Al-Mustaqbal University College

Department of Anesthesia techniques

Third Stage

Lecture 7

T- Tests in SPSS

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The T- Tests in SPSS
All *t* Tests are means comparisons

- One Sample *t* test

compares a sample average to a population mean

- Independent Samples *t* test

compares the averages of two groups whose members are independent

- Paired Samples *t* test

compares members of one group at two points in time

An Paired Samples T Test

- compares the means of two measurements taken from the same individual, object, or related units
- "paired" measurements
  1. A measurement taken at two different times
  2. A measurement taken under two different conditions
  3. Measurements taken from two halves or sides of a subject or experimental unit

T -Test

This test is also known as:

- Dependent *t* Test
- Paired *t* Test
- Repeated Measures *t* Test
- The variable used in this test is known as:
- Dependent variable, or test variable (continuous), measured at two different times or for two related conditions or units

Common Uses of T-Test

- Statistical difference between two time points
- Statistical difference between two conditions
- Statistical difference between two measurements
- Statistical difference between a matched pair

T -Test

- The Paired Samples *t* Test is not appropriate for analyses involving the following
- unpaired data
- comparisons between more than two units/groups
- a continuous outcome that is not normally distributed
- an ordinal/ranked outcome

Data Requirements

- Dependent variable that is continuous
- Related samples/groups
- Random sample of data from the population
- Normal distribution (approximately) of the difference between the paired values
- No outliers in the difference between the two related groups

Hypotheses

• The hypotheses can be expressed in two different ways that express the same idea and are mathematically equivalent:

• H0: $\mu 1 = \mu 2$ ("the paired population means are equal")

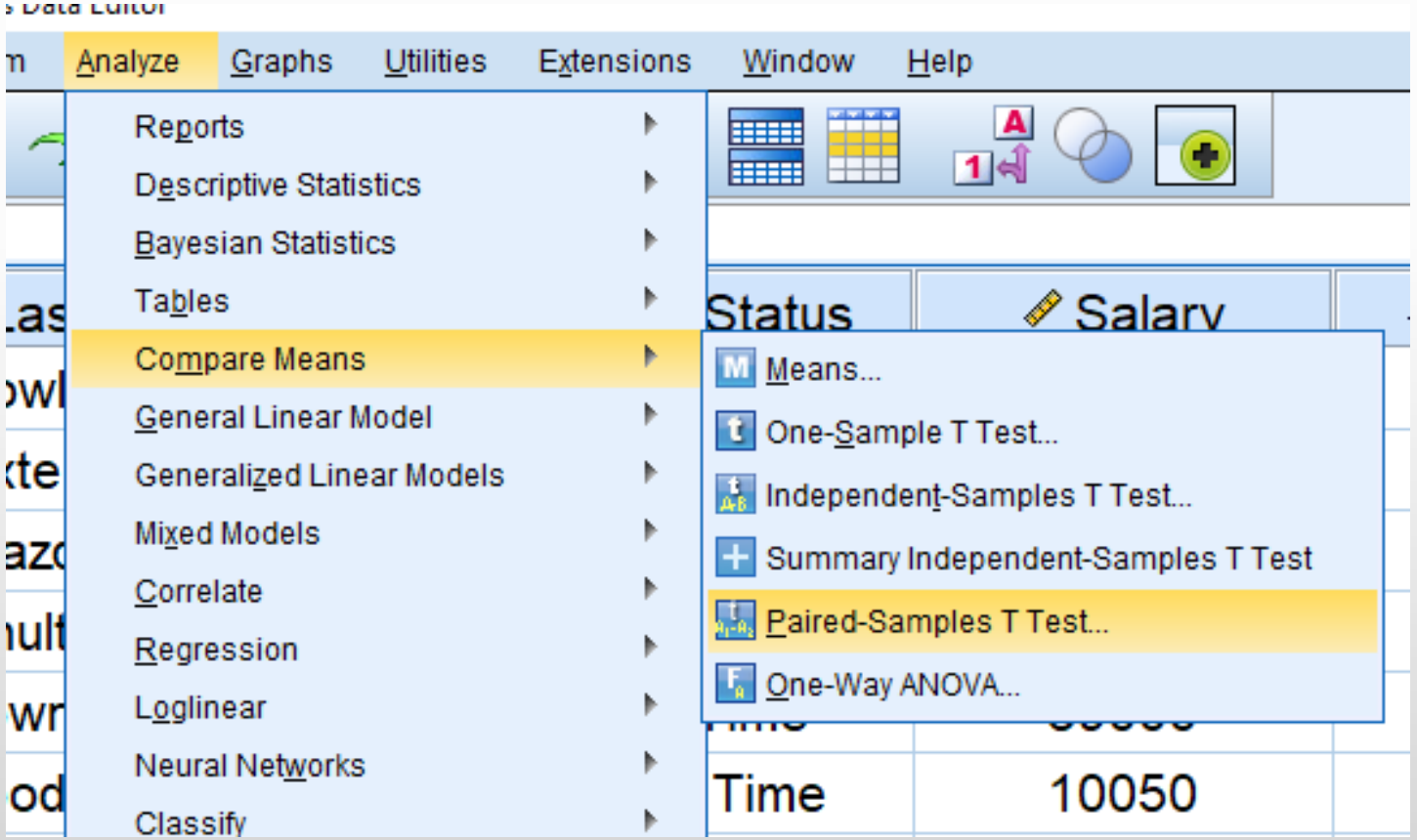
H1: $\mu 1 \neq \mu 2$ ("the paired population means are not equal")

