions_of_corruption) + (healthy_life_expectancy * factor(region)) +
## (freedom_to_make_life_choices * factor(region)) + (generosity *
## perceptions_of_corruption) + (generosity * factor(region)) +
## (perceptions_of_corruption * factor(region)), data = whr
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.35374 -0.24632  0.01092  0.25054  1.32025
##
## Coefficients:
##                               Estimate
## (Intercept)                      3.21189
## gdp_per_capita                    0.39808
## social_support                   0.57817
## healthy_life_expectancy          -0.20150
## freedom_to_make_life_choices     4.96229
## generosity                       -0.41669
## perceptions_of_corruption        5.10523
## I(perceptions_of_corruption^2)   -1.91758
## factor(region)CIS                -1.72214
## factor(region)East Asia           1.27588
## factor(region)Latin America and Caribbean -1.52492
## factor(region)Middle East         -3.43182
## factor(region)North Africa        -0.68046
## factor(region)North America       0.40817
## factor(region)Oceania            0.02620
## factor(region)Other              -1.72192
## factor(region)South Asia          -0.27264
## factor(region)Southeast Asia      -1.31715
## factor(region)Sub-Saharan Africa -0.39472
## factor(region)Western Europe      -1.36841
## gdp_per_capita:healthy_life_expectancy 1.04809
## gdp_per_capita:freedom_to_make_life_choices -1.55594
## gdp_per_capita:perceptions_of_corruption -1.52297
## gdp_per_capita:factor(region)CIS      0.38080
## gdp_per_capita:factor(region)East Asia 0.16728
## gdp_per_capita:factor(region)Latin America and Caribbean 0.53604
## gdp_per_capita:factor(region)Middle East 0.81097

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## gdp_per_capita:factor(region)North Africa	-0.26333
## gdp_per_capita:factor(region)North America	0.03964
## gdp_per_capita:factor(region)Oceania	0.24856
## gdp_per_capita:factor(region)Other	0.70258
## gdp_per_capita:factor(region)South Asia	0.12401
## gdp_per_capita:factor(region)Southeast Asia	1.33437
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.58932
## gdp_per_capita:factor(region)Western Europe	0.34192
## social_support:factor(region)CIS	0.20945
## social_support:factor(region)East Asia	-0.31573
## social_support:factor(region)Latin America and Caribbean	-0.47585
## social_support:factor(region)Middle East	0.58528
## social_support:factor(region)North Africa	-0.34611
## social_support:factor(region)North America	-0.50070
## social_support:factor(region)Oceania	-0.52796
## social_support:factor(region)Other	0.21327
## social_support:factor(region)South Asia	0.26948
## social_support:factor(region)Southeast Asia	-0.10745
## social_support:factor(region)Sub-Saharan Africa	-0.42074
## social_support:factor(region)Western Europe	-0.31320
## healthy_life_expectancy:freedom_to_make_life_choices	-2.03731
## healthy_life_expectancy:perceptions_of_corruption	-2.32461
## healthy_life_expectancy:factor(region)CIS	0.79195
## healthy_life_expectancy:factor(region)East Asia	-0.34021
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.18860
## healthy_life_expectancy:factor(region)Middle East	1.10132
## healthy_life_expectancy:factor(region)North Africa	1.28638
## healthy_life_expectancy:factor(region)North America	0.35966
## healthy_life_expectancy:factor(region)Oceania	0.87679
## healthy_life_expectancy:factor(region)Other	0.64994
## healthy_life_expectancy:factor(region)South Asia	0.88079
## healthy_life_expectancy:factor(region)Southeast Asia	1.92093
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.73001
## healthy_life_expectancy:factor(region)Western Europe	1.11447
## freedom_to_make_life_choices:factor(region)CIS	-0.06852
## freedom_to_make_life_choices:factor(region)East Asia	-3.08932
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.22569
## freedom_to_make_life_choices:factor(region)Middle East	0.67217
## freedom_to_make_life_choices:factor(region)North Africa	-1.24707
## freedom_to_make_life_choices:factor(region)North America	-0.41965
## freedom_to_make_life_choices:factor(region)Oceania	-0.85293
## freedom_to_make_life_choices:factor(region)Other	-0.34760
## freedom_to_make_life_choices:factor(region)South Asia	-4.78593
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.12131
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-2.86018

## freedom_to_make_life_choices:factor(region)Western Europe	-0.04114
## generosity:perceptions_of_corruption	-4.57565
## generosity:factor(region)CIS	1.04060
## generosity:factor(region)East Asia	-0.41540
## generosity:factor(region)Latin America and Caribbean	1.45088
## generosity:factor(region)Middle East	2.85164
## generosity:factor(region)North Africa	3.22095
## generosity:factor(region)North America	2.71196
## generosity:factor(region>Oceania	2.43248
## generosity:factor(region)Other	2.24931
## generosity:factor(region)South Asia	0.30051
## generosity:factor(region>Southeast Asia	0.60410
## generosity:factor(region>Sub-Saharan Africa	1.94151
## generosity:factor(region>Western Europe	2.13290
## perceptions_of_corruption:factor(region)CIS	-0.30002
## perceptions_of_corruption:factor(region)East Asia	3.12436
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.95384
## perceptions_of_corruption:factor(region>Middle East	0.94060
## perceptions_of_corruption:factor(region>North Africa	1.32948
## perceptions_of_corruption:factor(region>North America	2.34670
## perceptions_of_corruption:factor(region>Oceania	2.42269
## perceptions_of_corruption:factor(region)Other	-1.84822
## perceptions_of_corruption:factor(region>South Asia	7.16164
## perceptions_of_corruption:factor(region>Southeast Asia	0.47876
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-3.39933
## perceptions_of_corruption:factor(region>Western Europe	3.56537
##	Std. Error
## (Intercept)	0.51290
## gdp_per_capita	0.31823
## social_support	0.15349
## healthy_life_expectancy	0.52990
## freedom_to_make_life_choices	0.64863
## generosity	0.58725
## perceptions_of_corruption	1.17709
## I(perceptions_of_corruption^2)	1.15643
## factor(region)CIS	0.65273
## factor(region)East Asia	1.48539
## factor(region)Latin America and Caribbean	0.52300
## factor(region>Middle East	0.48215
## factor(region>North Africa	0.86643
## factor(region>North America	3.45815
## factor(region>Oceania	4.28450
## factor(region>Other	0.49263
## factor(region>South Asia	0.56762
## factor(region>Southeast Asia	0.78738

## factor(region)Sub-Saharan Africa	0.50477
## factor(region)Western Europe	0.80719
## gdp_per_capita:healthy_life_expectancy	0.30258
## gdp_per_capita:freedom_to_make_life_choices	0.32700
## gdp_per_capita:perceptions_of_corruption	0.51335
## gdp_per_capita:factor(region)CIS	0.28720
## gdp_per_capita:factor(region)East Asia	0.54277
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24368
## gdp_per_capita:factor(region)Middle East	0.26009
## gdp_per_capita:factor(region)North Africa	0.46551
## gdp_per_capita:factor(region)North America	0.95104
## gdp_per_capita:factor(region)Oceania	0.94392
## gdp_per_capita:factor(region)Other	0.25352
## gdp_per_capita:factor(region)South Asia	0.33381
## gdp_per_capita:factor(region)Southeast Asia	0.26196
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.25372
## gdp_per_capita:factor(region)Western Europe	0.32402
## social_support:factor(region)CIS	0.25184
## social_support:factor(region)East Asia	0.36351
## social_support:factor(region)Latin America and Caribbean	0.21658
## social_support:factor(region)Middle East	0.24929
## social_support:factor(region)North Africa	0.32297
## social_support:factor(region)North America	0.60761
## social_support:factor(region)Oceania	0.57604
## social_support:factor(region)Other	0.25103
## social_support:factor(region)South Asia	0.28000
## social_support:factor(region)Southeast Asia	0.28218
## social_support:factor(region)Sub-Saharan Africa	0.18261
## social_support:factor(region)Western Europe	0.24042
## healthy_life_expectancy:freedom_to_make_life_choices	0.70702
## healthy_life_expectancy:perceptions_of_corruption	0.88651
## healthy_life_expectancy:factor(region)CIS	0.61791
## healthy_life_expectancy:factor(region)East Asia	0.70851
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41307
## healthy_life_expectancy:factor(region)Middle East	0.44187
## healthy_life_expectancy:factor(region)North Africa	0.77941
## healthy_life_expectancy:factor(region)North America	1.37797
## healthy_life_expectancy:factor(region)Oceania	1.39489
## healthy_life_expectancy:factor(region)Other	0.40928
## healthy_life_expectancy:factor(region)South Asia	0.57941
## healthy_life_expectancy:factor(region)Southeast Asia	0.49383
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.44139
## healthy_life_expectancy:factor(region)Western Europe	0.53561
## freedom_to_make_life_choices:factor(region)CIS	0.53805
## freedom_to_make_life_choices:factor(region)East Asia	1.23463

