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 uređivanje podataka

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

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

```
## New names:
## Rows: 578 Columns: 18
## -- Column specification
## -------------------------------------------------------- Delimiter: "," chr
## (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>   <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~
```

```
colSums(is.na(dataset))
```

```
##                 ...1           depression              anxiety
##                    0                    0                    0
##               stress           narcissism         machiavelism
##                    0                    0                    0
##         psychoticism              sadism          neuroticism
##                    0                    0                    0
##         extraversion            openness        agreeableness
##                    0                    0                    0
```

```
##    conscientiousness                   age                   sex
##                    0                     0                     0
## ethnicity simplified       student status    employment status
##                    0                     0                     0
```

Jesu li ljudi s izraženijom mračnom trijadom 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

```
summary(dataset)
```

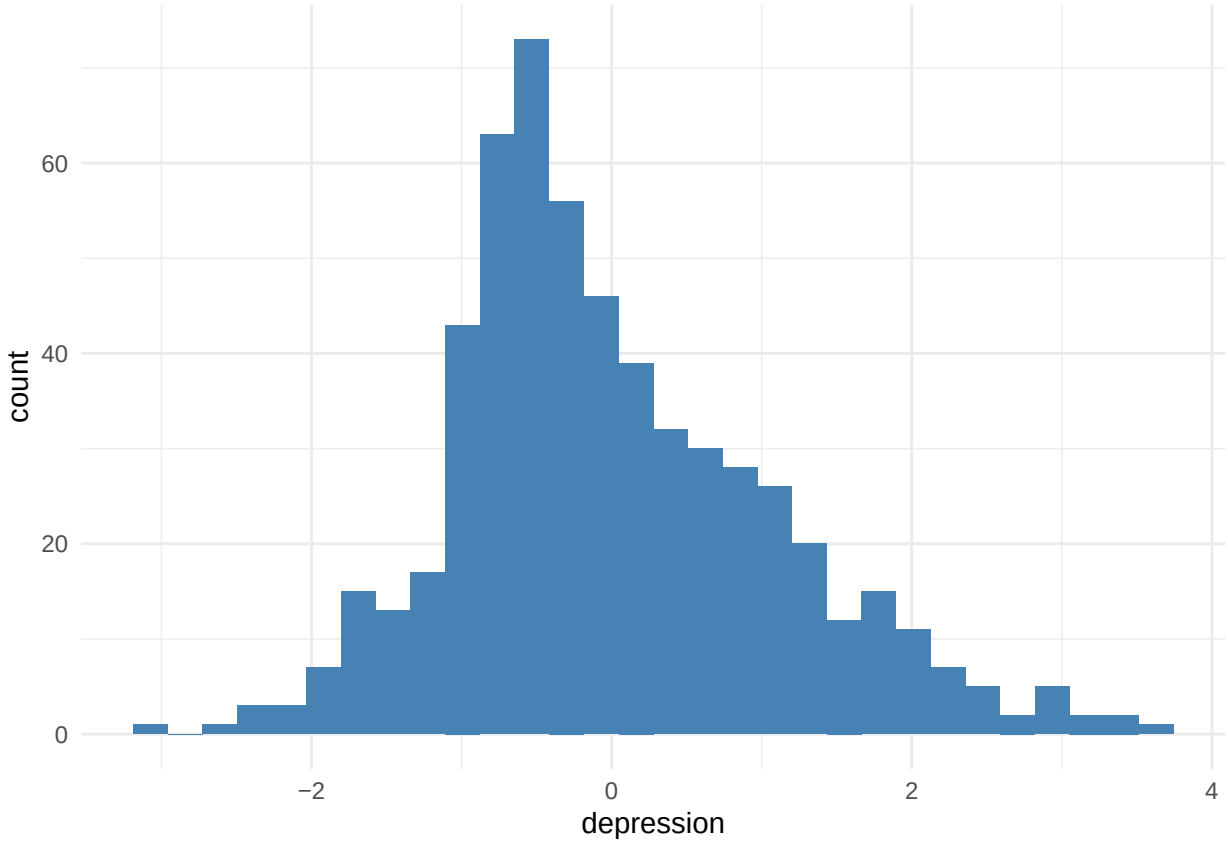
```
##       ...1         depression          anxiety             stress
##  Min.   :  1.0   Min.   :-3.071895   Min.   :-2.5641439   Min.   :-3.05249
##  1st Qu.:145.2   1st Qu.:-0.733502   1st Qu.:-0.7263151   1st Qu.:-0.77069
##  Median :289.5   Median :-0.213819   Median :-0.0967244   Median :-0.11924
##  Mean   :289.5   Mean   : 0.001253   Mean   :-0.0000235   Mean   :-0.04087
##  3rd Qu.:433.8   3rd Qu.: 0.676438   3rd Qu.: 0.6949174   3rd Qu.: 0.68952
##  Max.   :578.0   Max.   : 3.627776   Max.   : 3.3979854   Max.   : 3.16072
##    narcissism        machiavelism       psychoticism          sadism
##  Min.   :-2.60040   Min.   :-2.90802   Min.   :-2.039655   Min.   :-2.15989
##  1st Qu.:-0.75401   1st Qu.:-0.62095   1st Qu.:-0.776784   1st Qu.:-0.82465
##  Median : 0.09528   Median : 0.11580   Median :-0.114443   Median : 0.04723
##  Mean   :-0.01843   Mean   :-0.01757   Mean   :-0.007489   Mean   : 0.01490
##  3rd Qu.: 0.72894   3rd Qu.: 0.74468   3rd Qu.: 0.648087   3rd Qu.: 0.72848
##  Max.   : 2.65373   Max.   : 2.39437   Max.   : 2.998715   Max.   : 3.14130
##   neuroticism        extraversion          openness        agreeableness
##  Min.   :-2.31006   Min.   :-3.309888   Min.   :-3.37587   Min.   :-3.11895
##  1st Qu.:-0.72347   1st Qu.:-0.565625   1st Qu.:-0.63323   1st Qu.:-0.77041
```

```
##  Median :-0.09166   Median : 0.114901   Median :-0.10840   Median :-0.03658
##  Mean   :-0.01004   Mean   : 0.007446   Mean   : 0.01245   Mean   :-0.01864
##  3rd Qu.: 0.60871   3rd Qu.: 0.711136   3rd Qu.: 0.71339   3rd Qu.: 0.73748
##  Max.   : 2.94692   Max.   : 2.540486   Max.   : 2.98559   Max.   : 2.77040
##  conscientiousness        age               sex
##  Min.   :-2.9434959   Length:578         Length:578
##  1st Qu.:-0.7247433   Class :character   Class :character
##  Median :-0.0006556   Mode  :character   Mode  :character
##  Mean   :-0.0130613
##  3rd Qu.: 0.7838263
##  Max.   : 2.3968413
##  ethnicity simplified student status     employment status
##  Length:578           Length:578         Length:578
##  Class :character     Class :character   Class :character
##  Mode  :character     Mode  :character   Mode  :character
##
##
##
```

```
describe(dataset[, c("narcissism", "psychoticism", "machiavelism", "depression")])
```

```
##              vars   n  mean   sd median trimmed  mad   min  max range  skew
## narcissism      1 578 -0.02 1.05   0.10    0.01 1.08 -2.60 2.65  5.25 -0.22
## psychoticism    2 578 -0.01 1.04  -0.11   -0.06 1.05 -2.04 3.00  5.04  0.44
## machiavelism    3 578 -0.02 1.05   0.12    0.04 0.99 -2.91 2.39  5.30 -0.48
## depression      4 578  0.00 1.08  -0.21   -0.06 0.93 -3.07 3.63  6.70  0.61
##              kurtosis   se
## narcissism      -0.52 0.04
## psychoticism    -0.40 0.04
## machiavelism    -0.15 0.04
## depression       0.40 0.04
```

