

Final Dissertation Analysis Report

```
library(tidyverse)
library(lavaan)

disso_tib <- here::here ("data/clean_disso.csv") %>%
  readr::read_csv() %>%
  dplyr::mutate(
    groupedeth = forcats::as_factor(groupedeth),
    eth = forcats::as_factor(ethnicityxx)
  )

levels(disso_tib$groupedeth)
```

Loading data and checking levels

```
## [1] "White" "EM"
```

```
levels(disso_tib$eth)
```

```
## [1] "White" "Black" "Asian" "Other"
```

```
freq_eth_tbl <- disso_tib %>%
  dplyr::group_by(groupedeth) %>%
  dplyr::summarise(
    frequency= n()
  )
freq_eth_tbl%>%
  knitr::kable(digits = 3)
```

Demographic information (ethnicity, age, gender)

| groupedeth | frequency |
|------------|-----------|
| White | 180 |
| EM | 178 |

```
freq_ethh_tbl <- disso_tib %>%
  dplyr::group_by(eth) %>%
  dplyr::summarise(
    frequency= n()
  )
freq_ethh_tbl%>%
  knitr::kable(digits = 3)
```

| eth | frequency |
|-------|-----------|
| White | 180 |
| Black | 97 |
| Asian | 40 |
| Other | 41 |

```
freq_age_tbl <- disso_tib %>%
  dplyr::group_by(age) %>%
  dplyr::summarise(
    frequency= n ()
  )
freq_age_tbl%>%
  knitr::kable(digits = 3)
```

| age | frequency |
|-----|-----------|
| 16 | 2 |
| 17 | 4 |
| 18 | 9 |
| 19 | 27 |
| 20 | 21 |
| 21 | 23 |
| 22 | 34 |
| 23 | 27 |
| 24 | 30 |
| 25 | 19 |
| 26 | 24 |
| 27 | 26 |
| 28 | 20 |
| 29 | 16 |
| 30 | 7 |
| 31 | 5 |
| 32 | 14 |
| 33 | 9 |
| 34 | 5 |
| 35 | 6 |
| 36 | 8 |
| 37 | 3 |
| 38 | 2 |
| 39 | 3 |
| 40 | 2 |
| 41 | 4 |
| 42 | 3 |

| age | frequency |
|-----|-----------|
| 43 | 1 |
| 44 | 2 |
| 45 | 1 |
| 47 | 1 |

```
freq_gen_tbl <- disso_tib %>%
  dplyr::group_by(gender) %>%
  dplyr::summarise(
    frequency= n ()
  )
freq_gen_tbl%>%
  knitr::kable(digits = 3)
```

| gender | frequency |
|--------|-----------|
| 1 | 263 |
| 2 | 95 |

Checking the assumptions of linearity and looking for outliers

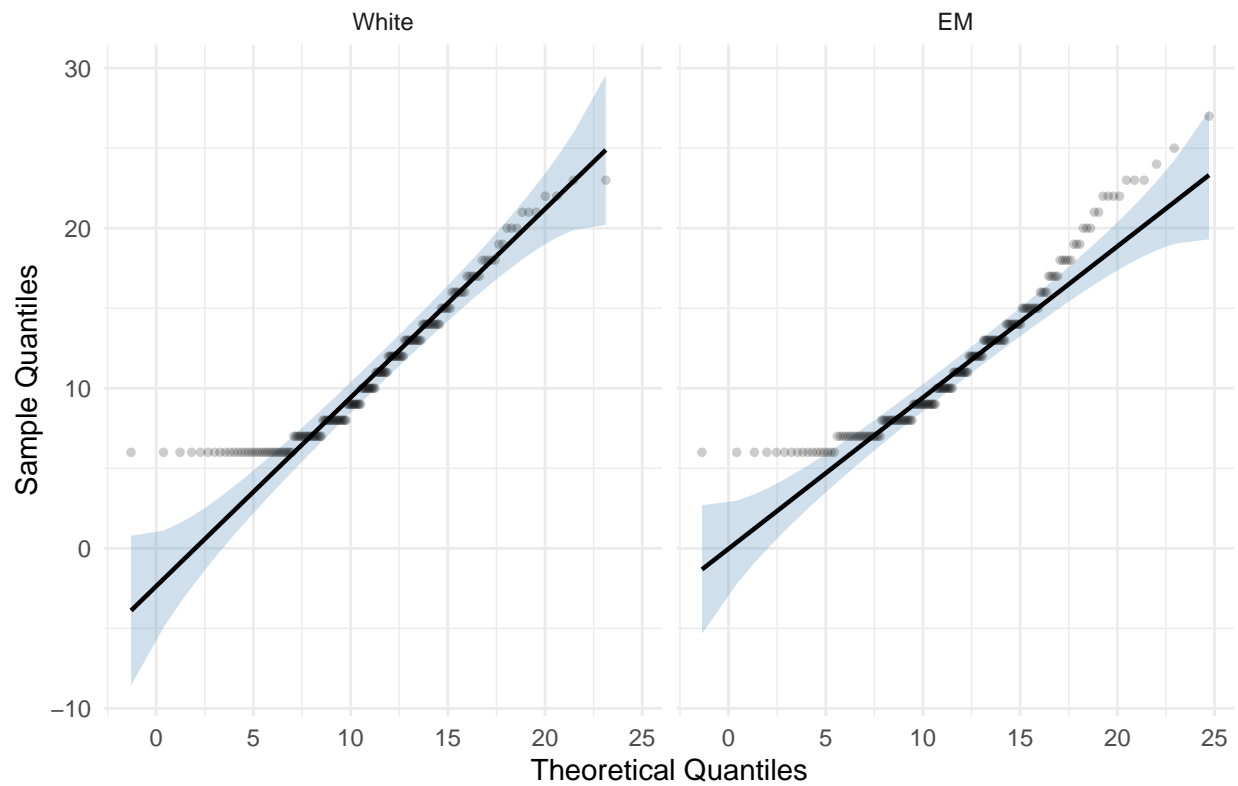
```
disso_tib %>%
  dplyr::group_by(groupedeth) %>%
  dplyr::summarize(
    n = n(),
    mean = mean(pos_pan),
    stnd.dev= sd(pos_pan),
    ci_lower = ggplot2::mean_cl_normal(pos_pan)$ymin,
    ci_upper = ggplot2::mean_cl_normal(pos_pan)$ymax,
    skew = moments::skewness(pos_pan, na.rm = TRUE),
    kurtosis = moments::kurtosis(pos_pan, na.rm = TRUE)
  )%>%
  knitr::kable(digits = 2)
```

Positive symptoms

| groupedeth | n | mean | stnd.dev | ci_lower | ci_upper | skew | kurtosis |
|------------|-----|-------|----------|----------|----------|------|----------|
| White | 180 | 10.92 | 4.42 | 10.27 | 11.57 | 0.77 | 2.77 |
| EM | 178 | 11.67 | 4.72 | 10.98 | 12.37 | 0.94 | 3.31 |

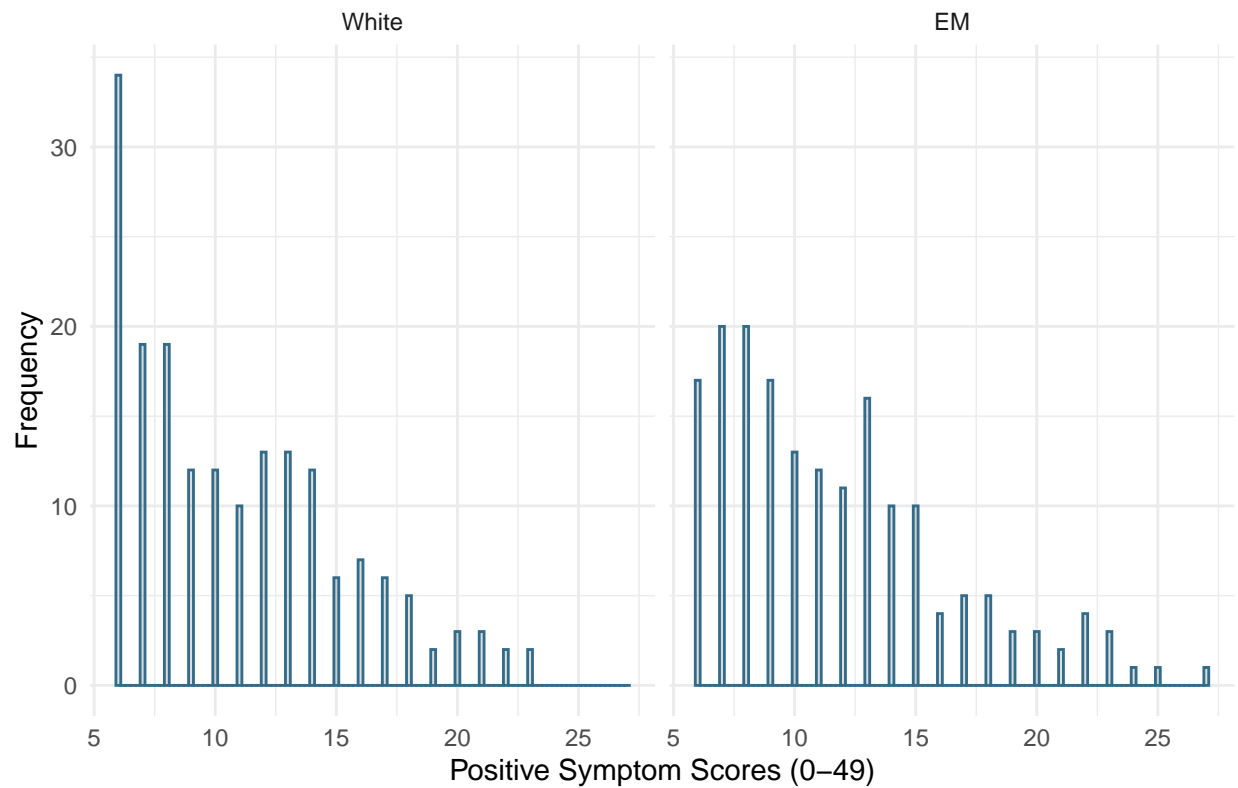
```
ggplot2::ggplot(disso_tib, aes(sample = pos_pan)) +
  qqplotr::stat_qq_band(fill = "#5c97bf", alpha = 0.3) +
  qqplotr::stat_qq_line(fill = "#5c97bf") +
  qqplotr::stat_qq_point(alpha=0.2, size= 1) +
  labs(x= "Theoretical Quantiles", y="Sample Quantiles", title= "Normal Q-Q plot of Positive Symptoms s
  facet_wrap(~ groupedeth)+
  theme_minimal()
```

