**Al-Mustaqbal University College**

**Department of Anesthesia techniques**

**Third Stage**

# Lecture 9

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# One Sample T-test

## Common Uses

**examines whether the mean of a population is statistically different from a known or hypothesized value.**

- **Single Sample *t* Test**

**The variable used in this test is known as:**

- **Test variable**

- **This approach involves creating a change score from two variables, and then comparing the mean change score to zero, which will indicate whether any change occurred between the two time points for the original measures**

# One Sample T-test

## Common Uses

- The **One Sample t Test** can only **compare a single sample mean to a specified constant.**
- **It can not compare sample means between two or more groups**. If you wish to compare the means of multiple groups to each other, you will likely want to run an Independent Samples *t* Test

# Data Requirements

- Test variable that is continuous (i.e., interval or ratio level)
- Scores on the test variable are independent (i.e., independence of observations)
- There is no relationship between scores on the test variable
- Violation of this assumption will yield an inaccurate p value
- Random sample of data from the population
- Normal distribution (approximately) of the sample and population on the test variable

# Data Requirements

- **Non-normal population distributions, especially those that are thick tailed or heavily skewed, considerably reduce the power of the test Among moderate or large samples, a violation of normality may still yield accurate *p* values**
- **Homogeneity of variances (i.e., variances approximately equal in both the sample and population)**
- **No outliers**

# Hypotheses

- The null hypothesis (H0) and (two-tailed) alternative hypothesis (H1) of the one sample T test can be expressed as:
- **H0: μ = μ0** ("the population mean is equal to the [proposed] population mean")
- **H1: μ ≠ μ0** ("the population mean is not equal to the [proposed] population mean")
- where μ is the "true" population mean and μ0 is the proposed value of the population mean.

