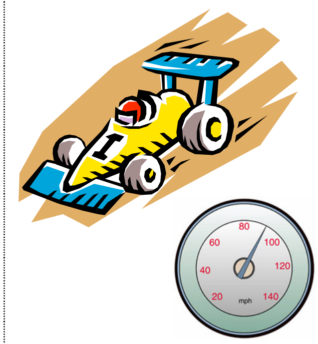
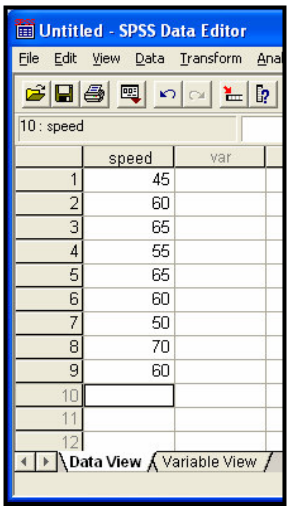
SPSS Guide: One-sample t-test (*Outcome: H_0 Retained*)

The Government claims cars traveling past your house average **55 mph**, but you think they are actually traveling much faster. You steal a police radar gun and record the speed of the next nine cars that pass your house: 45,60,65,55,65,60,50,70,60.

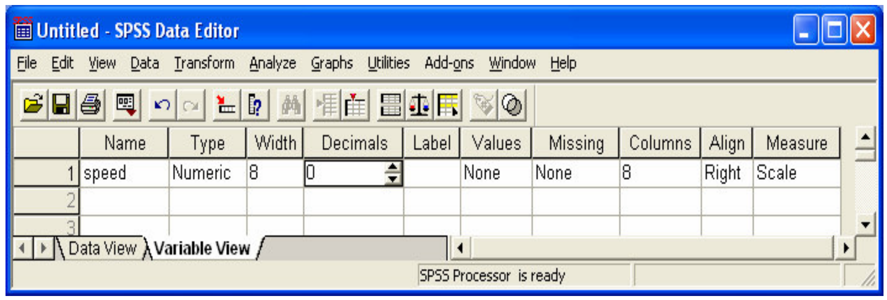
Why a one-sample t-test? You have only one sample, a claimed population average (55 mph), and no information about the standard deviation in the population (σ_x).



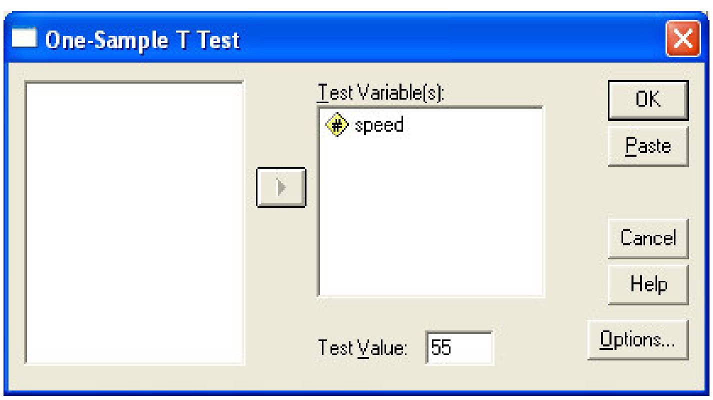
DATAVIEW



VARIABLEVIEW



You have data on only 1 variable, all from the same group, so you'll use just one column. Switch to **VARIABLE VIEW** to name your variable "speed" and to set the number of decimals to "0". *Hint: Use the tabs at the bottom of the screen to switch back and forth between the DATA VIEW and VARIABLE VIEW when working with your data.*



1. Go to the **Analyze Menu**, select **Compare Means**, then choose **One sample t-test**.
2. Select the variable "speed."
3. Set Test Value equal to μ (in this case 55). *You're testing to see if the data you have could really come from a population with a mean of 55.*

Statistical Hypotheses

H_0: $\mu = 55$ *This guess says any difference is just due to sample error*

H_A: $\mu \neq 55$ *This guess says any difference is due to a treatment effect (e.g., if you kept measuring, you'd eventually see a clear partner in which the cars are going faster than 55 on average)*

Formula

Difference observed.

$$t_{obtained} = \frac{\bar{x} - \mu}{\hat{s}_{\bar{x}}} = \frac{58.89 - 55}{2.606} = 1.492$$

Difference expected.

$t_{critical}$ = ± 2.306 (from t-test table; df=n-1, two-tailed, α=.05)

Definitions

$\bar{x}$ = sample mean

μ = population mean

$\hat{s}_{\bar{x}}$ = standard error of the mean (as an est.)

N = number of subjects in sample

Mean = $\bar{x}$ (or M) (sample mean)

Std. Deviation = $\hat{s}_x$ (standard deviation as an estimate.)

Std. Error Mean = $\hat{s}_{\bar{x}}$ (standard error of the mean as an est.)

Test Value = μ (the value you selected)

t = $t_{obtained}$

df = degrees of freedom = n - 1

sig = p_{obt} = chance diff due to sampling error

Mean Diff = $\bar{x} - \mu$

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d = effect size, a measure of practical signif.

SPSS Output

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
speed	9	58.89	7.817	2.606

Comparing to this hypothesized μ

One-Sample Test

	Test Value = 55					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
speed	1.492	8	.174	3.889	-2.12	9.90

Chance that we'd see a difference between the means just by luck. Because it's not less than 5%, we retain Ho and attribute the difference to sampling error.

Practical Significance

$$d = \frac{|\bar{x} - \mu|}{\hat{s}_x}$$

[Do only if t $_{obtained}$ exceeds t $_{critical}$. Here we cannot reject the Ho (we can't say there is a treatment effect), so it makes no sense to calculate practical significance (a measure of how big any treatment effect is).]

Summary of Statistic:

Retain Ho t(8) = 1.492, n.s.

This says that the t-test with 8 degrees of freedom was not significant.

Explanation of Study Outcome: The (research) hypothesis was not supported. The average speed of the cars (M = 58.89) did not differ significantly from the stated speed (μ = 55), t (8) = 1.492, n.s.

Guide to write-ups:

1. *State whether the research hypothesis was supported.*
2. *Summarize the statistical test*
3. *Summarize the practical significance (if appropriate).*