Normal Q–Q plot of Positive Symptoms score for EM and White groups



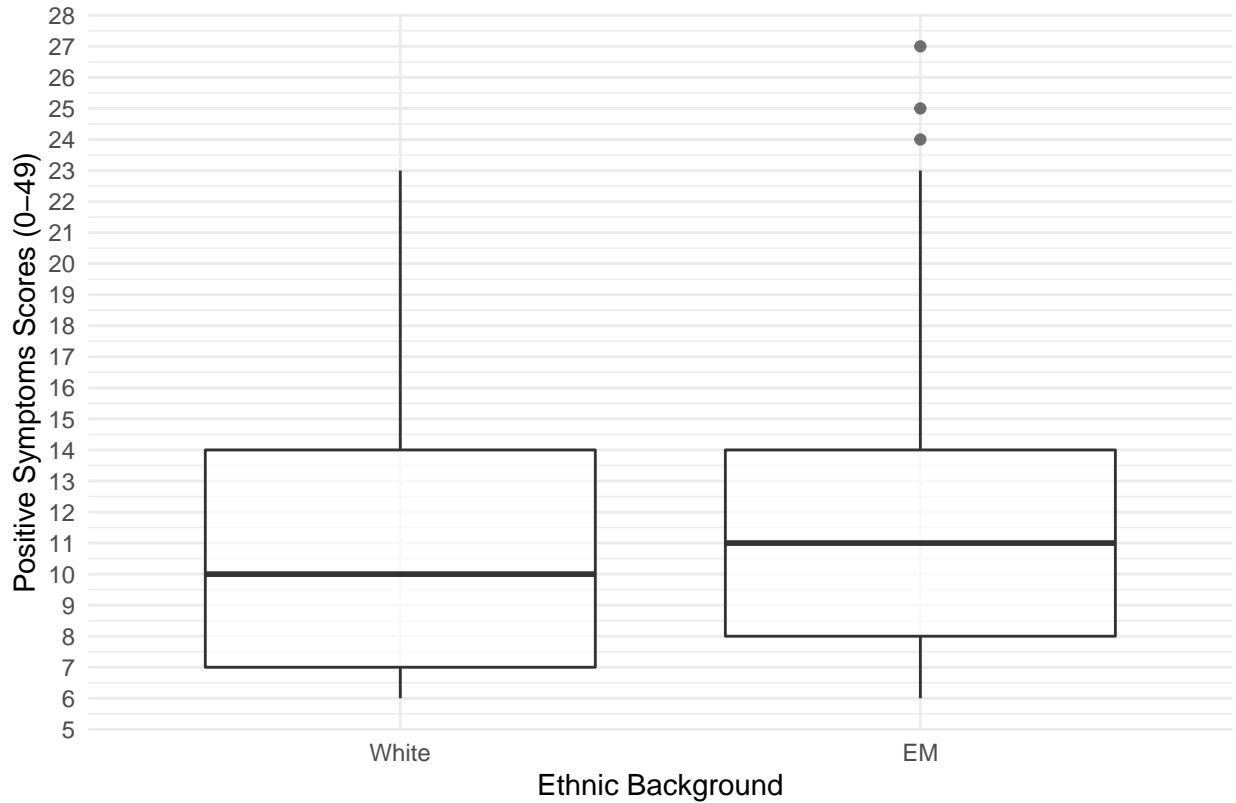
```
ggplot2::ggplot(disso_tib, aes(pos_pan))+
  geom_histogram(binwidth = 0.2, colour = "#336c8b", alpha= 0.2)+
  labs(y="Frequency", x= "Positive Symptom Scores (0-49)", title= "Histogram of Positive Symptoms score")
facet_wrap(~ groupedeth)+
  theme_minimal()
```

Histogram of Positive Symptoms scores for EM and White groups



```
ggplot2::ggplot(disso_tib, aes(groupedeth, pos_pan)) +
  geom_boxplot(alpha = 0.7) +
  scale_y_continuous(breaks = seq(0:49)) +
  labs(x = "Ethnic Background", y = "Positive Symptoms Scores (0-49)", title= "Box Plot of Positive Symptom Scores by Ethnic Background") +
  theme_minimal()
```

Box Plot of Positive Symptoms scores for EM and White groups



```
make_z <- function(x){
  (x - mean(x, na.rm = TRUE)) / sd(x, na.rm = TRUE)
}
```

```
disso_tib <- disso_tib %>%
  dplyr::mutate(
    pos_pan_z = make_z(pos_pan)
  )
```

```
disso_tib %>%
  dplyr::filter_at(
    vars(pos_pan_z),
    any_vars(. >= 3.00)
  )%>%
  knitr::kable(digits = 2)
```

```
disso_tib %>%
  dplyr::group_by(groupedeth) %>%
```

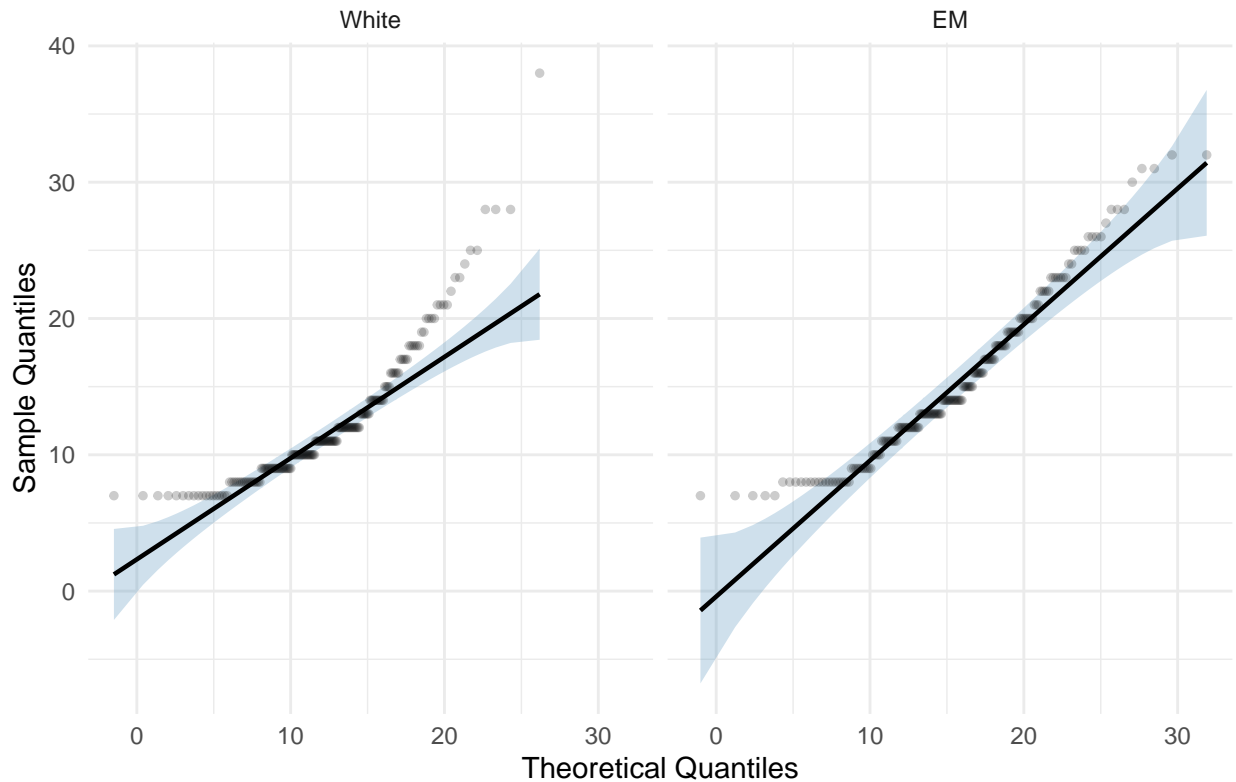
```
dplyr::summarize(
  n = n(),
  mean = mean(neg_pan),
  stnd.dev= sd(neg_pan),
  ci_lower = ggplot2::mean_cl_normal(neg_pan)$ymin,
  ci_upper = ggplot2::mean_cl_normal(neg_pan)$ymax,
  skew = moments::skewness(neg_pan, na.rm = TRUE),
  kurtosis = moments::kurtosis(neg_pan, na.rm = TRUE)
)%>%
knitr::kable(digits = 2)
```