	t value
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.44532
## freedom_to_make_life_choices:factor(region)Middle East	0.54878
## freedom_to_make_life_choices:factor(region)North Africa	0.63038
## freedom_to_make_life_choices:factor(region)North America	3.96250
## freedom_to_make_life_choices:factor(region)Oceania	3.75316
## freedom_to_make_life_choices:factor(region)Other	0.48947
## freedom_to_make_life_choices:factor(region)South Asia	0.70992
## freedom_to_make_life_choices:factor(region)Southeast Asia	0.81168
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	0.51842
## freedom_to_make_life_choices:factor(region)Western Europe	0.54370
## generosity:perceptions_of_corruption	1.63423
## generosity:factor(region)CIS	0.89520
## generosity:factor(region)East Asia	1.54663
## generosity:factor(region)Latin America and Caribbean	0.74310
## generosity:factor(region)Middle East	0.79345
## generosity:factor(region)North Africa	1.81596
## generosity:factor(region)North America	1.66745
## generosity:factor(region)Oceania	1.78320
## generosity:factor(region)Other	0.82986
## generosity:factor(region)South Asia	0.88933
## generosity:factor(region)Southeast Asia	0.70303
## generosity:factor(region)Sub-Saharan Africa	0.71387
## generosity:factor(region)Western Europe	0.72646
## perceptions_of_corruption:factor(region)CIS	0.97204
## perceptions_of_corruption:factor(region)East Asia	2.93350
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.98279
## perceptions_of_corruption:factor(region)Middle East	0.98649
## perceptions_of_corruption:factor(region)North Africa	1.71560
## perceptions_of_corruption:factor(region)North America	2.90760
## perceptions_of_corruption:factor(region)Oceania	2.05549
## perceptions_of_corruption:factor(region)Other	0.97595
## perceptions_of_corruption:factor(region)South Asia	1.81750
## perceptions_of_corruption:factor(region)Southeast Asia	0.97794
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	1.07608
## perceptions_of_corruption:factor(region)Western Europe	0.92966
##	
## (Intercept)	6.262
## gdp_per_capita	1.251
## social_support	3.767
## healthy_life_expectancy	-0.380
## freedom_to_make_life_choices	7.650
## generosity	-0.710
## perceptions_of_corruption	4.337
## I(perceptions_of_corruption^2)	-1.658
## factor(region)CIS	-2.638

## factor(region)East Asia	0.859
## factor(region)Latin America and Caribbean	-2.916
## factor(region)Middle East	-7.118
## factor(region)North Africa	-0.785
## factor(region)North America	0.118
## factor(region)Oceania	0.006
## factor(region)Other	-3.495
## factor(region)South Asia	-0.480
## factor(region)Southeast Asia	-1.673
## factor(region)Sub-Saharan Africa	-0.782
## factor(region)Western Europe	-1.695
## gdp_per_capita:healthy_life_expectancy	3.464
## gdp_per_capita:freedom_to_make_life_choices	-4.758
## gdp_per_capita:perceptions_of_corruption	-2.967
## gdp_per_capita:factor(region)CIS	1.326
## gdp_per_capita:factor(region)East Asia	0.308
## gdp_per_capita:factor(region)Latin America and Caribbean	2.200
## gdp_per_capita:factor(region)Middle East	3.118
## gdp_per_capita:factor(region)North Africa	-0.566
## gdp_per_capita:factor(region)North America	0.042
## gdp_per_capita:factor(region)Oceania	0.263
## gdp_per_capita:factor(region)Other	2.771
## gdp_per_capita:factor(region)South Asia	0.372
## gdp_per_capita:factor(region)Southeast Asia	5.094
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.323
## gdp_per_capita:factor(region)Western Europe	1.055
## social_support:factor(region)CIS	0.832
## social_support:factor(region)East Asia	-0.869
## social_support:factor(region)Latin America and Caribbean	-2.197
## social_support:factor(region)Middle East	2.348
## social_support:factor(region)North Africa	-1.072
## social_support:factor(region)North America	-0.824
## social_support:factor(region)Oceania	-0.917
## social_support:factor(region)Other	0.850
## social_support:factor(region)South Asia	0.962
## social_support:factor(region)Southeast Asia	-0.381
## social_support:factor(region)Sub-Saharan Africa	-2.304
## social_support:factor(region)Western Europe	-1.303
## healthy_life_expectancy:freedom_to_make_life_choices	-2.882
## healthy_life_expectancy:perceptions_of_corruption	-2.622
## healthy_life_expectancy:factor(region)CIS	1.282
## healthy_life_expectancy:factor(region)East Asia	-0.480
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.298
## healthy_life_expectancy:factor(region)Middle East	2.492
## healthy_life_expectancy:factor(region)North Africa	1.650

## healthy_life_expectancy:factor(region)North America	0.261
## healthy_life_expectancy:factor(region)Oceania	0.629
## healthy_life_expectancy:factor(region)Other	1.588
## healthy_life_expectancy:factor(region)South Asia	1.520
## healthy_life_expectancy:factor(region)Southeast Asia	3.890
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.654
## healthy_life_expectancy:factor(region)Western Europe	2.081
## freedom_to_make_life_choices:factor(region)CIS	-0.127
## freedom_to_make_life_choices:factor(region)East Asia	-2.502
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.507
## freedom_to_make_life_choices:factor(region)Middle East	1.225
## freedom_to_make_life_choices:factor(region)North Africa	-1.978
## freedom_to_make_life_choices:factor(region)North America	-0.106
## freedom_to_make_life_choices:factor(region)Oceania	-0.227
## freedom_to_make_life_choices:factor(region)Other	-0.710
## freedom_to_make_life_choices:factor(region)South Asia	-6.741
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.846
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.517
## freedom_to_make_life_choices:factor(region)Western Europe	-0.076
## generosity:perceptions_of_corruption	-2.800
## generosity:factor(region)CIS	1.162
## generosity:factor(region)East Asia	-0.269
## generosity:factor(region)Latin America and Caribbean	1.952
## generosity:factor(region)Middle East	3.594
## generosity:factor(region)North Africa	1.774
## generosity:factor(region)North America	1.626
## generosity:factor(region)Oceania	1.364
## generosity:factor(region)Other	2.710
## generosity:factor(region)South Asia	0.338
## generosity:factor(region)Southeast Asia	0.859
## generosity:factor(region)Sub-Saharan Africa	2.720
## generosity:factor(region)Western Europe	2.936
## perceptions_of_corruption:factor(region)CIS	-0.309
## perceptions_of_corruption:factor(region)East Asia	1.065
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.971
## perceptions_of_corruption:factor(region)Middle East	0.953
## perceptions_of_corruption:factor(region)North Africa	0.775
## perceptions_of_corruption:factor(region)North America	0.807
## perceptions_of_corruption:factor(region)Oceania	1.179
## perceptions_of_corruption:factor(region)Other	-1.894
## perceptions_of_corruption:factor(region)South Asia	3.940
## perceptions_of_corruption:factor(region)Southeast Asia	0.490
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-3.159
## perceptions_of_corruption:factor(region)Western Europe	3.835
##	Pr(> t)

