

Projekt: Analiza ličnosti i njenih mračnih crta

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Motivacija i opis problema

Ličnost je jedna od središnjih tema psihologije, a danas se najčešće opisuje putem petofaktorskog modela Big Five, koji uključuje: ekstraverziju (razlikuje osobe po razini društvene angažiranosti), ugodnost (obuhvaća empatiju i kooperativnost nasuprot sumnjičavosti), savjesnost (govori o odgovornosti nasuprot neorganiziranosti), neuroticizam (opisuje emocionalnu nestabilnost i sklonost negativnim emocijama) te otvorenost (označava kreativnost nasuprot konvencionalnosti). Uz te osnovne dimenzije, česte su i procjene tzv. mračne trijade: narcizma (povišen osjećaj vlastite važnosti i manjak empatije), psihopatije (impulzivnost, bezosjećajnost i antisocijalnost) i makijavelizma (manipulativnost i instrumentalno iskorištavanje drugih). Cilj ovog projekta je analizirati u kakvoj su vezi osnovne crte ličnosti, mračne crte ličnosti te sklonost stresu, depresiji i anksioznosti.

Učitavanje i pregled podataka

Podatke iz CSV datoteke učitavamo u varijablu *dataset* kako bismo ih mogli bolje analizirati.

```
dataset <- read_csv('Personality_data.csv')

## New names:
## Rows: 578 Columns: 18
## -- Column specification
## -----
## (5): age, sex, ethnicity simplified, student status, employment status dbl
## (13): ...1, depression, anxiety, stress, narcissism, machiavelism, psych...
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.
## * `-->` ...
## * `-->` ...1'
```

Dalje, prikažemo prvih nekoliko redaka da vidimo primjere vrijednosti svakog od stupaca.

```
head(dataset)
```

```
## # A tibble: 6 x 18
##   ...1 depression anxiety stress narcissism machiavelism psychoticism sadism
##   <dbl>      <dbl>    <dbl>    <dbl>      <dbl>      <dbl>      <dbl>
## 1     1       1.24    1.08    0.505     1.50      0.254     -0.201   0.0193
## 2     2       1.07    1.16    0.266     0.791      0.562      1.31    0.870
## 3     3      -0.581   -0.263   -0.556    -0.267      -0.692     -0.691   -0.208
```

```

## 4      4      3.03    1.99    1.94      0.415      0.856      2.19    1.10
## 5      5      1.22   -0.774   0.104     -2.34     -1.99     -0.733   -1.57
## 6      6      0.828   -0.186   0.728     -0.333      1.59      1.87    1.72
## # i 10 more variables: neuroticism <dbl>, extraversion <dbl>, openness <dbl>,
## # agreeableness <dbl>, conscientiousness <dbl>, age <chr>, sex <chr>,
## # 'ethnicity simplified' <chr>, 'student status' <chr>,
## # 'employment status' <chr>

```

Zatim, pomoću metoda *names()* i *glimpse()*, dajemo si bolji uvid u tipove podataka i strukturu.

```
names(dataset)
```

```

## [1] "...1"                  "depression"          "anxiety"
## [4] "stress"                "narcissism"          "machiavelism"
## [7] "psychoticism"          "sadism"              "neuroticism"
## [10] "extraversion"          "openness"            "agreeableness"
## [13] "conscientiousness"     "age"                 "sex"
## [16] "ethnicity simplified"  "student status"       "employment status"

```

```
glimpse(dataset)
```

```

## Rows: 578
## Columns: 18
## $ ...1 <dbl> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, ~
## $ depression <dbl> 1.24028239, 1.07356352, -0.58072240, 3.03206310~
## $ anxiety <dbl> 1.07785482, 1.15519418, -0.26310737, 1.98720356~
## $ stress <dbl> 0.50512161, 0.26619388, -0.55579868, 1.94173788~
## $ narcissism <dbl> 1.50455897, 0.79126351, -0.26693805, 0.41549063~
## $ machiavelism <dbl> 0.25408691, 0.56182597, -0.69164422, 0.85587890~
## $ psychoticism <dbl> -0.20141634, 1.31253355, -0.69076562, 2.1866752~
## $ sadism <dbl> 0.01933759, 0.86951395, -0.20777818, 1.10452165~
## $ neuroticism <dbl> -0.20124424, 0.56874269, -0.19237042, 1.4630829~
## $ extraversion <dbl> 0.64878308, 0.44347482, -1.75862486, -1.8731478~
## $ openness <dbl> 0.2455288, -0.9359119, -0.6614584, 1.8180786, ~~
## $ agreeableness <dbl> -0.02353314, -1.17591066, -0.31643069, 0.655438~
## $ conscientiousness <dbl> -0.042944525, -1.043162336, -0.481776915, 0.039~
## $ age <chr> "CONSENT_REVOKED", "CONSENT_REVOKED", "29", "37~
## $ sex <chr> "CONSENT_REVOKED", "CONSENT_REVOKED", "Female", ~
## $ 'ethnicity simplified' <chr> "CONSENT_REVOKED", "CONSENT_REVOKED", "Black", ~
## $ 'student status' <chr> "CONSENT_REVOKED", "CONSENT_REVOKED", "DATA_EXP~
## $ 'employment status' <chr> "CONSENT_REVOKED", "CONSENT_REVOKED", "DATA_EXP~

```

Prema uvidu u strukturu podataka vidljivo je da je varijabla **age** tipa *character*, što nije prikladno jer bi u statističkim modelima bila tretirana kao kategorijska umjesto numerička varijabla. Stoga je varijabla **age** pretvorena u numerički tip podataka.

Varijabla **sex** predstavlja kategorijsku varijablu te je, radi ispravne primjene u regresijskim modelima, pretvorena u tip *factor*.

Kako bi se osigurala valjanost analize, iz uzorka su uklonjeni svi ispitanici koji sadrže vrijednosti *CONSENT_REVOKED* ili *DATA_EXPIRED*, budući da ti zapisi ne predstavljaju stvarne podatke ispitanika.

```

data_clean <- dataset %>%
  filter(
    if_all(everything(),
      ~ !(. %in% c("CONSENT_REVOKED", "DATA_EXPIRED")))
  ) %>%
  mutate(
    age = as.numeric(age),
    sex = factor(sex)
  )

head(data_clean)

## # A tibble: 6 x 18
##   ...1 depression anxiety stress narcissism machiavelism psychoticism sadism
##   <dbl>     <dbl>    <dbl>    <dbl>     <dbl>     <dbl>     <dbl>    <dbl>
## 1     4     3.03    1.99    1.94     0.415     0.856    2.19    1.10
## 2     5     1.22   -0.774   0.104    -2.34     -1.99    -0.733   -1.57
## 3     6     0.828   -0.186   0.728    -0.333     1.59     1.87    1.72
## 4     7     0.0276   0.182   0.498     0.807     1.65     0.568   0.0681
## 5     9     0.633    1.14    0.421    -0.309     0.634     0.219   0.0423
## 6    10    -0.267   -1.68    0.188     0.608     0.294     0.442   0.780
## # i 10 more variables: neuroticism <dbl>, extraversion <dbl>, openness <dbl>,
## # agreeableness <dbl>, conscientiousness <dbl>, age <dbl>, sex <fct>,
## # 'ethnicity simplified' <chr>, 'student status' <chr>,
## # 'employment status' <chr>

```

Jesu li ljudi s izraženijom mračnom trijadem skloniji depresiji?

Nezavisna varijabla (prediktori)- Mračna trijada:

- Narcizam
- Psihopatija
- Makijavelizam

Zavisna varijabla

- Depresija (kontinuirana skala)

Kontrolne varijable

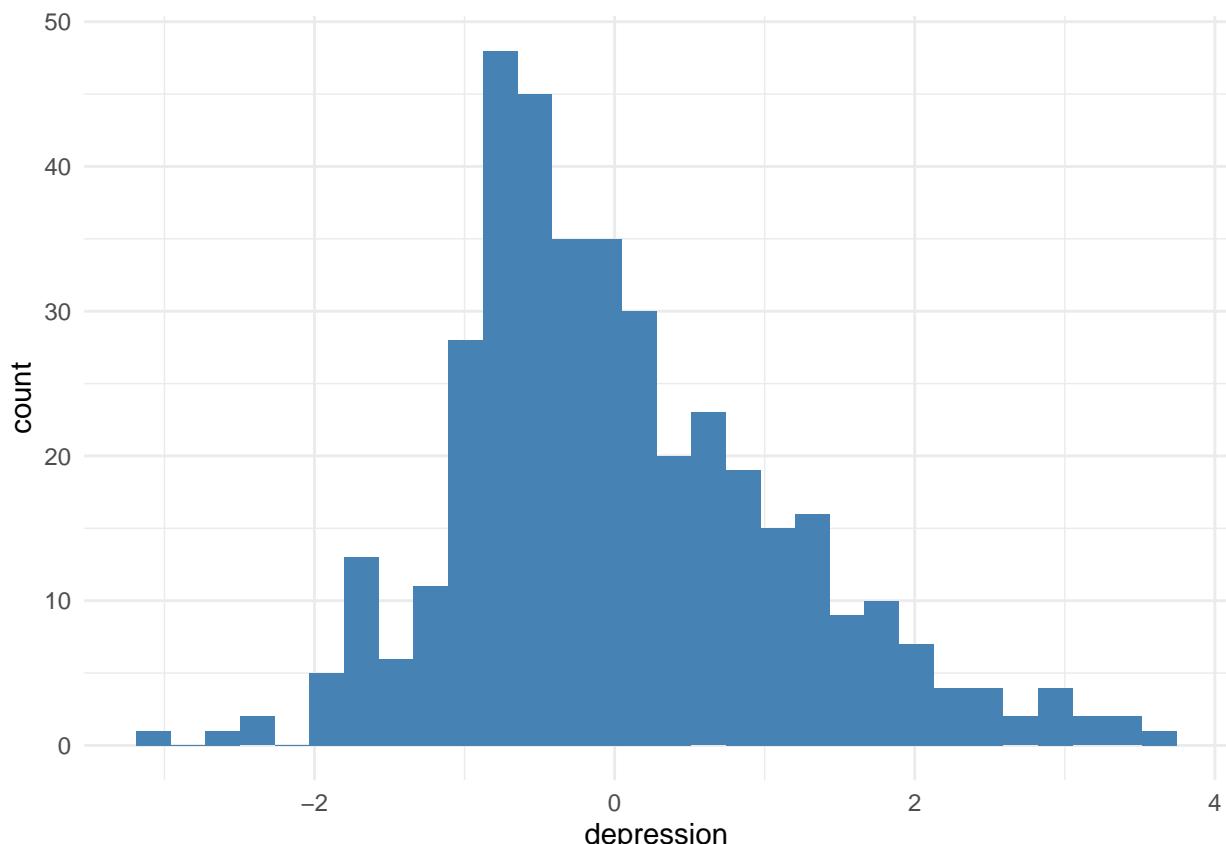
- Dob
- Spol
- Neuroticizam (važan jer je jak prediktor depresije)
- Ostale Big Five crte

Upoznavanje podataka i provjera distribucija

```
describe(data_clean %>%
  select(depression, narcissism, machiavelism, psychoticism))
```

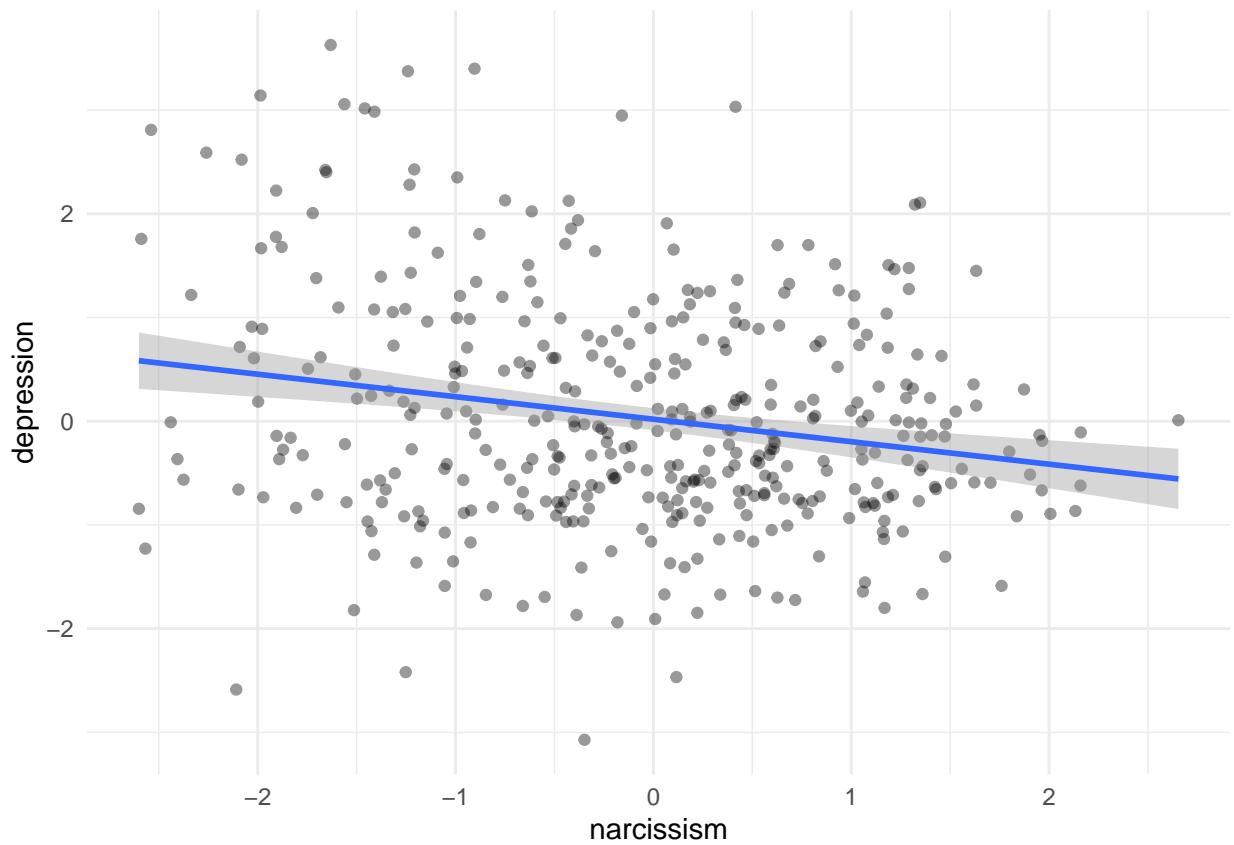
```
##           vars   n   mean     sd median trimmed   mad    min   max range skew
## depression      1 398  0.04  1.10 -0.14  -0.04  0.96 -3.07 3.63  6.70  0.63
## narcissism     2 398 -0.08  1.07  0.02  -0.05  1.16 -2.60 2.65  5.25 -0.16
## machiavelism    3 398 -0.05  1.08  0.05   0.00  1.09 -2.91 2.39  5.30 -0.37
## psychoticism   4 398 -0.08  1.00 -0.20  -0.14  1.04 -2.00 2.99  4.99  0.48
##                  kurtosis   se
## depression       0.48 0.06
## narcissism      -0.63 0.05
## machiavelism     -0.41 0.05
## psychoticism     -0.48 0.05
```

```
ggplot(data_clean, aes(depression)) +
  geom_histogram(bins = 30, fill = "steelblue") +
  theme_minimal()
```



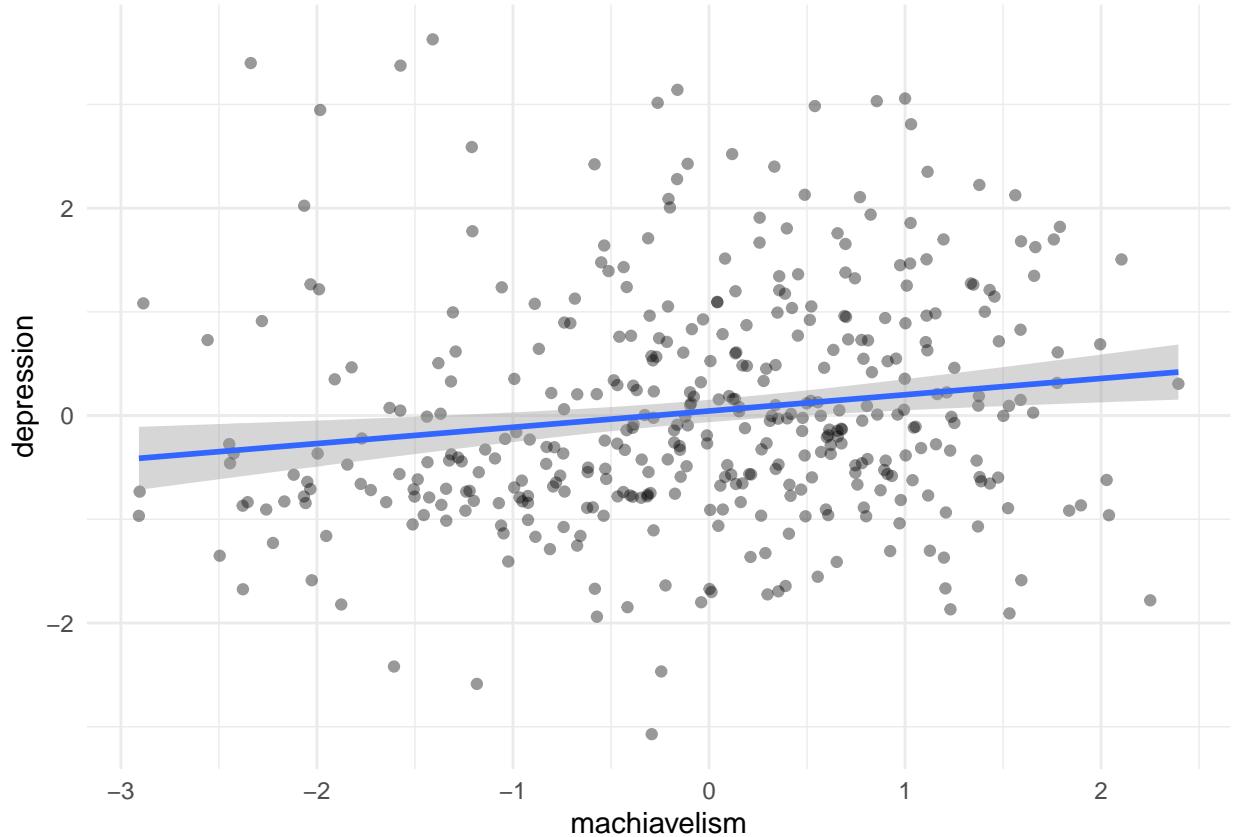
```
ggplot(data_clean, aes(narcissism, depression)) +
  geom_point(alpha = 0.4) +
  geom_smooth(method = "lm", se = TRUE) +
  theme_minimal()
```