Negative symptoms

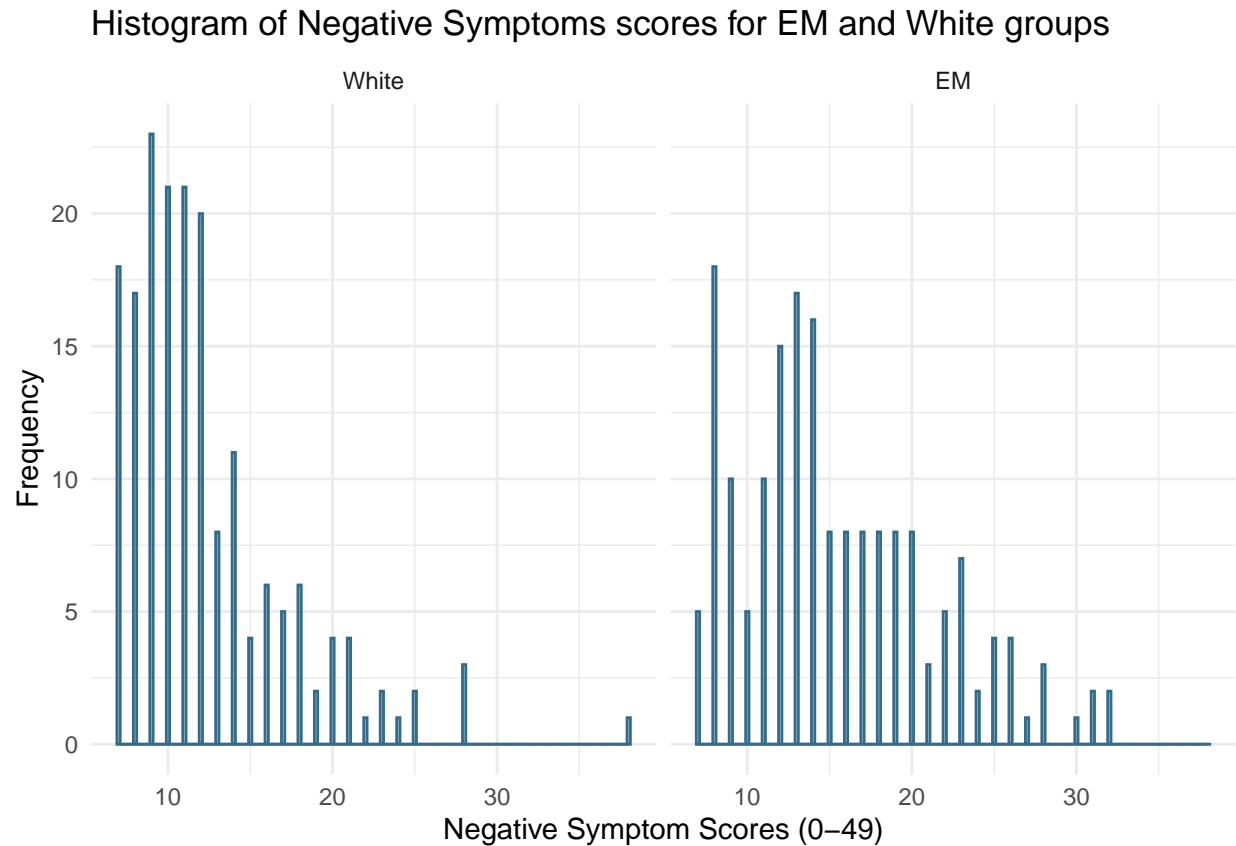
| groupedeth | n | mean | stnd.dev | ci_lower | ci_upper | skew | kurtosis |
|------------|-----|-------|----------|----------|----------|------|----------|
| White | 180 | 12.35 | 5.00 | 11.61 | 13.09 | 1.74 | 7.09 |
| EM | 178 | 15.43 | 5.96 | 14.55 | 16.31 | 0.73 | 2.92 |

```
ggplot2::ggplot(disso_tib, aes(sample = neg_pan)) +
  qqplotr::stat_qq_band(fill= "#5c97bf", alpha = 0.3) +
  qqplotr::stat_qq_line(fill = "#5c97bf") +
  qqplotr::stat_qq_point(alpha=0.2, size= 1) +
labs(x= "Theoretical Quantiles", y="Sample Quantiles", title= "Normal Q-Q plot of Negative Symptoms scores")
facet_wrap(~ groupedeth)+
theme_minimal()
```

Normal Q-Q plot of Negative Symptoms scores for EM and White groups



```
ggplot2::ggplot(disso_tib, aes(neg_pan))+
  geom_histogram(binwidth = 0.2, fill = "#56B4E9", colour = "#336c8b", alpha= 0.2)+
  labs(y="Frequency", x= "Negative Symptom Scores (0-49)", title= "Histogram of Negative Symptoms scores")
facet_wrap(~ groupedeth)+
  theme_minimal()
```



```
ggplot2::ggplot(disso_tib, aes(groupedeth, neg_pan)) +
  geom_boxplot(alpha = 0.7) +
  scale_y_continuous(breaks = seq(0:49)) +
  labs(x = "Ethnic Background", y = "Negative Symptoms Scores (0-49)", fill = "Ethnic Background", title = "Boxplot of Negative Symptoms Scores by Ethnic Background")
  theme_minimal()
```

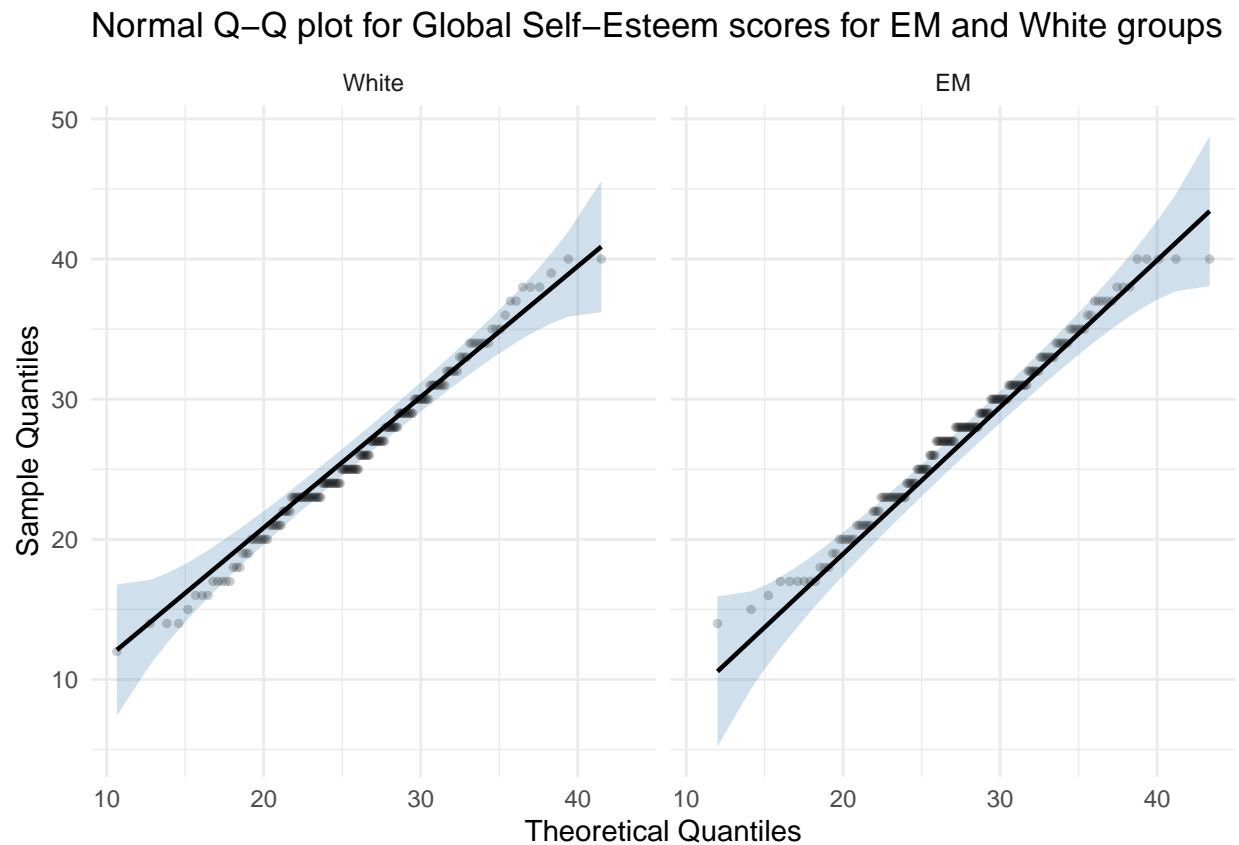


```
dplyr::summarize(
  n = n(),
  mean = mean(selfesteem),
  stnd.dev= sd(selfesteem),
  ci_lower = ggplot2::mean_cl_normal(selfesteem)$ymin,
  ci_upper = ggplot2::mean_cl_normal(selfesteem)$ymax,
  skew = moments::skewness(selfesteem, na.rm = TRUE),
  kurtosis = moments::kurtosis(selfesteem, na.rm = TRUE)
)%>%
knitr::kable(digits = 2)
```