## (Intercept)	5.25e-10
## gdp_per_capita	0.211201
## social_support	0.000173
## healthy_life_expectancy	0.703813
## freedom_to_make_life_choices	4.06e-14
## generosity	0.478116
## perceptions_of_corruption	1.56e-05
## I(perceptions_of_corruption^2)	0.097538
## factor(region)CIS	0.008437
## factor(region)East Asia	0.390536
## factor(region)Latin America and Caribbean	0.003614
## factor(region)Middle East	1.87e-12
## factor(region)North Africa	0.432393
## factor(region)North America	0.906061
## factor(region)Oceania	0.995121
## factor(region)Other	0.000490
## factor(region)South Asia	0.631082
## factor(region)Southeast Asia	0.094619
## factor(region)Sub-Saharan Africa	0.434380
## factor(region)Western Europe	0.090280
## gdp_per_capita:healthy_life_expectancy	0.000551
## gdp_per_capita:freedom_to_make_life_choices	2.19e-06
## gdp_per_capita:perceptions_of_corruption	0.003069
## gdp_per_capita:factor(region)CIS	0.185115
## gdp_per_capita:factor(region)East Asia	0.757988
## gdp_per_capita:factor(region)Latin America and Caribbean	0.028008
## gdp_per_capita:factor(region)Middle East	0.001863
## gdp_per_capita:factor(region)North Africa	0.571708
## gdp_per_capita:factor(region)North America	0.966761
## gdp_per_capita:factor(region)Oceania	0.792342
## gdp_per_capita:factor(region)Other	0.005668
## gdp_per_capita:factor(region)South Asia	0.710319
## gdp_per_capita:factor(region)Southeast Asia	4.06e-07
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.020361
## gdp_per_capita:factor(region)Western Europe	0.291537
## social_support:factor(region)CIS	0.405747
## social_support:factor(region)East Asia	0.385262
## social_support:factor(region)Latin America and Caribbean	0.028204
## social_support:factor(region)Middle East	0.019046
## social_support:factor(region)North Africa	0.284098
## social_support:factor(region)North America	0.410077
## social_support:factor(region)Oceania	0.359566
## social_support:factor(region)Other	0.395719
## social_support:factor(region)South Asia	0.336027
## social_support:factor(region)Southeast Asia	0.703440

## social_support:factor(region)Sub-Saharan Africa	0.021387
## social_support:factor(region)Western Europe	0.192920
## healthy_life_expectancy:freedom_to_make_life_choices	0.004026
## healthy_life_expectancy:perceptions_of_corruption	0.008846
## healthy_life_expectancy:factor(region)CIS	0.200208
## healthy_life_expectancy:factor(region)East Asia	0.631182
## healthy_life_expectancy:factor(region)Latin America and Caribbean	1.39e-07
## healthy_life_expectancy:factor(region)Middle East	0.012821
## healthy_life_expectancy:factor(region)North Africa	0.099106
## healthy_life_expectancy:factor(region)North America	0.794132
## healthy_life_expectancy:factor(region>Oceania	0.529748
## healthy_life_expectancy:factor(region)Other	0.112538
## healthy_life_expectancy:factor(region)South Asia	0.128729
## healthy_life_expectancy:factor(region>Southeast Asia	0.000106
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.098407
## healthy_life_expectancy:factor(region>Western Europe	0.037666
## freedom_to_make_life_choices:factor(region)CIS	0.898681
## freedom_to_make_life_choices:factor(region)East Asia	0.012472
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.612389
## freedom_to_make_life_choices:factor(region>Middle East	0.220876
## freedom_to_make_life_choices:factor(region>North Africa	0.048123
## freedom_to_make_life_choices:factor(region>North America	0.915674
## freedom_to_make_life_choices:factor(region>Oceania	0.820262
## freedom_to_make_life_choices:factor(region>Other	0.477749
## freedom_to_make_life_choices:factor(region>South Asia	2.42e-11
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.000127
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	4.21e-08
## freedom_to_make_life_choices:factor(region>Western Europe	0.939703
## generosity:perceptions_of_corruption	0.005193
## generosity:factor(region)CIS	0.245290
## generosity:factor(region)East Asia	0.788294
## generosity:factor(region)Latin America and Caribbean	0.051109
## generosity:factor(region>Middle East	0.000339
## generosity:factor(region>North Africa	0.076363
## generosity:factor(region>North America	0.104121
## generosity:factor(region>Oceania	0.172785
## generosity:factor(region>Other	0.006813
## generosity:factor(region>South Asia	0.735492
## generosity:factor(region>Southeast Asia	0.390351
## generosity:factor(region>Sub-Saharan Africa	0.006627
## generosity:factor(region>Western Europe	0.003387
## perceptions_of_corruption:factor(region)CIS	0.757644
## perceptions_of_corruption:factor(region)East Asia	0.287060
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.331969
## perceptions_of_corruption:factor(region>Middle East	0.340536

## perceptions_of_corruption:factor(region)North Africa	0.438529
## perceptions_of_corruption:factor(region)North America	0.419770
## perceptions_of_corruption:factor(region)Oceania	0.238769
## perceptions_of_corruption:factor(region)Other	0.058494
## perceptions_of_corruption:factor(region)South Asia	8.60e-05
## perceptions_of_corruption:factor(region)Southeast Asia	0.624533
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	0.001622
## perceptions_of_corruption:factor(region)Western Europe	0.000132
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	***
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## I(perceptions_of_corruption^2)	.
## factor(region)CIS	**
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region)Middle East	***
## factor(region)North Africa	
## factor(region)North America	
## factor(region)Oceania	
## factor(region)Other	***
## factor(region)South Asia	
## factor(region)Southeast Asia	.
## factor(region)Sub-Saharan Africa	
## factor(region)Western Europe	.
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	***
## gdp_per_capita:perceptions_of_corruption	**
## gdp_per_capita:factor(region)CIS	
## gdp_per_capita:factor(region)East Asia	
## gdp_per_capita:factor(region)Latin America and Caribbean	*
## gdp_per_capita:factor(region)Middle East	**
## gdp_per_capita:factor(region)North Africa	
## gdp_per_capita:factor(region)North America	
## gdp_per_capita:factor(region)Oceania	
## gdp_per_capita:factor(region)Other	**
## gdp_per_capita:factor(region)South Asia	
## gdp_per_capita:factor(region)Southeast Asia	***
## gdp_per_capita:factor(region)Sub-Saharan Africa	*
## gdp_per_capita:factor(region)Western Europe	
## social_support:factor(region)CIS	

```

## social_support:factor(region)East Asia
## social_support:factor(region)Latin America and Caribbean *
## social_support:factor(region)Middle East *
## social_support:factor(region)North Africa
## social_support:factor(region)North America
## social_support:factor(region)Oceania
## social_support:factor(region)Other
## social_support:factor(region)South Asia
## social_support:factor(region)Southeast Asia
## social_support:factor(region)Sub-Saharan Africa *
## social_support:factor(region)Western Europe
## healthy_life_expectancy:freedom_to_make_life_choices **
## healthy_life_expectancy:perceptions_of_corruption **
## healthy_life_expectancy:factor(region)CIS
## healthy_life_expectancy:factor(region)East Asia
## healthy_life_expectancy:factor(region)Latin America and Caribbean ***
## healthy_life_expectancy:factor(region)Middle East *
## healthy_life_expectancy:factor(region)North Africa .
## healthy_life_expectancy:factor(region)North America
## healthy_life_expectancy:factor(region)Oceania
## healthy_life_expectancy:factor(region)Other
## healthy_life_expectancy:factor(region)South Asia
## healthy_life_expectancy:factor(region)Southeast Asia ***
## healthy_life_expectancy:factor(region)Sub-Saharan Africa .
## healthy_life_expectancy:factor(region)Western Europe *
## freedom_to_make_life_choices:factor(region)CIS
## freedom_to_make_life_choices:factor(region)East Asia *
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean
## freedom_to_make_life_choices:factor(region)Middle East
## freedom_to_make_life_choices:factor(region)North Africa *
## freedom_to_make_life_choices:factor(region)North America
## freedom_to_make_life_choices:factor(region)Oceania
## freedom_to_make_life_choices:factor(region)Other
## freedom_to_make_life_choices:factor(region)South Asia ***
## freedom_to_make_life_choices:factor(region)Southeast Asia ***
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***
## freedom_to_make_life_choices:factor(region)Western Europe
## generosity:perceptions_of_corruption **
## generosity:factor(region)CIS
## generosity:factor(region)East Asia
## generosity:factor(region)Latin America and Caribbean .
## generosity:factor(region)Middle East ***
## generosity:factor(region)North Africa .
## generosity:factor(region)North America
## generosity:factor(region)Oceania