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



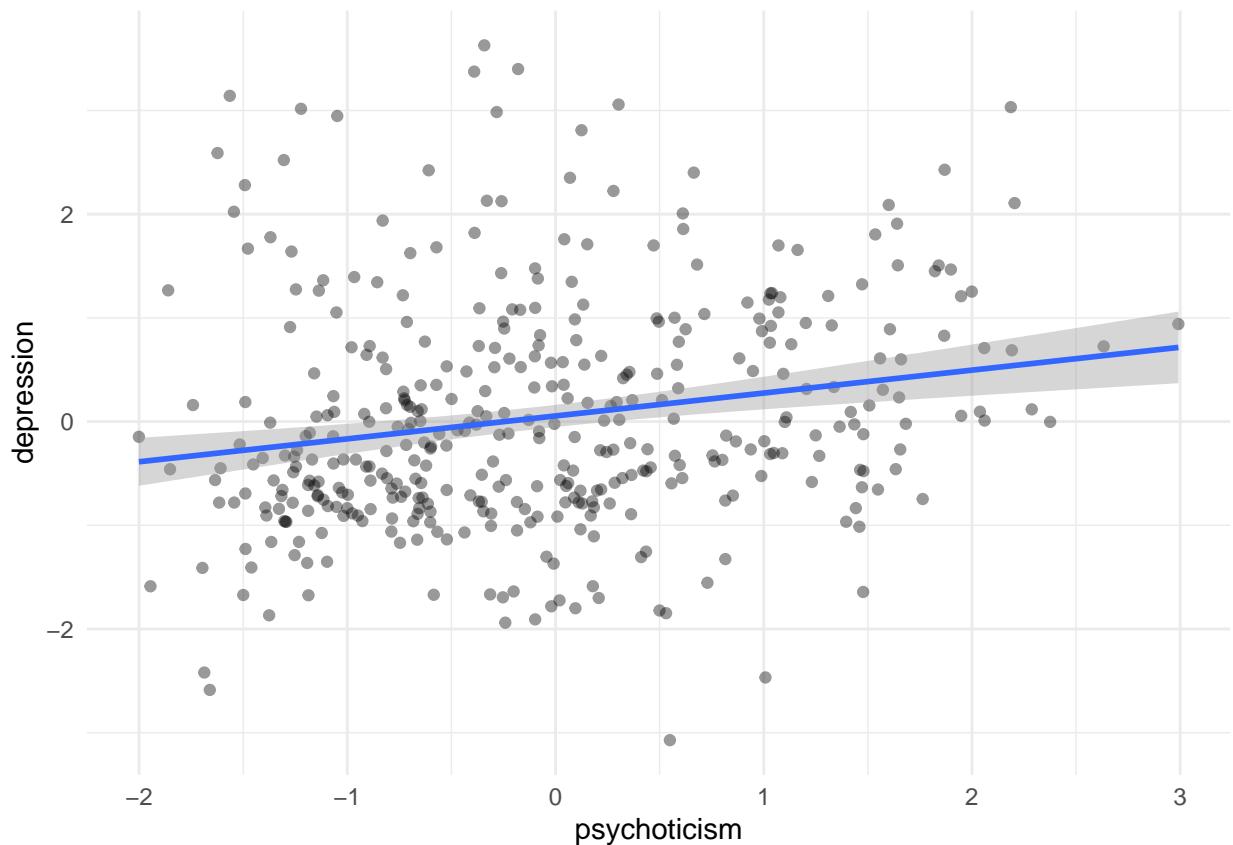
```
ggplot(data_clean, aes(machiavelism, depression)) +  
  geom_point(alpha = 0.4) +  
  geom_smooth(method = "lm", se = TRUE) +  
  theme_minimal()
```

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



```
ggplot(data_clean, aes(psychoticism, depression)) +  
  geom_point(alpha = 0.4) +  
  geom_smooth(method = "lm", se = TRUE) +  
  theme_minimal()
```

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



Pearsonove korelacije

```
cor.test(data_clean$depression, data_clean$narcissism)

##
## Pearson's product-moment correlation
##
## data: data_clean$depression and data_clean$narcissism
## t = -4.2976, df = 396, p-value = 2.176e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.3031034 -0.1151869
## sample estimates:
##       cor
## -0.2110948

cor.test(data_clean$depression, data_clean$machiavelism)

##
## Pearson's product-moment correlation
##
## data: data_clean$depression and data_clean$machiavelism
## t = 3.1025, df = 396, p-value = 0.002057
```

```

## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.05660396 0.24857887
## sample estimates:
##        cor
## 0.1540449

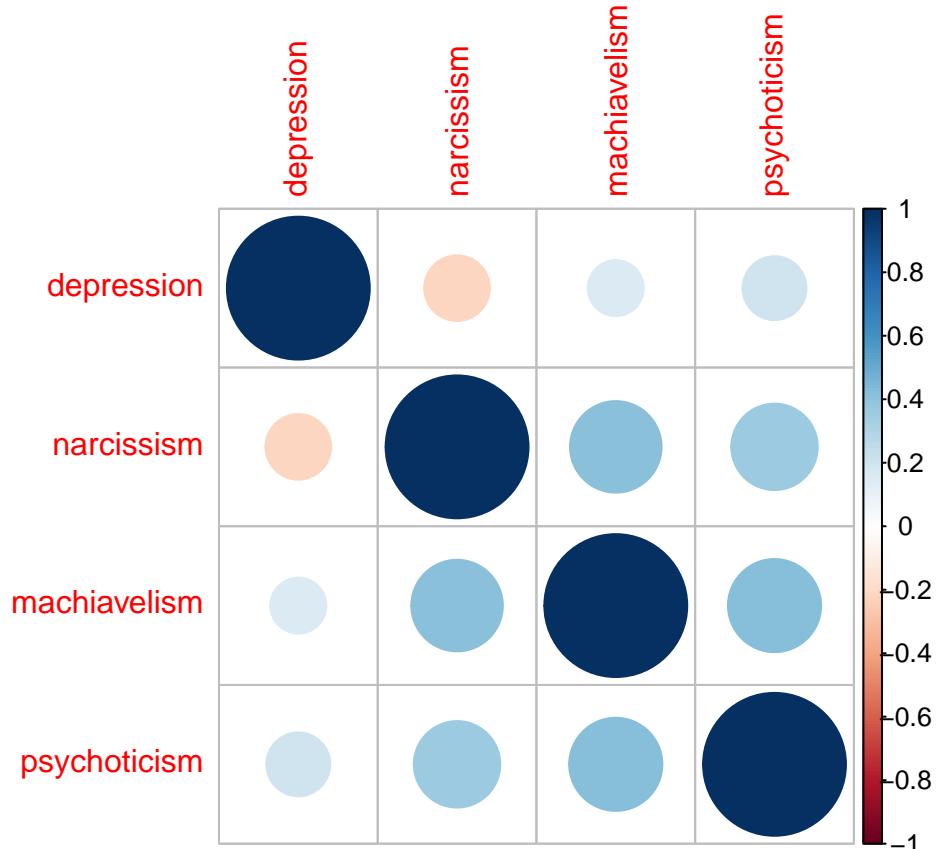
cor.test(data_clean$depression, data_clean$psychoticism)

##
##  Pearson's product-moment correlation
##
## data: data_clean$depression and data_clean$psychoticism
## t = 4.0662, df = 396, p-value = 5.767e-05
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.1039454 0.2927352
## sample estimates:
##        cor
## 0.2001979

vars <- data_clean %>%
  select(depression, narcissism, machiavelism, psychoticism) %>%
  na.omit()

corrplot(cor(vars))

```



Linearna regresija

```
model1 <- lm(depression ~ narcissism + machiavelism + psychoticism,
               data = data_clean)

summary(model1)

## 
## Call:
## lm(formula = depression ~ narcissism + machiavelism + psychoticism,
##      data = data_clean)
##
## Residuals:
##       Min     1Q   Median     3Q    Max 
## -3.3437 -0.6086 -0.1376  0.5302  3.5540 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept)  0.03894   0.05100   0.763  0.445638    
## narcissism -0.39957   0.05334  -7.490 4.55e-13 ***  
## machiavelism  0.20893   0.05434   3.845 0.000141 ***  
## psychoticism  0.28178   0.05770   4.884 1.52e-06 ***  
## --- 
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 
##
## Residual standard error: 1.013 on 394 degrees of freedom
## Multiple R-squared:  0.1648, Adjusted R-squared:  0.1585 
## F-statistic: 25.92 on 3 and 394 DF,  p-value: 2.545e-15 

model2 <- lm(depression ~ narcissism + machiavelism + psychoticism +
               neuroticism + extraversion + openness +
               agreeableness + conscientiousness +
               age + sex,
               data = data_clean)

summary(model2)

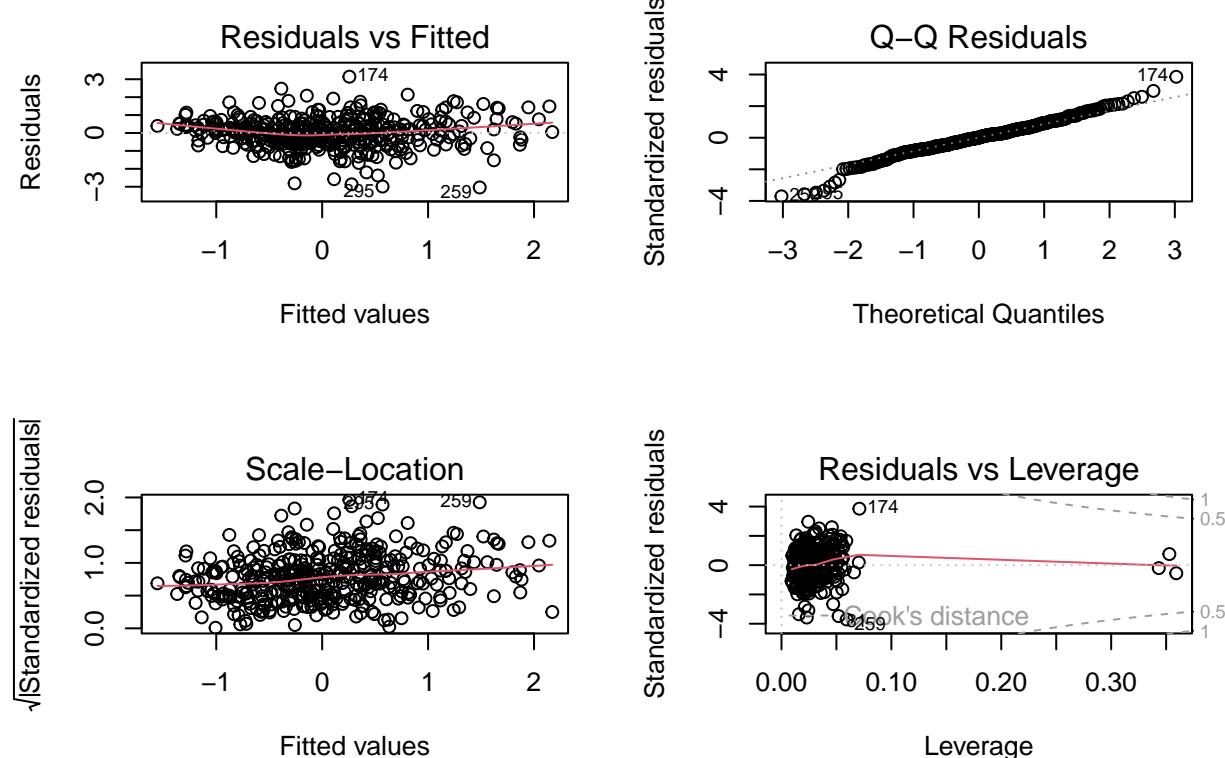
## 
## Call:
## lm(formula = depression ~ narcissism + machiavelism + psychoticism +
##      neuroticism + extraversion + openness + agreeableness + conscientiousness +
##      age + sex, data = data_clean)
##
## Residuals:
##       Min     1Q   Median     3Q    Max 
## -3.04151 -0.47610  0.00567  0.48682  3.14221 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -0.140193   0.307609  -0.456  0.64883    
## narcissism -0.028672   0.056505  -0.507  0.61214    
## machiavelism  0.042643   0.048557   0.878  0.38038
```

```

## psychoticism      0.147544  0.055444  2.661  0.00811 ** 
## neuroticism       0.456063  0.058382  7.812 5.39e-14 *** 
## extraversion     -0.240851  0.061139 -3.939 9.69e-05 *** 
## openness          0.041799  0.043854  0.953  0.34111 
## agreeableness     0.042698  0.055370  0.771  0.44110 
## conscientiousness -0.035091  0.056614 -0.620  0.53574 
## age               0.002255  0.009454  0.239  0.81160 
## sexMale           0.154454  0.089629  1.723  0.08564 . 
## sexPrefer not to say 0.204176  0.497526  0.410  0.68175 
## --- 
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 
## 
## Residual standard error: 0.8454 on 386 degrees of freedom 
## Multiple R-squared:  0.4302, Adjusted R-squared:  0.4139 
## F-statistic: 26.49 on 11 and 386 DF,  p-value: < 2.2e-16 

par(mfrow = c(2,2))
plot(model2)

```



Postoje li razlike u nekim crtama ličnosti među spolovima?

```

# odabir
traits_vars <- dataset %>%

```

```

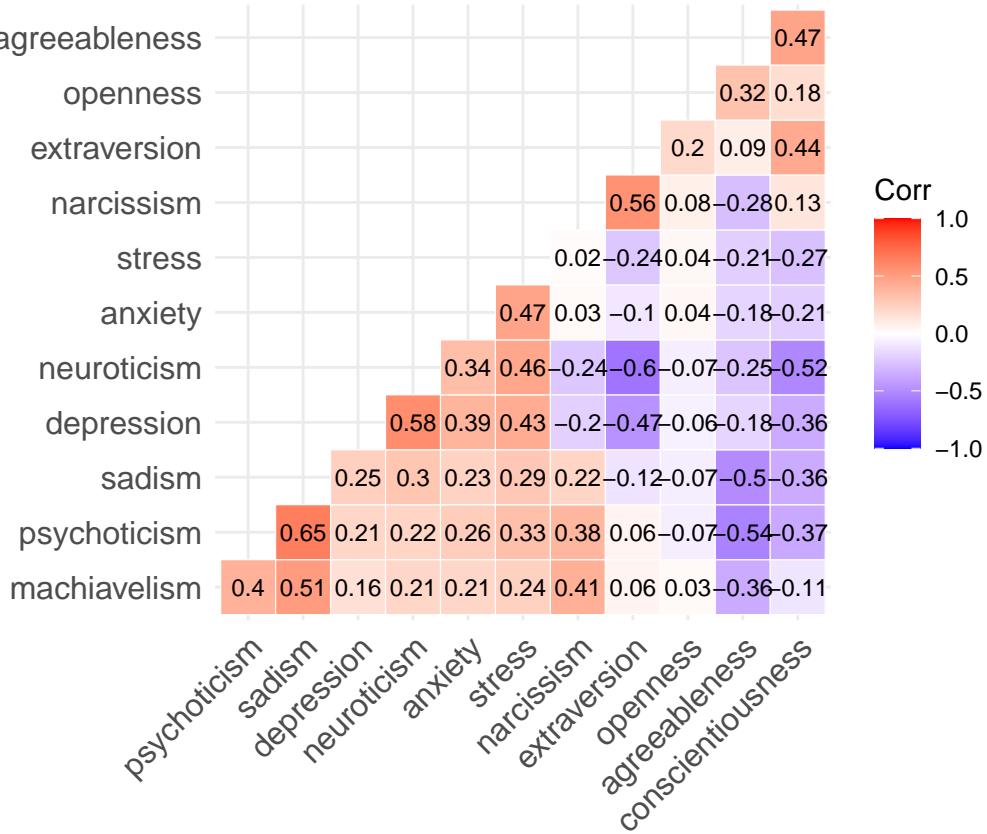
select(
  depression, anxiety, stress,
  narcissism, machiavelism, psychoticism, sadism,
  neuroticism, extraversion, openness, agreeableness, conscientiousness
)

# korelacijska matrica
corr_mat <- cor(traits_vars, use = "pairwise.complete.obs")

# korelacijska heatmapa
ggcorrplot(
  corr_mat,
  type = "lower",
  lab = TRUE,
  lab_size = 3,
  hc.order = TRUE,
  outline.col = "white"
)

## Warning: `aes_string()`' was deprecated in ggplot2 3.0.0.
## i Please use tidy evaluation idioms with `aes()`'.
## i See also `vignette("ggplot2-in-packages")` for more information.
## i The deprecated feature was likely used in the ggcrrplot package.
## Please report the issue at <https://github.com/kassambara/ggcrrplot/issues>.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.

```



Osobe s većom anksioznošću, depresijom i stresom imaju tendenciju biti i više neurotične.

Mračne osobine su međusobno umjereno povezane.

Visoka savjesnost štiti od depresije i stresa (negativna korelacija).

Ugodnost je snažno suprotna psihoticizmu i sadizmu.

Big Five su međusobno slabo do umjereno povezane.

