WORKSHOP 2: INTRODUCTION TO SPSS 2

SPSS Basics:

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UBC Library Research Commons
Background questions

• Have you used SPSS before?

• Have you worked with other data analysis software?

• Have you conducted any quantitative data analysis before?
Outline

Part 1: What statistical model should I apply?
- Different statistical models
- Common criteria for selecting statistical models
- Selecting statistical models based on the criteria

Part 2: How can we run statistical models in SPSS?
- Example data
- Independent sample T-test
- Independent one-way ANOVA
- Pearson’s correlation
- Simple & Multiple regression
Part 1
What statistical model should I apply?

• Different statistical models
• Common criteria for selecting statistical models
• Selecting statistical models based on the criteria
Different statistical models

Common statistical models:
• Pearson’s Correlation
• Independent sample T-test
• Independent one-way/two-way ANOVA
• Ordinary least square/linear regression
• Binary logistic regression
• Paired-sample T-test
• Repeated measures ANOVA
• Latent growth curve models
• …

Tools

Build your theory!
(by answering research questions)
Common criteria for selecting statistical models

• Study design:
  Cross-sectional design vs. Longitudinal (repeated measures) design

• Research interest:
  Association vs. Group difference vs. Prediction vs. Change

• Type of data:
  Continuous data vs. Categorical data

• Inference:
  Descriptive vs. Inferential
Common criteria for selecting statistical models

Study design:

- **Cross-sectional study** collects data in “one time point” only

  ![Cross-sectional study diagram]

  *E.g.*, collect data (set of variables) in 2005 from public schools in BC

- **Longitudinal study** (repeated measures) collects data in “multiple time points”

  ![Longitudinal study diagram]

  *E.g.*, collect data (set of variables) in 2005, 2007, 2009 from public schools in BC
Different statistical models

Common statistical models:

• Pearson’s Correlation
• Independent sample T-test
• Independent one-way/two-way ANOVA
• Ordinary least square/linear regression
• Binary logistic regression
• Paired-sample T-test
• Repeated measures ANOVA
• Latent growth curve models

In general…

Longitudinal/repeated measures studies
Common criteria for selecting statistical models

Research interest:

• **Association** → *What is the direction and the strength of association between variables?*

  *E.g.,*
  - Are there associations between distress, self-esteem, and quality of life? If so, are the associations positive or negative? how strong is it?

• **Group difference** → *Are there group differences in a variable?*

  *E.g.,*
  - Are there differences in quality of life between males and females?
  - Are there differences in quality of life between 3 different marital status groups?
Research interest:

• **Prediction** → *Does a set of variables predict the phenomenon of interest?*
  
  *E.g.*,  
  - Does distress levels, self-esteem, and gender predict individuals’ quality of life?

• **Change** → *How much change occurs in the phenomenon of interest?*
  
  *E.g.*,  
  - Does change occur in individuals’ levels of self-esteem from time 1 to time 2?
  - What is the pattern of change in depression level across 4 years in a school?
Different statistical models

Common statistical models:

- Pearson’s Correlation  
  \textit{Association}
- Independent sample T-test
- Independent one-way/two-way ANOVA
- Ordinary least square/linear regression
- Binary logistic regression
- Paired-sample T-test
- Repeated measures ANOVA  
  \textit{Change}
- Latent growth curve models
- …

In general…

- Group difference
- Prediction
Common criteria for selecting statistical models

Type of data:

- **Continuous data** → numbers represent the “amount”
  
  *E.g.*,  
  - Sum scores of math test representing the amount of math ability  
  - Total scores of quality of life scale

- **Categorical data** → numbers/strings represent the “type”
  
  *E.g.*,  
  - Gender, Country ID, Marital status, Employment status, Yes/No response

- **Ordinal data** → numbers/string represent the “order”
  
  *E.g.*, Rank (1st, 2nd, 3rd), Size (small, medium, large)
Variable distinction & Data type:

- Two types of variables based on direction

- **Dependent variable (= DV; outcome; test variable)**
  - “Values in DV” depend on values in IV
  - Type of data in DV matters in the selection of statistical models (Continuous DV vs. Categorical DV)

- **Independent variable (= IV; predictor; explanatory variable)**
  - “Values in IV” affect/change values in DV
  - Type of data in IV usually affects the interpretation but not the selection of statistical models (Continuous IV vs. Categorical IV)
Different statistical models

Common statistical models:

- Pearson’s Correlation
- Independent sample T-test
- Independent one-way/two-way ANOVA
- Ordinary least square/linear regression
- Binary logistic regression
- Paired-sample T-test
- Repeated measures ANOVA
- Latent growth curve models
- ...