Global Self-Esteem

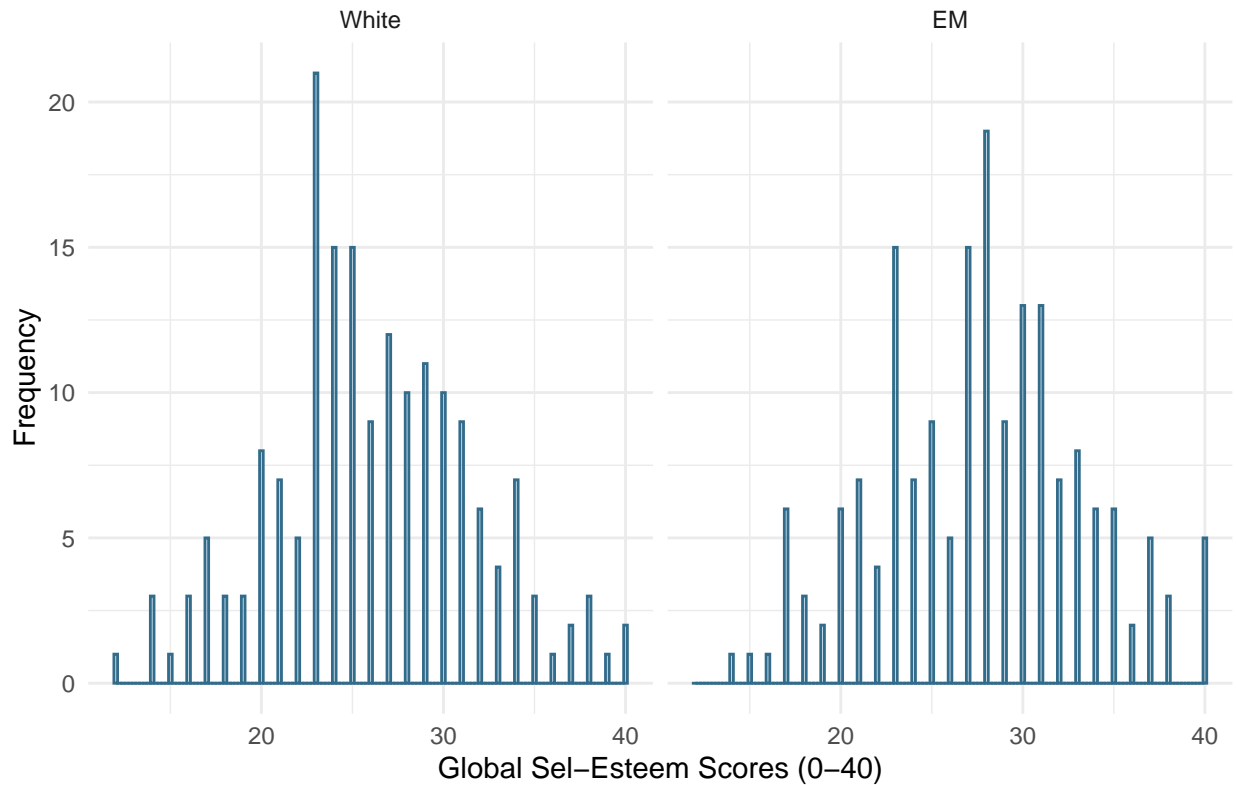
| groupedeth | n | mean | stnd.dev | ci_lower | ci_upper | skew | kurtosis |
|------------|-----|-------|----------|----------|----------|-------|----------|
| White | 180 | 26.08 | 5.58 | 25.26 | 26.90 | 0.12 | 2.87 |
| EM | 178 | 27.67 | 5.68 | 26.83 | 28.51 | -0.03 | 2.61 |

```
ggplot2::ggplot(disso_tib, aes(sample = selfesteem)) +
  qqplotr::stat_qq_band(fill= "#5c97bf", alpha = 0.3) +
  qqplotr::stat_qq_line(fill = "#5c97bf") +
  qqplotr::stat_qq_point(alpha=0.2, size= 1) +
labs(x= "Theoretical Quantiles", y="Sample Quantiles", title= "Normal Q-Q plot for Global Self-Esteem scores for EM and White groups") +
facet_wrap(~ groupedeth)+
theme_minimal()
```



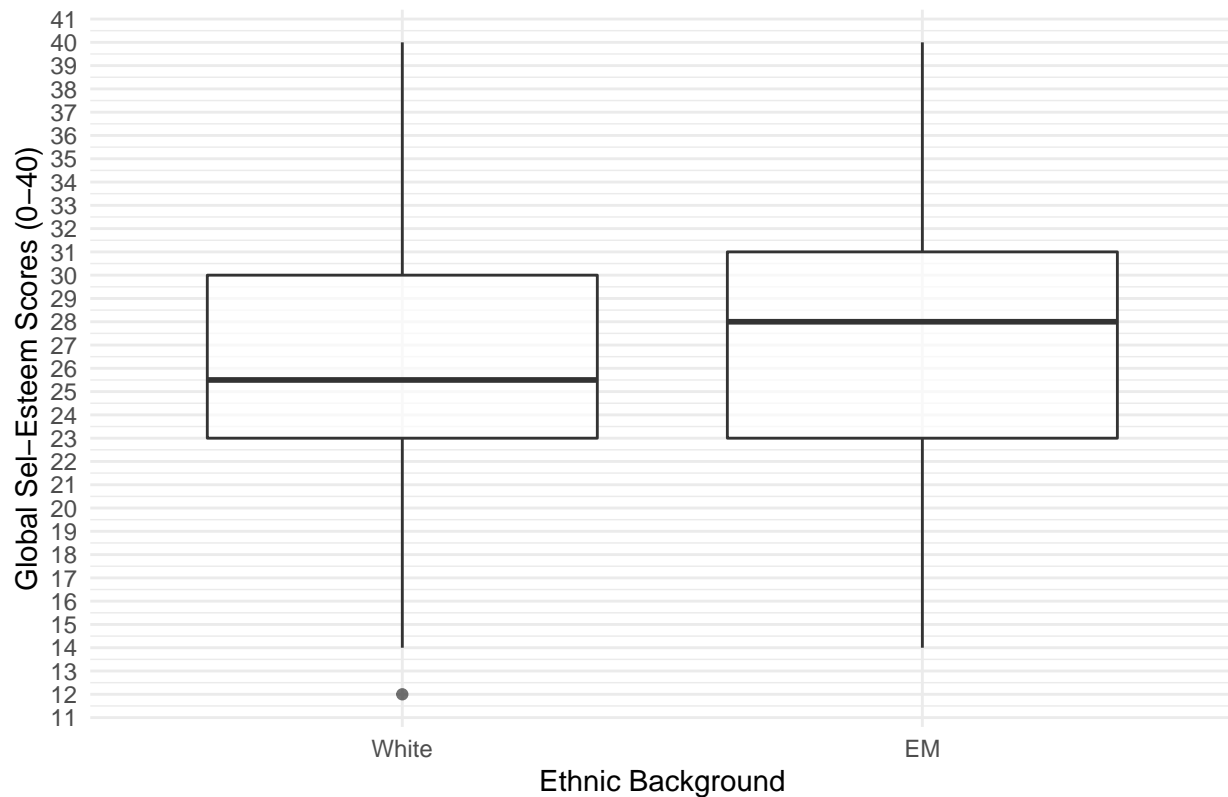
```
ggplot2::ggplot(disso_tib, aes(selfesteem))+
  geom_histogram(binwidth = 0.2, fill = "#56B4E9", colour = "#336c8b", alpha= 0.2)+
  labs(y="Frequency", x= "Global Sel-Esteem Scores (0-40)", title= "Histogram for Global Self-Esteem scores")+
  facet_wrap(~ groupedeth)+
  theme_minimal()
```