Najveće korelacije su:

Psychoticism–Sadism (0.65) Depression–Neuroticism (0.58) Extraversion–Narcissism(0.56) Machiavelism–Psychoticism (0.51)

```
table(dataset$sex)
```

```
##  
## CONSENT_REVOKED DATA_EXPIRED Female Male  
## 34 1 234 306  
## Prefer not to say  
## 3
```

```
df_sex <- dataset %>%  
  filter(sex %in% c("Male", "Female"))
```

```
big_five <- df_sex %>%  
  pivot_longer(
```

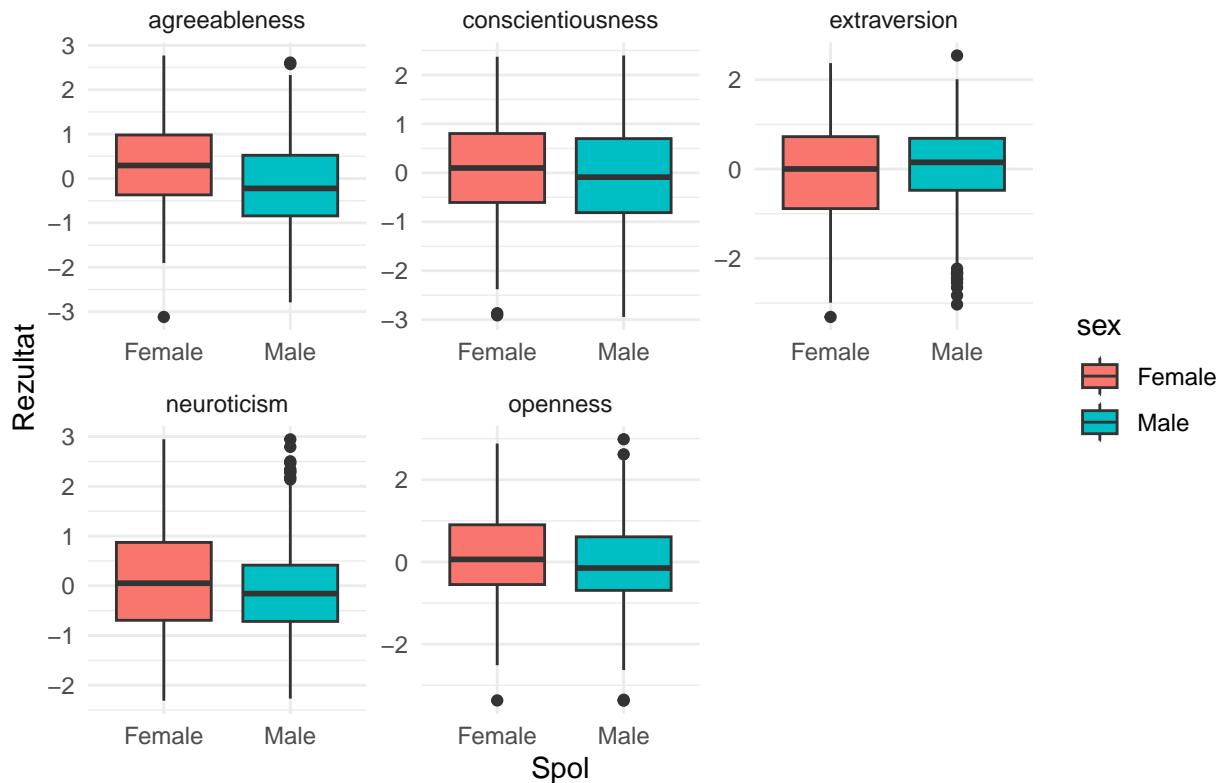
```

cols = c(neuroticism, extraversion, openness, agreeableness, conscientiousness),
names_to = "trait",
values_to = "score"
)

ggplot(big_five, aes(x = sex, y = score, fill = sex)) +
  geom_boxplot() +
  facet_wrap(~ trait, scales = "free") +
  theme_minimal() +
  labs(
    title = "Big Five osobine po spolu (Male vs Female)",
    x = "Spol",
    y = "Rezultat"
)

```

Big Five osobine po spolu (Male vs Female)



U ovom uzorku se pojavljuju obrasci u skladu s očekivanjima.

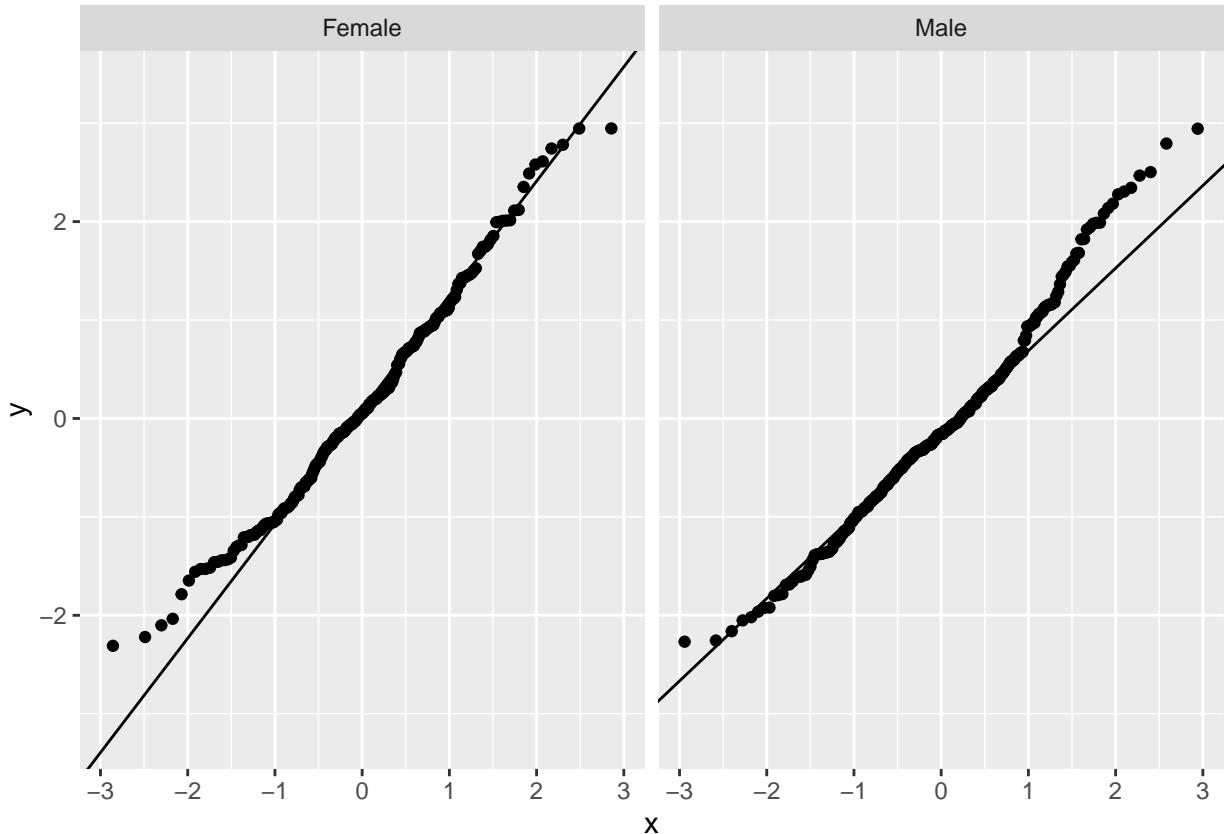
Najveće razlike bilježimo kod neurotizma (žene više) i ugodnost (žene više). Kod ekstraverzije, otvorenosti i savjesnosti ne bilježimo velike razlike što se tiče medijana.

```

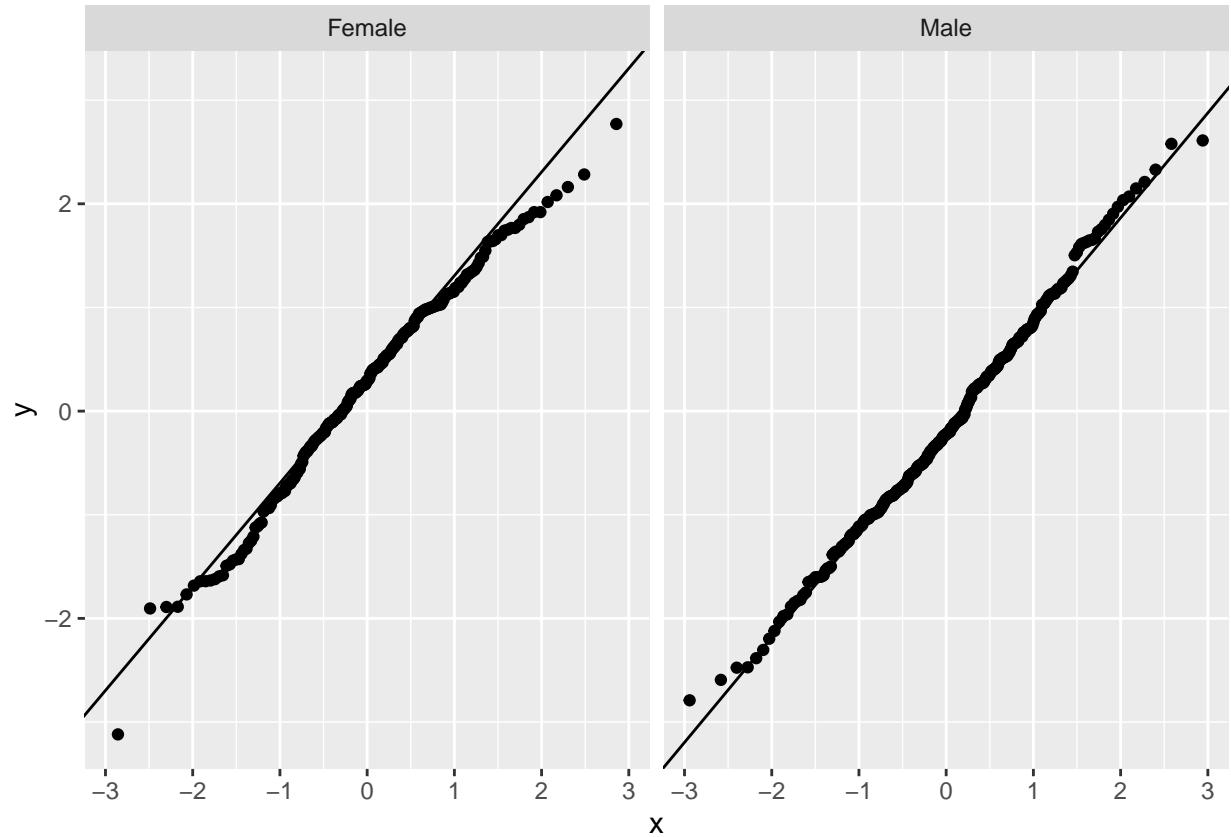
df_clean <- dataset |>
  filter(sex %in% c("Male", "Female"))

ggplot(df_clean, aes(sample = neuroticism)) +
  stat_qq() + stat_qq_line() +
  facet_wrap(~sex)

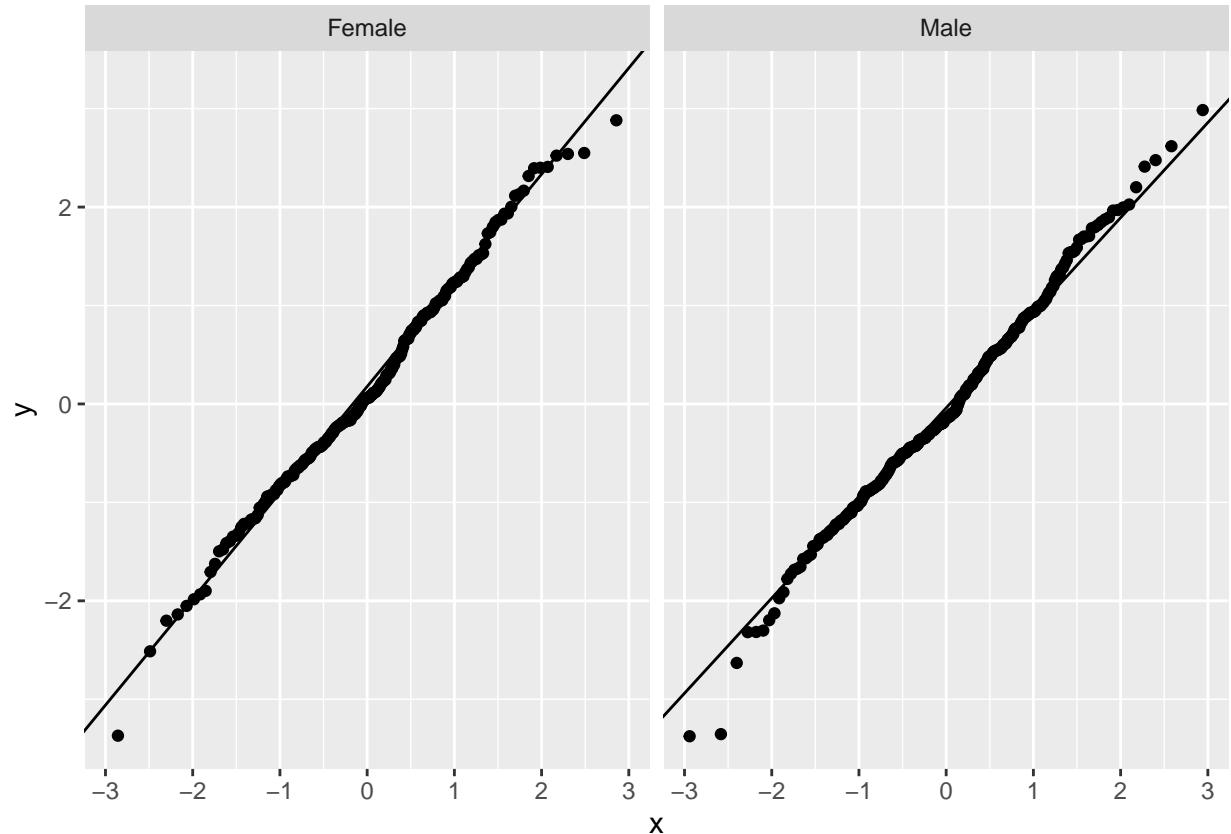
```



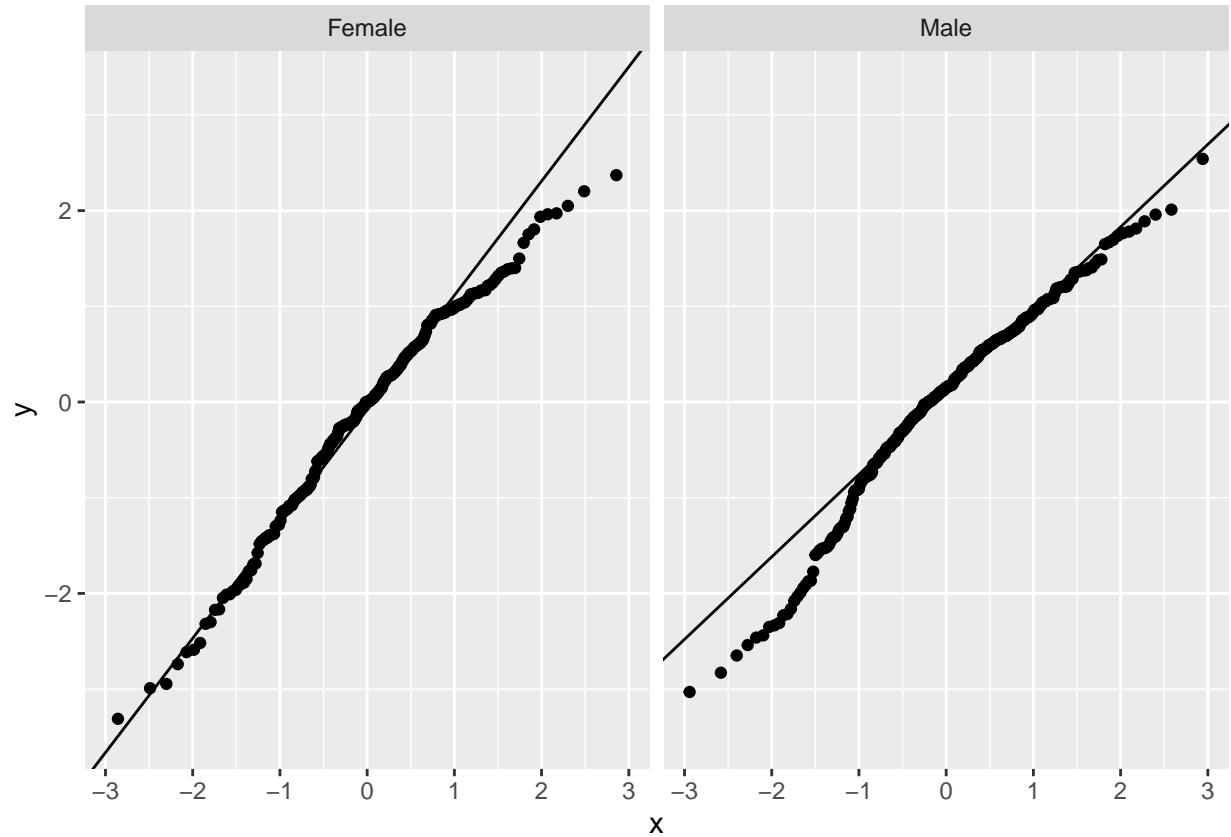
```
ggplot(df_clean, aes(sample = agreeableness)) +  
  stat_qq() + stat_qq_line() +  
  facet_wrap(~sex)
```



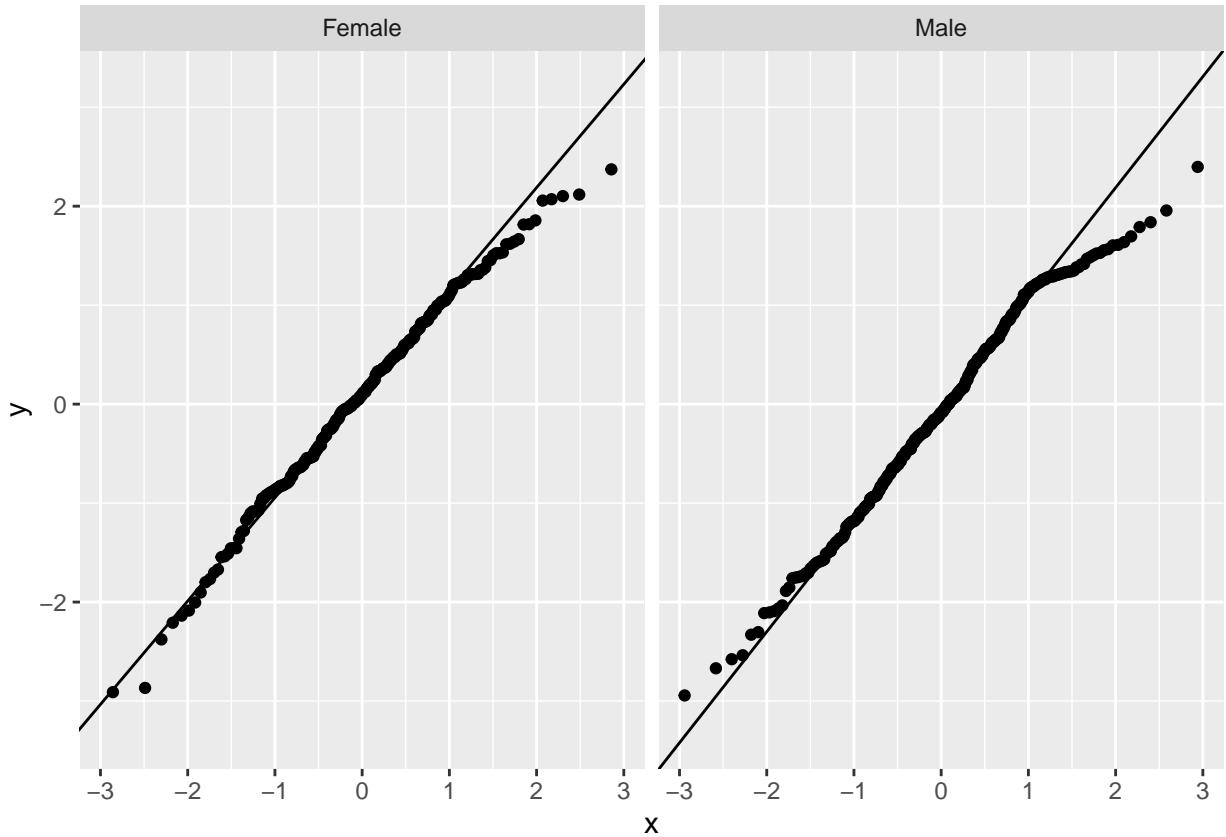
```
ggplot(df_clean, aes(sample = openness)) +  
  stat_qq() + stat_qq_line() +  
  facet_wrap(~sex)
```



```
ggplot(df_clean, aes(sample = extraversion)) +  
  stat_qq() + stat_qq_line() +  
  facet_wrap(~sex)
```



```
ggplot(df_clean, aes(sample = conscientiousness)) +  
  stat_qq() + stat_qq_line() +  
  facet_wrap(~sex)
```



Distribucije u skupinama su priližno normalne. Promatramo dvije nezavisne skupine: Female i Male (ostale ćemo ukloniti). Big Five i ostale osobine su kontinuirane.