• H0: $\mu 1 - \mu 2 = 0$ ("the difference between the paired population means is equal to 0")

H1: $\mu 1 - \mu 2 \neq 0$ ("the difference between the paired population means is not 0")

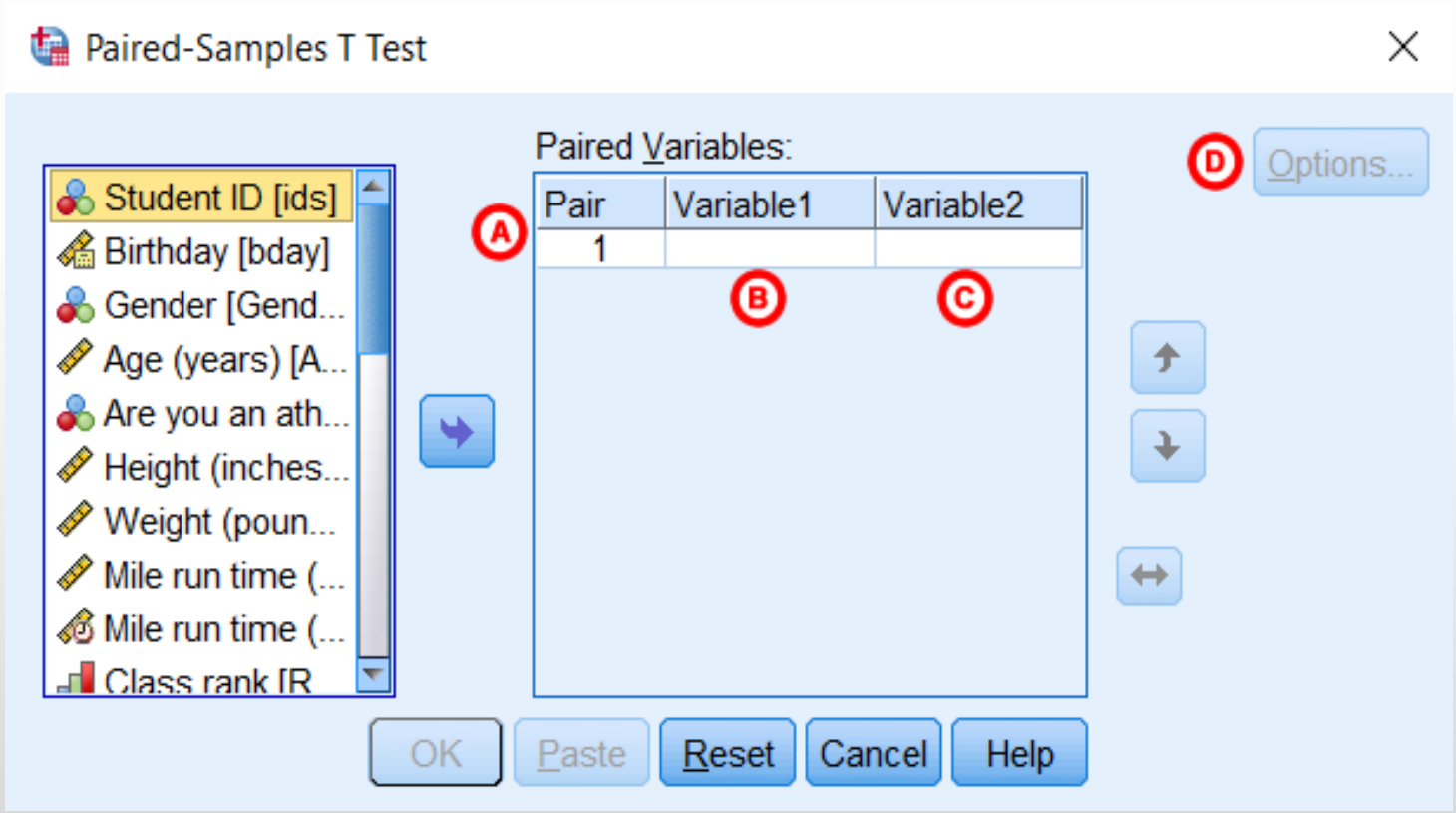
Run a Paired Samples t Test

- To run a Paired Samples t Test in SPSS, click Analyze > Compare Means > Paired-Samples T Test.



Data Set-Up

- Move variables to the right by selecting them in the list and clicking the blue arrow buttons. You will specify the paired variables in the Paired Variables area.



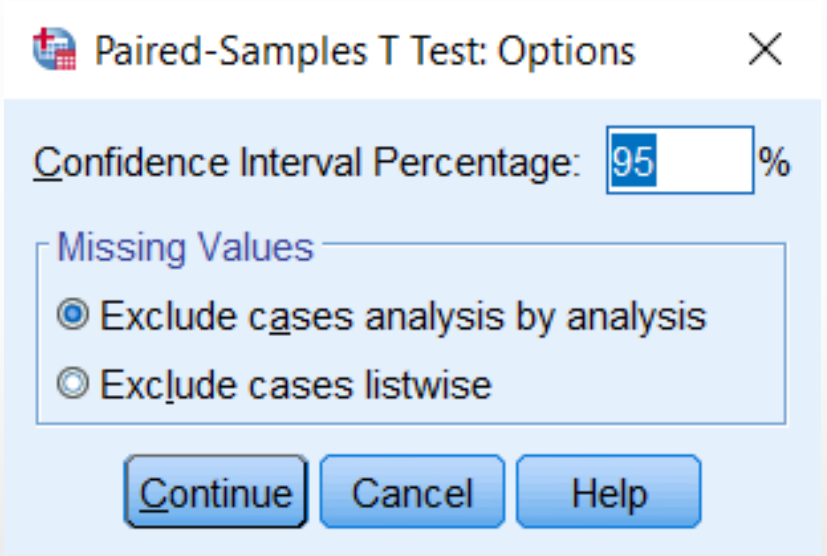
Paired samples T-test

- **A Pair:** The “Pair” column represents the number of Paired Samples *t* Tests to run.
- **B Variable1:** The first variable, representing the first group of matched values.
- **C Variable2:** The second variable, representing the second group of matched values
- **D Options:** Clicking **Options** will open a window where you can specify the **Confidence Interval Percentage** and how the analysis will address **Missing Values**

Paired samples T-test

- Setting the confidence interval percentage does not have any impact on the calculation of the p-value.

- If you are only running one paired samples t test, the two "missing values“ settings will produce the same results.



Problem Statement

- Sample dataset has placement test scores (out of 100 points) for four subject areas:

English Reading Math Writing

- Suppose we are particularly interested in the English and Math sections, and want to determine whether students tended to score higher on their English or Math test, on average