Histogram for Global Self-Esteem scores for EM and White groups



```
ggplot2::ggplot(disso_tib, aes(groupedeth, selfesteem)) +
  geom_boxplot(alpha = 0.7) +
  scale_y_continuous(breaks = seq(0: 40)) +
  labs(x = "Ethnic Background", y = "Global Sel-Esteem Scores (0-40)", title= "Box Plot for Global Self-Esteem Scores")+
  theme_minimal()
```

Box Plot for Global Self-Esteem scores for EM and White groups



```
disso_tib <- disso_tib %>%
  dplyr::mutate(
    selfesteem_z = make_z(selfesteem)
  )
```

```
disso_tib %>%
  dplyr::filter_at(
    vars(selfesteem_z),
    any_vars(. >= 3.00)
  )
```

```
## # A tibble: 0 x 56
## # ... with 56 variables: ID <chr>, RANDOMISATION <dbl>, RANDOM_DATE <chr>,
## #   gender <dbl>, DOB <chr>, groupedeth <fct>, ethnicityxx <chr>, age <dbl>,
## #   PANSS_1 <dbl>, PANSS_2 <dbl>, PANSS_3 <dbl>, PANSS_4 <dbl>, PANSS_5 <dbl>,
## #   PANSS_6 <dbl>, PANSS_7 <dbl>, PANSS_8 <dbl>, PANSS_9 <dbl>, PANSS_10 <dbl>,
## #   PANSS_11 <dbl>, PANSS_12 <dbl>, PANSS_13 <dbl>, PANSS_14 <dbl>,
## #   PANSS_15 <dbl>, PANSS_16 <dbl>, PANSS_17 <dbl>, PANSS_18 <dbl>,
## #   PANSS_19 <dbl>, dep <dbl>, PANSS_21 <dbl>, PANSS_22 <dbl>, ...
```

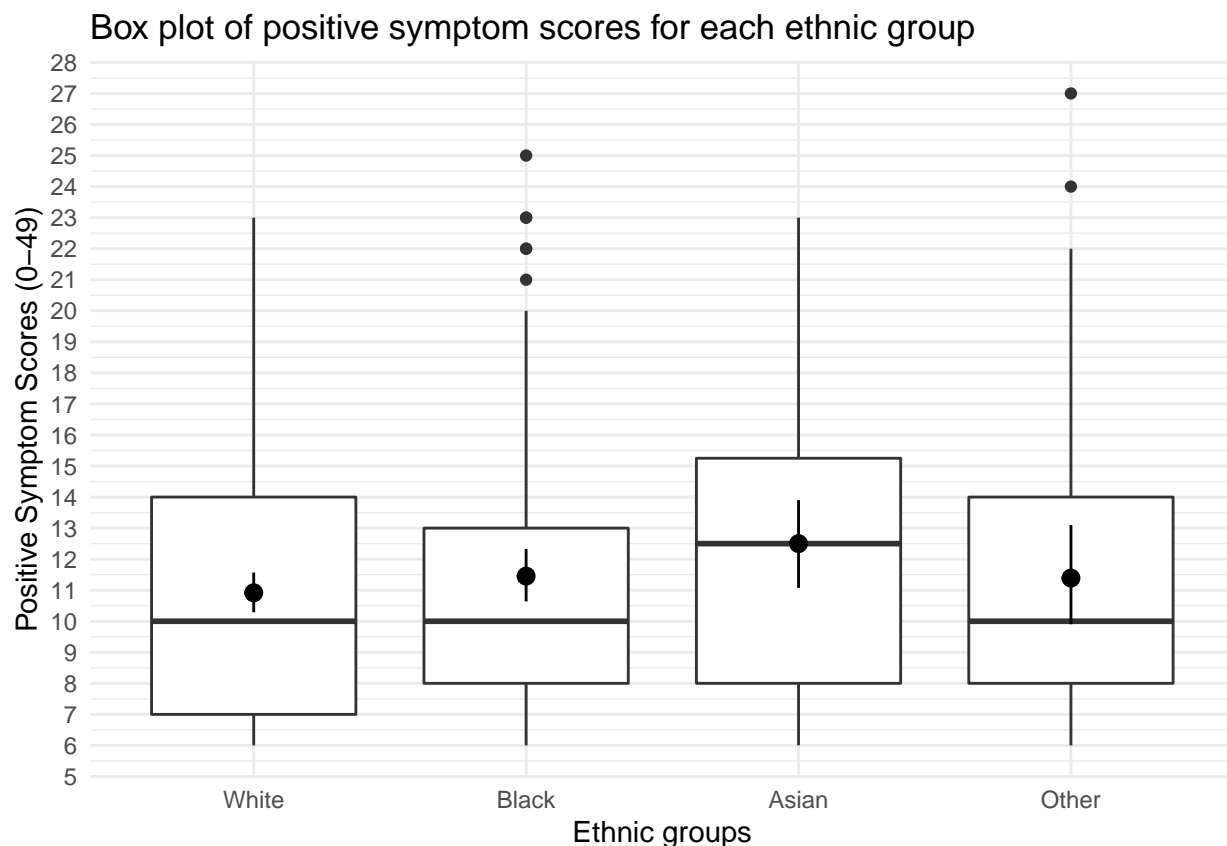
Comparing all ethnic groups

Positive symptoms Group means

```
disso_tib %>%
  dplyr::group_by(eth) %>%
  dplyr::summarize(
    n = n(),
    mean = mean(pos_pan),
    stnd.dev= sd(pos_pan),
    ci_lower = ggplot2::mean_cl_normal(pos_pan)$ymin,
    ci_upper = ggplot2::mean_cl_normal(pos_pan)$ymax
  )%>%
  knitr::kable(digits = 2)
```

| eth | n | mean | stnd.dev | ci_lower | ci_upper |
|-------|-----|-------|----------|----------|----------|
| White | 180 | 10.92 | 4.42 | 10.27 | 11.57 |
| Black | 97 | 11.45 | 4.50 | 10.55 | 12.36 |
| Asian | 40 | 12.50 | 4.80 | 10.97 | 14.03 |
| Other | 41 | 11.39 | 5.18 | 9.75 | 13.03 |

```
ggplot2::ggplot(disso_tib, aes(eth, pos_pan)) +
  geom_boxplot() +
  stat_summary(fun.data = "mean_cl_boot") +
  labs(x = "Ethnic groups", y = "Positive Symptom Scores (0-49)", title= "Box plot of positive symptom scores for each ethnic group") +
  scale_y_continuous(breaks = 0:49) +
  theme_minimal()
```



Associations

```
oneway.test(pos_pan ~ eth, data = disso_tib)
```

```
##
## One-way analysis of means (not assuming equal variances)
##
## data: pos_pan and eth
## F = 1.3048, num df = 3.00, denom df = 103.77, p-value = 0.2769
```

```
pos_rob <- robust::lmRob(pos_pan ~ eth, data = disso_tib, na.action = na.exclude)
summary(pos_rob)
```

```
##
## Call:
## robust::lmRob(formula = pos_pan ~ eth, data = disso_tib, na.action = na.exclude)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.3324 -3.6056 -0.6056  3.1140 16.5705
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  10.6056     0.3534  30.010  <2e-16 ***
## ethBlack      0.2804     0.6116   0.458  0.6469
## ethAsian      1.7268     0.8176   2.112  0.0354 *
## ethOther     -0.1761     0.8274  -0.213  0.8316
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.459 on 354 degrees of freedom
## Multiple R-Squared:  0.01167
##
## Test for Bias:
##              statistic    p-value
## M-estimate     18.823 0.0008514
## LS-estimate      6.798 0.1469414
```

```
parameters::model_parameters(pos_rob, robust = TRUE, vcov.type = "HC4", digits = 3)
```