Provjerimo t-test za nezavisne uzorke.

```
# lista osobina
traits <- c("neuroticism", "extraversion", "openness",
           "agreeableness", "conscientiousness")

# t-test za svaku osobinu
results <- lapply(traits, function(tr) {
  formula <- as.formula(paste(tr, "~ sex")) #npr. neuroticism ~ sex
  test <- t.test(formula, data = df_sex)
  print(test$estimate)
  tibble(
    trait = tr, #naziv osobine
    t_statistic = round(test$statistic, 3), #t vrijednost
    p_value = round(test$p.value, 5),
    mean_female = round(test$estimate["mean in group Female"], 3),
    mean_male = round(test$estimate["mean in group Male"], 3)
  )
})

## mean in group Female  mean in group Male
##          0.12409868      -0.08549065
## mean in group Female  mean in group Male
##         -0.10705134      0.03251542
```

```

## mean in group Female    mean in group Male
##          0.14946019      -0.04513137
## mean in group Female    mean in group Male
##          0.2373490       -0.1549429
## mean in group Female    mean in group Male
##          0.07711172      -0.08224288

results_df <- bind_rows(results)
results_df

## # A tibble: 5 x 5
##   trait           t_statistic p_value mean_female mean_male
##   <chr>            <dbl>     <dbl>        <dbl>      <dbl>
## 1 neuroticism      2.34     0.0198      0.124     -0.085
## 2 extraversion     -1.53    0.127       -0.107     0.033
## 3 openness          2.15     0.0322      0.149     -0.045
## 4 agreeableness    4.52     0.00001     0.237     -0.155
## 5 conscientiousness 1.82     0.0687      0.077     -0.082

```

Žene postižu značajno veće rezultate od muškaraca u:

Neuroticizmu ($p = 0.0198$ - značajna razlika)

Otvorenosti ($p = 0.0323$) - žene imaju statistički značajnu višu otvorenost

Ugodnosti ($p = 7.8 \times 10^{-6}$ - vrlo značajna razlika) - žene su ugodnije.

Nema značajnih razlika u:

Ekstraverziji ($p = 0.127$) - žene su malo niže, a muškarci više, no razlika nije statistički značajna.

Savjesnosti ($p = 0.069$).

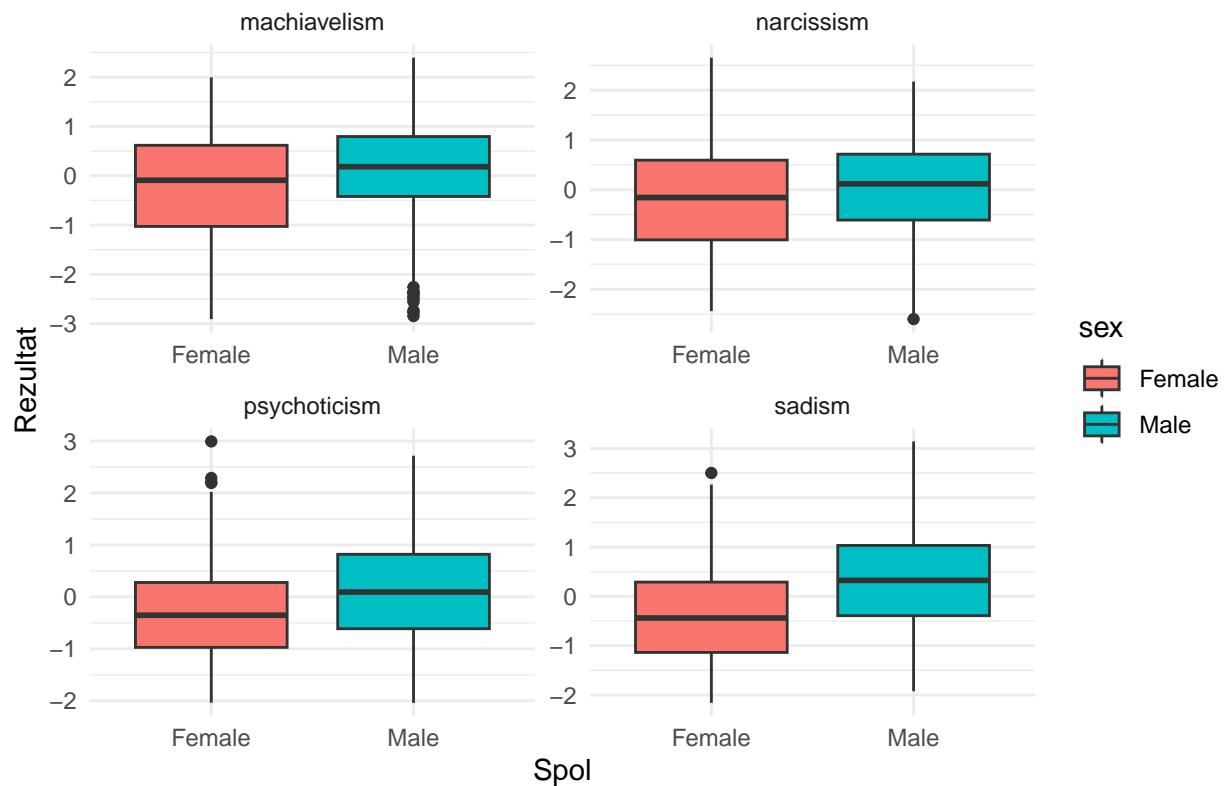
```

dark_traits <- df_sex %>%
  pivot_longer(
    cols = c(narcissism, machiavelism, psychoticism, sadism),
    names_to = "trait",
    values_to = "score"
  )

ggplot(dark_traits, aes(x = sex, y = score, fill = sex)) +
  geom_boxplot() +
  facet_wrap(~ trait, scales = "free") +
  theme_minimal() +
  labs(
    title = "Mračne osobine ličnosti po spolu (Male vs Female)",
    x = "Spol",
    y = "Rezultat"
  )

```

Mračne osobine ličnosti po spolu (Male vs Female)



```
dark <- c("narcissism", "machiavelism", "psychoticism", "sadism")
```

```
dark_results <- lapply(dark, function(tr) {
  formula <- as.formula(paste(tr, "~ sex"))
  test <- t.test(formula, data = df_sex)
  tibble(
    trait = tr,
    t_statistic = round(test$statistic, 3),
    p_value = round(test$p.value, 5),
    mean_female = round(test$estimate["mean in group Female"], 3),
    mean_male = round(test$estimate["mean in group Male"], 3)
  )
})
```

```
dark_results_df <- bind_rows(dark_results)
dark_results_df
```

```
## # A tibble: 4 x 5
##   trait      t_statistic p_value mean_female mean_male
##   <chr>          <dbl>    <dbl>        <dbl>       <dbl>
## 1 narcissism     -2.48  0.0135      -0.189      0.037
## 2 machiavelism    -3.37  0.00082     -0.223      0.087
## 3 psychoticism    -4.52  0.00001     -0.253      0.136
## 4 sadism          -7.46  0           -0.363      0.271
```

U analizi mračnih osobina ličnosti pronađene su jasne spolne razlike. Budući da je u t-testu korišten format

$\text{tr} \sim \text{sex}$, negativne t-vrijednosti ukazuju na više rezultate u skupini muškaraca u odnosu na žene.

Rezultati pokazuju da muškarci postižu statistički značajno više rezultate na svim analiziranim mračnim crtama — narcizmu, makijavelizmu, psihoticizmu i sadizmu (sve $p < 0.05$). Najizraženija razlika uočena je kod sadizma, gdje muškarci ostvaruju znatno više prosječne vrijednosti u odnosu na žene, što ukazuje na snažan spolni efekt na ovu osobinu.

Jačaju li neke osobine s godinama?

Nezavisna varijabla (prediktori):

-> Dob (age)

Zavisne varijable:

-> Ekstraverzija (extraversion) -> Ugodnost (agreeableness) -> Savjesnost (conscientiousness) -> Neuroticizam (neuroticism) -> Otvorenost (openness)

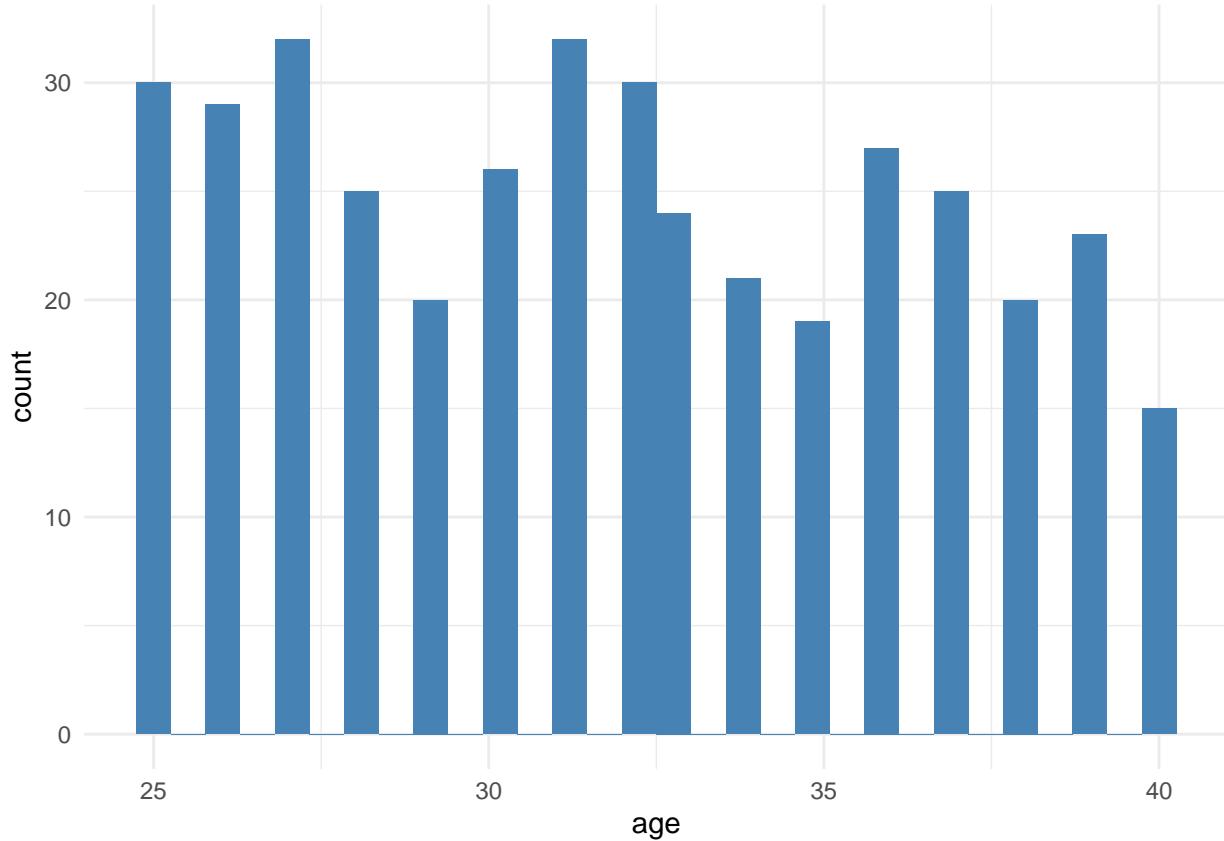
U nastavku se analiza provodi zasebno za svaku osobinu. Budući da su i dob i crte ličnosti kontinuirane varijable, a istraživačko pitanje se odnosi na linearnu promjenu s godinama, jednostavna linearna regresija predstavlja najprikladniji statistički pristup.

```
describe(data_clean %>%
  select(age, extraversion, agreeableness,
         conscientiousness, neuroticism, openness))
```

	vars	n	mean	sd	median	trimmed	mad	min	max	range
## age	1	398	31.92	4.54	32.00	31.83	5.93	25.00	40.00	15.00
## extraversion	2	398	-0.04	1.09	0.09	0.02	1.05	-3.31	2.54	5.85
## agreeableness	3	398	0.07	1.03	0.10	0.07	1.12	-3.12	2.77	5.89
## conscientiousness	4	398	0.05	0.99	0.07	0.08	1.05	-2.94	2.40	5.34
## neuroticism	5	398	0.05	1.05	-0.07	0.00	1.05	-2.27	2.95	5.22
## openness	6	398	0.04	1.05	-0.09	0.04	0.95	-3.38	2.99	6.36
##			skew	kurtosis	se					
## age		0.12	-1.18	0.23						
## extraversion		-0.50	-0.11	0.05						
## agreeableness		-0.06	-0.33	0.05						
## conscientiousness		-0.26	-0.28	0.05						
## neuroticism		0.41	-0.05	0.05						
## openness		-0.03	0.33	0.05						

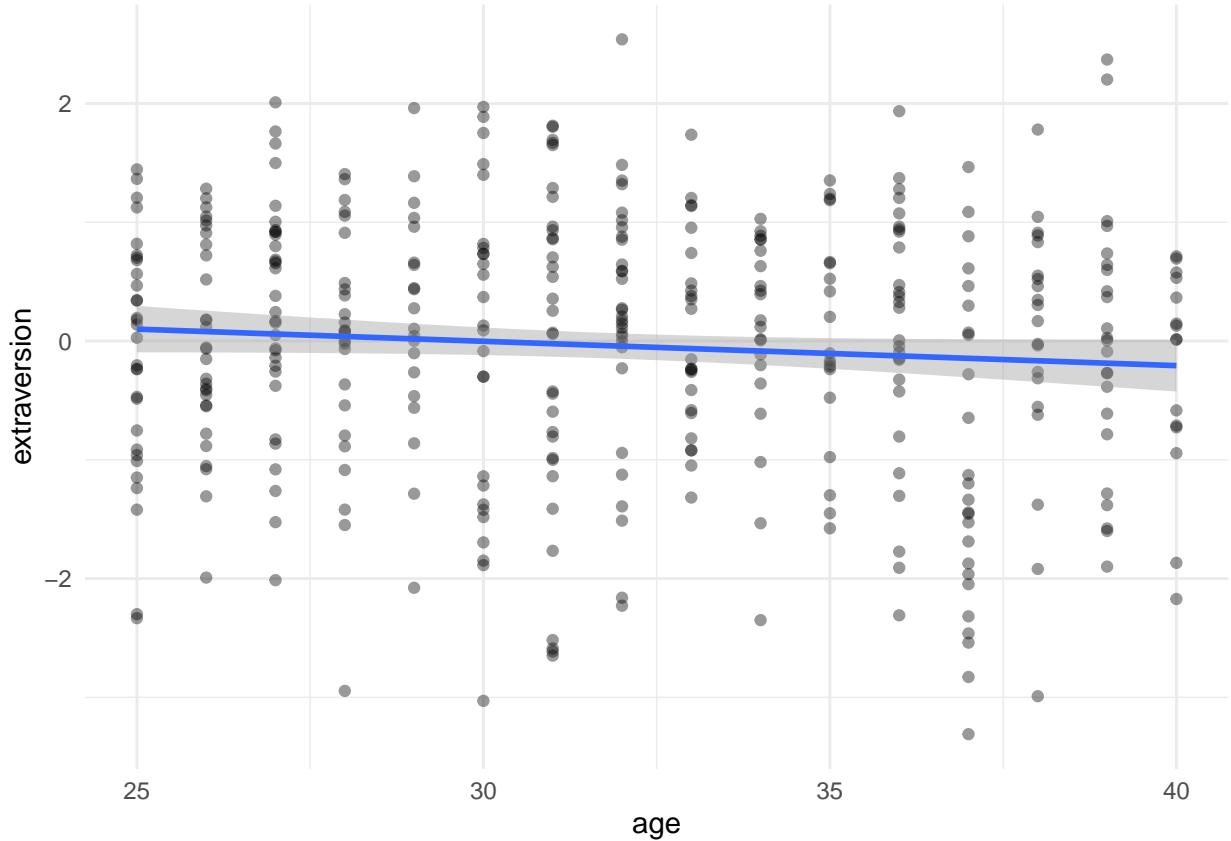
Deskriptivna statistika pruža osnovni uvid u raspodjelu dobi i razinu pojedinih crta ličnosti u uzorku ispitanika.

```
ggplot(data_clean, aes(age)) +
  geom_histogram(bins = 30, fill = "steelblue") +
  theme_minimal()
```