Before the Test

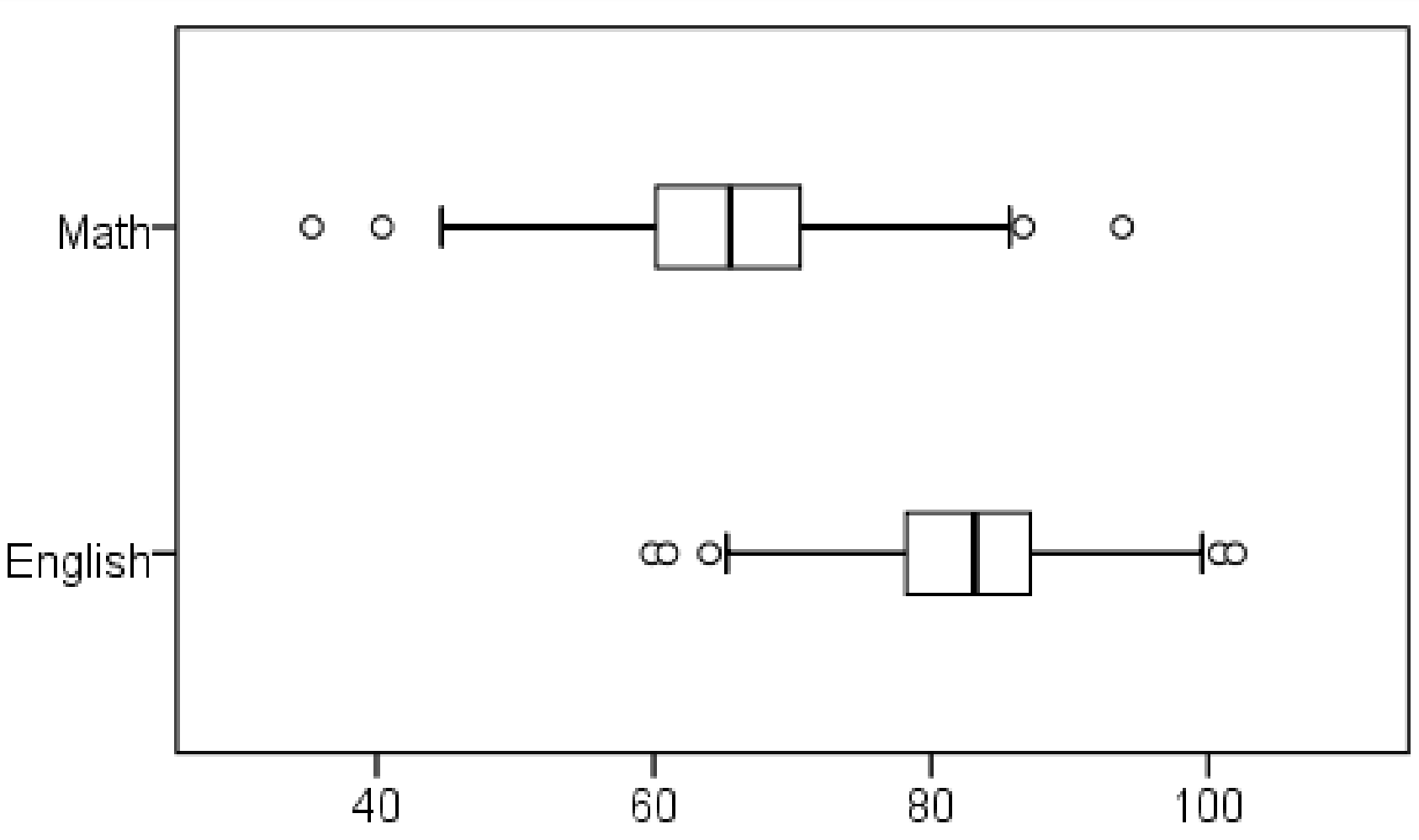
- English has a high of 101.95, a low of 59.83

- (Analyze > Descriptive Statistics > Descriptives)

Comparative Boxplot

- Click **Analyze > Descriptive Statistics > Explore**
- Add English and Math to the **Dependents** box
- change the **Display** option to **Plots**
- Click the **Plots** button, and in the Boxplots area, change the selection to **Dependents Together**
- also uncheck **Stem-and-leaf**. Click **Continue**

Comparative Boxplot



Running the Test

• Click **Analyze** > **Compare Means** > **Paired-Samples T Test.**

• Select the variable English and move it to the Variable1 slot in the Paired Variables box. Then select the variable Math and move it to the Variable2 slot in the Paired Variables box.

• Click OK.

Output

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	English	82.7441	398	6.84480	.34310
	Math	65.4468	398	8.46214	.42417

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	English & Math	398	.243	.000

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
English - Math	17.30	9.50303	.4763	16.3608	18.2337	36.313	397	.000

Output

From the results, we can say that:

- English and Math scores were weakly and positively correlated ($r = 0.243$, $p < 0.001$).
- There was a significant average difference between English and Math scores ($t397 = 36.313$, $p < 0.001$).
- On average, English scores were 17.3 points higher than Math scores (95% CI [16.36, 18.23]).


Thank You