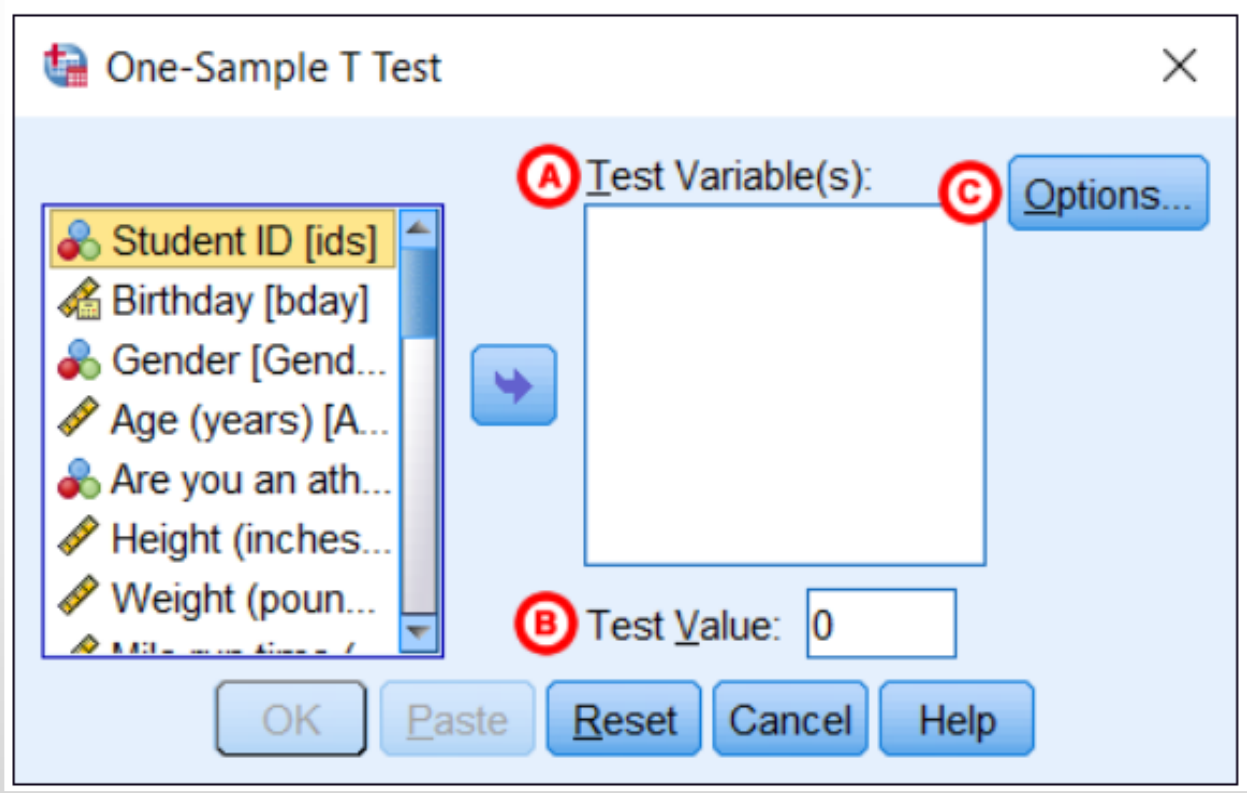
# Data Setup

## Your data should include

- **one continuous**
- **numeric variable**
- **The variable's measurement level should be defined as Scale in the Variable View window.**