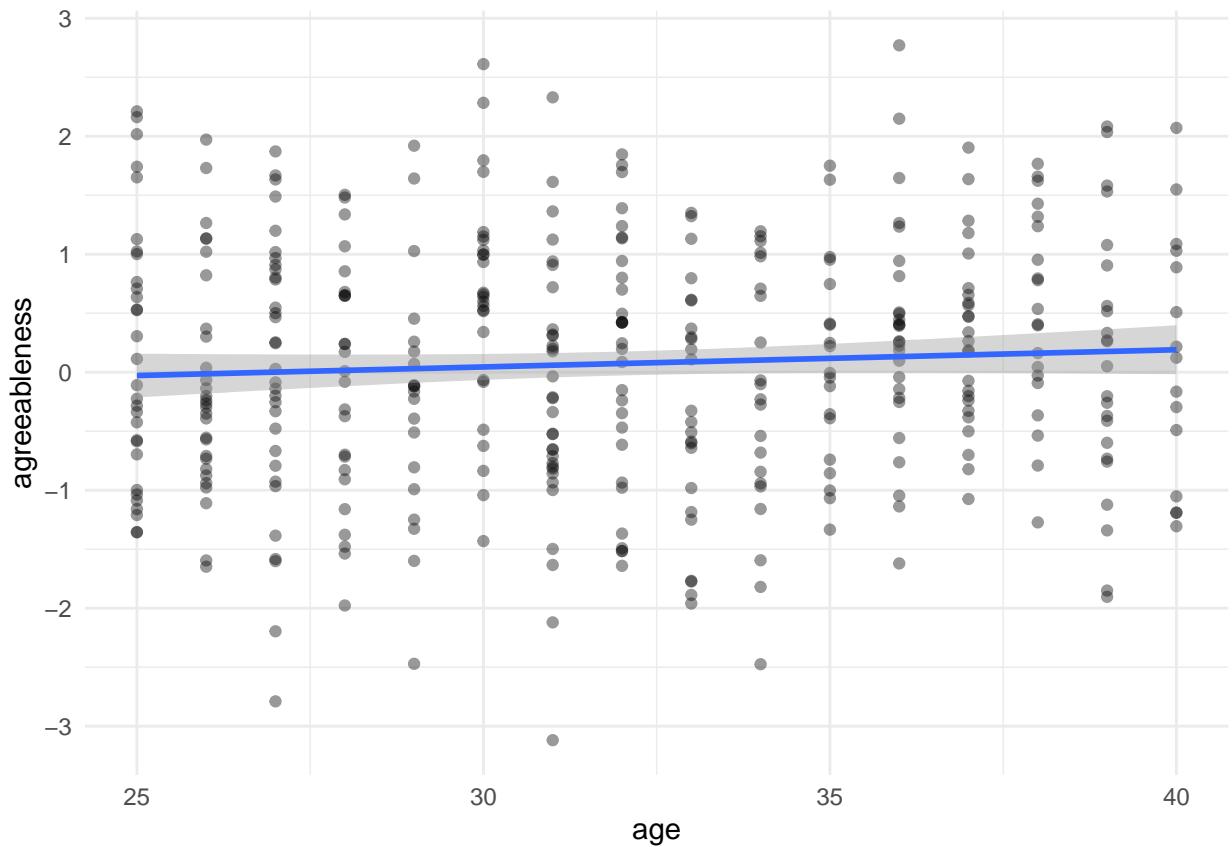
Histogram dobi prikazuje raspodjelu ispitanika po dobnim skupinama te omogućuje procjenu raspona i strukture dobi u uzorku.

```
ggplot(data_clean, aes(age, extraversion)) +  
  geom_point(alpha = 0.4) +  
  geom_smooth(method = "lm", se = TRUE) +  
  theme_minimal()  
  
## `geom_smooth()` using formula = 'y ~ x'
```



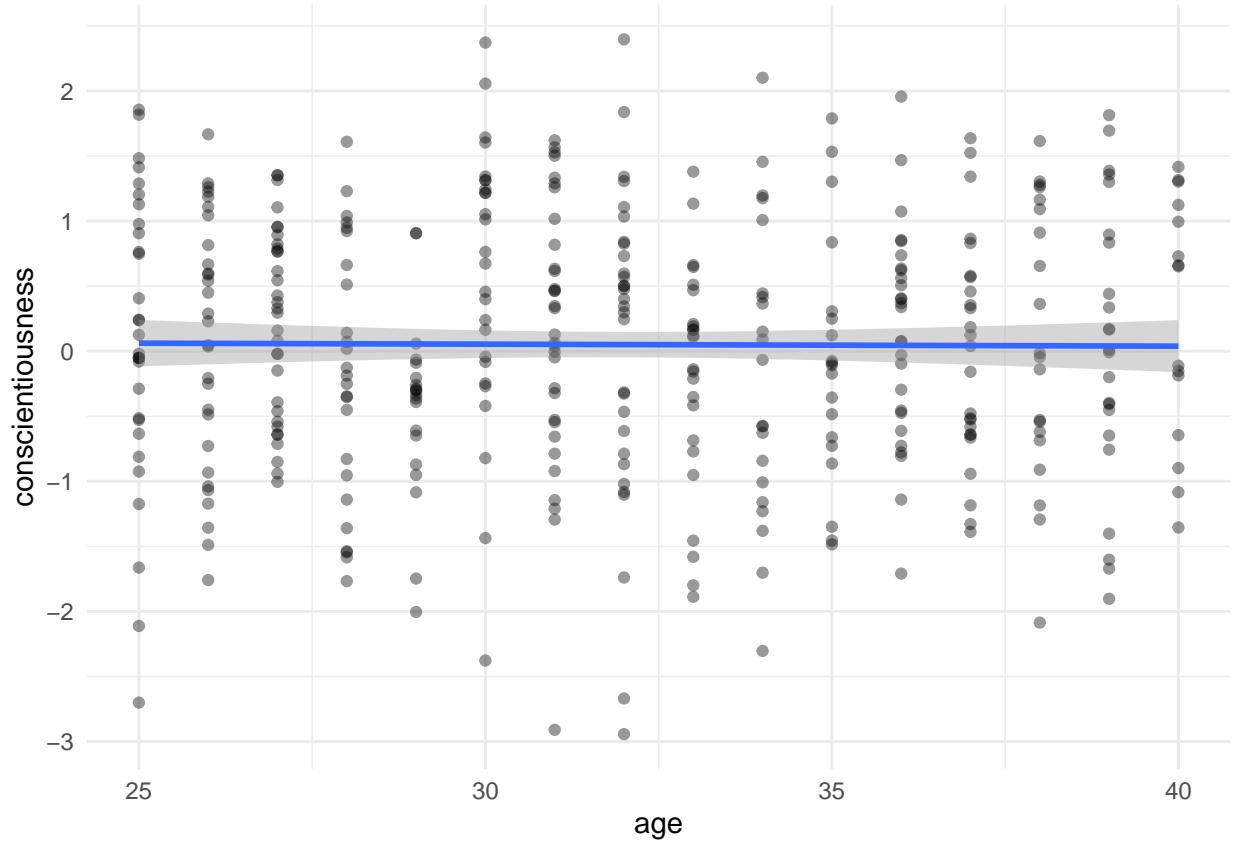
```
ggplot(data_clean, aes(age, agreeableness)) +
  geom_point(alpha = 0.4) +
  geom_smooth(method = "lm", se = TRUE) +
  theme_minimal()
```

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



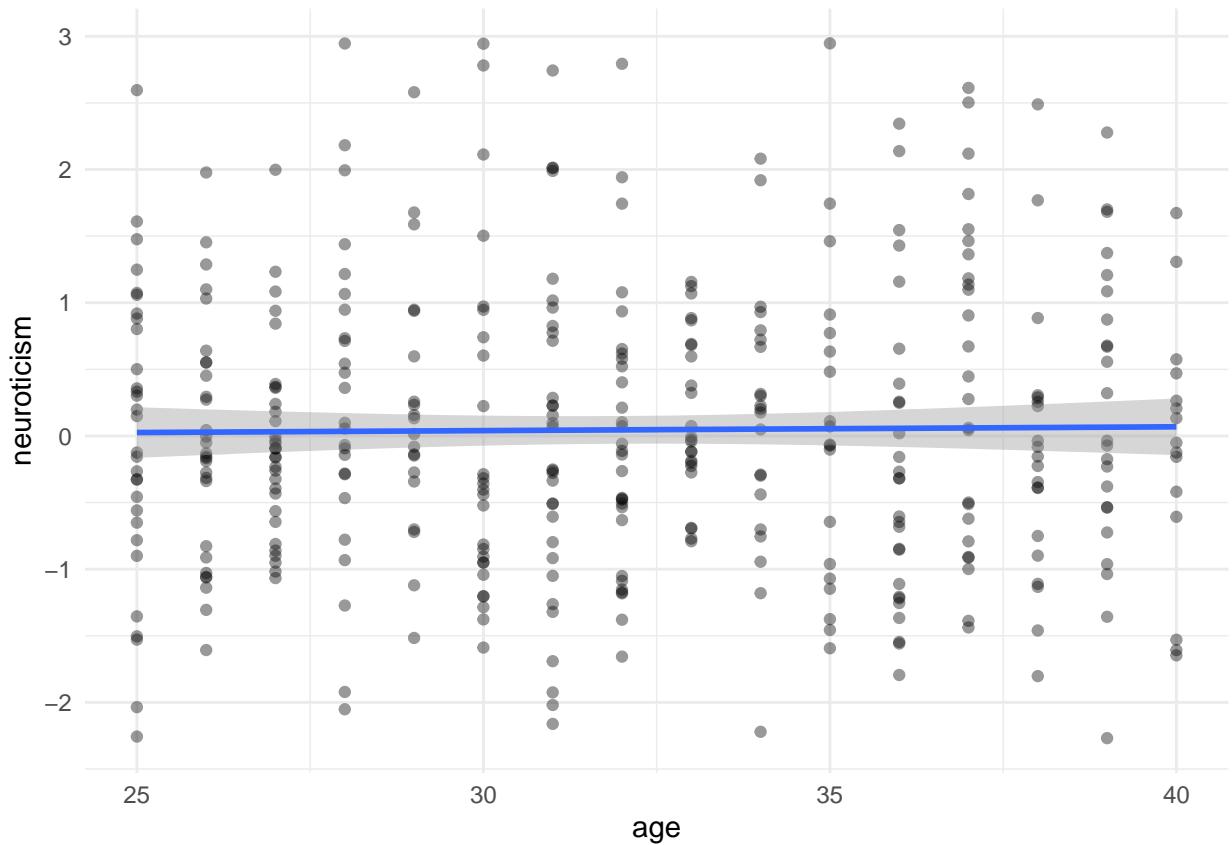
```
ggplot(data_clean, aes(age, conscientiousness)) +
  geom_point(alpha = 0.4) +
  geom_smooth(method = "lm", se = TRUE) +
  theme_minimal()
```

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



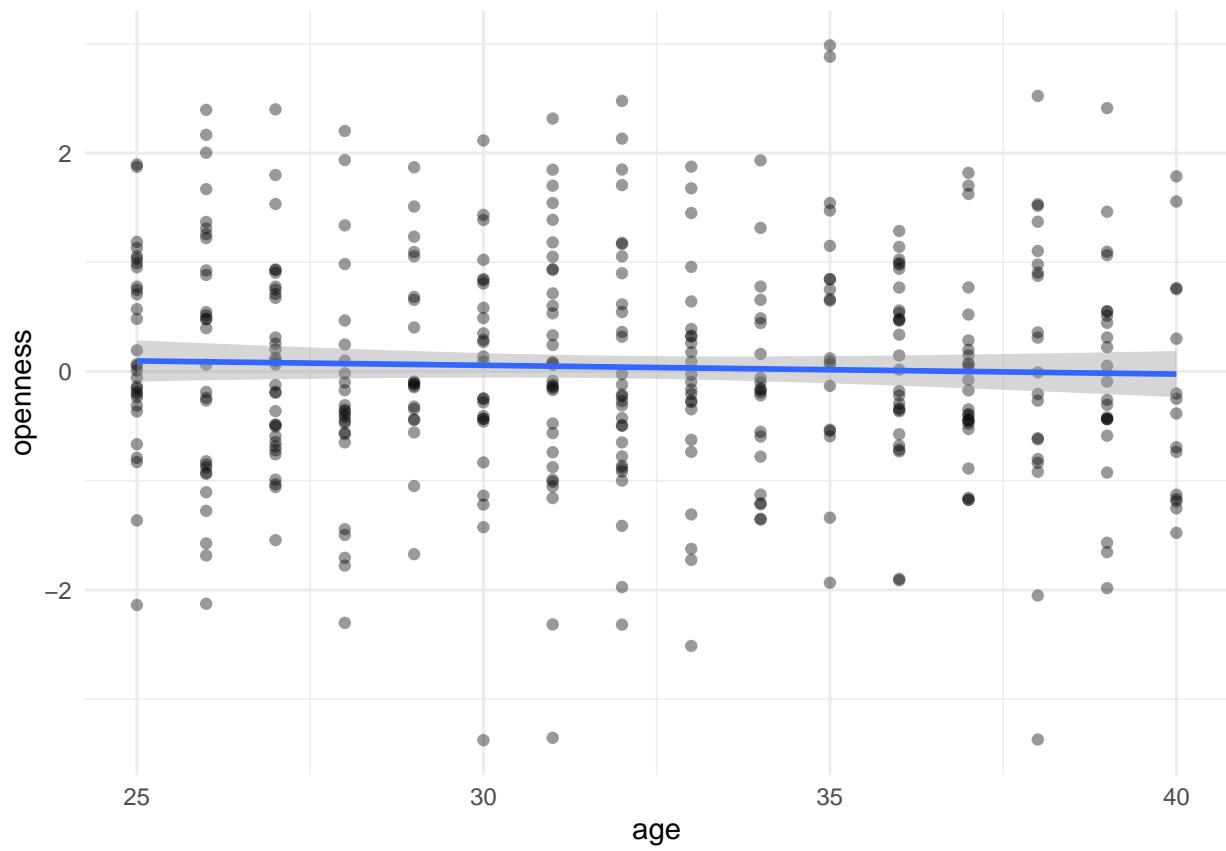
```
ggplot(data_clean, aes(age, neuroticism)) +
  geom_point(alpha = 0.4) +
  geom_smooth(method = "lm", se = TRUE) +
  theme_minimal()
```

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



```
ggplot(data_clean, aes(age, openness)) +
  geom_point(alpha = 0.4) +
  geom_smooth(method = "lm", se = TRUE) +
  theme_minimal()
```

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



Raspršeni dijagrami s pripadajućim regresijskim linijama korišteni su za vizualnu procjenu linearnog odnosa između dobi i pojedinih crta ličnosti. Grafički prikazi ne upućuju na izražene linearne trendove, iako se kod nekih osobina može uočiti blagi rast ili pad vrijednosti s porastom dobi.

```
cor.test(data_clean$age, data_clean$extraversion)
```

```
##
## Pearson's product-moment correlation
##
## data: data_clean$age and data_clean$extraversion
## t = -1.7053, df = 396, p-value = 0.08893
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.18215014  0.01302653
## sample estimates:
##          cor
## -0.08538084
```

```
cor.test(data_clean$age, data_clean$agreeableness)
```

```
##
## Pearson's product-moment correlation
##
## data: data_clean$age and data_clean$agreeableness
## t = 1.2789, df = 396, p-value = 0.2017
```

```

## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.0343782  0.1614170
## sample estimates:
##       cor
## 0.06413658

cor.test(data_clean$age, data_clean$conscientiousness)

##
## Pearson's product-moment correlation
##
## data: data_clean$age and data_clean$conscientiousness
## t = -0.13972, df = 396, p-value = 0.889
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.10524642  0.09134006
## sample estimates:
##       cor
## -0.007021018

cor.test(data_clean$age, data_clean$neuroticism)

##
## Pearson's product-moment correlation
##
## data: data_clean$age and data_clean$neuroticism
## t = 0.2454, df = 396, p-value = 0.8063
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.08607148  0.11049500
## sample estimates:
##       cor
## 0.01233089

cor.test(data_clean$age, data_clean$openness)

##
## Pearson's product-moment correlation
##
## data: data_clean$age and data_clean$openness
## t = -0.69464, df = 396, p-value = 0.4877
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.13272862  0.06363051
## sample estimates:
##       cor
## -0.03488574

```

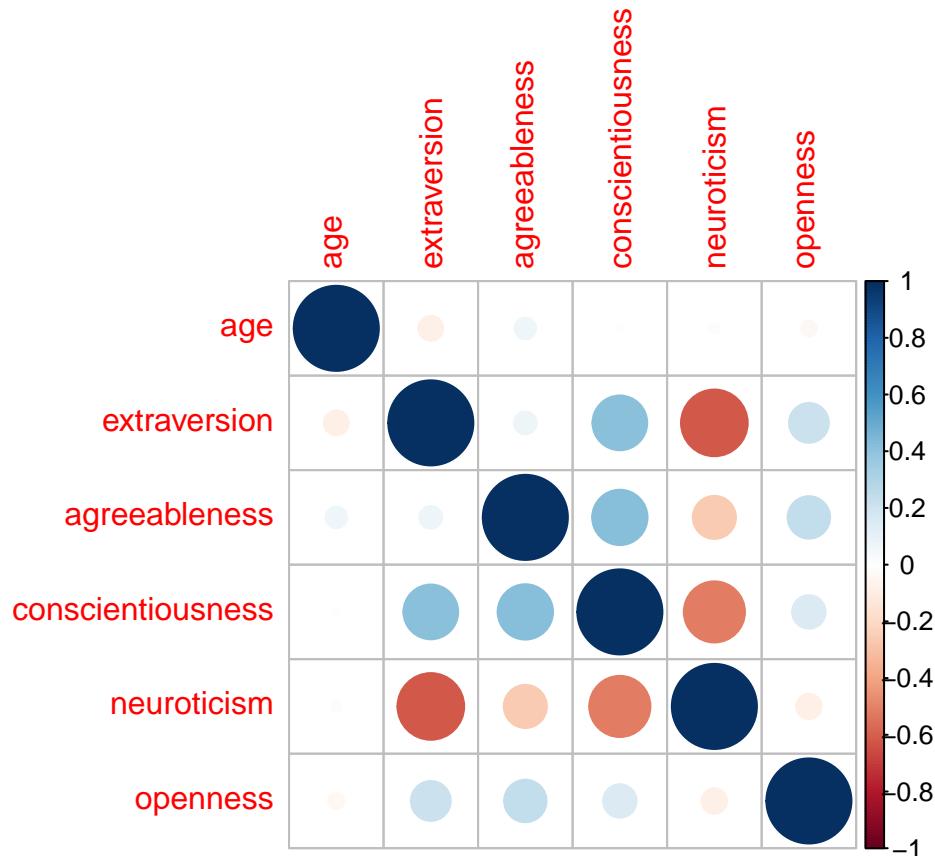
Pearsonove korelacije korištene su kao preliminarna analiza odnosa dobi i crta ličnosti. Rezultati korelacija ne upućuju na statistički značajne povezanosti između dobi i promatranih osobina.

```

vars <- data_clean %>%
  select(age, extraversion, agreeableness,
         conscientiousness, neuroticism, openness) %>%
  na.omit()

corrplot(cor(vars))

```



Korelacijska matrica dodatno potvrđuje izostanak snažnih povezanosti između dobi i pojedinih crta ličnosti.

```

model_consc <- lm(conscientiousness ~ age, data = data_clean)
summary(model_consc)

```

```

##
## Call:
## lm(formula = conscientiousness ~ age, data = data_clean)
##
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -2.99434 -0.68117  0.01346  0.76485  2.34600 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) 0.099902  0.353798   0.282   0.778    
## age        -0.001533  0.010973  -0.140   0.889    
## 
## Residual standard error: 0.9919 on 396 degrees of freedom

