2–Sample t-Test

Independent t-Test

Independent t-Test

The independent t-Test compares the means of TWO samples **from different** populations

Independent t-Test

- The Means of the two Samples are compared in the t-test to determine if there is a Statistically Significant difference

- The test is sometimes called the Independent Samples t-test

(Samples are said to be independent if they come from unrelated Populations and the Samples have no effect on each other)

Independent t-Test

EXAMPLE

In a test of a new drug, one Population took the **drug** and the other Population took the **placebo**

Independent t-Test

EXAMPLE

2-Sample *t*-test				
Sample 1 Not trained $n_1 = 6$			Sample 2 Trained $n_2 = 5$	
J. Black	72		A. Conrad	76
T. Gerard	80		J. David	78
M. Lowry	78		W. Johns	83
P. Mason	74		F. Lyons	86
R. Vargas	79		M. White	61
B. Wilson	70			

Independent t-Test

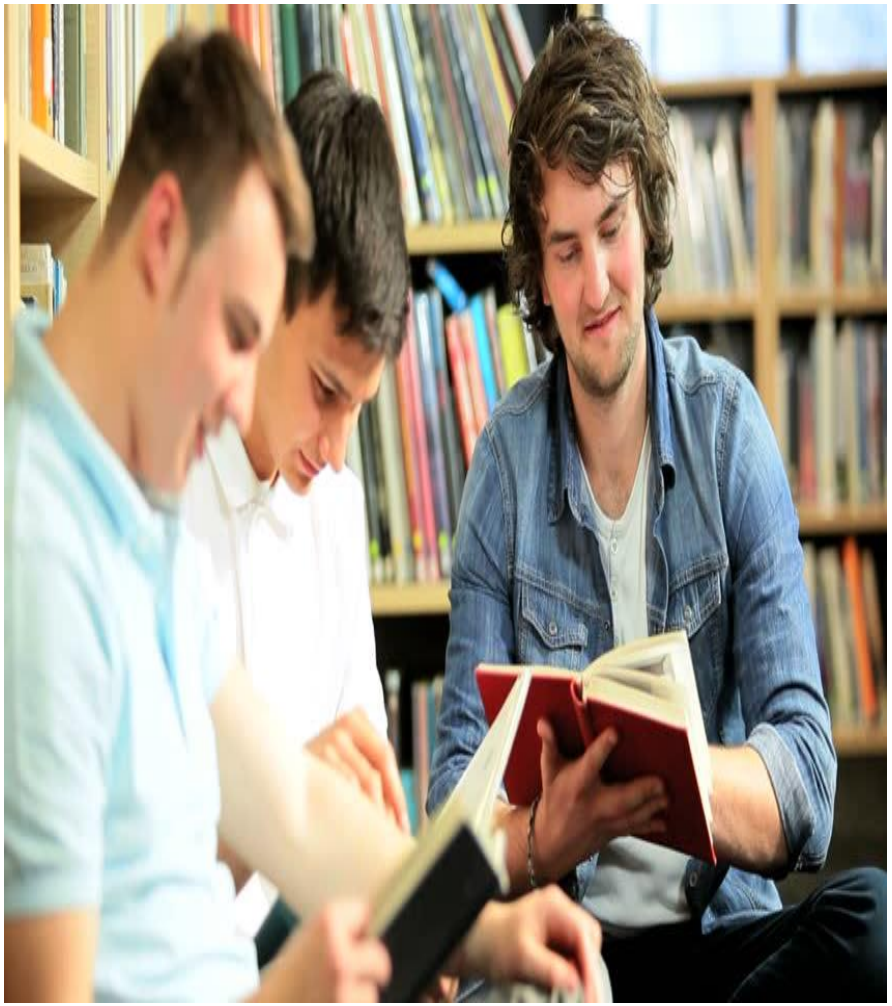
Independent t-Test

EXAMPLE

Do males and females differ in terms of their exam scores?