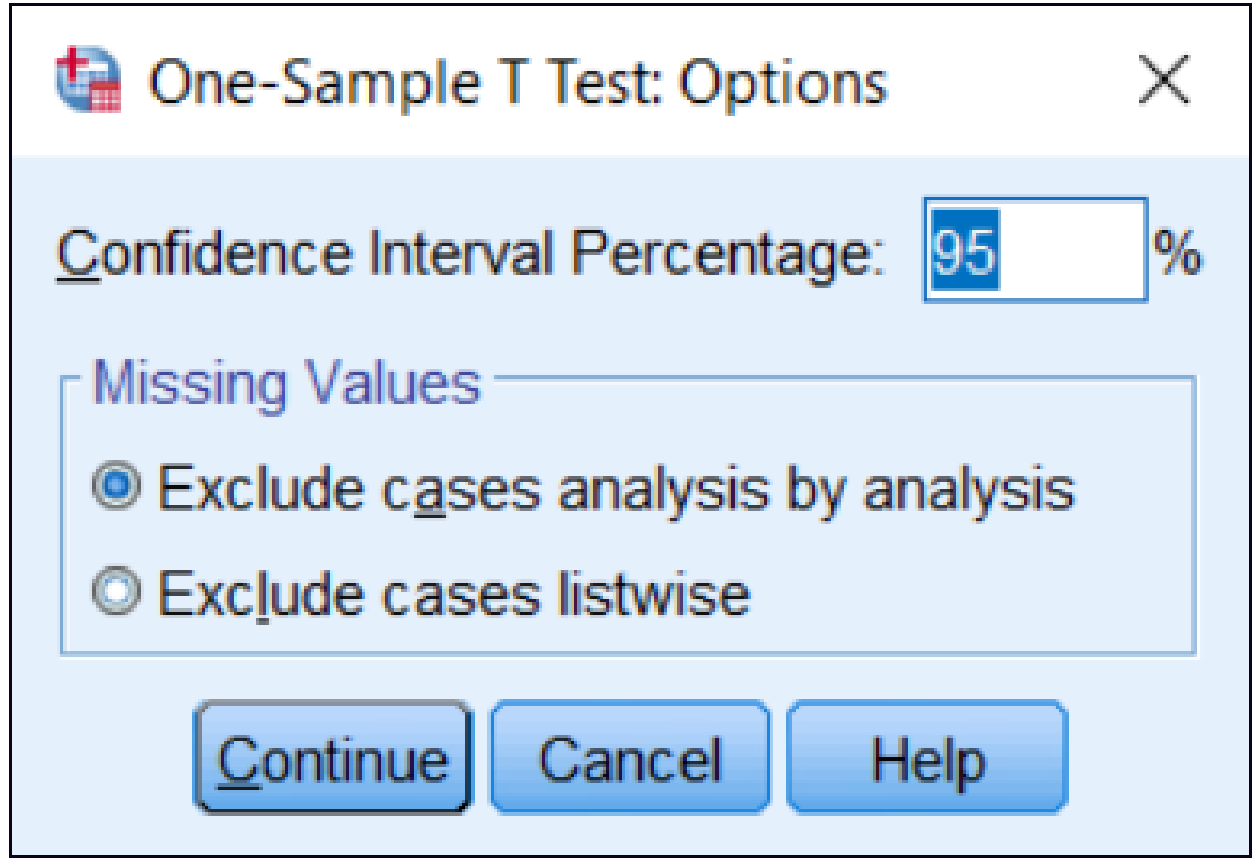
# Hypotheses

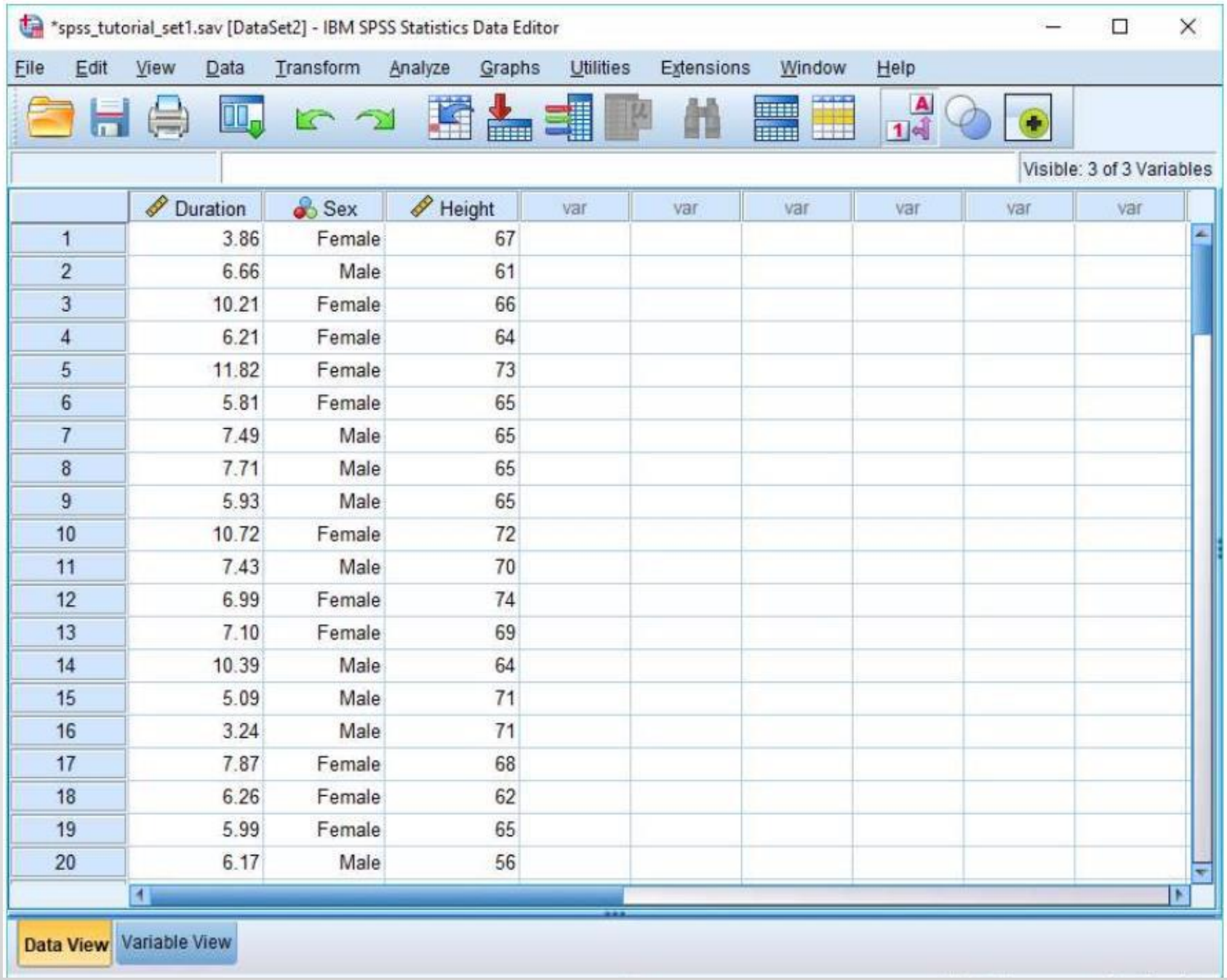
- To run a One Sample t Test in SPSS, click **Analyze** > **Compare Means** > **One-Sample T Test.**



# Run a One Sample T-test

- **A Test Variable(s):** The variable whose mean will be compared to the hypothesized population mean
- **Test Value:** The hypothesized population mean against which your test variable(s) will be compared.
- **Options:** Clicking **Options** will open a window where you can specify the **Confidence Interval Percentage** and how the analysis will address **Missing Values** (i.e., **Exclude cases analysis by analysis** or **Exclude cases listwise**). Click **Continue** when you are finished making specifications.