```

```
## Multiple R-squared:  4.929e-05, Adjusted R-squared:  -0.002476
## F-statistic: 0.01952 on 1 and 396 DF,  p-value: 0.889
```

```
model_extra <- lm(extraversion ~ age, data = data_clean)
summary(model_extra)
```

```
##
## Call:
## lm(formula = extraversion ~ age, data = data_clean)
##
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -3.1645 -0.6666  0.1027  0.7857  2.5834 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept)  0.61250   0.38726   1.582   0.1145    
## age         -0.02048   0.01201  -1.705   0.0889 .  
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.086 on 396 degrees of freedom
## Multiple R-squared:  0.00729, Adjusted R-squared:  0.004783 
## F-statistic: 2.908 on 1 and 396 DF,  p-value: 0.08893
```

```
model_agree <- lm(agreeableness ~ age, data = data_clean)
summary(model_agree)
```

```
##
## Call:
## lm(formula = agreeableness ~ age, data = data_clean)
##
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -3.1780 -0.7163  0.0236  0.7345  2.6385 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -0.39279   0.36742  -1.069   0.286    
## age          0.01457   0.01140   1.279   0.202    
## ---
## Residual standard error: 1.03 on 396 degrees of freedom
## Multiple R-squared:  0.004114, Adjusted R-squared:  0.001599 
## F-statistic: 1.636 on 1 and 396 DF,  p-value: 0.2017
```

```
model_neuro <- lm(neuroticism ~ age, data = data_clean)
summary(model_neuro)
```

```
##
## Call:
## lm(formula = neuroticism ~ age, data = data_clean)
##
```

```

## Residuals:
##      Min     1Q Median     3Q    Max
## -2.3342 -0.7428 -0.1191  0.6403  2.9115
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.045980  0.376568 -0.122   0.903
## age         0.002866  0.011679  0.245   0.806
##
## Residual standard error: 1.056 on 396 degrees of freedom
## Multiple R-squared:  0.0001521, Adjusted R-squared:  -0.002373
## F-statistic: 0.06022 on 1 and 396 DF, p-value: 0.8063

model_open <- lm(openness ~ age, data = data_clean)
summary(model_open)

```

```

##
## Call:
## lm(formula = openness ~ age, data = data_clean)
##
## Residuals:
##      Min     1Q Median     3Q    Max
## -3.4319 -0.6082 -0.1301  0.6922  2.9697
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.297455  0.373452  0.796   0.426
## age        -0.008046  0.011583 -0.695   0.488
##
## Residual standard error: 1.047 on 396 degrees of freedom
## Multiple R-squared:  0.001217, Adjusted R-squared:  -0.001305
## F-statistic: 0.4825 on 1 and 396 DF, p-value: 0.4877

```

Za svaku crtu ličnosti provedena je analiza jednostavne linearne regresije u kojoj je dob korištena kao nezavisna varijabla. U niti jednom modelu dob se nije pokazala statistički značajnim prediktorom ($p > 0.05$). Vrijednosti koeficijenta determinacije bile su vrlo niske, što upućuje na slab objašnjavanjući doprinos dobi.

Na temelju provedene analize može se zaključiti da se u promatranom uzorku ne uočava statistički značajno jačanje niti slabljenje crta ličnosti s godinama. Dob se u ovom istraživanju nije pokazala značajnim prediktorom promjena u okviru Big Five modela ličnosti.

```

library(broom)

models <- list(
  Extraversion = model_extra,
  Agreeableness = model_agree,
  Conscientiousness = model_consc,
  Neuroticism = model_neuro,
  Openness = model_open
)

results <- lapply(models, tidy) |>
  bind_rows(.id = "Trait") |>

```

```

filter(term == "age")

results

## # A tibble: 5 x 6
##   Trait      term  estimate std.error statistic p.value
##   <chr>     <chr>    <dbl>     <dbl>     <dbl>    <dbl>
## 1 Extraversion age    -0.0205    0.0120    -1.71    0.0889
## 2 Agreeableness age     0.0146    0.0114     1.28    0.202
## 3 Conscientiousness age    -0.00153   0.0110    -0.140   0.889
## 4 Neuroticism    age     0.00287   0.0117     0.245   0.806
## 5 Openness       age    -0.00805   0.0116    -0.695   0.488

```

Tablica prikazuje procijenjene regresijske koeficijente za učinak dobi na pojedine crte ličnosti.

Jesu li crte ličnosti i sklonost stresu, depresiji i anksioznosti povezane sa zanimanjem?

```

df_job <- dataset %>% filter(!sex %in% c("CONSENT_REVOKED"),
                                !`student status` %in% c("CONSENT_REVOKED", "DATA_EXPIRED"),
                                !`employment status` %in% c("CONSENT_REVOKED", "DATA_EXPIRED"))
                                )

df_job <- df_job %>% mutate(
  occupation_group = if_else(
    `student status` == "Yes",
    "Student",
    `employment status`
  )
) %>% filter(!occupation_group %in% c("Other", "Due to start a new job within the next month", "Not in

table(df_job$occupation_group)

##
##                                     Full-Time          Part-Time
##                                     205                      36
## Student Unemployed (and job seeking)
##                                     109                      24

df_job %>%
  group_by(occupation_group) %>%
  summarise(
    n = n(),
    mean_stress = mean(stress, na.rm = TRUE),
    mean_depression = mean(depression, na.rm = TRUE),
    mean_anxiety = mean(anxiety, na.rm = TRUE)
  )

```

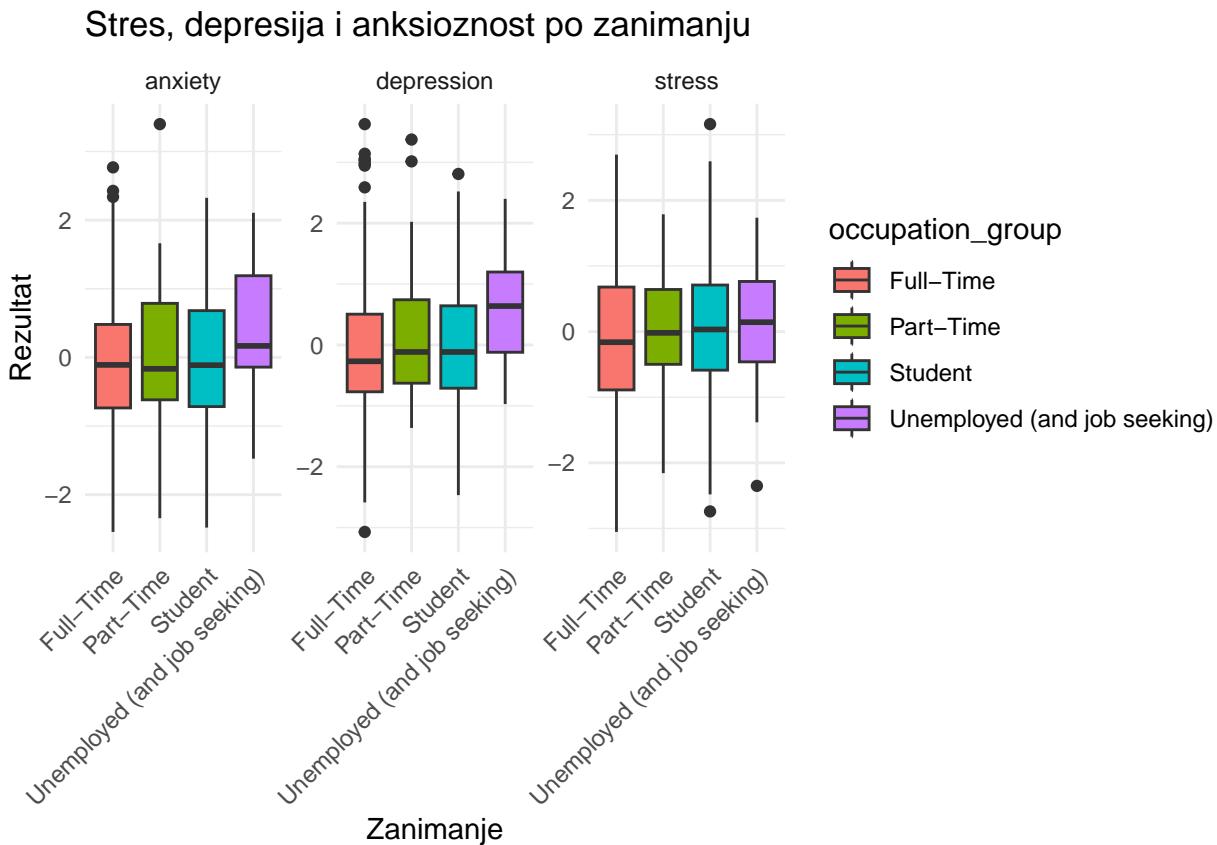
```

## # A tibble: 4 x 5
##   occupation_group      n mean_stress mean_depression mean_anxiety
##   <chr>          <int>     <dbl>           <dbl>         <dbl>
## 1 Full-Time        205    -0.0739        -0.0466       -0.0342
## 2 Part-Time         36     0.0756          0.127        0.107 
## 3 Student          109     0.0739          0.0126      -0.0677
## 4 Unemployed (and job seeking) 24     0.109          0.561        0.346

mental_long <- df_job %>%
  pivot_longer(
    cols = c(stress, depression, anxiety),
    names_to = "outcome",
    values_to = "score"
  )

ggplot(mental_long, aes(x = occupation_group, y = score, fill = occupation_group)) +
  geom_boxplot() +
  facet_wrap(~ outcome, scales = "free_y") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  labs(
    title = "Stres, depresija i anksioznost po zanimanju",
    x = "Zanimanje",
    y = "Rezultat"
  )

```



Vizualni pregled distribucija pokazuje da se razine stresa, depresije i anksioznosti uvelike preklapaju između

skupina definiranih prema zanimanju, što upućuje na izražene individualne razlike unutar skupina. Iako nezaposleni sudionici pokazuju viši medijan depresivnosti u odnosu na ostale skupine, razlike nisu statistički potvrđene. Razine stresa pokazuju vrlo slične obrasce u svim skupinama, dok se anksioznost nepojavljuje sustavno povezanom sa zanimanjem. Ovi nalazi sugeriraju da profesionalni status sam po sebi ima ograničen doprinos objašnjenju mentalnog zdravlja te da individualne crte ličnosti vjerojatno imaju snažniju ulogu.

Provodenje ANOVA analize - Razlikuju li se razine anksioznosti, depresije i stresa po zanimanjima?

Test prepostavke normalnosti za anksioznost

```
require(nortest)
lillie.test(df_job$anxiety)

## 
##  Lilliefors (Kolmogorov-Smirnov) normality test
## 
## data: df_job$anxiety
## D = 0.040688, p-value = 0.1385

lillie.test(df_job$anxiety[df_job$occupation_group=='Full-Time'])

## 
##  Lilliefors (Kolmogorov-Smirnov) normality test
## 
## data: df_job$anxiety[df_job$occupation_group == "Full-Time"]
## D = 0.060222, p-value = 0.06789

lillie.test(df_job$anxiety[df_job$occupation_group=='Part-Time'])

## 
##  Lilliefors (Kolmogorov-Smirnov) normality test
## 
## data: df_job$anxiety[df_job$occupation_group == "Part-Time"]
## D = 0.15146, p-value = 0.03593

lillie.test(df_job$anxiety[df_job$occupation_group=='Unemployed (and job seeking)'])

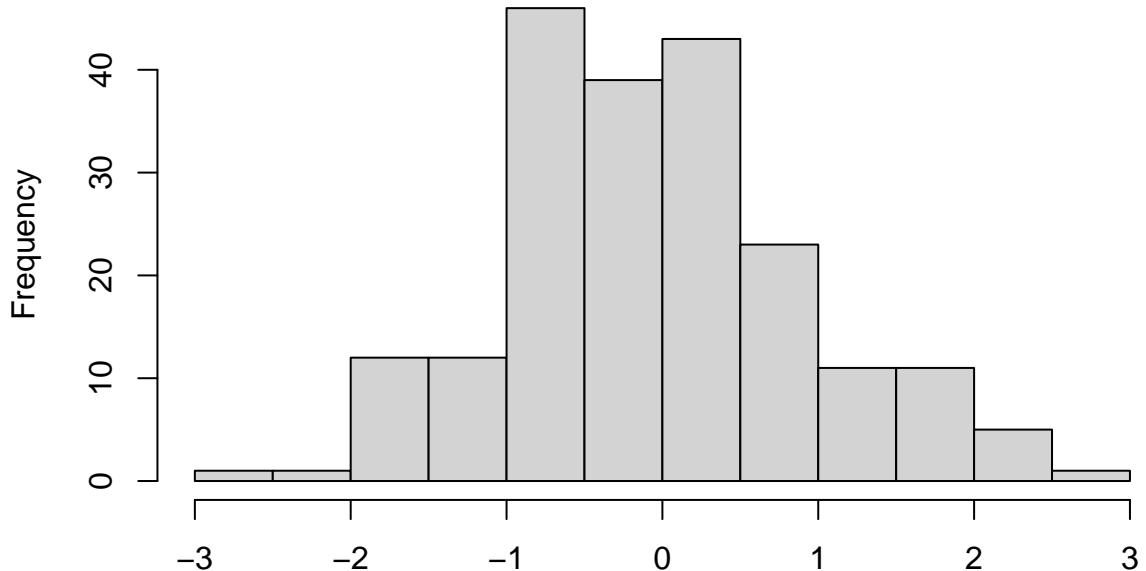
## 
##  Lilliefors (Kolmogorov-Smirnov) normality test
## 
## data: df_job$anxiety[df_job$occupation_group == "Unemployed (and job seeking)"]
## D = 0.11293, p-value = 0.5953

lillie.test(df_job$anxiety[df_job$occupation_group=='Student'])

## 
##  Lilliefors (Kolmogorov-Smirnov) normality test
## 
## data: df_job$anxiety[df_job$occupation_group == "Student"]
## D = 0.042081, p-value = 0.9066
```

```
hist(df_job$anxiety[df_job$occupation_group=="Full-Time"])
```

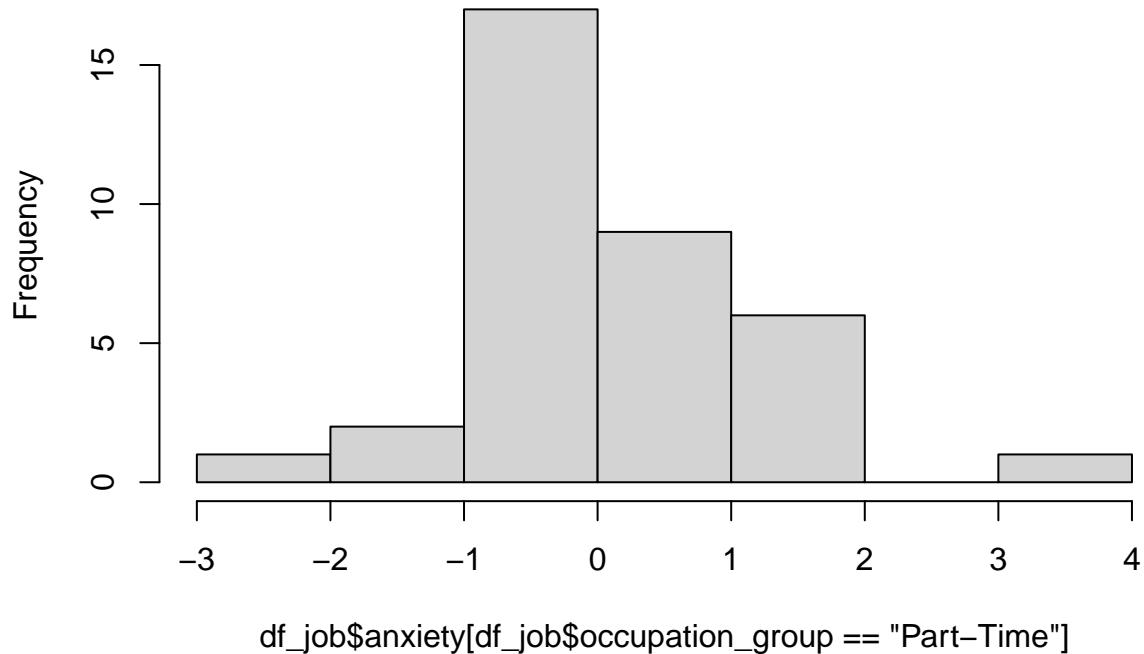
Histogram of df_job\$anxiety[df_job\$occupation_group == "Full-Time"]



df_job\$anxiety[df_job\$occupation_group == "Full-Time"]

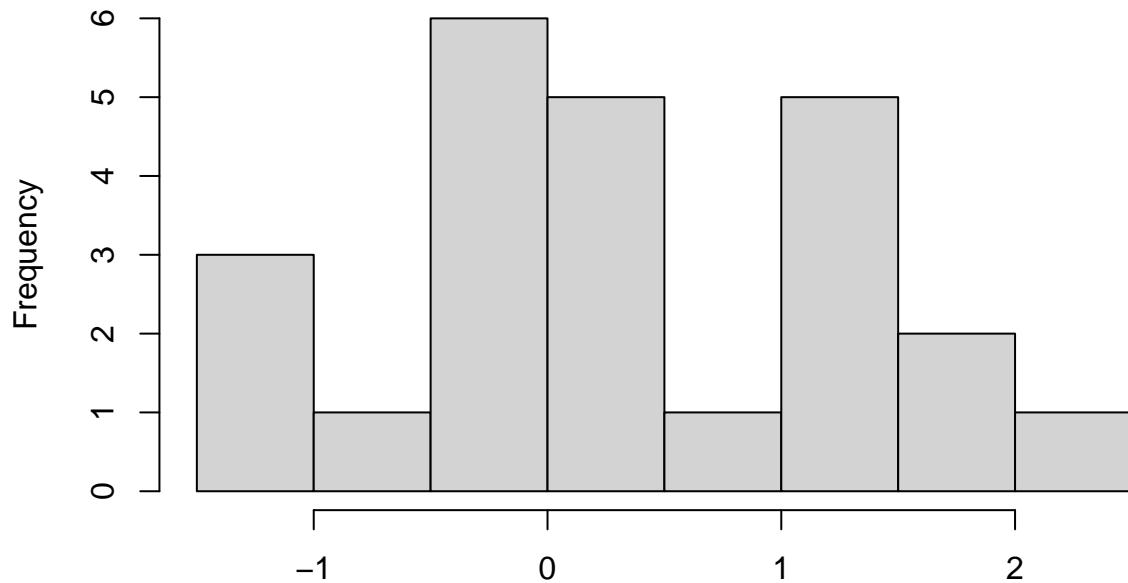
```
hist(df_job$anxiety[df_job$occupation_group=="Part-Time"])
```