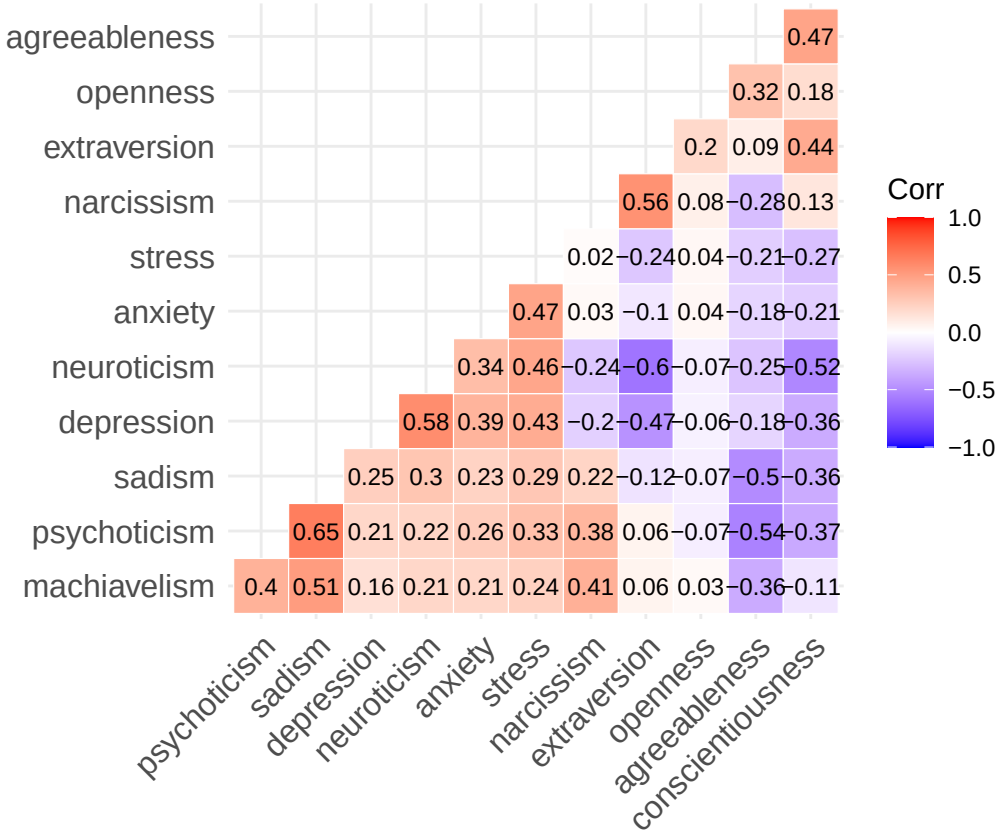
```
library(ggplot2)

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



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 ggcorrplot package.
##   Please report the issue at <https://github.com/kassambara/ggcorrplot/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)

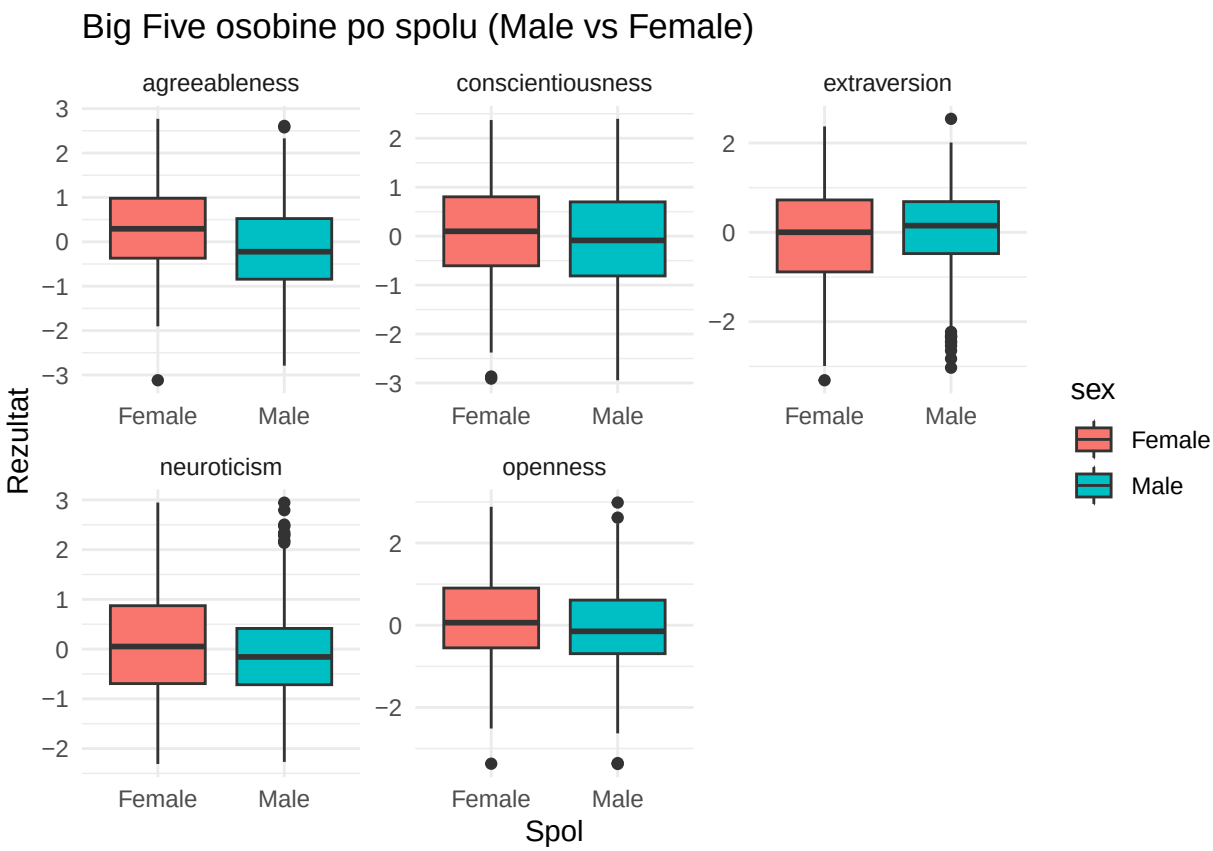
```
table(dataset$sex)
```