In general...

Continuous data

Continuous data

Categorical data
Common criteria for selecting statistical models

Inference:

- **Descriptive statistics** provide a summary of sample and make an inference about “samples” only
  
  *E.g.*, gender difference in the quality of life *among the samples* (N=100)

- **Inferential statistics** allow making an inference about “population”
  
  *E.g.*, gender difference in the quality of life *in the population*
Selecting statistical models based on the criteria

<table>
<thead>
<tr>
<th></th>
<th>Cross sectional</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Association</td>
<td>Group difference</td>
<td>Prediction</td>
</tr>
<tr>
<td>Continuous</td>
<td>Continuous</td>
<td>Continuous</td>
</tr>
<tr>
<td>Categorical</td>
<td>Categorical</td>
<td>Categorical</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data type</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Longitudinal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td>Categorical</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Repeated measures)</td>
</tr>
</tbody>
</table>
Selecting statistical models based on the criteria

<table>
<thead>
<tr>
<th>Association</th>
<th>Group difference</th>
<th>Prediction</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous-Continuous</td>
<td>* Continuous</td>
<td>* Continuous</td>
<td>...</td>
</tr>
<tr>
<td>Categorical-Categorical</td>
<td>* Categorical</td>
<td>* Categorical</td>
<td>...</td>
</tr>
<tr>
<td><strong>Pearson correlation</strong></td>
<td>Chi-square test of independence</td>
<td>Independent T-test</td>
<td>Simple ordinary least square (OLS)/linear regression</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>One-way ANOVA</td>
<td>Multiple ordinary least square (OLS)/linear regression</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>Two-way ANOVA</td>
<td>...</td>
</tr>
</tbody>
</table>

* Dependent variable
Selecting statistical models based on the criteria

<table>
<thead>
<tr>
<th>Longitudinal (repeated measures)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Continuous</td>
<td>* Categorical</td>
</tr>
<tr>
<td>* Paried sample T-test</td>
<td>Latent growth curve model with categorical data</td>
</tr>
<tr>
<td>* Repeated measure ANOVA</td>
<td>...</td>
</tr>
<tr>
<td>* Latent growth curve model</td>
<td>...</td>
</tr>
</tbody>
</table>

* Dependent variable
How can we run statistical models in SPSS?

• Example data
• Independent sample T-test
• Independent one-way ANOVA
• Pearson’s correlation
• Simple & Multiple regression
Example data

• Cross-sectional design:
  A set of variables measured from each person in one time point

• A set of variables:
  - Gender (Male = 0, Female = 1)
  - Age (range 10 – 80)
  - Marital status (Married, common law = 1, Widow, divorce, separate = 2, Single, never married = 3)
  - Employment (no job = 1, part time = 2, full time = 3)
  - Quality of life_total (range 0 – 20)
  - Distress_total (range 0 – 20)
  - Self-esteem items (range 0 – 3)

• Missing data are coded as 999
Independent sample T-test
(Two groups comparison)
Independent sample T-test

- **Independent T-test** is used to see whether there is a **group difference** (not sample group difference) in **continuous data** between **two groups**.

<table>
<thead>
<tr>
<th>Cross sectional</th>
<th>Group difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous</td>
</tr>
<tr>
<td>Independent T-test</td>
<td>...</td>
</tr>
<tr>
<td>One-way/Two-way ANOVA</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Independent sample T-test

• Group difference between two groups is examined by “group mean difference”

Group A
6.8
↓
Group B
12.4
↓
Mean difference
5.6

• The sample mean difference is tested to see whether it can be generalized to the population level
Independent sample T-test

Example
Is there group difference in quality of life total scores between males and females?