Histogram of df_job\$anxiety[df_job\$occupation_group == "Part-Time"]



```
hist(df_job$anxiety[df_job$occupation_group=='Unemployed (and job seeking)'])
```

```
m of df_job$anxiety[df_job$occupation_group == "Unemployed (and jc
```



```
df_job$anxiety[df_job$occupation_group == "Unemployed (and job seeking)"]
```

```
hist(df_job$anxiety[df_job$occupation_group=='Student'])
```

Histogram of df_job\$anxiety[df_job\$occupation_group == "Student"]



df_job\$anxiety[df_job\$occupation_group == "Student"]

Test prepostavke normalnosti za depresiju

```
require(nortest)
lillie.test(df_job$anxiety)

##
##  Lilliefors (Kolmogorov-Smirnov) normality test
##
##  data:  df_job$anxiety
##  D = 0.040688, p-value = 0.1385

lillie.test(df_job$anxiety[df_job$occupation_group=='Full-Time'])

##
##  Lilliefors (Kolmogorov-Smirnov) normality test
##
##  data:  df_job$anxiety[df_job$occupation_group == "Full-Time"]
##  D = 0.060222, p-value = 0.06789

lillie.test(df_job$anxiety[df_job$occupation_group=='Part-Time'])

##
##  Lilliefors (Kolmogorov-Smirnov) normality test
##
##  data:  df_job$anxiety[df_job$occupation_group == "Part-Time"]
##  D = 0.15146, p-value = 0.03593
```

```
lillie.test(df_job$anxiety[df_job$occupation_group=='Unemployed (and job seeking)'])
```

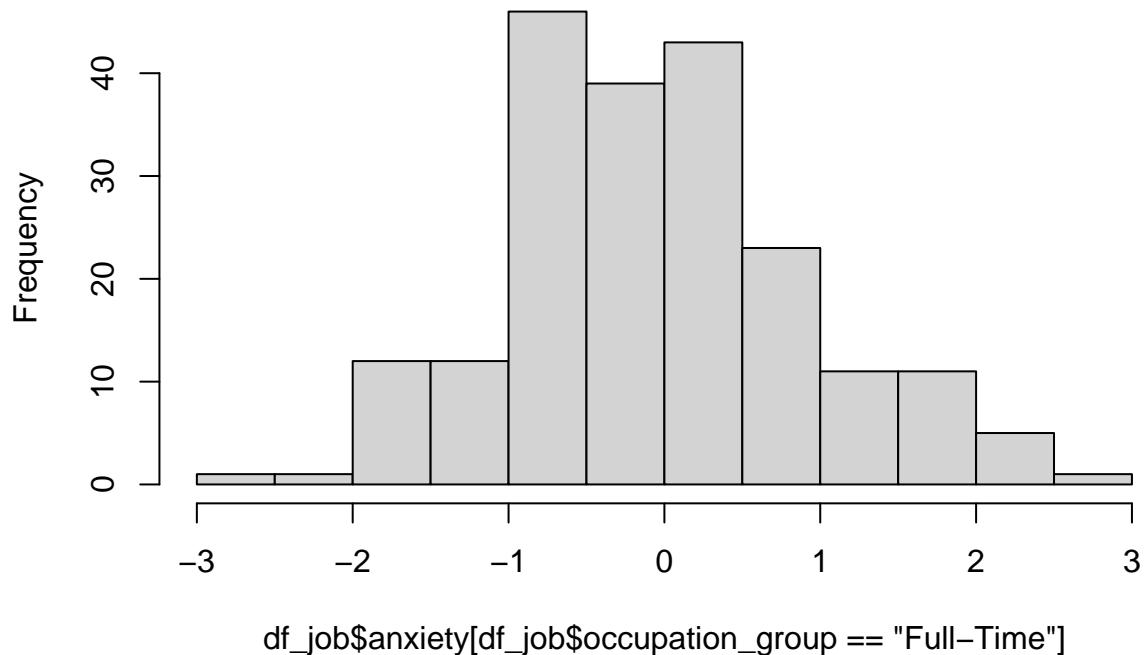
```
##  
## Lilliefors (Kolmogorov-Smirnov) normality test  
##  
## data: df_job$anxiety[df_job$occupation_group == "Unemployed (and job seeking)"]  
## D = 0.11293, p-value = 0.5953
```

```
lillie.test(df_job$anxiety[df_job$occupation_group=='Student'])
```

```
##  
## Lilliefors (Kolmogorov-Smirnov) normality test  
##  
## data: df_job$anxiety[df_job$occupation_group == "Student"]  
## D = 0.042081, p-value = 0.9066
```

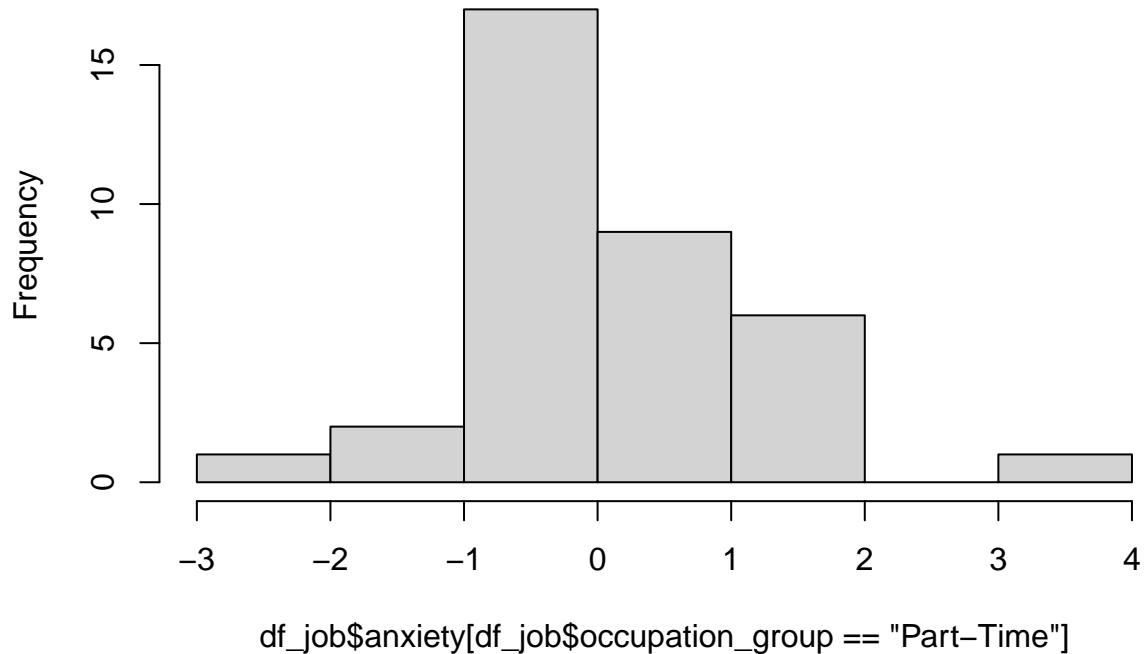
```
hist(df_job$anxiety[df_job$occupation_group=='Full-Time'])
```

Histogram of df_job\$anxiety[df_job\$occupation_group == "Full-Time"]



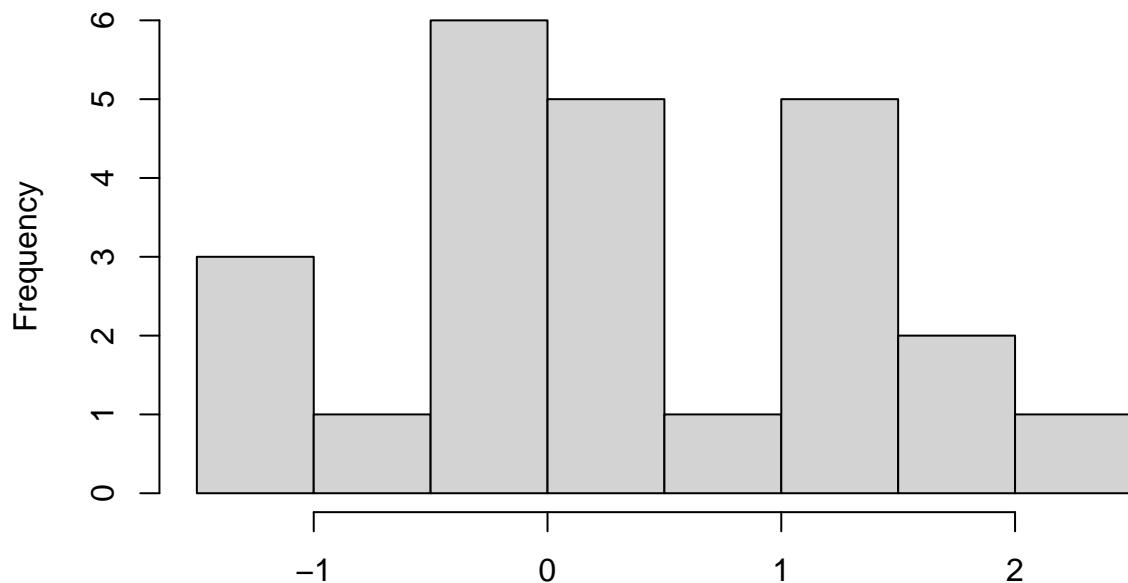
```
hist(df_job$anxiety[df_job$occupation_group=='Part-Time'])
```

Histogram of df_job\$anxiety[df_job\$occupation_group == "Part-Time"]



```
hist(df_job$anxiety[df_job$occupation_group=='Unemployed (and job seeking)'])
```

```
m of df_job$anxiety[df_job$occupation_group == "Unemployed (and jc
```



```
df_job$anxiety[df_job$occupation_group == "Unemployed (and job seeking)"]
```

```
hist(df_job$anxiety[df_job$occupation_group=='Student'])
```

Histogram of df_job\$anxiety[df_job\$occupation_group == "Student"]



df_job\$anxiety[df_job\$occupation_group == "Student"]

Test prepostavki normalnosti za stres

```
require(nortest)
lillie.test(df_job$stress)

##
## Lilliefors (Kolmogorov-Smirnov) normality test
##
## data: df_job$stress
## D = 0.038095, p-value = 0.2075

lillie.test(df_job$stress[df_job$occupation_group=='Full-Time'])

##
## Lilliefors (Kolmogorov-Smirnov) normality test
##
## data: df_job$stress[df_job$occupation_group == "Full-Time"]
## D = 0.057729, p-value = 0.09354

lillie.test(df_job$stress[df_job$occupation_group=='Part-Time'])

##
## Lilliefors (Kolmogorov-Smirnov) normality test
##
## data: df_job$stress[df_job$occupation_group == "Part-Time"]
## D = 0.091433, p-value = 0.6263
```

```
lillie.test(df_job$stress[df_job$occupation_group=='Unemployed (and job seeking)'])
```

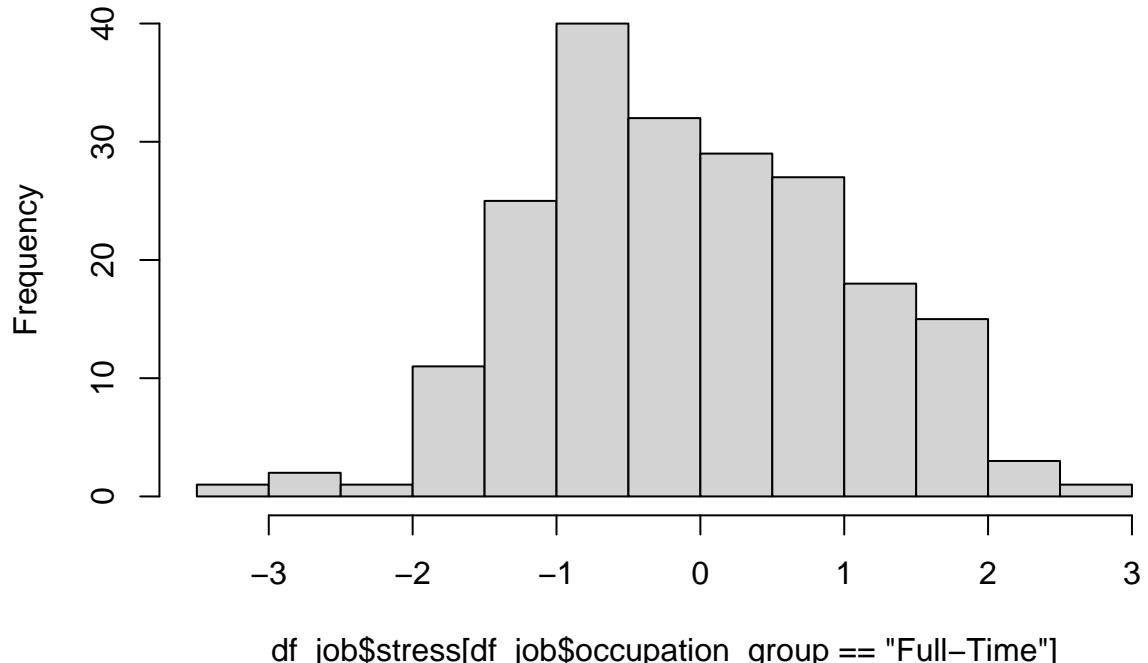
```
##  
## Lilliefors (Kolmogorov-Smirnov) normality test  
##  
## data: df_job$stress[df_job$occupation_group == "Unemployed (and job seeking)"]  
## D = 0.070023, p-value = 0.9916
```

```
lillie.test(df_job$stress[df_job$occupation_group=='Student'])
```

```
##  
## Lilliefors (Kolmogorov-Smirnov) normality test  
##  
## data: df_job$stress[df_job$occupation_group == "Student"]  
## D = 0.062087, p-value = 0.3808
```

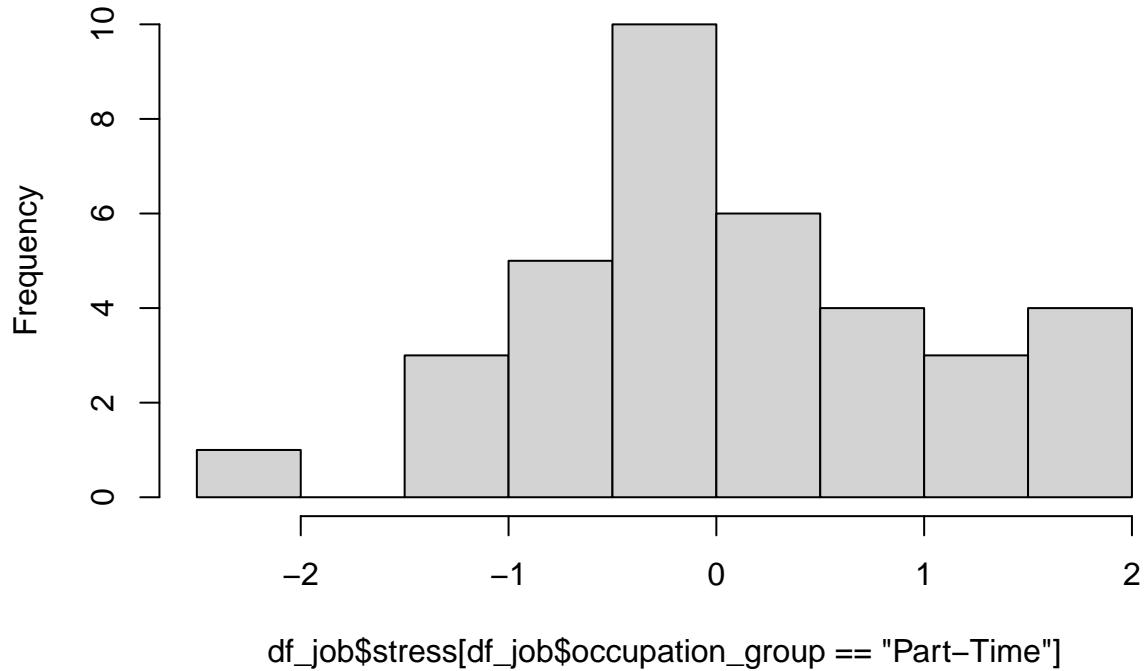
```
hist(df_job$stress[df_job$occupation_group=='Full-Time'])
```

Histogram of df_job\$stress[df_job\$occupation_group == "Full-Time"]



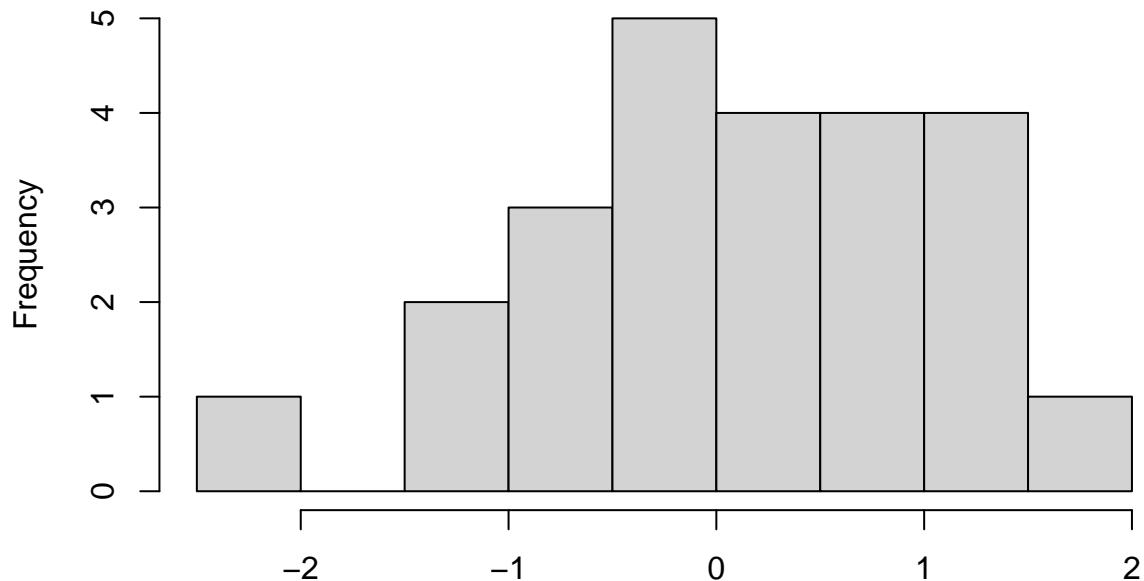
```
hist(df_job$stress[df_job$occupation_group=='Part-Time'])
```

Histogram of df_job\$stress[df_job\$occupation_group == "Part-Time"]



```
hist(df_job$stress[df_job$occupation_group=="Part-Time"])
```