One-Sample T Test: Options
Confidence Interval Percentage:
95
%
Missing Values
Exclude cases analysis by analysis
Exclude cases listwise
Continue
Cancel
Help


*spss_tutorial_set1.sav [DataSet2] - IBM SPSS Statistics Data Editor
File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help
Visible: 3 of 3 Variables
Duration Sex Height var var var var var var
1 3.86 Female 67
2 6.66 Male 61
3 10.21 Female 66
4 6.21 Female 64
5 11.82 Female 73
6 5.81 Female 65
7 7.49 Male 65
8 7.71 Male 65
9 5.93 Male 65
10 10.72 Female 72
11 7.43 Male 70
12 6.99 Female 74
13 7.10 Female 69
14 10.39 Male 64
15 5.09 Male 71
16 3.24 Male 71
17 7.87 Female 68
18 6.26 Female 62
19 5.99 Female 65
20 6.17 Male 56
Data View
Variable View

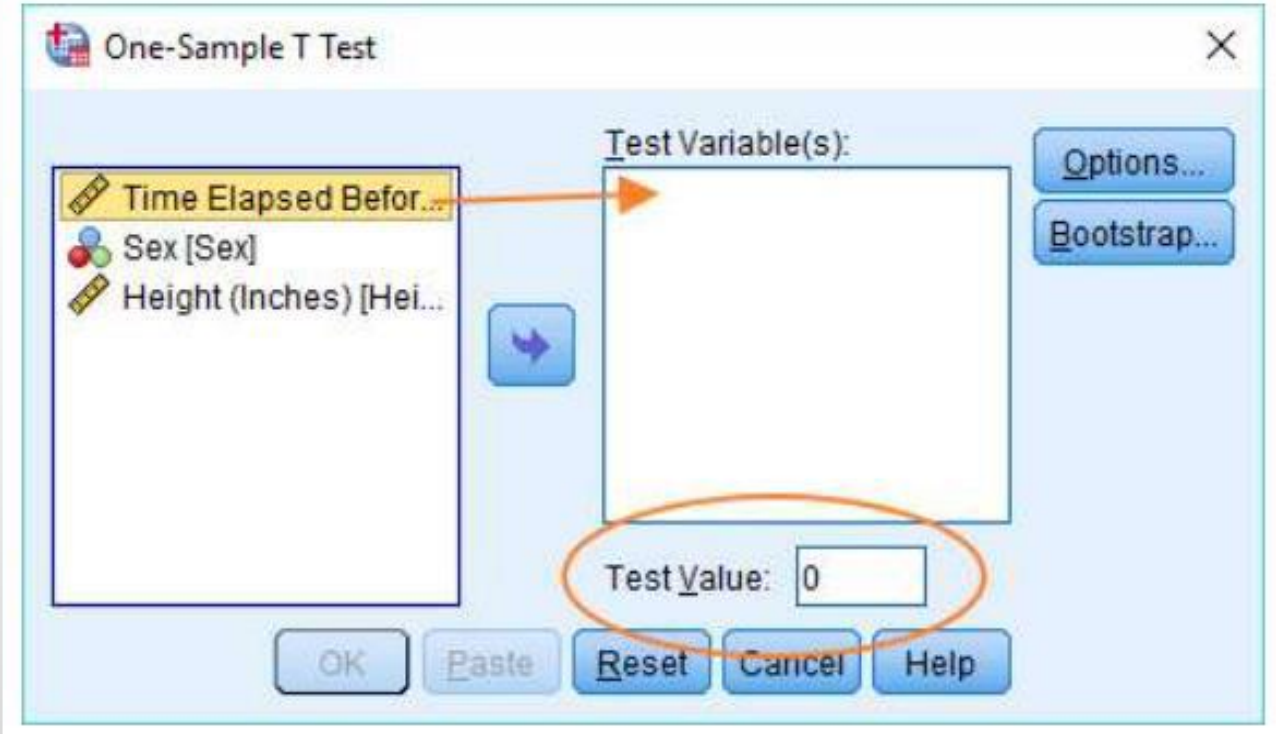
# Practical Part

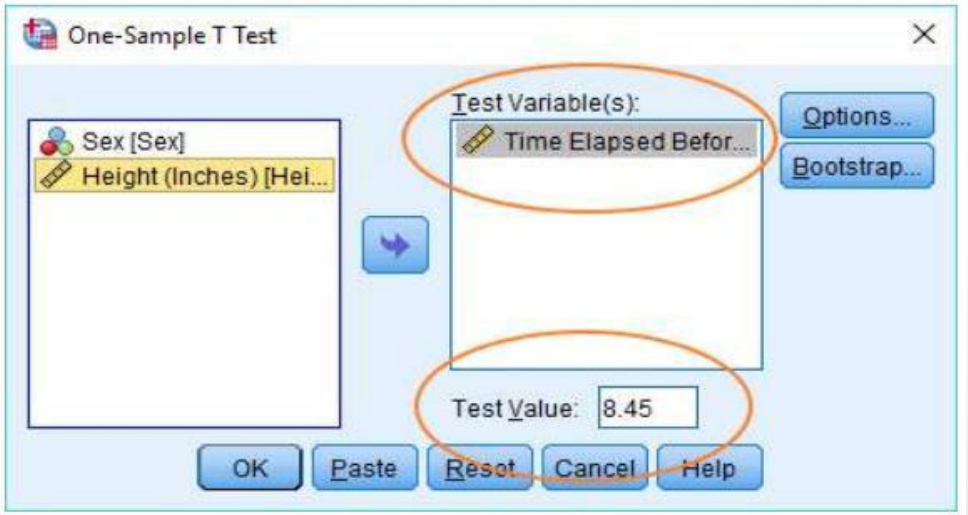
- **Our data is from a hypothetical study that examines how long it takes people to fall asleep during a statistics lesson.**
- **Duration variable, which is the number of minutes that elapses from the start of the lesson before a subject falls asleep.**
- **Imagine we already know that in the population as a whole the average amount of time it takes for somebody to fall asleep is 8.45 minutes. This compares to the average time in our sample of 7.35 minutes.**
- **Question**

**whether the difference between these two means is large enough for us to conclude there is a real difference between our sample group and the wider population in terms of the amount of time it takes to fall asleep.**

# Practical Part

To begin the one sample t test, click on **Analyze -> Compare Means -> One- Sample T Test**






*Output13 [Document13] - IBM SPSS Statistics Viewer

File Edit View Data Transform Insert Format Analyze Graphs Utilities Extensions Window Help

- Output
  - Log
  - T-Test
    - Title
    - Notes
    - One-Sample Stati
    - One-Sample Test

```
T-TEST
  /TESTVAL=8.45
  /MISSING=ANALYSIS
  /VARIABLES=Duration
  /CRITERIA=CI(.95).
```

**T-Test**

**One-Sample Statistics**

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Time Elapsed Before Sleep (Mins) | 100 | 7.3541 | 2.33632 | .23363 |

**One-Sample Test**

| | Test Value = 8.45 | | | | | |
|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference Lower | Upper |
| Time Elapsed Before Sleep (Mins) | -4.691 | 99 | .000 | -1.09590 | -1.5595 | -.6323 |

IBM SPSS Statistics Processor is ready | Unicode:ON

# Practical Part

- The t value is **-4.691** (see the One-Sample Test table, above), which gives us a **p-value** (or 2-tailed significance value) **of .000**. This is going to be a significant result for any realistic alpha level.
- A standard alpha level **is .05**, and .000 is smaller than **.05**, so we're going to **reject the null hypothesis** which asserts there is no difference between our sample mean and the population mean.
- **This counts** as evidence that the difference between our sample group and the population as a whole is real. Put simply, it seems that our subjects fall to sleep in statistics lessons more quickly than is true of the population as a whole.


Thank You