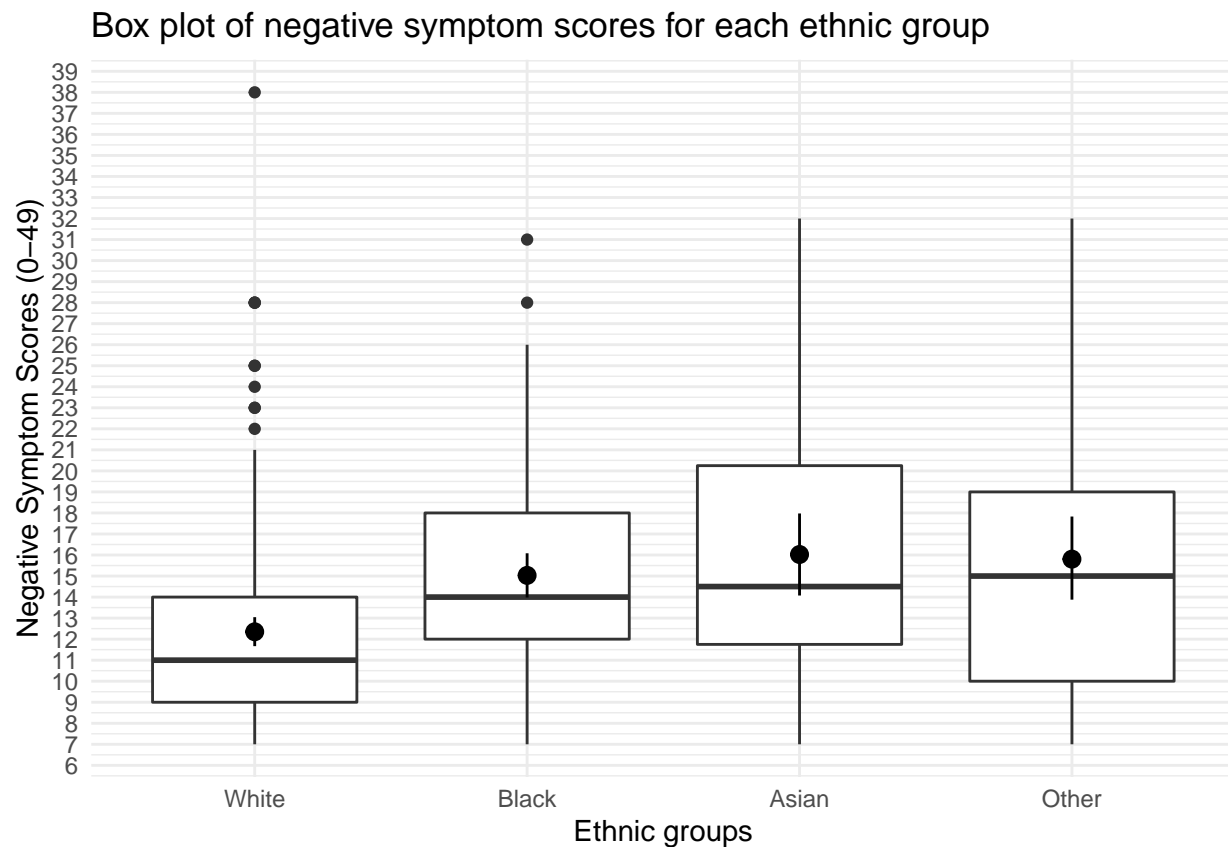
```
## # Fixed Effects
##
## Parameter | Coefficient | SE | 95% CI | t(354) | p
## -----|-----|-----|-----|-----|-----
## (Intercept) | 10.606 | 0.353 | [ 9.91, 11.30] | 30.010 | < .001
## eth [Black] | 0.280 | 0.612 | [-0.92, 1.48] | 0.458 | 0.647
## eth [Asian] | 1.727 | 0.818 | [ 0.12, 3.33] | 2.112 | 0.035
## eth [Other] | -0.176 | 0.827 | [-1.80, 1.45] | -0.213 | 0.832
```

Negative Symtpoms Group means

```
disso_tib %>%
  dplyr::group_by(eth) %>%
  dplyr::summarize(
    n = n(),
    mean = mean(neg_pan),
    stnd.dev= sd(neg_pan),
    ci_lower = ggplot2::mean_cl_normal(neg_pan)$ymin,
    ci_upper = ggplot2::mean_cl_normal(neg_pan)$ymax
  )%>%
  knitr::kable(digits = 2)
```

| eth | n | mean | stnd.dev | ci_lower | ci_upper |
|-------|-----|-------|----------|----------|----------|
| White | 180 | 12.35 | 5.00 | 11.61 | 13.09 |
| Black | 97 | 15.03 | 5.42 | 13.94 | 16.12 |
| Asian | 40 | 16.02 | 6.50 | 13.95 | 18.10 |
| Other | 41 | 15.80 | 6.68 | 13.70 | 17.91 |

```
ggplot2::ggplot(disso_tib, aes(eth, neg_pan)) +
  geom_boxplot() +
  stat_summary(fun.data = "mean_cl_boot") +
  labs(x = "Ethnic groups", y = "Negative Symptom Scores (0-49)", title= "Box plot of negative symptom scores",
  scale_y_continuous(breaks = 0:49) +
  theme_minimal()
```



Associations

```
oneway.test(neg_pan ~ eth, data = disso_tib)
```

```
##
## One-way analysis of means (not assuming equal variances)
##
## data: neg_pan and eth
## F = 9.2207, num df = 3.0, denom df = 100.3, p-value = 1.919e-05
```

```
neg_rob <- robust::lmRob(neg_pan ~ eth, data = disso_tib, na.action = na.exclude)
summary(neg_rob)
```

```
##
## Call:
## robust::lmRob(formula = neg_pan ~ eth, data = disso_tib, na.action = na.exclude)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -7.5126 -2.5905 -0.5905  3.7396 26.4095
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  11.5905     0.3954  29.317 < 2e-16 ***
## ethBlack      2.6698     0.6727   3.969 8.76e-05 ***
## ethAsian      2.9221     0.9350   3.125 0.00192 **
## ethOther      2.7418     0.9014   3.042 0.00253 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.52 on 354 degrees of freedom
## Multiple R-Squared: 0.05595
##
## Test for Bias:
##              statistic    p-value
## M-estimate      15.75 3.371e-03
## LS-estimate     44.29 5.589e-09
```

```
parameters::model_parameters(neg_rob, robust = TRUE, vcov.type = "HC4", digits = 3)
```

```
## # Fixed Effects
##
## Parameter | Coefficient | SE | 95% CI | t(354) | p
## -----|-----|-----|-----|-----|-----
## (Intercept) | 11.591 | 0.395 | [10.81, 12.37] | 29.317 | < .001
## eth [Black] | 2.670 | 0.673 | [ 1.35, 3.99] | 3.969 | < .001
## eth [Asian] | 2.922 | 0.935 | [ 1.08, 4.76] | 3.125 | 0.002
## eth [Other] | 2.742 | 0.901 | [ 0.97, 4.51] | 3.042 | 0.003
```

Testing

Independent t-test

```
pos_bt_rob <- WRS2::yuen(pos_pan ~ groupedeth, data = disso_tib, nboot = 1000, side = TRUE)
pos_bt_rob
```

Posiitive symtpoms

```
## Call:
## WRS2::yuen(formula = pos_pan ~ groupedeth, data = disso_tib,
##     nboot = 1000, side = TRUE)
##
## Test statistic: 1.2704 (df = 213.19), p-value = 0.20532
##
## Trimmed mean difference: -0.66667
## 95 percent confidence interval:
## -1.701      0.3677
##
## Explanatory measure of effect size: 0.1
```

```
neg_bt_rob <- WRS2::yuen(neg_pan ~ groupedeth, data = disso_tib, nboot = 1000, side = TRUE)
neg_bt_rob
```

Negative symtpoms

```
## Call:
## WRS2::yuen(formula = neg_pan ~ groupedeth, data = disso_tib,
##     nboot = 1000, side = TRUE)
##
## Test statistic: 5.9239 (df = 192.15), p-value = 0
##
## Trimmed mean difference: -3.44444
## 95 percent confidence interval:
## -4.5913      -2.2976
##
## Explanatory measure of effect size: 0.44
```

Assumptpions for the mediation analysis

Positive

```
step1 <- lm(pos_pan ~ groupedeth, data = disso_tib) # Predictor (X) predicting outcome (Y) to test for
summary(step1)
```

```
##
## Call:
## lm(formula = pos_pan ~ groupedeth, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.6742 -3.8560 -0.9167  2.8940 15.3258
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   10.9167     0.3407  32.045  <2e-16 ***
## groupedethEM    0.7575     0.4831   1.568   0.118
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.571 on 356 degrees of freedom
## Multiple R-squared:  0.006858,    Adjusted R-squared:  0.004068
## F-statistic: 2.458 on 1 and 356 DF,  p-value: 0.1178
```

```
step2 <- lm(selfesteem ~ groupedeth, data = disso_tib) # Predictor (X) predicting mediator (M) to test for s
summary(step2)
```

```
##
## Call:
## lm(formula = selfesteem ~ groupedeth, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -14.0778  -3.6742  -0.0778   3.7731  13.9222
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   26.0778     0.4195  62.161  < 2e-16 ***
## groupedethEM    1.5964     0.5950   2.683  0.00763 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.628 on 356 degrees of freedom
## Multiple R-squared:  0.01982,    Adjusted R-squared:  0.01707
## F-statistic: 7.199 on 1 and 356 DF,  p-value: 0.007633
```

```
step3 <- lm(pos_pan ~ selfesteem, data = disso_tib) # Mediator (M) predicting outcome (Y) to test for s
summary(step3)
```

```
##
## Call:
## lm(formula = pos_pan ~ selfesteem, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.1100  -3.7190  -0.9972   2.6052 15.4464
```

```
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) 15.03115    1.15663  12.996 < 2e-16 ***
## selfesteem  -0.13910    0.04212  -3.303  0.00105 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.518 on 356 degrees of freedom
## Multiple R-squared:  0.02973,    Adjusted R-squared:  0.02701
## F-statistic: 10.91 on 1 and 356 DF,  p-value: 0.001054
```