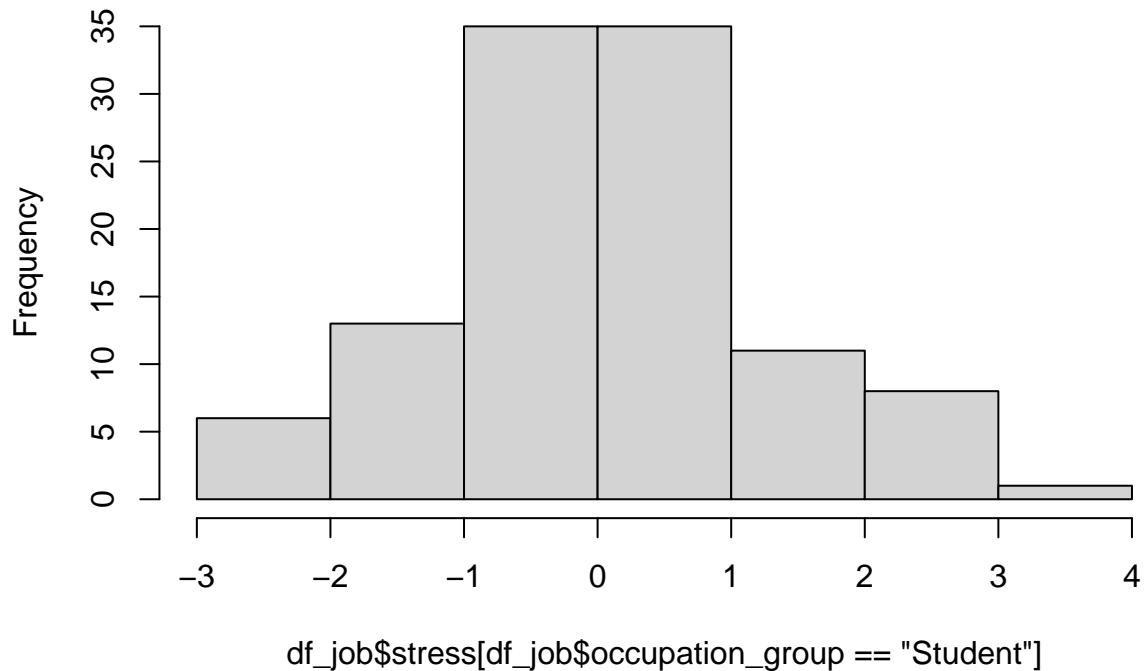
```
sum of df_job$stress[df_job$occupation_group == "Unemployed (and jo
```



```
df_job$stress[df_job$occupation_group == "Unemployed (and job seeking)"]
```

```
hist(df_job$stress[df_job$occupation_group=='Student'])
```

Histogram of df_job\$stress[df_job\$occupation_group == "Student"]



Test prepostavki homogenosti varijanci za anksioznost

```
bartlett.test(df_job$anxiety ~ df_job$occupation_group)
```

```
##  
##  Bartlett test of homogeneity of variances  
##  
##  data:  df_job$anxiety by df_job$occupation_group  
##  Bartlett's K-squared = 1.0818, df = 3, p-value = 0.7815
```

```
var((df_job$anxiety[df_job$occupation_group=='Full-Time']))
```

```
## [1] 0.9497347
```

```
var((df_job$anxiety[df_job$occupation_group=='Part-Time']))
```

```
## [1] 1.159903
```

```
var((df_job$anxiety[df_job$occupation_group=='Unemployed (and job seeking)']))
```

```
## [1] 1.070241
```

```
var((df_job$anxiety[df_job$occupation_group=='Student']))  
## [1] 1.091825
```

Test prepostavki homogenosti varijanci za depresiju

```
bartlett.test(df_job$depression ~ df_job$occupation_group)
```

```
##  
##  Bartlett test of homogeneity of variances  
##  
## data: df_job$depression by df_job$occupation_group  
## Bartlett's K-squared = 0.78061, df = 3, p-value = 0.8541
```

```
var((df_job$depression[df_job$occupation_group=='Full-Time']))
```

```
## [1] 1.200926
```

```
var((df_job$depression[df_job$occupation_group=='Part-Time']))
```

```
## [1] 1.220683
```

```
var((df_job$depression[df_job$occupation_group=='Unemployed (and job seeking)']))
```

```
## [1] 0.9148913
```

```
var((df_job$depression[df_job$occupation_group=='Student']))
```

```
## [1] 1.222059
```

Test prepostavki homogenosti varijanci za stres

```
bartlett.test(df_job$stress ~ df_job$occupation_group)
```

```
##  
##  Bartlett test of homogeneity of variances  
##  
## data: df_job$stress by df_job$occupation_group  
## Bartlett's K-squared = 3.3471, df = 3, p-value = 0.3411
```

```
var((df_job$stress[df_job$occupation_group=='Full-Time']))
```

```
## [1] 1.14987
```

```
var((df_job$stress[df_job$occupation_group=='Part-Time']))
```

```
## [1] 0.8855903
```

```

var((df_job$stress[df_job$occupation_group=='Unemployed (and job seeking)']))

## [1] 1.022324

var((df_job$stress[df_job$occupation_group=='Student']))

## [1] 1.408198

summary(aov(anxiety ~ occupation_group, data = df_job))

##                                Df Sum Sq Mean Sq F value Pr(>F)
## occupation_group      3     4.0   1.339   1.314  0.269
## Residuals            370  376.9   1.019

summary(aov(depression ~ occupation_group, data = df_job))

##                                Df Sum Sq Mean Sq F value Pr(>F)
## occupation_group      3     8.3   2.781   2.334 0.0736 .
## Residuals            370  440.7   1.191
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

summary(aov(stress ~ occupation_group, data = df_job))

##                                Df Sum Sq Mean Sq F value Pr(>F)
## occupation_group      3     2.2   0.732   0.614  0.606
## Residuals            370  441.2   1.192

```

Provedene su jednosmjerne analize varijance (ANOVA) s ciljem ispitivanja razlika u razini anksioznosti, depresije i stresa između skupina definiranih prema zanimanju. Prethodno tome, provedena su testiranja pretpostavki normalnosti podataka i homogenosti varijanci za anksioznost, depresiju i stres s obzirom na kategoriju koja opisuje radni odnos occupation_group. Sve su se pretpostavke pokazale ispravnima.

Rezultati pokazuju da ne postoje statistički značajne razlike u razini anksioznosti među zanimanjima, $F(3, 370) = 1.31$, $p = 0.269$. Također, nisu utvrđene statistički značajne razlike u razini stresa, $F(3, 370) = 0.61$, $p = 0.606$.

Za depresiju je uočen trend prema razlikama između skupina, no rezultat nije dosegnuo konvencionalnu razinu statističke značajnosti, $F(3, 370) = 2.33$, $p = 0.0736$. Dobiveni nalazi upućuju na to da zanimanje samo po sebi nije snažan prediktor razine mentalnog zdravlja u ovom uzorku.

Provodenje višestruke regresije za pokazivanje doprinosa zanimanja anksioznosti povrh ličnosti

```

model_anxiety <- lm(
  anxiety ~ occupation_group +
  narcissism + machiavelism + psychoticism + sadism + neuroticism +
  extraversion + openness + agreeableness + conscientiousness,
  data = df_job
)

summary(model_anxiety)

```

```

## 
## Call:
## lm(formula = anxiety ~ occupation_group + narcissism + machiavelism +
##      psychoticism + sadism + neuroticism + extraversion + openness +
##      agreeableness + conscientiousness, data = df_job)
## 
## Residuals:
##    Min      1Q  Median      3Q     Max 
## -2.8777 -0.5030  0.0377  0.5391  3.2731 
## 
## Coefficients:
##                               Estimate Std. Error t value
## (Intercept)               0.010784  0.064791  0.166
## occupation_groupPart-Time 0.171681  0.168508  1.019
## occupation_groupStudent   -0.110070 0.110430 -0.997
## occupation_groupUnemployed (and job seeking) 0.048740  0.210452  0.232
## narcissism                -0.066293  0.063274 -1.048
## machiavelism               0.089268  0.058164  1.535
## psychoticism                0.069755  0.068022  1.025
## sadism                     0.070111  0.063485  1.104
## neuroticism                 0.372737  0.064679  5.763
## extraversion                0.117466  0.068659  1.711
## openness                    0.066920  0.050444  1.327
## agreeableness                -0.035415 0.064335 -0.550
## conscientiousness            -0.007022 0.064727 -0.108
## 
## Pr(>|t|) 
## (Intercept)          0.868
## occupation_groupPart-Time 0.309
## occupation_groupStudent 0.320
## occupation_groupUnemployed (and job seeking) 0.817
## narcissism           0.295
## machiavelism          0.126
## psychoticism          0.306
## sadism                0.270
## neuroticism           1.77e-08 ***
## extraversion          0.088 .
## openness              0.185
## agreeableness         0.582
## conscientiousness    0.914
## --- 
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 0.9153 on 361 degrees of freedom
## Multiple R-squared:  0.2061, Adjusted R-squared:  0.1797 
## F-statistic: 7.807 on 12 and 361 DF,  p-value: 5.873e-13

```

U svrhu ispitivanja odnosa između zanimanja i anksioznosti, proveden je model višestruke linearne regresije kojim se ispituje doprinos radnog statusa povrh crta ličnosti.

Rezultati pokazuju da je model statistički značajan u cjelini ($F(12, 361) = 7.807$, $p = 5.873 \times 10^{-13}$), pri čemu Multiple R-squared iznosi 0.2061, a Adjusted R-squared 0.1797. Iako je objašnjeni udio varijance manji u odnosu na modele za stres i depresiju, vrijednosti upućuju na to da model ipak ima smisla za interpretaciju.

Analizom mračnih crta ličnosti nije utvrđen nijedan statistički značajan prediktor anksioznosti. Narcizam, makijavelizam, psihoticizam i sadizam nisu pokazali jedinstveni doprinos u ovom modelu, što sugerira da se

njihova povezanost s anksioznošću ne zadržava nakon uključivanja ostalih crta ličnosti.

Unutar petofaktorskog modela ličnosti, neuroticizam se jasno istaknuo kao ključni prediktor anksioznosti ($\beta = 0.372737$, $p = 1.77 \times 10^{-8}$). Osobe s višim razinama neuroticizma pokazuju izraženiju anksioznost, neovisno o zanimanju i ostalim osobinama ličnosti, što je u skladu s postojećim teorijskim i empirijskim nalazima. Ekstraverzija nije dosegnula razinu statističke značajnosti ($\beta = 0.117466$, $p = 0.088$), no uočen je slab trend koji upućuje na višu razinu anksioznosti kod ekstravertiranijih osoba. Ostale Big Five crte nisu se pokazale značajnima u ovom modelu.

Provodenje višestruke regresije za pokazivanje doprinosa zanimanja depresiji povrh ličnosti

```
model_depression <- lm(  
  depression ~ occupation_group +  
  narcissism + machiavelism + psychoticism + sadism + neuroticism +  
  extraversion + openness + agreeableness + conscientiousness,  
  data = df_job  
)  
  
summary(model_depression)  
  
##  
## Call:  
## lm(formula = depression ~ occupation_group + narcissism + machiavelism +  
##      psychoticism + sadism + neuroticism + extraversion + openness +  
##      agreeableness + conscientiousness, data = df_job)  
##  
## Residuals:  
##       Min     1Q   Median     3Q    Max  
## -3.02110 -0.46296  0.03503  0.47615  2.57324  
##  
## Coefficients:  
##                               Estimate Std. Error t value  
## (Intercept)                 0.056563  0.057575  0.982  
## occupation_groupPart-Time -0.002998  0.149741 -0.020  
## occupation_groupStudent   -0.035153  0.098132 -0.358  
## occupation_groupUnemployed (and job seeking) -0.181134  0.187013 -0.969  
## narcissism                -0.027405  0.056227 -0.487  
## machiavelism               0.088226  0.051687  1.707  
## psychoticism                0.129060  0.060446  2.135  
## sadism                     0.015564  0.056414  0.276  
## neuroticism                  0.439192  0.057476  7.641  
## extraversion                 -0.302426  0.061012 -4.957  
## openness                     0.031826  0.044826  0.710  
## agreeableness                0.056346  0.057170  0.986  
## conscientiousness            -0.018329  0.057518 -0.319  
##                               Pr(>|t|)  
## (Intercept)                   0.3266  
## occupation_groupPart-Time    0.9840  
## occupation_groupStudent      0.7204  
## occupation_groupUnemployed (and job seeking) 0.3334  
## narcissism                   0.6263
```

```

## machiavelism          0.0887 .
## psychoticism         0.0334 *
## sadism                0.7828
## neuroticism          1.96e-13 ***
## extraversion         1.10e-06 ***
## openness              0.4782
## agreeableness        0.3250
## conscientiousness    0.7502
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ',' 1
##
## Residual standard error: 0.8133 on 361 degrees of freedom
## Multiple R-squared:  0.4682, Adjusted R-squared:  0.4506
## F-statistic: 26.49 on 12 and 361 DF,  p-value: < 2.2e-16

```

Kako bi se ispitao doprinos zanimanja depresiji uz kontrolu crta ličnosti, proveden je model višestruke linearne regresije.

Model se pokazao izrazito snažnim u objašnjenju ishoda, s vrijednostima $F(12, 361) = 26.49$ i $p = 2.2 \times 10^{-16}$. Multiple R-squared iznosi 0.4682, dok Adjusted R-squared iznosi 0.4506, što upućuje na to da model objašjava velik dio varijance depresije te ima vrlo dobru objašnjavajuću snagu.

Među mračnim crtama ličnosti, psihoticizam se ponovno pokazao statistički značajnim pozitivnim prediktorom depresije ($\beta = 0.204240$, $p = 0.00316$). Ovaj rezultat sugerira da osobe s izraženijim obilježjima psihoticizma imaju višu razinu depresije, čak i nakon kontrole ostalih osobina ličnosti i radnog statusa. Makijskijvelizam je pokazao granični efekt ($\beta = 0.112090$, $p = 0.05728$), dok narcizam i sadizam nisu imali značajan doprinos u objašnjenju depresije.

Unutar petofaktorskog modela, neuroticizam se ponovno istaknuo kao najsnažniji pozitivni prediktor depresije ($\beta = 0.439192$, $p = 1.96 \times 10^{-13}$), potvrđujući njegovu ključnu ulogu u objašnjenju emocionalnih potreškoća. Za razliku od modela za stres i anksioznost, ekstraverzija se ovdje pokazala statistički značajnim negativnim prediktorom ($\beta = -0.302426$, $p = 1.10 \times 10^{-6}$), što upućuje na to da osobe s višom razinom ekstraverzije pokazuju nižu razinu depresije. Ostale crte Big Five modela nisu se pokazale značajnim.

Provodenje višestruke regresije za pokazivanje doprinosa zanimanja depresiji povrh ličnosti

```

model_stress <- lm(
  stress ~ occupation_group +
  narcissism + machiavelism + psychoticism + sadism + neuroticism +
  extraversion + openness + agreeableness + conscientiousness,
  data = df_job
)

summary(model_stress)

##
## Call:
## lm(formula = stress ~ occupation_group + narcissism + machiavelism +
##     psychoticism + sadism + neuroticism + extraversion + openness +
##     agreeableness + conscientiousness, data = df_job)
##
## Residuals:

```

```

##      Min     1Q   Median     3Q    Max
## -3.0898 -0.5186  0.0879  0.5882  3.2164
##
## Coefficients:
##                               Estimate Std. Error t value
## (Intercept)                0.006104  0.065465  0.093
## occupation_groupPart-Time  0.089980  0.170263  0.528
## occupation_groupStudent    0.046961  0.111580  0.421
## occupation_groupUnemployed (and job seeking) -0.362641  0.212643 -1.705
## narcissism                 -0.012195  0.063933 -0.191
## machiavelism               0.112090  0.058770  1.907
## psychoticism                0.204240  0.068730  2.972
## sadism                      -0.029011  0.064146 -0.452
## neuroticism                 0.406136  0.065353  6.215
## extraversion                -0.084191  0.069374 -1.214
## openness                     0.142228  0.050970  2.790
## agreeableness                -0.048592  0.065005 -0.748
## conscientiousness            0.004554  0.065401  0.070
## Pr(>|t|)
## (Intercept)                  0.92576
## occupation_groupPart-Time    0.59749
## occupation_groupStudent      0.67410
## occupation_groupUnemployed (and job seeking) 0.08898 .
## narcissism                   0.84883
## machiavelism                 0.05728 .
## psychoticism                  0.00316 **
## sadism                       0.65135
## neuroticism                  1.42e-09 ***
## extraversion                  0.22570
## openness                      0.00554 **
## agreeableness                 0.45525
## conscientiousness             0.94453
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9248 on 361 degrees of freedom
## Multiple R-squared:  0.3036, Adjusted R-squared:  0.2805
## F-statistic: 13.12 on 12 and 361 DF,  p-value: < 2.2e-16

```

Iz modela višestruke linearne regresije koji izračunava doprinos zanimanja stresu povrh ličnosti zaključujemo sljedeće stvari.

Model se pokazuje statistički značajnim u cjelini s vrijednostima $F(12, 361) = 13.12$ i $p = 2.2 \times 10^{-16}$ (< 0.001) te je Multiple R-squared = 0.3036 i Adjusted R-squared = 0.2805. Ove vrijednosti upućuju da model ima dobru potpornu (objašnjavajuću) snagu.

Među mračnim crtama ličnosti, psihoticizam se istaknuo kao statistički značajan pozitivan prediktor ($\beta = 0.204240$, $p = 0.00316$ (< 0.01)). To znači da osobe s višim razinama psihoticizma pokazuju višu razinu stresa, čak i nakon utjecaja ostalih crta ličnosti i oblika radnog angažmana. Makijavelizam je pokazao trend prema pozitivnoj povezanosti ($/beta = 0.112090$, $p = 0.05728$ (< 0.1)), ali rezultati su nedovoljni za snažnu povezanost. Narcizam i sadizam nisu pokazali značajan doprinos.

Unutar petofaktorskog Big 5 modela, neurocitizam se pokazao daleko najsnažnijim prediktorom ishoda ($\beta = 0.406136$, $p = 1.42 \times 10^{-9}$ (< 0.001)). Viša razina neurocitizma povezana je s višom razinom stresa, neovisno o radnom odnosu i ostalim crtama ličnosti. Ovaj rezultat je u potpunosti u skladu s teorijskim očekivanjima.

Izdvajamo i otvorenost kao statistički značajan pozititvan prediktor ($\beta = 0.142228$, $p = 0.00554$ (< 0.01)). Ovaj podatak sugerira da osobe s više otvorenosti mogu biti osjetljivije na stres. Ekstraverzija, ugodnost i savjesnost nisu pokazale statistički značajan u ovom modelu.