```

```

## generosity:factor(region)Other ** 
## generosity:factor(region)South Asia
## generosity:factor(region)Southeast Asia
## generosity:factor(region)Sub-Saharan Africa ** 
## generosity:factor(region)Western Europe ** 
## perceptions_of_corruption:factor(region)CIS
## perceptions_of_corruption:factor(region)East Asia
## perceptions_of_corruption:factor(region)Latin America and Caribbean
## perceptions_of_corruption:factor(region)Middle East
## perceptions_of_corruption:factor(region)North Africa
## perceptions_of_corruption:factor(region)North America
## perceptions_of_corruption:factor(region)Oceania
## perceptions_of_corruption:factor(region)Other .
## perceptions_of_corruption:factor(region)South Asia *** 
## perceptions_of_corruption:factor(region)Southeast Asia
## perceptions_of_corruption:factor(region)Sub-Saharan Africa ** 
## perceptions_of_corruption:factor(region)Western Europe *** 
## --- 
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4196 on 1217 degrees of freedom
## Multiple R-squared: 0.866, Adjusted R-squared: 0.8553
## F-statistic: 81.09 on 97 and 1217 DF, p-value: < 2.2e-16

```

$I(\text{generosity}^2)$ is significant at $\alpha = 0.05$, so we can include it, but here the R^2_{adj} remains same. Therefore,, we will not include this term.

7 Best Model

Since we have checked for all the possible, interaction terms as well as higher order terms. The best model is the one with the reduced interaction terms.

```

whr_best_model <- lm(happiness_score ~ gdp_per_capita +
                      social_support +
                      healthy_life_expectancy +
                      freedom_to_make_life_choices +
                      generosity +
                      perceptions_of_corruption +
                      factor(region) +
                      (gdp_per_capita * healthy_life_expectancy) +
                      (gdp_per_capita * freedom_to_make_life_choices) +
                      (gdp_per_capita * perceptions_of_corruption) +
                      (gdp_per_capita * factor(region)) +

```

```

(social_support * factor(region)) +
(healthy_life_expectancy * freedom_to_make_life_choices) +
(healthy_life_expectancy * perceptions_of_corruption) +
(healthy_life_expectancy * factor(region)) +
(freedom_to_make_life_choices * factor(region)) +
(generosity * perceptions_of_corruption) +
(generosity * factor(region)) +
(perceptions_of_corruption * factor(region))
, data = whr)
summary(whr_best_model)

## Call:
## lm(formula = happiness_score ~ gdp_per_capita + social_support +
##     healthy_life_expectancy + freedom_to_make_life_choices +
##     generosity + perceptions_of_corruption + factor(region) +
##     (gdp_per_capita * healthy_life_expectancy) + (gdp_per_capita *
##     freedom_to_make_life_choices) + (gdp_per_capita * perceptions_of_corruption) +
##     (gdp_per_capita * factor(region)) + (social_support * factor(region)) +
##     (healthy_life_expectancy * freedom_to_make_life_choices) +
##     (healthy_life_expectancy * perceptions_of_corruption) + (healthy_life_expectancy *
##     factor(region)) + (freedom_to_make_life_choices * factor(region)) +
##     (generosity * perceptions_of_corruption) + (generosity *
##     factor(region)) + (perceptions_of_corruption * factor(region)),
##     data = whr)
##
## Residuals:
##      Min      1Q      Median      3Q      Max
## -1.34436 -0.24416  0.00955  0.24863  1.32098
##
## Coefficients:
##                               Estimate
## (Intercept)                  3.19120
## gdp_per_capita                 0.41375
## social_support                  0.57952
## healthy_life_expectancy       -0.21223
## freedom_to_make_life_choices    4.94649
## generosity                     -0.37436
## perceptions_of_corruption      5.30010
## factor(region)CIS                -1.74083
## factor(region)East Asia            1.26156
## factor(region)Latin America and Caribbean   -1.50952
## factor(region)Middle East          -3.40556
## factor(region)North Africa           -0.66540

```

## factor(region)North America	0.33928
## factor(region)Oceania	0.04485
## factor(region)Other	-1.68364
## factor(region)South Asia	-0.25806
## factor(region)Southeast Asia	-1.15272
## factor(region)Sub-Saharan Africa	-0.30375
## factor(region)Western Europe	-1.53632
## gdp_per_capita:healthy_life_expectancy	1.05992
## gdp_per_capita:freedom_to_make_life_choices	-1.55492
## gdp_per_capita:perceptions_of_corruption	-1.84158
## gdp_per_capita:factor(region)CIS	0.40220
## gdp_per_capita:factor(region)East Asia	0.18271
## gdp_per_capita:factor(region)Latin America and Caribbean	0.53778
## gdp_per_capita:factor(region)Middle East	0.81398
## gdp_per_capita:factor(region)North Africa	-0.26601
## gdp_per_capita:factor(region)North America	0.08978
## gdp_per_capita:factor(region)Oceania	0.33842
## gdp_per_capita:factor(region)Other	0.72395
## gdp_per_capita:factor(region)South Asia	0.13254
## gdp_per_capita:factor(region)Southeast Asia	1.30590
## gdp_per_capita:factor(region)Sub-Saharan Africa	0.60001
## gdp_per_capita:factor(region)Western Europe	0.44545
## social_support:factor(region)CIS	0.21121
## social_support:factor(region)East Asia	-0.31997
## social_support:factor(region)Latin America and Caribbean	-0.47733
## social_support:factor(region)Middle East	0.59152
## social_support:factor(region)North Africa	-0.34928
## social_support:factor(region)North America	-0.49871
## social_support:factor(region)Oceania	-0.53084
## social_support:factor(region)Other	0.19384
## social_support:factor(region)South Asia	0.26829
## social_support:factor(region)Southeast Asia	-0.11634
## social_support:factor(region)Sub-Saharan Africa	-0.43870
## social_support:factor(region)Western Europe	-0.31500
## healthy_life_expectancy:freedom_to_make_life_choices	-2.01117
## healthy_life_expectancy:perceptions_of_corruption	-2.50372
## healthy_life_expectancy:factor(region)CIS	0.81630
## healthy_life_expectancy:factor(region)East Asia	-0.33383
## healthy_life_expectancy:factor(region)Latin America and Caribbean	2.19384
## healthy_life_expectancy:factor(region)Middle East	1.06753
## healthy_life_expectancy:factor(region)North Africa	1.30020
## healthy_life_expectancy:factor(region)North America	0.37137
## healthy_life_expectancy:factor(region)Oceania	0.92406
## healthy_life_expectancy:factor(region)Other	0.69640
## healthy_life_expectancy:factor(region)South Asia	0.87184