Individuals’ Quality of life total scores

Sample group difference
Inferential statistics

Population Group difference?
Independent sample T-test

Analyze > Compare Means > Independent-Sample T Test …
## Independent sample T-test

- **Results:**

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances</td>
<td>2.490</td>
<td>.116</td>
</tr>
<tr>
<td>assumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances</td>
<td>-1.762</td>
<td>.060</td>
</tr>
<tr>
<td>not assumed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Levene’s Test aims to test equal variance assumption**

*one of the assumptions for independent T-test*

**Sig (p value) > 0.05 indicates the equal variance assumption is met**
Independent sample T-test

• Results:

<table>
<thead>
<tr>
<th></th>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Quality of life</td>
<td>2.490</td>
<td>.116</td>
</tr>
<tr>
<td></td>
<td>-1.762</td>
<td>197.875</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conceptually,
- **t test statistic** → **sample group mean difference for hypothesis testing**
- **sig (i.e. p value)** → probability of getting the observed **t value** (representing sample group difference) WHEN no group difference in the population
Independent one-way ANOVA
(Comparison between three or more groups)
Independent one-way ANOVA

- **Independent one-way ANOVA** is used to see whether there is **group difference** (not sample group difference) in **continuous data** between **more than three groups**

<table>
<thead>
<tr>
<th>Data type</th>
<th>Group difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross sectional</td>
<td></td>
</tr>
<tr>
<td><strong>Continuous</strong></td>
<td>Independent T-test</td>
</tr>
<tr>
<td><strong>Categorical</strong></td>
<td>...</td>
</tr>
</tbody>
</table>
Independent one-way ANOVA

• Why not multiple T-tests?

Multiple t-tests lead to inflation of the Type-1 error rate

*Note. Type-1 error* (false positive error): error that rejects a true null hypothesis (i.e., no group difference)*
Independent one-way ANOVA

- **Two steps**: overall group differences and post-hoc analysis
  1) **Overall group difference test**: 
     - $F$ test statistic tests whether there is *at least* one group difference between two groups.
  
     - **pair 1**: Group A vs. Group B
     - **pair 2**: Group A vs. Group C
     - **pair 3**: Group B vs. Group C

  2) **Post-hoc paired-comparisons test**: 
     - Post-hoc test shows which groups have difference by testing all pairs of groups individually

     - Modified T-test is used to adjust inflated Type-1 error
Independent one-way ANOVA

• Example

Are there group differences in quality of life total scores between married, widow/separate, and single marital status groups?
Independent one-way ANOVA

SPSS: Analyze > Compare Means > One-Way ANOVA ...
Independent one-way ANOVA

- Results: Overall group difference (omnibus test results)

<table>
<thead>
<tr>
<th>Quality of life</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>643.663</td>
<td>2</td>
<td>321.831</td>
<td>19.827</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>3197.732</td>
<td>197</td>
<td>16.232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3841.395</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conceptually,
- **Sum of Squares, Mean Square → variations**
- **df → degrees of freedom**
- **F → Between-group variation/ Within-group variation**
- **Sig (i.e. p value) → probability of getting the observed F value (representing sample group differences) WHEN no group differences in the population**
Independent one-way ANOVA

- Results: Which groups differ? (post hoc test results)

### Post Hoc Tests

**Dependent Variable:** Quality of life  
**Tukey HSD**

<table>
<thead>
<tr>
<th>(I) Marital status</th>
<th>(J) Marital status</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval Lower Bound</th>
<th>95% Confidence Interval Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>married, common law</td>
<td>widow, divorce, separate</td>
<td>4.381*</td>
<td>.712</td>
<td>.000</td>
<td>2.70</td>
<td>6.06</td>
</tr>
<tr>
<td>single, never married</td>
<td></td>
<td>1.423</td>
<td>.695</td>
<td>.104</td>
<td>- .22</td>
<td>3.06</td>
</tr>
<tr>
<td>widow, divorce, separate</td>
<td>married, common law</td>
<td>-4.381*</td>
<td>.712</td>
<td>.000</td>
<td>-6.06</td>
<td>-2.70</td>
</tr>
<tr>
<td>single, never married</td>
<td></td>
<td>-2.958*</td>
<td>.689</td>
<td>.000</td>
<td>-4.59</td>
<td>-1.33</td>
</tr>
<tr>
<td>single, never married</td>
<td>married, common law</td>
<td>-1.423</td>
<td>.695</td>
<td>.104</td>
<td>-3.06</td>
<td>.22</td>
</tr>
<tr>
<td>widow, divorce, separate</td>
<td></td>
<td>2.958*</td>
<td>.689</td>
<td>.000</td>
<td>1.33</td>
<td>4.59</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.
Correlation
(Association between variables)
Pearson’s correlation