```
##
##   CONSENT_REVOKED      DATA_EXPIRED            Female              Male
```

```
##                 34                  1                234                306
## Prefer not to say
##                  3
```

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

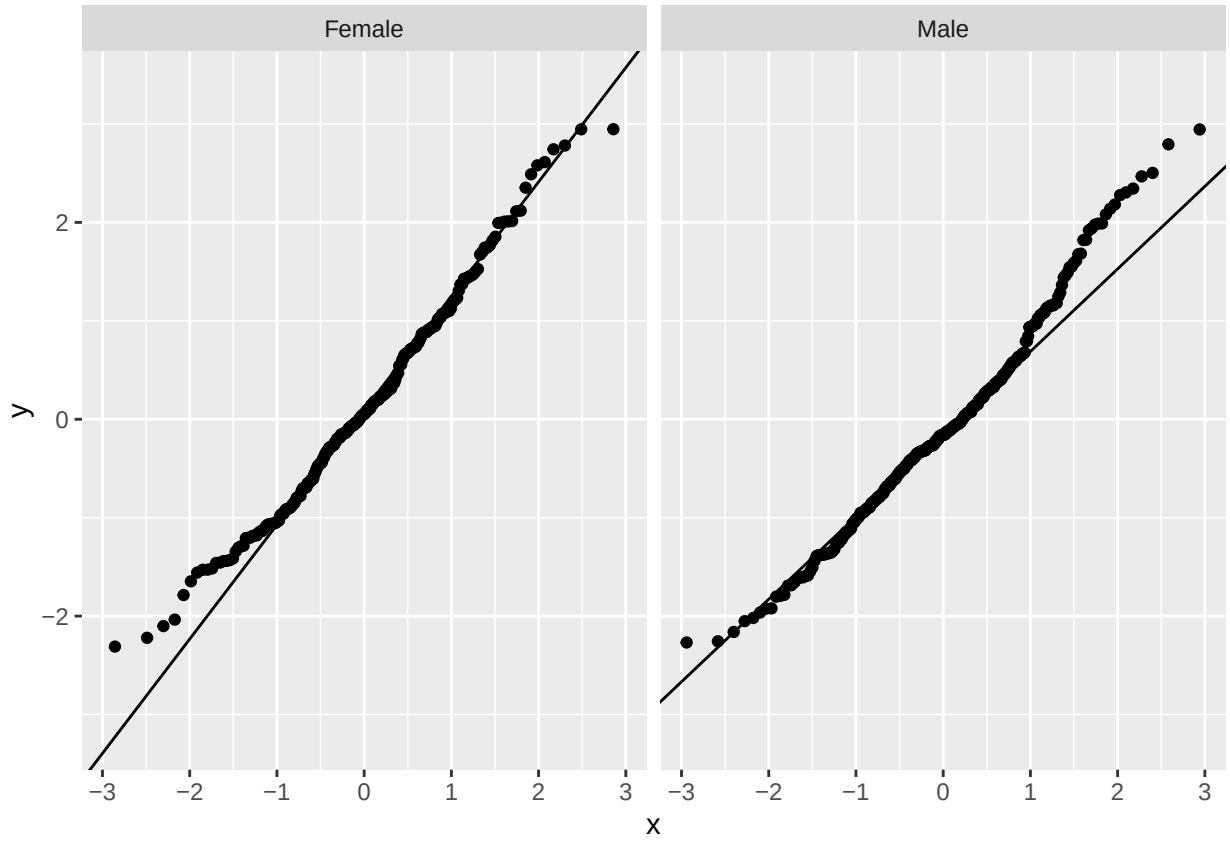
```r
big_five <- df_sex %>%
  pivot_longer(
    cols = c(neuroticism, extraversion, openness, agreeableness, conscientiousness),
    names_to = "trait",
    values_to = "score"
  )