## healthy_life_expectancy:factor(region)Southeast Asia	1.85858
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.72886
## healthy_life_expectancy:factor(region)Western Europe	1.19355
## freedom_to_make_life_choices:factor(region)CIS	-0.04831
## freedom_to_make_life_choices:factor(region)East Asia	-3.07759
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.22647
## freedom_to_make_life_choices:factor(region)Middle East	0.73699
## freedom_to_make_life_choices:factor(region)North Africa	-1.24844
## freedom_to_make_life_choices:factor(region)North America	-0.35762
## freedom_to_make_life_choices:factor(region)Oceania	-0.82154
## freedom_to_make_life_choices:factor(region)Other	-0.35035
## freedom_to_make_life_choices:factor(region)South Asia	-4.78164
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.18597
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-2.87322
## freedom_to_make_life_choices:factor(region)Western Europe	-0.05354
## generosity:perceptions_of_corruption	-4.90466
## generosity:factor(region)CIS	1.01556
## generosity:factor(region)East Asia	-0.41648
## generosity:factor(region)Latin America and Caribbean	1.41633
## generosity:factor(region)Middle East	2.86785
## generosity:factor(region)North Africa	3.27103
## generosity:factor(region)North America	2.78522
## generosity:factor(region)Oceania	2.53639
## generosity:factor(region)Other	2.10864
## generosity:factor(region)South Asia	0.29822
## generosity:factor(region)Southeast Asia	0.53184
## generosity:factor(region)Sub-Saharan Africa	1.91517
## generosity:factor(region)Western Europe	2.30002
## perceptions_of_corruption:factor(region)CIS	-0.64621
## perceptions_of_corruption:factor(region)East Asia	3.06527
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.82176
## perceptions_of_corruption:factor(region)Middle East	0.57172
## perceptions_of_corruption:factor(region)North Africa	1.14942
## perceptions_of_corruption:factor(region)North America	1.91691
## perceptions_of_corruption:factor(region)Oceania	1.49658
## perceptions_of_corruption:factor(region)Other	-2.22936
## perceptions_of_corruption:factor(region)South Asia	6.98011
## perceptions_of_corruption:factor(region)Southeast Asia	0.07582
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	-4.24701
## perceptions_of_corruption:factor(region)Western Europe	3.03120
##	Std. Error
## (Intercept)	0.51312
## gdp_per_capita	0.31832
## social_support	0.15359
## healthy_life_expectancy	0.53024

## freedom_to_make_life_choices	0.64903
## generosity	0.58712
## perceptions_of_corruption	1.17205
## factor(region)CIS	0.65310
## factor(region)East Asia	1.48643
## factor(region)Latin America and Caribbean	0.52330
## factor(region)Middle East	0.48224
## factor(region)North Africa	0.86700
## factor(region)North America	3.46038
## factor(region>Oceania	4.28756
## factor(region)Other	0.49244
## factor(region)South Asia	0.56795
## factor(region>Southeast Asia	0.78167
## factor(region>Sub-Saharan Africa	0.50214
## factor(region>Western Europe	0.80139
## gdp_per_capita:healthy_life_expectancy	0.30272
## gdp_per_capita:freedom_to_make_life_choices	0.32723
## gdp_per_capita:perceptions_of_corruption	0.47638
## gdp_per_capita:factor(region)CIS	0.28711
## gdp_per_capita:factor(region)East Asia	0.54308
## gdp_per_capita:factor(region)Latin America and Caribbean	0.24385
## gdp_per_capita:factor(region>Middle East	0.26027
## gdp_per_capita:factor(region>North Africa	0.46584
## gdp_per_capita:factor(region>North America	0.95124
## gdp_per_capita:factor(region>Oceania	0.94304
## gdp_per_capita:factor(region>Other	0.25337
## gdp_per_capita:factor(region>South Asia	0.33401
## gdp_per_capita:factor(region>Southeast Asia	0.26158
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.25382
## gdp_per_capita:factor(region>Western Europe	0.31818
## social_support:factor(region)CIS	0.25202
## social_support:factor(region)East Asia	0.36376
## social_support:factor(region)Latin America and Caribbean	0.21674
## social_support:factor(region>Middle East	0.24944
## social_support:factor(region>North Africa	0.32320
## social_support:factor(region>North America	0.60805
## social_support:factor(region>Oceania	0.57645
## social_support:factor(region>Other	0.25093
## social_support:factor(region>South Asia	0.28020
## social_support:factor(region>Southeast Asia	0.28233
## social_support:factor(region>Sub-Saharan Africa	0.18242
## social_support:factor(region>Western Europe	0.24059
## healthy_life_expectancy:freedom_to_make_life_choices	0.70735
## healthy_life_expectancy:perceptions_of_corruption	0.88054
## healthy_life_expectancy:factor(region)CIS	0.61818

## healthy_life_expectancy:factor(region)East Asia	0.70900
## healthy_life_expectancy:factor(region)Latin America and Caribbean	0.41335
## healthy_life_expectancy:factor(region)Middle East	0.44172
## healthy_life_expectancy:factor(region)North Africa	0.77992
## healthy_life_expectancy:factor(region)North America	1.37894
## healthy_life_expectancy:factor(region>Oceania	1.39560
## healthy_life_expectancy:factor(region)Other	0.40861
## healthy_life_expectancy:factor(region)South Asia	0.57980
## healthy_life_expectancy:factor(region>Southeast Asia	0.49275
## healthy_life_expectancy:factor(region>Sub-Saharan Africa	0.44170
## healthy_life_expectancy:factor(region>Western Europe	0.53387
## freedom_to_make_life_choices:factor(region>CIS	0.53830
## freedom_to_make_life_choices:factor(region>East Asia	1.23549
## freedom_to_make_life_choices:factor(region>Latin America and Caribbean	0.44564
## freedom_to_make_life_choices:factor(region>Middle East	0.54778
## freedom_to_make_life_choices:factor(region>North Africa	0.63083
## freedom_to_make_life_choices:factor(region>North America	3.96516
## freedom_to_make_life_choices:factor(region>Oceania	3.75580
## freedom_to_make_life_choices:factor(region>Other	0.48982
## freedom_to_make_life_choices:factor(region>South Asia	0.71043
## freedom_to_make_life_choices:factor(region>Southeast Asia	0.81132
## freedom_to_make_life_choices:factor(region>Sub-Saharan Africa	0.51873
## freedom_to_make_life_choices:factor(region>Western Europe	0.54404
## generosity:perceptions_of_corruption	1.62330
## generosity:factor(region>CIS	0.89571
## generosity:factor(region>East Asia	1.54774
## generosity:factor(region>Latin America and Caribbean	0.74334
## generosity:factor(region>Middle East	0.79396
## generosity:factor(region>North Africa	1.81701
## generosity:factor(region>North America	1.66806
## generosity:factor(region>Oceania	1.78338
## generosity:factor(region>Other	0.82611
## generosity:factor(region>South Asia	0.88997
## generosity:factor(region>Southeast Asia	0.70218
## generosity:factor(region>Sub-Saharan Africa	0.71421
## generosity:factor(region>Western Europe	0.71996
## perceptions_of_corruption:factor(region>CIS	0.95004
## perceptions_of_corruption:factor(region>East Asia	2.93539
## perceptions_of_corruption:factor(region>Latin America and Caribbean	0.98026
## perceptions_of_corruption:factor(region>Middle East	0.96177
## perceptions_of_corruption:factor(region>North Africa	1.71339
## perceptions_of_corruption:factor(region>North America	2.89810
## perceptions_of_corruption:factor(region>Oceania	1.97958
## perceptions_of_corruption:factor(region>Other	0.94918
## perceptions_of_corruption:factor(region>South Asia	1.81550