• Pearson’s correlation is used to examine **associations between** variables (represented by continuous data) by looking at the direction and strength of the associations

<table>
<thead>
<tr>
<th>Association</th>
<th>Continuous-Continuous</th>
<th>Categorical-Categorical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson correlation</td>
<td>Chi-square test of independence</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>Cramer's V</td>
<td>...</td>
</tr>
</tbody>
</table>
Pearson’s correlation

• **Pearson’s correlation range:** \(-1 \leq \text{Correlation} \leq +1\)

• **Direction of association**
  - Positive correlation $\rightarrow$ positive association
  - Negative correlation $\rightarrow$ negative association

• **Strength of association**\(^1\)
  - Between \((0.7 – 1.0)\) or \((-1.0 – -0.7)\) $\rightarrow$ strong association
  - Between \((0.3 – 0.7)\) or \((-0.7 – 0.9.7)\) $\rightarrow$ moderate association
  - Between \((0.0 – 0.3)\) or \((0.0 – -0.3)\) $\rightarrow$ weak association

Pearson’s correlation

- Visualize the direction of association and strength of association

![Scatter plots with Pearson's correlation coefficients: r = 0.9, r = -0.8, r = -0.6, r = 0.5]
Pearson’s correlation

• Example

Are there *associations between quality of life, distress, and self-esteem*?

*What is the direction and the strength of the associations?*
Pearson’s correlation

Analyze > Correlate > Bivariate
Correlation

• Results:

<table>
<thead>
<tr>
<th></th>
<th>Quality of life</th>
<th>Distress</th>
<th>Esteem_total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>-0.708**</td>
<td>0.660**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>200</td>
<td>198</td>
<td>200</td>
</tr>
<tr>
<td>Distress</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-0.708**</td>
<td>1</td>
<td>-0.685**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>198</td>
<td>198</td>
<td>198</td>
</tr>
<tr>
<td>Esteem_total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>0.660**</td>
<td>-0.685**</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>200</td>
<td>198</td>
<td>200</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
Simple and multiple OLS/linear regression
(Predict the phenomenon using a set of variables)
Simple and multiple OLS/linear regression

- Ordinary least squares (OLS) or Linear regression is used to examine what factors explain/predict the phenomenon of interest (represented by continuous data)

*Dependent variable*
Simple and multiple OLS/linear regression

- **Simple OLS/linear regression** only includes “one” independent variable (IV) to explain/predict the phenomenon of interest.
- **Multiple OLS/linear regression** includes “multiple” independent variable (IV).

\[
DV = b_0 + b_1 (IV 1)
\]

\[
DV = b_0 + b_1 (IV 1) + b_2 (IV 2) + b_3 (IV 3)
\]
Simple and multiple OLS/linear regression

Regression assumptions ¹:

• Linear relationship
• Multivariate normality
• No or little multicollinearity
• No auto-correlation
• Homoscedasticity

http://www.stat.yale.edu/Courses/1997-98/101/linreg.htm
Simple OLS/linear regression

- $DV = b_0 + b_1 (IV) \rightarrow$ E.g., $Y = 53 + 0.38 \times (X)$
- $b_0$ (intercept; constant) = predicted mean value of $DV$ when $IV = 0$
- $b_1$ (slope; coefficient) = predicted change in $DV$ for one unit change in $IV$
Simple OLS/linear regression

• Example
Does distress explain/predict quality of life?
Simple OLS/linear regression

Analyze > Regression > Linear ...
Simple OLS/linear regression

Output

Regression

Variables Entered/Removed

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables Entered</th>
<th>Variables Removed</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distress</td>
<td></td>
<td>Enter</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Quality of life
b. All requested variables entered.