Negative

```
step1.1 <- lm(neg_pan ~ groupedeth, data = disso_tib) # Predictor (X) predicting outcome (Y) to test for
summary(step1.1)
```

```
##
## Call:
## lm(formula = neg_pan ~ groupedeth, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.433 -3.433 -1.350   2.650  25.650
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  12.3500     0.4099  30.126 < 2e-16 ***
## groupedethEM   3.0826     0.5814   5.302 2.01e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.5 on 356 degrees of freedom
## Multiple R-squared:  0.07319,    Adjusted R-squared:  0.07059
## F-statistic: 28.11 on 1 and 356 DF,  p-value: 2.012e-07
```

```
step2.1 <- lm(selfesteem ~ groupedeth, data = disso_tib) # Predictor (X) predicting mediator (M) to test for
summary(step2.1)
```

```
##
## Call:
## lm(formula = selfesteem ~ groupedeth, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -14.0778  -3.6742  -0.0778   3.7731  13.9222
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept) 26.0778 0.4195 62.161 < 2e-16 ***
## groupedethEM 1.5964 0.5950 2.683 0.00763 **
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.628 on 356 degrees of freedom
## Multiple R-squared: 0.01982, Adjusted R-squared: 0.01707
## F-statistic: 7.199 on 1 and 356 DF, p-value: 0.007633
```

```
step3.1 <- lm(neg_pan ~ selfesteem, data = disso_tib) # Mediator (M) predicting outcome (Y) to test for
summary(step3.1)
```

```
##
## Call:
## lm(formula = neg_pan ~ selfesteem, data = disso_tib)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.916 -4.844 -1.871  3.125 24.117
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 13.801868  1.462660  9.436  <2e-16 ***
## selfesteem   0.003007  0.053259  0.056   0.955
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.713 on 356 degrees of freedom
## Multiple R-squared: 8.956e-06, Adjusted R-squared: -0.0028
## F-statistic: 0.003189 on 1 and 356 DF, p-value: 0.955
```

Mediation analysis

```
pos_mod <- 'pos_pan ~ c*groupedeth + b*selfesteem
selfesteem ~ a*groupedeth

indirect_effect :=a*b
total_effect :=c + (a*b)

selfesteem ~~ dep
,

set.seed(1234)

pos_full_mod <- sem(pos_mod, data = disso_tib, se = "bootstrap", bootstrap = 1000)

summary(pos_full_mod, standardized = TRUE)
```

Positive symptoms

```

## lavaan 0.6-9 ended normally after 39 iterations
##
## Estimator ML
## Optimization method NLMINB
## Number of model parameters 7
##
## Number of observations 358
##
## Model Test User Model:
##
## Test statistic 21.687
## Degrees of freedom 2
## P-value (Chi-square) 0.000
##
## Parameter Estimates:
##
## Standard errors Bootstrap
## Number of requested bootstrap draws 1000
## Number of successful bootstrap draws 1000
##
## Regressions:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## pos_pan ~
## groupedeth (c) 0.999 0.471 2.123 0.034 0.999 0.109
## selfesteem (b) -0.152 0.043 -3.548 0.000 -0.152 -0.188
## selfesteem ~
## groupedeth (a) 1.477 0.529 2.791 0.005 1.477 0.130
##
## Covariances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .selfesteem ~~
## dep -3.978 0.483 -8.241 0.000 -3.978 -0.447
##
## Variances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .pos_pan 20.050 1.576 12.722 0.000 20.050 0.958
## .selfesteem 31.506 2.208 14.270 0.000 31.506 0.983
## dep 2.510 0.152 16.459 0.000 2.510 1.000
##
## Defined Parameters:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## indirect_effct -0.224 0.103 -2.167 0.030 -0.224 -0.024
## total_effect 0.776 0.468 1.657 0.098 0.776 0.085

```

```
parameterestimates(pos_full_mod, boot.ci.type = "bca.simple", standardized = TRUE)
```

```

## lhs op rhs label est se z pvalue
## 1 pos_pan ~ groupedeth c 0.999 0.471 2.123 0.034
## 2 pos_pan ~ selfesteem b -0.152 0.043 -3.548 0.000
## 3 selfesteem ~ groupedeth a 1.477 0.529 2.791 0.005
## 4 selfesteem ~~ dep -3.978 0.483 -8.241 0.000
## 5 pos_pan ~~ pos_pan 20.050 1.576 12.722 0.000
## 6 selfesteem ~~ selfesteem 31.506 2.208 14.270 0.000
## 7 dep ~~ dep 2.510 0.152 16.459 0.000

```

```
## 8      groupedeth ~~ groupedeth      0.250 0.000      NA      NA
## 9 indirect_effect :=      a*b indirect_effect -0.224 0.103 -2.167 0.030
## 10 total_effect :=      c+(a*b) total_effect 0.776 0.468 1.657 0.098
##      ci.lower ci.upper std.lv std.all std.nox
## 1      0.015      1.868 0.999 0.109 0.218
## 2     -0.233     -0.066 -0.152 -0.188 -0.188
## 3      0.514      2.603 1.477 0.130 0.261
## 4     -4.962     -3.055 -3.978 -0.447 -0.447
## 5     17.185     23.429 20.050 0.958 0.958
## 6     27.353     35.851 31.506 0.983 0.983
## 7      2.245      2.860 2.510 1.000 1.000
## 8      0.250      0.250 0.250 1.000 0.250
## 9     -0.499     -0.072 -0.224 -0.024 -0.049
## 10     -0.196      1.625 0.776 0.085 0.170
```

```
broom::glance(pos_full_mod)%>%
  knitr::kable(digits = 2)
```

| agfi | AIC | BIC | cfi | chisq | npar | rmsearm | rmsea.conf | highly | converged | estimator | groups | missing | method | obs | orig | nexcluded |
|------|---------|---------|------|-------|------|---------|------------|--------|-----------|-----------|--------|---------|----------|-----|------|-----------|
| 0.81 | 5619.85 | 5647.06 | 0.83 | 21.69 | 7 | 0.17 | 0.23 | 0.07 | 0.5 | TRUE | ML | 1 | listwise | 358 | 358 | 0 |

```
broom::tidy(pos_full_mod, conf.int = TRUE)%>%
  knitr::kable(digits = 2)
```

| term | op | label | estimate | std.error | statistic | p.value | conf.low | conf.high | std.lv | std.all | std.nox |
|--------------------------|----|-----------------|----------|-----------|-----------|---------|----------|-----------|--------|---------|---------|
| pos_pan ~ groupedeth | ~ | c | 1.00 | 0.47 | 2.12 | 0.03 | 0.03 | 1.87 | 1.00 | 0.11 | 0.22 |
| pos_pan ~ selfesteem | ~ | b | -0.15 | 0.04 | -3.55 | 0.00 | -0.23 | -0.06 | - | -0.19 | -0.19 |
| selfesteem ~ groupedeth | ~ | a | 1.48 | 0.53 | 2.79 | 0.01 | 0.45 | 2.55 | 1.48 | 0.13 | 0.26 |
| selfesteem ~~ dep | ~~ | | -3.98 | 0.48 | -8.24 | 0.00 | -4.93 | -2.97 | - | -0.45 | -0.45 |
| pos_pan ~~ pos_pan | ~~ | | 20.05 | 1.58 | 12.72 | 0.00 | 16.87 | 23.10 | 20.05 | 0.96 | 0.96 |
| selfesteem ~~ selfesteem | ~~ | | 31.51 | 2.21 | 14.27 | 0.00 | 27.27 | 35.74 | 31.51 | 0.98 | 0.98 |
| dep ~~ dep | ~~ | | 2.51 | 0.15 | 16.46 | 0.00 | 2.21 | 2.82 | 2.51 | 1.00 | 1.00 |
| groupedeth ~~ groupedeth | ~~ | | 0.25 | 0.00 | NA | NA | 0.25 | 0.25 | 0.25 | 1.00 | 0.25 |
| indirect_effect := a*b | := | indirect_effect | 0.22 | 0.10 | -2.17 | 0.03 | -0.46 | -0.05 | - | -0.02 | -0.05 |
| total_effect := c+(a*b) | := | total_effect | 0.78 | 0.47 | 1.66 | 0.10 | -0.16 | 1.66 | 0.78 | 0.08 | 0.17 |

```
summary(pos_full_mod, standardized = TRUE)
```

```
## lavaan 0.6-9 ended normally after 39 iterations
##
```

```

## Estimator ML
## Optimization method NLMINB
## Number of model parameters 7
##
## Number of observations 358
##
## Model Test User Model:
##
## Test statistic 21.687
## Degrees of freedom 2
## P-value (Chi-square) 0.000
##
## Parameter Estimates:
##
## Standard errors Bootstrap
## Number of requested bootstrap draws 1000
## Number of successful bootstrap draws 1000
##
## Regressions:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## pos_pan ~
## groupedeth (c) 0.999 0.471 2.123 0.034 0.999 0.109
## selfesteem (b) -0.152 0.043 -3.548 0.000 -0.152 -0.188
## selfesteem ~
## groupedeth (a) 1.477 0.529 2.791 0.005 1.477 0.130
##
## Covariances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .selfesteem ~~
## dep -3.978 0.483 -8.241 0.000 -3.978 -0.447
##
## Variances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .pos_pan 20.050 1.576 12.722 0.000 20.050 0.958
## .selfesteem 31.506 2.208 14.270 0.000 31.506 0.983
## dep 2.510 0.152 16.459 0.000 2.510 1.000
##
## Defined Parameters:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## indirect_effct -0.224 0.103 -2.167 0.030 -0.224 -0.024
## total_effect 0.776 0.468 1.657 0.098 0.776 0.085