## perceptions_of_corruption:factor(region)Southeast Asia	0.94795
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	0.94757
## perceptions_of_corruption:factor(region)Western Europe	0.87269
##	t value
## (Intercept)	6.219
## gdp_per_capita	1.300
## social_support	3.773
## healthy_life_expectancy	-0.400
## freedom_to_make_life_choices	7.621
## generosity	-0.638
## perceptions_of_corruption	4.522
## factor(region)CIS	-2.665
## factor(region)East Asia	0.849
## factor(region)Latin America and Caribbean	-2.885
## factor(region)Middle East	-7.062
## factor(region)North Africa	-0.767
## factor(region)North America	0.098
## factor(region)Oceania	0.010
## factor(region)Other	-3.419
## factor(region)South Asia	-0.454
## factor(region>Southeast Asia	-1.475
## factor(region)Sub-Saharan Africa	-0.605
## factor(region)Western Europe	-1.917
## gdp_per_capita:healthy_life_expectancy	3.501
## gdp_per_capita:freedom_to_make_life_choices	-4.752
## gdp_per_capita:perceptions_of_corruption	-3.866
## gdp_per_capita:factor(region)CIS	1.401
## gdp_per_capita:factor(region)East Asia	0.336
## gdp_per_capita:factor(region)Latin America and Caribbean	2.205
## gdp_per_capita:factor(region)Middle East	3.127
## gdp_per_capita:factor(region)North Africa	-0.571
## gdp_per_capita:factor(region)North America	0.094
## gdp_per_capita:factor(region>Oceania	0.359
## gdp_per_capita:factor(region)Other	2.857
## gdp_per_capita:factor(region)South Asia	0.397
## gdp_per_capita:factor(region>Southeast Asia	4.992
## gdp_per_capita:factor(region)Sub-Saharan Africa	2.364
## gdp_per_capita:factor(region)Western Europe	1.400
## social_support:factor(region)CIS	0.838
## social_support:factor(region)East Asia	-0.880
## social_support:factor(region)Latin America and Caribbean	-2.202
## social_support:factor(region)Middle East	2.371
## social_support:factor(region)North Africa	-1.081
## social_support:factor(region)North America	-0.820
## social_support:factor(region>Oceania	-0.921

## social_support:factor(region)Other	0.772
## social_support:factor(region)South Asia	0.957
## social_support:factor(region)Southeast Asia	-0.412
## social_support:factor(region)Sub-Saharan Africa	-2.405
## social_support:factor(region)Western Europe	-1.309
## healthy_life_expectancy:freedom_to_make_life_choices	-2.843
## healthy_life_expectancy:perceptions_of_corruption	-2.843
## healthy_life_expectancy:factor(region)CIS	1.320
## healthy_life_expectancy:factor(region)East Asia	-0.471
## healthy_life_expectancy:factor(region)Latin America and Caribbean	5.307
## healthy_life_expectancy:factor(region)Middle East	2.417
## healthy_life_expectancy:factor(region)North Africa	1.667
## healthy_life_expectancy:factor(region)North America	0.269
## healthy_life_expectancy:factor(region>Oceania	0.662
## healthy_life_expectancy:factor(region)Other	1.704
## healthy_life_expectancy:factor(region)South Asia	1.504
## healthy_life_expectancy:factor(region)Southeast Asia	3.772
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	1.650
## healthy_life_expectancy:factor(region)Western Europe	2.236
## freedom_to_make_life_choices:factor(region)CIS	-0.090
## freedom_to_make_life_choices:factor(region)East Asia	-2.491
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	-0.508
## freedom_to_make_life_choices:factor(region)Middle East	1.345
## freedom_to_make_life_choices:factor(region)North Africa	-1.979
## freedom_to_make_life_choices:factor(region)North America	-0.090
## freedom_to_make_life_choices:factor(region>Oceania	-0.219
## freedom_to_make_life_choices:factor(region)Other	-0.715
## freedom_to_make_life_choices:factor(region)South Asia	-6.731
## freedom_to_make_life_choices:factor(region)Southeast Asia	-3.927
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	-5.539
## freedom_to_make_life_choices:factor(region)Western Europe	-0.098
## generosity:perceptions_of_corruption	-3.021
## generosity:factor(region)CIS	1.134
## generosity:factor(region)East Asia	-0.269
## generosity:factor(region)Latin America and Caribbean	1.905
## generosity:factor(region)Middle East	3.612
## generosity:factor(region)North Africa	1.800
## generosity:factor(region)North America	1.670
## generosity:factor(region>Oceania	1.422
## generosity:factor(region)Other	2.553
## generosity:factor(region)South Asia	0.335
## generosity:factor(region)Southeast Asia	0.757
## generosity:factor(region)Sub-Saharan Africa	2.682
## generosity:factor(region)Western Europe	3.195
## perceptions_of_corruption:factor(region)CIS	-0.680

## perceptions_of_corruption:factor(region)East Asia	1.044
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.838
## perceptions_of_corruption:factor(region)Middle East	0.594
## perceptions_of_corruption:factor(region)North Africa	0.671
## perceptions_of_corruption:factor(region)North America	0.661
## perceptions_of_corruption:factor(region>Oceania	0.756
## perceptions_of_corruption:factor(region)Other	-2.349
## perceptions_of_corruption:factor(region)South Asia	3.845
## perceptions_of_corruption:factor(region>Southeast Asia	0.080
## perceptions_of_corruption:factor(region>Sub-Saharan Africa	-4.482
## perceptions_of_corruption:factor(region>Western Europe	3.473
##	Pr(> t)
## (Intercept)	6.85e-10
## gdp_per_capita	0.193917
## social_support	0.000169
## healthy_life_expectancy	0.689047
## freedom_to_make_life_choices	5.03e-14
## generosity	0.523838
## perceptions_of_corruption	6.72e-06
## factor(region>CIS	0.007790
## factor(region>East Asia	0.396204
## factor(region>Latin America and Caribbean	0.003988
## factor(region>Middle East	2.75e-12
## factor(region>North Africa	0.442947
## factor(region>North America	0.921911
## factor(region>Oceania	0.991656
## factor(region>Other	0.000649
## factor(region>South Asia	0.649646
## factor(region>Southeast Asia	0.140555
## factor(region>Sub-Saharan Africa	0.545352
## factor(region>Western Europe	0.055465
## gdp_per_capita:healthy_life_expectancy	0.000480
## gdp_per_capita:freedom_to_make_life_choices	2.26e-06
## gdp_per_capita:perceptions_of_corruption	0.000117
## gdp_per_capita:factor(region>CIS	0.161516
## gdp_per_capita:factor(region>East Asia	0.736607
## gdp_per_capita:factor(region>Latin America and Caribbean	0.027612
## gdp_per_capita:factor(region>Middle East	0.001805
## gdp_per_capita:factor(region>North Africa	0.568074
## gdp_per_capita:factor(region>North America	0.924820
## gdp_per_capita:factor(region>Oceania	0.719764
## gdp_per_capita:factor(region>Other	0.004346
## gdp_per_capita:factor(region>South Asia	0.691578
## gdp_per_capita:factor(region>Southeast Asia	6.83e-07
## gdp_per_capita:factor(region>Sub-Saharan Africa	0.018240

## gdp_per_capita:factor(region)Western Europe	0.161773
## social_support:factor(region)CIS	0.402146
## social_support:factor(region)East Asia	0.379239
## social_support:factor(region)Latin America and Caribbean	0.027826
## social_support:factor(region)Middle East	0.017878
## social_support:factor(region)North Africa	0.280041
## social_support:factor(region)North America	0.412275
## social_support:factor(region)Oceania	0.357296
## social_support:factor(region)Other	0.439974
## social_support:factor(region)South Asia	0.338506
## social_support:factor(region)Southeast Asia	0.680371
## social_support:factor(region)Sub-Saharan Africa	0.016324
## social_support:factor(region)Western Europe	0.190688
## healthy_life_expectancy:freedom_to_make_life_choices	0.004540
## healthy_life_expectancy:perceptions_of_corruption	0.004538
## healthy_life_expectancy:factor(region)CIS	0.186923
## healthy_life_expectancy:factor(region)East Asia	0.637837
## healthy_life_expectancy:factor(region)Latin America and Caribbean	1.32e-07
## healthy_life_expectancy:factor(region)Middle East	0.015806
## healthy_life_expectancy:factor(region)North Africa	0.095753
## healthy_life_expectancy:factor(region)North America	0.787732
## healthy_life_expectancy:factor(region)Oceania	0.508015
## healthy_life_expectancy:factor(region)Other	0.088575
## healthy_life_expectancy:factor(region)South Asia	0.132916
## healthy_life_expectancy:factor(region)Southeast Asia	0.000170
## healthy_life_expectancy:factor(region)Sub-Saharan Africa	0.099176
## healthy_life_expectancy:factor(region)Western Europe	0.025554
## freedom_to_make_life_choices:factor(region)CIS	0.928499
## freedom_to_make_life_choices:factor(region)East Asia	0.012872
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean	0.611411
## freedom_to_make_life_choices:factor(region)Middle East	0.178744
## freedom_to_make_life_choices:factor(region)North Africa	0.048038
## freedom_to_make_life_choices:factor(region)North America	0.928150
## freedom_to_make_life_choices:factor(region)Oceania	0.826891
## freedom_to_make_life_choices:factor(region)Other	0.474585
## freedom_to_make_life_choices:factor(region)South Asia	2.59e-11
## freedom_to_make_life_choices:factor(region)Southeast Asia	9.09e-05
## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa	3.72e-08
## freedom_to_make_life_choices:factor(region)Western Europe	0.921627
## generosity:perceptions_of_corruption	0.002568
## generosity:factor(region)CIS	0.257103
## generosity:factor(region)East Asia	0.787906
## generosity:factor(region)Latin America and Caribbean	0.056967
## generosity:factor(region)Middle East	0.000316
## generosity:factor(region)North Africa	0.072072