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"
  )
```



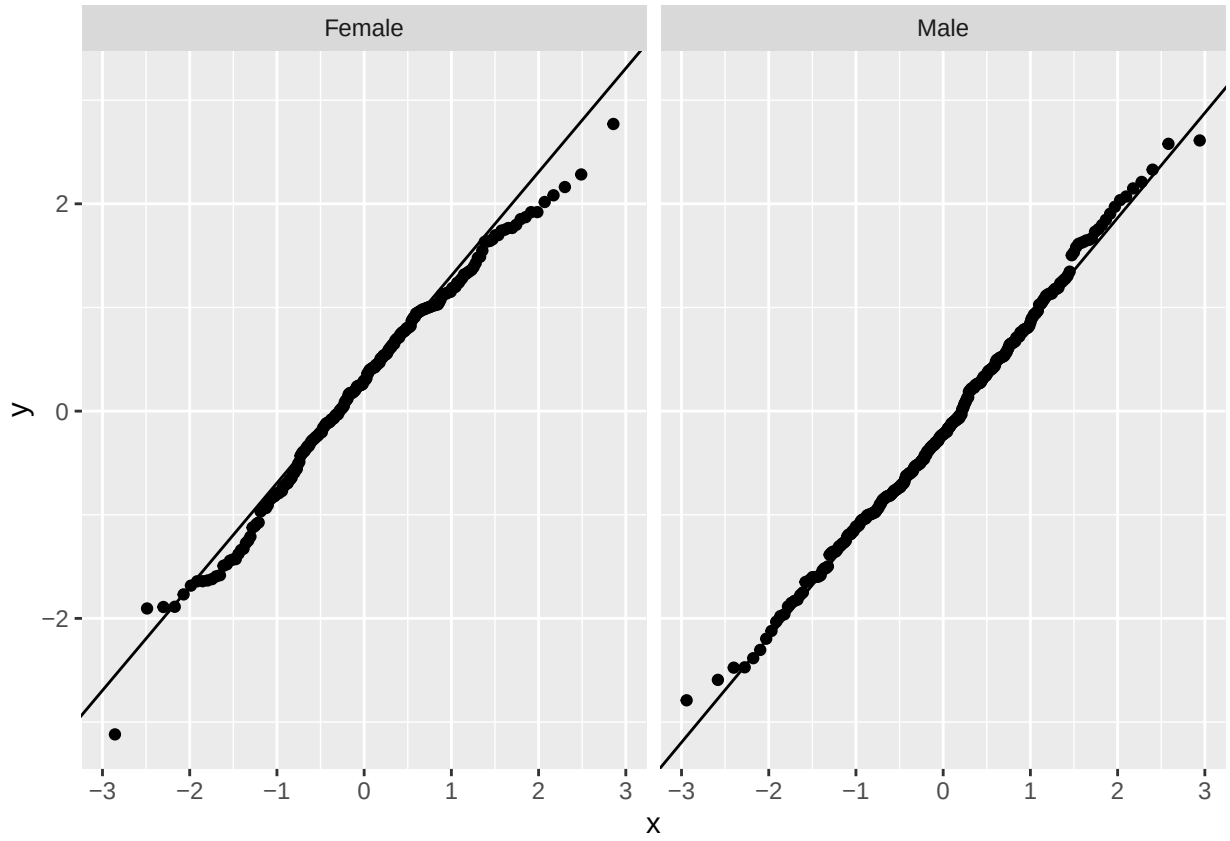
U ovom uzorku se pojavljuju obrasci u skladu s očekivanjima.

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

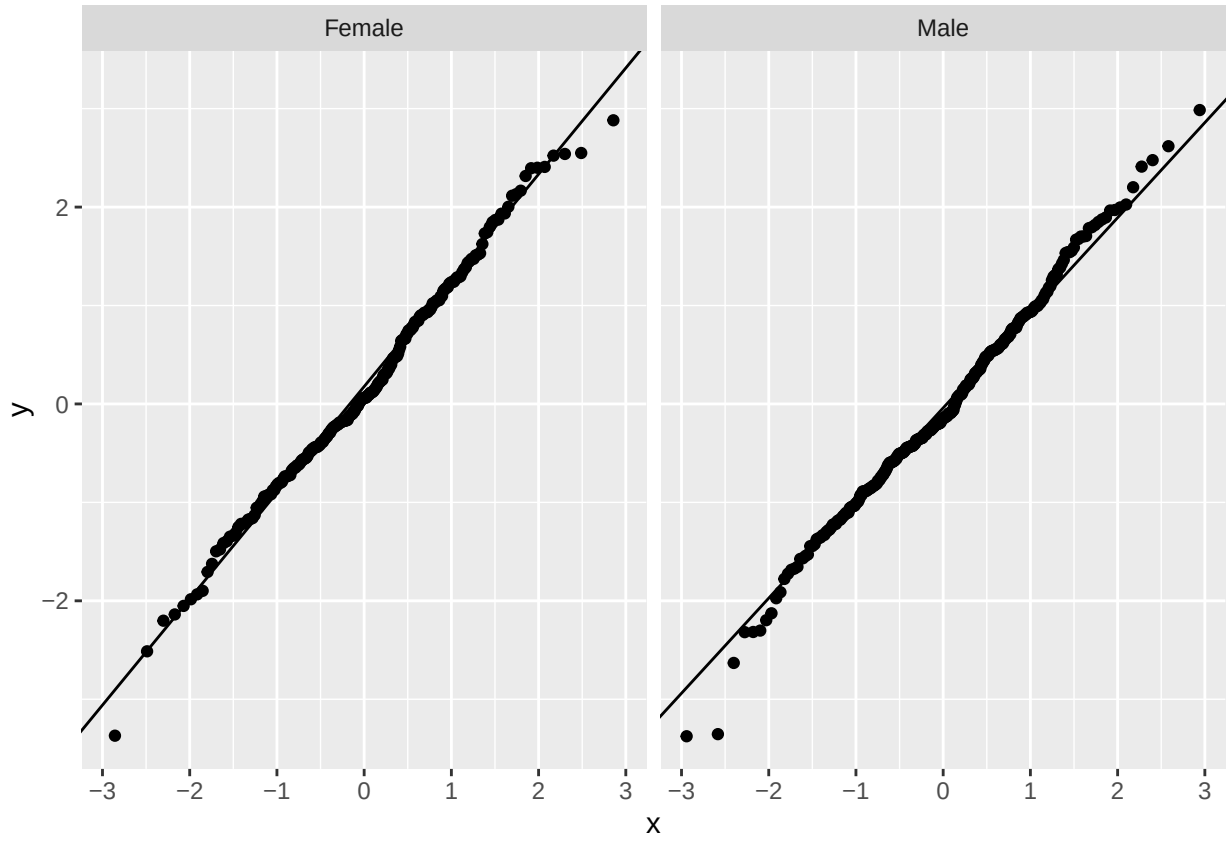
```
df_clean <- dataset |>
  filter(sex %in% c("Male", "Female"))