```

```

neg_mod <- 'neg_pan ~ c*groupedeth + b*selfesteem
selfesteem ~ a*groupedeth

indirect_effect :=a*b
total_effect :=c + (a*b)
selfesteem~~ dep
'

set.seed(1234)

```

```
neg_full_mod <- sem(neg_mod, data = disso_tib, se = "bootstrap", bootstrap = 1000)

summary(neg_full_mod, standardized = TRUE)
```

Negative symptoms

```
## lavaan 0.6-9 ended normally after 39 iterations
##
## Estimator ML
## Optimization method NLMINB
## Number of model parameters 7
##
## Number of observations 358
##
## Model Test User Model:
##
## Test statistic 0.452
## Degrees of freedom 2
## P-value (Chi-square) 0.798
##
## Parameter Estimates:
##
## Standard errors Bootstrap
## Number of requested bootstrap draws 1000
## Number of successful bootstrap draws 1000
##
## Regressions:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## neg_pan ~
## groupedeth (c) 3.140 0.584 5.378 0.000 3.140 0.276
## selfesteem (b) -0.036 0.047 -0.762 0.446 -0.036 -0.036
## selfesteem ~
## groupedeth (a) 1.477 0.529 2.791 0.005 1.477 0.130
##
## Covariances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .selfesteem ~~
## dep -3.978 0.483 -8.241 0.000 -3.978 -0.447
##
## Variances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .neg_pan 30.039 2.892 10.387 0.000 30.039 0.925
## .selfesteem 31.506 2.208 14.270 0.000 31.506 0.983
## dep 2.510 0.152 16.459 0.000 2.510 1.000
##
## Defined Parameters:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## indirect_effct -0.053 0.078 -0.684 0.494 -0.053 -0.005
## total_effect 3.087 0.574 5.373 0.000 3.087 0.271
```



```
parameterestimates(neg_full_mod, boot.ci.type = "bca.simple", standardized = TRUE)
```

```
##           lhs op           rhs           label    est    se      z pvalue
## 1      neg_pan ~ groupedeth           c  3.140 0.584  5.378  0.000
## 2      neg_pan ~ selfesteem           b -0.036 0.047 -0.762  0.446
## 3    selfesteem ~ groupedeth           a  1.477 0.529  2.791  0.005
## 4    selfesteem ~~           dep        -3.978 0.483 -8.241  0.000
## 5      neg_pan ~~           neg_pan      30.039 2.892 10.387  0.000
## 6    selfesteem ~~ selfesteem      31.506 2.208 14.270  0.000
## 7           dep ~~           dep         2.510 0.152 16.459  0.000
## 8    groupedeth ~~ groupedeth         0.250 0.000    NA    NA
## 9 indirect_effect :=           a*b indirect_effect -0.053 0.078 -0.684  0.494
## 10 total_effect :=      c+(a*b) total_effect  3.087 0.574  5.373  0.000
##   ci.lower ci.upper std.lv std.all std.noxx
## 1       1.920   4.235  3.140   0.276   0.551
## 2      -0.130   0.058 -0.036  -0.036  -0.036
## 3       0.514   2.603  1.477   0.130   0.261
## 4      -4.962  -3.055 -3.978  -0.447  -0.447
## 5      24.896  36.056 30.039   0.925   0.925
## 6      27.353  35.851 31.506   0.983   0.983
## 7       2.245   2.860  2.510   1.000   1.000
## 8       0.250   0.250  0.250   1.000   0.250
## 9      -0.248   0.064 -0.053  -0.005  -0.009
## 10      1.860   4.162  3.087   0.271   0.542
```

```
broom::glance(pos_full_mod)%>%
  knitr::kable(digits = 2)
```

| agfi | AIC | BIC | cfi | chisq | npar | rmse | armse | conf.low | conf.high | std.lv | std.all | std.noxx | converged | estimator | groups | missing_method | observed | df | excluded |
|------|---------|---------|------|-------|------|------|-------|----------|-----------|--------|---------|----------|-----------|-----------|--------|----------------|----------|----|----------|
| 0.81 | 5619.85 | 5647.06 | 0.83 | 21.69 | 7 | 0.17 | 0.23 | 0.07 | 0.5 | TRUE | ML | 1 | listwise | 358 | 358 | 0 | | | |

```
broom::tidy(pos_full_mod, conf.int = TRUE)%>%
  knitr::kable(digits = 2)
```

| term | op | label | estimate | std.error | statistic | p.value | conf.low | conf.high | std.lv | std.all | std.noxx |
|--------------------------|----|-------|----------|-----------|-----------|---------|----------|-----------|--------|---------|----------|
| pos_pan ~ groupedeth | ~ | c | 1.00 | 0.47 | 2.12 | 0.03 | 0.03 | 1.87 | 1.00 | 0.11 | 0.22 |
| pos_pan ~ selfesteem | ~ | b | -0.15 | 0.04 | -3.55 | 0.00 | -0.23 | -0.06 | - | -0.19 | -0.19 |
| selfesteem ~ groupedeth | ~ | a | 1.48 | 0.53 | 2.79 | 0.01 | 0.45 | 2.55 | 1.48 | 0.13 | 0.26 |
| selfesteem ~~ dep | ~~ | | -3.98 | 0.48 | -8.24 | 0.00 | -4.93 | -2.97 | - | -0.45 | -0.45 |
| pos_pan ~~ pos_pan | ~~ | | 20.05 | 1.58 | 12.72 | 0.00 | 16.87 | 23.10 | 20.05 | 0.96 | 0.96 |
| selfesteem ~~ selfesteem | ~~ | | 31.51 | 2.21 | 14.27 | 0.00 | 27.27 | 35.74 | 31.51 | 0.98 | 0.98 |
| dep ~~ dep | ~~ | | 2.51 | 0.15 | 16.46 | 0.00 | 2.21 | 2.82 | 2.51 | 1.00 | 1.00 |

| term | op | label | estimate | std.error | statistic | p.value | conf.low | conf.high | std.lv | std.all | std.no |
|-----------------|----|-----------------|----------|-----------|-----------|---------|----------|-----------|--------|---------|--------|
| groupedeth ~ | ~~ | | 0.25 | 0.00 | NA | NA | 0.25 | 0.25 | 0.25 | 1.00 | 0.25 |
| groupedeth | | | | | | | | | | | |
| indirect_effect | := | indirect_effect | 0.22 | 0.10 | -2.17 | 0.03 | -0.46 | -0.05 | - | -0.02 | -0.05 |
| := a*b | | | | | | | | | 0.22 | | |
| total_effect | := | total_effect | 0.78 | 0.47 | 1.66 | 0.10 | -0.16 | 1.66 | 0.78 | 0.08 | 0.17 |
| c+(a*b) | | | | | | | | | | | |

```
summary(neg_full_mod, standardized = TRUE)
```

```
## lavaan 0.6-9 ended normally after 39 iterations
##
## Estimator ML
## Optimization method NLMINB
## Number of model parameters 7
##
## Number of observations 358
##
## Model Test User Model:
##
## Test statistic 0.452
## Degrees of freedom 2
## P-value (Chi-square) 0.798
##
## Parameter Estimates:
##
## Standard errors Bootstrap
## Number of requested bootstrap draws 1000
## Number of successful bootstrap draws 1000
##
## Regressions:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## neg_pan ~
## groupedeth (c) 3.140 0.584 5.378 0.000 3.140 0.276
## selfesteem (b) -0.036 0.047 -0.762 0.446 -0.036 -0.036
## selfesteem ~
## groupedeth (a) 1.477 0.529 2.791 0.005 1.477 0.130
##
## Covariances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .selfesteem ~~
## dep -3.978 0.483 -8.241 0.000 -3.978 -0.447
##
## Variances:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## .neg_pan 30.039 2.892 10.387 0.000 30.039 0.925
## .selfesteem 31.506 2.208 14.270 0.000 31.506 0.983
## dep 2.510 0.152 16.459 0.000 2.510 1.000
##
## Defined Parameters:
## Estimate Std.Err z-value P(>|z|) Std.lv Std.all
## indirect_effct -0.053 0.078 -0.684 0.494 -0.053 -0.005
```

| | | | | | | | |
|----|--------------|-------|-------|-------|-------|-------|-------|
| ## | total_effect | 3.087 | 0.574 | 5.373 | 0.000 | 3.087 | 0.271 |
|----|--------------|-------|-------|-------|-------|-------|-------|