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.708a</td>
<td>.502</td>
<td>.499</td>
<td>3.096</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Distress
b. Dependent Variable: Quality of life

ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>1</td>
<td>1891.133</td>
<td>1891.133</td>
<td>.000b</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>196</td>
<td>9.583</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>197</td>
<td>19.395</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Quality of life
b. Predictors: (Constant), Distress

Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
<td></td>
<td>18.322</td>
<td>.533</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Distress</td>
<td></td>
<td>-.638</td>
<td>-.708</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Quality of life
Simple OLS/linear regression

Output

Residuals Statistics

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Value</td>
<td>5.56</td>
<td>17.68</td>
<td>11.51</td>
<td>3.088</td>
<td>198</td>
</tr>
<tr>
<td>Residual</td>
<td>-8.684</td>
<td>8.999</td>
<td>-0.000</td>
<td>3.088</td>
<td>198</td>
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<tr>
<td>Std. Predicted Value</td>
<td>-1.919</td>
<td>1.994</td>
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<td>198</td>
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<tr>
<td>Std. Residual</td>
<td>-2.805</td>
<td>2.871</td>
<td>0.000</td>
<td>0.987</td>
<td>198</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Quality of life
Multiple OLS/linear regression

- $DV = b_0 + b_1 (IV_1) + b_2 (IV_2) + b_3 (IV_3) + \ldots$

$b_0$ (intercept; constant) = predicted mean value of $DV$ when $IV_1$, $IV_2$, $IV_3$ \ldots = 0

$b_1$ (slope; coefficient) = predicted change in $DV$ for one unit change in $IV_1$,

\[\ldots when IV_2, IV_3 \ldots remains constant\]
Multiple OLS/linear regression

- **Example**
  
  Do distress, self-esteem, and gender explain/predict quality of life?
Multiple OLS/linear regression

Analyze > Regression > Linear ...

- Distress
- Esteem_total
- Gender
- Age
Multiple OLS/linear regression

Output

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.745a</td>
<td>.555</td>
<td>.546</td>
<td>2.932</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Age, Gender, Esteem_total, Distress
b. Dependent Variable: Quality of life

ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>4</td>
<td>506.964</td>
<td>58.992</td>
<td>.000b</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>189</td>
<td>8.594</td>
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<td></td>
<td>Total</td>
<td>193</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Quality of life
b. Predictors: (Constant), Age, Gender, Esteem_total, Distress
Multiple OLS/linear regression

Output

\[ Y = 12.041 + (-0.416)(\text{Distress}) + 0.221(\text{Esteem}) + 0.564(\text{Gender}) \]

### Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>95.0% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distress</td>
<td>B: -0.416</td>
<td>Std. Error: 0.060</td>
<td>t: -6.895</td>
<td>Sig: .000</td>
</tr>
<tr>
<td></td>
<td>Esteem_total</td>
<td>B: 0.221</td>
<td>Std. Error: 0.044</td>
<td>t: 5.024</td>
<td>Sig: .000</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>B: 0.564</td>
<td>Std. Error: 0.428</td>
<td>t: 1.316</td>
<td>Sig: .190</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>B: -0.000</td>
<td>Std. Error: 0.012</td>
<td>t: -0.023</td>
<td>Sig: .835</td>
</tr>
</tbody>
</table>

*a Dependent Variable: Quality of life

### Residuals Statistics

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Value</td>
<td>4.69</td>
<td>19.17</td>
<td>11.55</td>
<td>3.241</td>
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<td>Residual</td>
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<td>Std. Predicted Value</td>
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<td>Std. Residual</td>
<td>-2.838</td>
<td>2.507</td>
<td>.000</td>
<td>.990</td>
<td>194</td>
</tr>
</tbody>
</table>

*a Dependent Variable: Quality of life
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- Systematic Review Search Methodology
- Citation Management
- Thesis Formatting
- Nvivo Software Support
- SPSS Software Support
- R Group
- Multi-Disciplinary Graduate Student Writing Group
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• One-on-one Consultation

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THANK YOU!

QUESTION, COMMENT, IDEAS
FEEDBACK