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



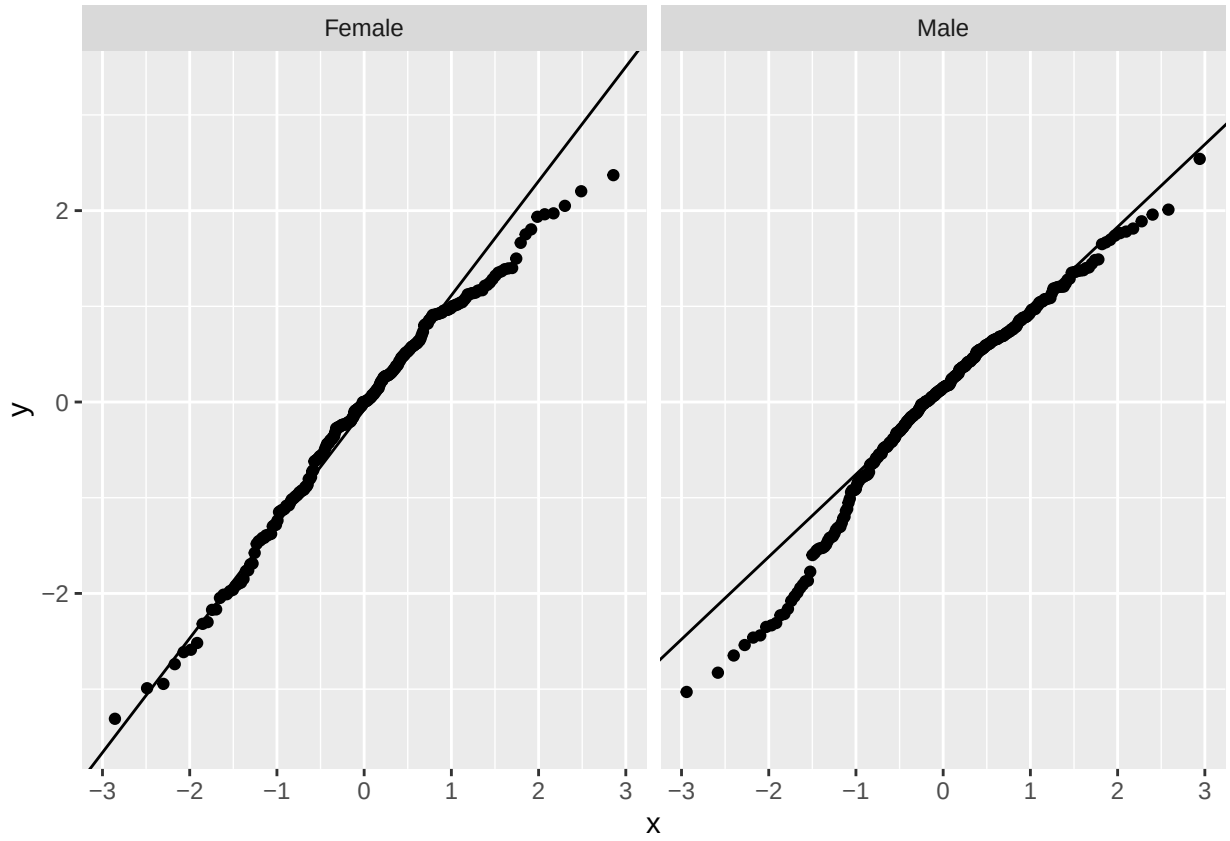

```
ggplot(df_clean, aes(sample = agreeableness)) +
  stat_qq() + stat_qq_line() +
  facet_wrap(~sex)
```