## generosity:factor(region)North America	0.095229
## generosity:factor(region)Oceania	0.155213
## generosity:factor(region)Other	0.010816
## generosity:factor(region)South Asia	0.737619
## generosity:factor(region)Southeast Asia	0.448946
## generosity:factor(region)Sub-Saharan Africa	0.007428
## generosity:factor(region)Western Europe	0.001436
## perceptions_of_corruption:factor(region)CIS	0.496507
## perceptions_of_corruption:factor(region)East Asia	0.296579
## perceptions_of_corruption:factor(region)Latin America and Caribbean	0.402023
## perceptions_of_corruption:factor(region)Middle East	0.552326
## perceptions_of_corruption:factor(region)North Africa	0.502446
## perceptions_of_corruption:factor(region)North America	0.508457
## perceptions_of_corruption:factor(region)Oceania	0.449789
## perceptions_of_corruption:factor(region)Other	0.018997
## perceptions_of_corruption:factor(region)South Asia	0.000127
## perceptions_of_corruption:factor(region)Southeast Asia	0.936266
## perceptions_of_corruption:factor(region)Sub-Saharan Africa	8.09e-06
## perceptions_of_corruption:factor(region)Western Europe	0.000532
##	
## (Intercept)	***
## gdp_per_capita	
## social_support	***
## healthy_life_expectancy	
## freedom_to_make_life_choices	***
## generosity	
## perceptions_of_corruption	***
## factor(region)CIS	**
## factor(region)East Asia	
## factor(region)Latin America and Caribbean	**
## factor(region)Middle East	***
## factor(region)North Africa	
## factor(region)North America	
## factor(region)Oceania	
## factor(region)Other	***
## factor(region)South Asia	
## factor(region)Southeast Asia	
## factor(region)Sub-Saharan Africa	
## factor(region)Western Europe	.
## gdp_per_capita:healthy_life_expectancy	***
## gdp_per_capita:freedom_to_make_life_choices	***
## gdp_per_capita:perceptions_of_corruption	***
## gdp_per_capita:factor(region)CIS	
## gdp_per_capita:factor(region)East Asia	
## gdp_per_capita:factor(region)Latin America and Caribbean	*

```

## gdp_per_capita:factor(region)Middle East ** 
## gdp_per_capita:factor(region)North Africa 
## gdp_per_capita:factor(region)North America 
## gdp_per_capita:factor(region)Oceania 
## gdp_per_capita:factor(region)Other ** 
## gdp_per_capita:factor(region)South Asia 
## gdp_per_capita:factor(region)Southeast Asia *** 
## gdp_per_capita:factor(region)Sub-Saharan Africa * 
## gdp_per_capita:factor(region)Western Europe 
## social_support:factor(region)CIS 
## social_support:factor(region)East Asia 
## social_support:factor(region)Latin America and Caribbean * 
## social_support:factor(region)Middle East * 
## social_support:factor(region)North Africa 
## social_support:factor(region)North America 
## social_support:factor(region)Oceania 
## social_support:factor(region)Other 
## social_support:factor(region)South Asia 
## social_support:factor(region)Southeast Asia 
## social_support:factor(region)Sub-Saharan Africa * 
## social_support:factor(region)Western Europe 
## healthy_life_expectancy:freedom_to_make_life_choices ** 
## healthy_life_expectancy:perceptions_of_corruption ** 
## healthy_life_expectancy:factor(region)CIS 
## healthy_life_expectancy:factor(region)East Asia 
## healthy_life_expectancy:factor(region)Latin America and Caribbean *** 
## healthy_life_expectancy:factor(region)Middle East * 
## healthy_life_expectancy:factor(region)North Africa . 
## healthy_life_expectancy:factor(region)North America 
## healthy_life_expectancy:factor(region)Oceania 
## healthy_life_expectancy:factor(region)Other . 
## healthy_life_expectancy:factor(region)South Asia 
## healthy_life_expectancy:factor(region)Southeast Asia *** 
## healthy_life_expectancy:factor(region)Sub-Saharan Africa . 
## healthy_life_expectancy:factor(region)Western Europe * 
## freedom_to_make_life_choices:factor(region)CIS 
## freedom_to_make_life_choices:factor(region)East Asia * 
## freedom_to_make_life_choices:factor(region)Latin America and Caribbean 
## freedom_to_make_life_choices:factor(region)Middle East 
## freedom_to_make_life_choices:factor(region)North Africa * 
## freedom_to_make_life_choices:factor(region)North America 
## freedom_to_make_life_choices:factor(region)Oceania 
## freedom_to_make_life_choices:factor(region)Other 
## freedom_to_make_life_choices:factor(region)South Asia *** 
## freedom_to_make_life_choices:factor(region)Southeast Asia ***

```

```

## freedom_to_make_life_choices:factor(region)Sub-Saharan Africa ***

## freedom_to_make_life_choices:factor(region)Western Europe

## generosity:perceptions_of_corruption **

## generosity:factor(region)CIS

## generosity:factor(region)East Asia

## generosity:factor(region)Latin America and Caribbean .

## generosity:factor(region)Middle East ***

## generosity:factor(region)North Africa .

## generosity:factor(region)North America .

## generosity:factor(region)Oceania

## generosity:factor(region)Other *

## generosity:factor(region)South Asia

## generosity:factor(region)Southeast Asia

## generosity:factor(region)Sub-Saharan Africa **

## generosity:factor(region)Western Europe **

## perceptions_of_corruption:factor(region)CIS

## perceptions_of_corruption:factor(region)East Asia

## perceptions_of_corruption:factor(region)Latin America and Caribbean

## perceptions_of_corruption:factor(region)Middle East

## perceptions_of_corruption:factor(region)North Africa

## perceptions_of_corruption:factor(region)North America

## perceptions_of_corruption:factor(region)Oceania

## perceptions_of_corruption:factor(region)Other *

## perceptions_of_corruption:factor(region)South Asia ***

## perceptions_of_corruption:factor(region)Southeast Asia

## perceptions_of_corruption:factor(region)Sub-Saharan Africa ***

## perceptions_of_corruption:factor(region)Western Europe ***

## ---

## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## Residual standard error: 0.4199 on 1218 degrees of freedom

## Multiple R-squared: 0.8657, Adjusted R-squared: 0.8551

## F-statistic: 81.79 on 96 and 1218 DF, p-value: < 2.2e-16

```

Multiple R-squared: 0.8657 — This indicates that approximately 86.57% of the variation in happiness scores is explained by your model, which is a strong fit.

Adjusted R-squared: 0.8551 — The adjusted R-squared accounts for the number of predictors and suggests a slightly smaller, but still substantial, fit. F-statistic: The high F-statistic(403) with a p-value of less than 2.2e-16 suggests that the model is statistically significant overall.