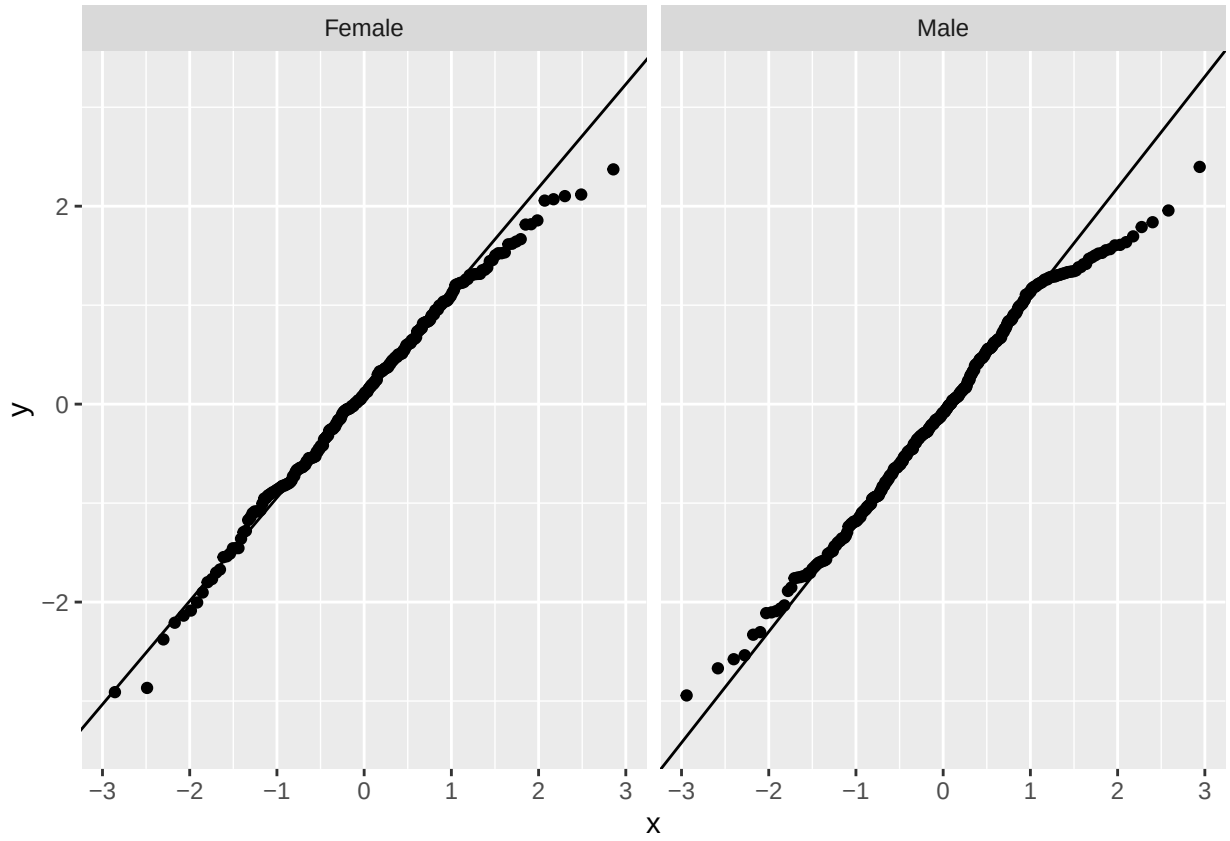

```
ggplot(df_clean, aes(sample = openness)) +
  stat_qq() + stat_qq_line() +
  facet_wrap(~sex)
```




```
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 približno normalne. Promatramo dvije nezavisne skupine: Female i Male (ostale ćemo ukloniti). Big Five i ostale osobine su kontinuirane.

Provest ćemo 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

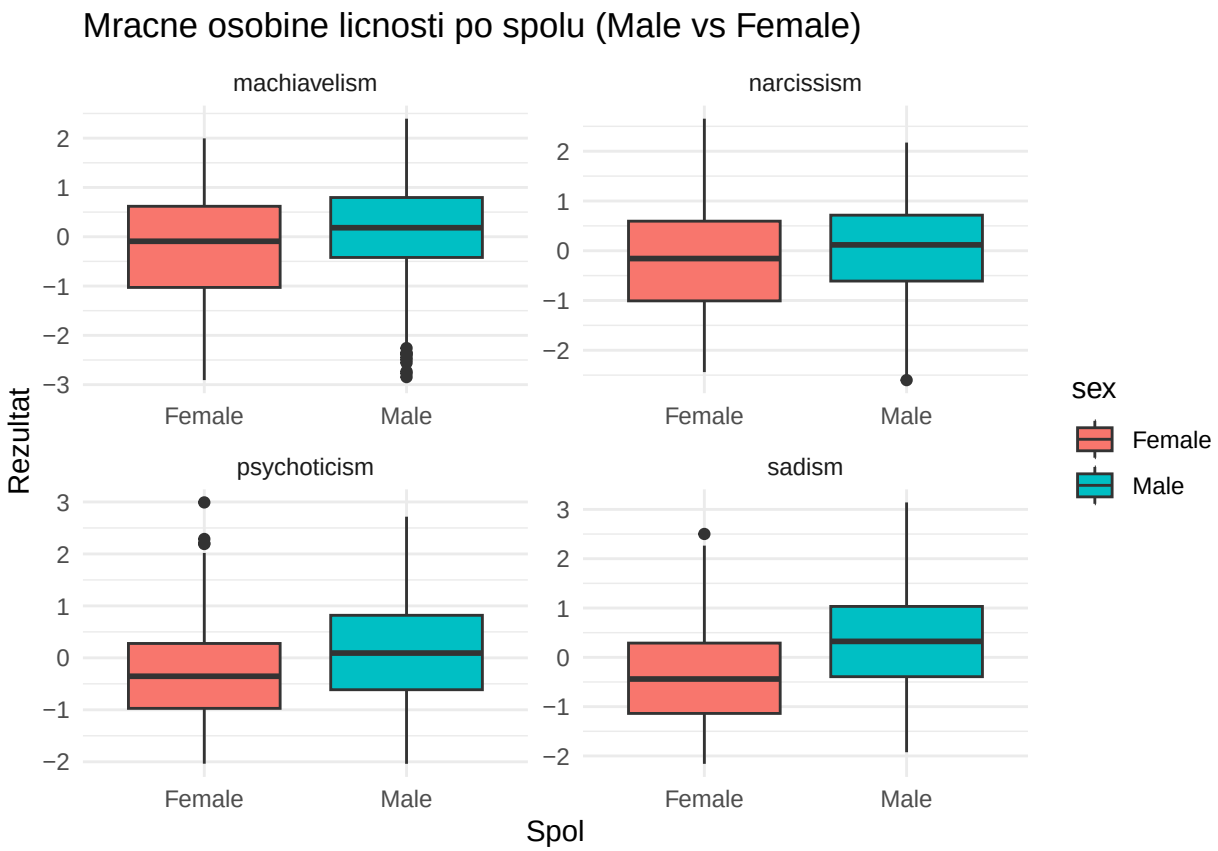
Ugodnosti ($p = 7.8 \times 10^{-6}$ - vrlo značajna razlika) - žene su ugodnije.

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"
  )
```




```
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

tr ~ 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.

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")
                             )
```

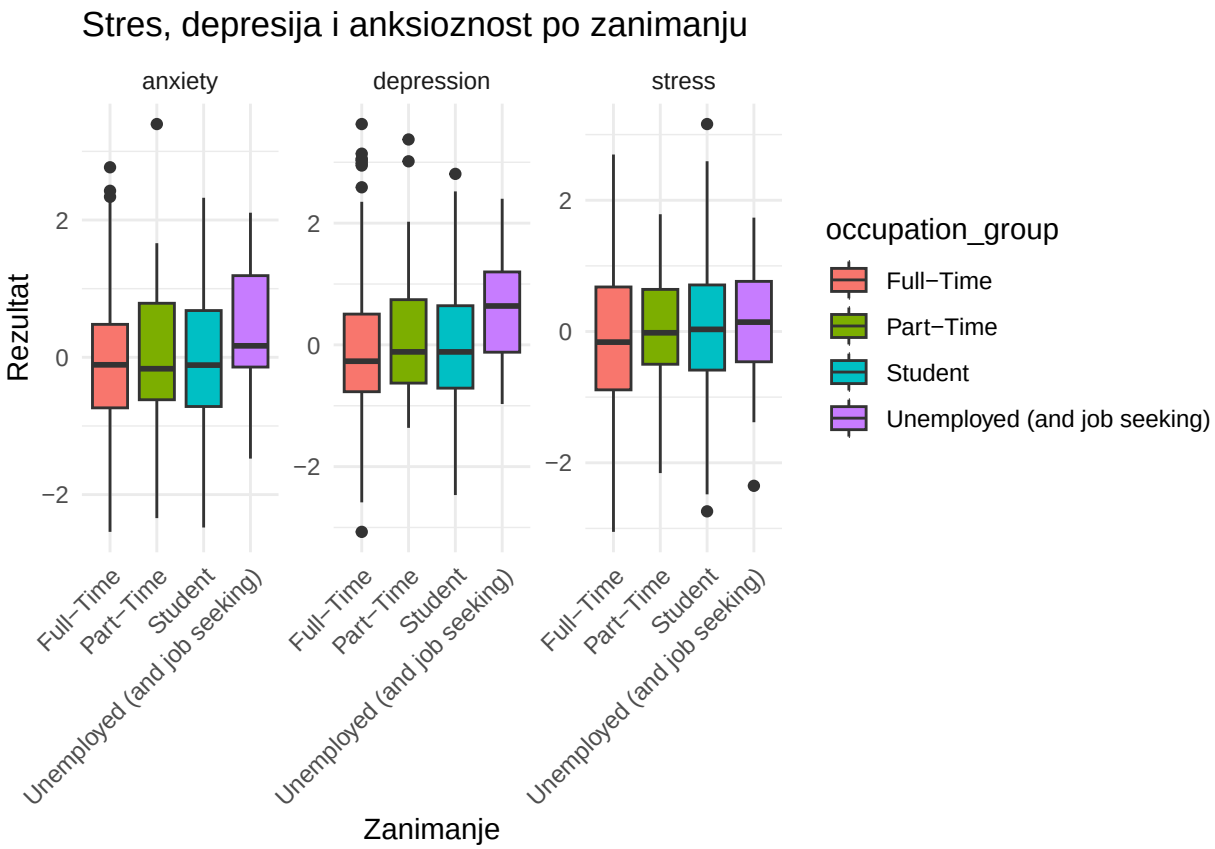
```
df_job <- df_job %>% mutate(
    occupation_group = if_else(
      `student status` == "Yes",
      "Student",
      `employment status`
    )
  ) %>% filter(!occupation_group %in% c("Other", "Due to start a new job within the next month", "Not i

#table(df_job$occupation_group)
```

```
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.

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

```
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
```

```r
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
```

```r
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.

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.

Provođenje višestruke regresije za pokazivanje doprinosa zanimanja anksioznosti povrh ličnosti

```r
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 ($F(12, 361) = 7.807$, $p = 5.873 \text{x} 10^{-13}$), 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 ($\beta = 0.372737$, $p = 1.77 \text{x} 10^{-8}$). 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.

Provođenje 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 $p = 2.2\text{x}10^{-16}$. Multiple R-squared iznosi 0.4682, dok Adjusted R-squared iznosi 0.4506, što upućuje na to da model objašnjava 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. Makijavelizam 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 ($\beta = 0.439192$, $p = 1.96\text{x}10^{-13}$), potvrđujući njegovu ključnu ulogu u objašnjenju emocionalnih poteškoća. Za razliku od modela za stres i anksioznost, ekstraverzija se ovdje pokazala statistički značajnim negativnim prediktorom ($\beta = -0.302426$, $p = 1.10\text{x}10^{-6}$), što upućuje na to da osobe s višom razinom ekstraverzije pokazuju nižu razinu depresije. Ostale crte Big Five modela nisu se pokazale značajnima.

Provođenje višestruke regresije za pokazivanje doprinosa zanimanja depresiji povrh ličnosti

```r
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 = 2.2x10^{-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 (β = 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 (β = 0.406136, p = 1.42x10^{-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 (β = 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.