The equation for the best model will be :

$$\begin{aligned}
\widehat{\text{happiness_score}} = & 3.19120 + 0.41375X_{gdp_per_capita} + 0.57952X_{social_support} - 0.21223X_{healthy_life_expectancy} \\
& + 4.94649X_{freedom_to_make_life_choices} - 0.37436X_{generosity} + 5.30010X_{perceptions_of_corruption} \\
& - 1.74083X_{regionCIS} + 1.26156X_{regionEast_Asia} - 1.50952X_{regionLatin_America_and_Caribbean} \\
& - 3.40556X_{regionMiddle_East} - 0.66540X_{regionNorth_Africa} + 0.33928X_{regionNorth_Africa} \\
& + 0.04485X_{regionOceania} - 1.68364X_{regionOther} - 0.25806X_{regionSouth_Asia} \\
& - 1.15272X_{regionSoutheast_Asia} - 0.30375X_{regionSub_Saharan_Africa} - 1.53632X_{regionSub_Saharan_Africa} \\
& + 1.05992X_{gdp_per_capita} \cdot X_{healthy_life_expectancy} - 1.55492X_{gdp_per_capita} \cdot X_{freedom_to_make_life_choices} \\
& - 1.84158X_{gdp_per_capita} \cdot X_{perceptions_of_corruption} + 0.40220X_{gdp_per_capita} \cdot X_{regionCIS} \\
& + 0.18271X_{gdp_per_capita} \cdot X_{regionEast_Asia} + 0.53778X_{gdp_per_capita} \cdot X_{regionLatin_America_and_Caribbean} \\
& + 0.81398X_{gdp_per_capita} \cdot X_{regionMiddle_East} - 0.26601X_{gdp_per_capita} \cdot X_{regionNorth_Africa} \\
& + 0.08978X_{gdp_per_capita} \cdot X_{regionNorth_America} + 0.33842X_{gdp_per_capita} \cdot X_{regionOceania} \\
& + 0.72395X_{gdp_per_capita} \cdot X_{regionOther} + 0.13254X_{gdp_per_capita} \cdot X_{regionSouth_Asia} \\
& + 1.30590X_{gdp_per_capita} \cdot X_{regionSoutheast_Asia} + 0.60001X_{gdp_per_capita} \cdot X_{regionSub_Saharan_Africa} \\
& + 0.44545X_{gdp_per_capita} \cdot X_{regionWestern_Europe} + 0.21121X_{social_support} \cdot X_{regionCIS} \\
& - 0.31997X_{social_support} \cdot X_{regionEast_Asia} - 0.47733X_{social_support} \cdot X_{regionLatin_America_and_Caribbean} \\
& + 0.59152X_{social_support} \cdot X_{regionMiddle_East} - 0.34928X_{social_support} \cdot X_{regionNorth_Africa} \\
& - 0.49871X_{social_support} \cdot X_{regionNorth_America} - 0.53084X_{social_support} \cdot X_{regionOceania} \\
& + 0.19384X_{social_support} \cdot X_{regionOther} + 0.26829X_{social_support} \cdot X_{regionSouth_Asia} \\
& - 0.11634X_{social_support} \cdot X_{regionSoutheast_Asia} - 0.43870X_{social_support} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.31500X_{social_support} \cdot X_{regionWestern_Europe} - 2.01117X_{healthy_life_expectancy} \cdot X_{regionCIS} \\
& - 2.50372X_{healthy_life_expectancy} \cdot X_{perceptions_of_corruption} + 0.81630X_{healthy_life_expectancy} \cdot X_{regionEast_Asia} \\
& + 0.70900X_{healthy_life_expectancy} \cdot X_{regionMiddle_East} + 2.19384X_{healthy_life_expectancy} \cdot X_{regionNorth_Africa} \\
& + 1.06753X_{healthy_life_expectancy} \cdot X_{regionOther} + 1.30020X_{healthy_life_expectancy} \cdot X_{regionSouth_Asia} \\
& + 0.37137X_{healthy_life_expectancy} \cdot X_{regionNorth_America} + 0.92406X_{healthy_life_expectancy} \cdot X_{regionOceania} \\
& + 0.69640X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} + 0.87184X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} \\
& + 1.85858X_{healthy_life_expectancy} \cdot X_{regionSoutheast_Asia} + 0.72886X_{healthy_life_expectancy} \cdot X_{regionSub_Saharan_Africa} \\
& + 1.19355X_{healthy_life_expectancy} \cdot X_{regionWestern_Europe} - 0.04831X_{freedom_to_make_life_choices} \cdot X_{regionCIS} \\
& - 3.07759X_{freedom_to_make_life_choices} \cdot X_{regionEast_Asia} - 0.22647X_{freedom_to_make_life_choices} \cdot X_{regionMiddle_East} \\
& + 0.73699X_{freedom_to_make_life_choices} \cdot X_{regionOther} - 1.24844X_{freedom_to_make_life_choices} \cdot X_{regionSouth_Asia} \\
& - 0.35762X_{freedom_to_make_life_choices} \cdot X_{regionNorth_America} - 0.82154X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.35035X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} - 4.78164X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 3.18597X_{freedom_to_make_life_choices} \cdot X_{regionSoutheast_Asia} - 2.87322X_{freedom_to_make_life_choices} \cdot X_{regionSub_Saharan_Africa} \\
& - 0.05354X_{freedom_to_make_life_choices} \cdot X_{regionWestern_Europe} - 4.90466X_{generosity} \cdot X_{regionCIS} \\
& + 1.01556X_{generosity} \cdot X_{regionEast_Asia} - 0.41648X_{generosity} \cdot X_{regionMiddle_East} \\
& + 1.41633X_{generosity} \cdot X_{regionOther} + 2.86785X_{generosity} \cdot X_{regionSouth_Asia} \\
& + 3.27103X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 2.78522X_{generosity} \cdot X_{regionSub_Saharan_Africa} \\
& + 2.53639X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 2.10864X_{generosity} \cdot X_{regionSub_Saharan_Africa} \\
& + 0.20822X_{generosity} \cdot X_{regionSub_Saharan_Africa} + 0.52184X_{generosity} \cdot X_{regionSub_Saharan_Africa}
\end{aligned}$$

8 Conclusion

The analysis of World Happiness Data from 2015 to 2023 reveals several key factors that influence happiness scores across different regions over time.

Key Findings:

- Economic conditions (GDP per capita) play a significant role in determining happiness.
- Social support, healthy life expectancy, freedom to make life choices, and generosity are all positively correlated with higher happiness scores.
- Lower perceptions of corruption are associated with higher happiness.
- Geographic regions exhibit significant differences in happiness scores, highlighting the need for region-specific policies.

Policy Implications:

- Policymakers should focus on improving economic conditions, enhancing social support systems, and promoting healthy life expectancy.
- Encouraging generosity and ensuring freedom in making life choices can also contribute to higher happiness levels.
- Reducing corruption perceptions is crucial for improving overall well-being.

Global Efforts:

- The study underscores the importance of a multi-faceted approach to improving happiness, involving economic, social, and governance factors.
- International cooperation and data-driven policymaking can help in designing strategies that reduce inequality and enhance quality of life globally.
- In summary, this project provides actionable insights for policymakers and highlights the complex interplay of factors that influence happiness, emphasizing the need for a holistic approach to improve well-being worldwide.

8.1 Future Scope

Incorporation of Additional Variables: Integrating data from other sources, such as the World Bank or the United Nations, could provide a more holistic view.

Time-Series Analysis: Using advanced time-series models like ARIMA or machine learning algorithms to predict future happiness trends.

Regional Deep Dives: Developing region-specific policies and interventions based on these findings.

Non-Linear and Interaction Effects: Investigating interaction effects between different predictors to understand how they collectively impact happiness.

Policy Implementation and Evaluation: Collaborating with policymakers to implement strategies based on the findings of this study.

Methodological Insights:

These results were obtained after addressing critical assumptions in the model. Initially, the data exhibited heteroscedasticity and residuals that were not normally distributed, potentially affecting the validity of the analysis. To counter these issues, we applied log transformations to the dependent variable, ensuring the model assumptions were better met. By refining the model, we could derive more reliable and interpretable insights into the factors driving happiness across the globe.

8.2 References

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