Take a sample of males and a separate sample of females and apply the hypothesis testing steps to determine if there is a Significant difference in scores between the groups

Independent t-Test



Independent t-Test

Conditions to perform the Independent t-Test

- Both samples the dependent variable should be normally distributed
- Both samples should be independent
- Both variances are equal
- Sample size **NOT** necessary the same

Independent t-Test

Hypothesis statement

The **Null hypothesis** for the independent t-test is that the population means from the two unrelated groups are equal:

$$H_0: u_1 = u_2$$

Independent t-Test

Alternative Hypothesis

The population means are not equal:

$$H_A: u_1 \neq u_2$$

Independent t-Test

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}}$$

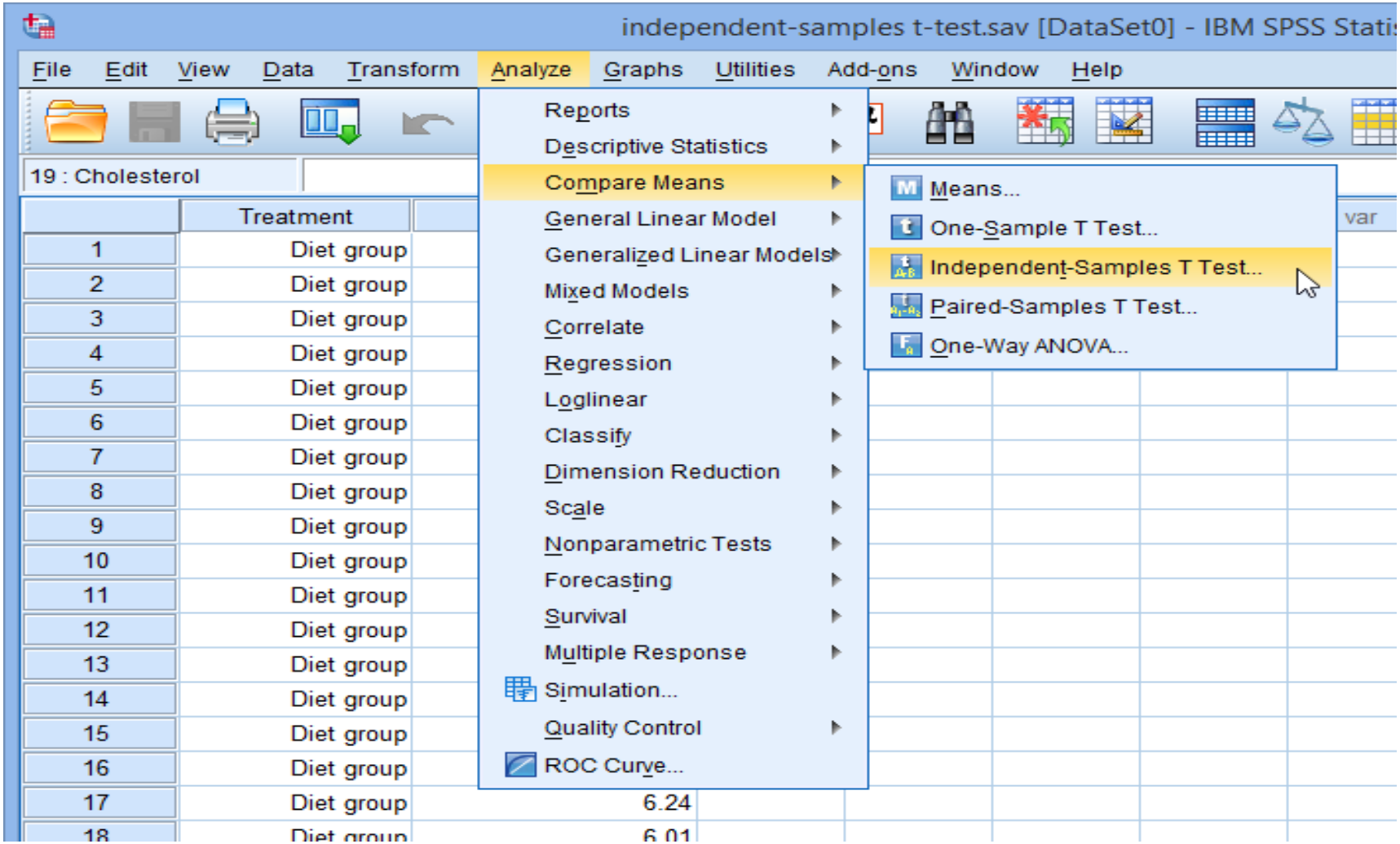
$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s^2_{pooled}}{n_1} + \frac{s^2_{pooled}}{n_2}}$$

Independent t-Test

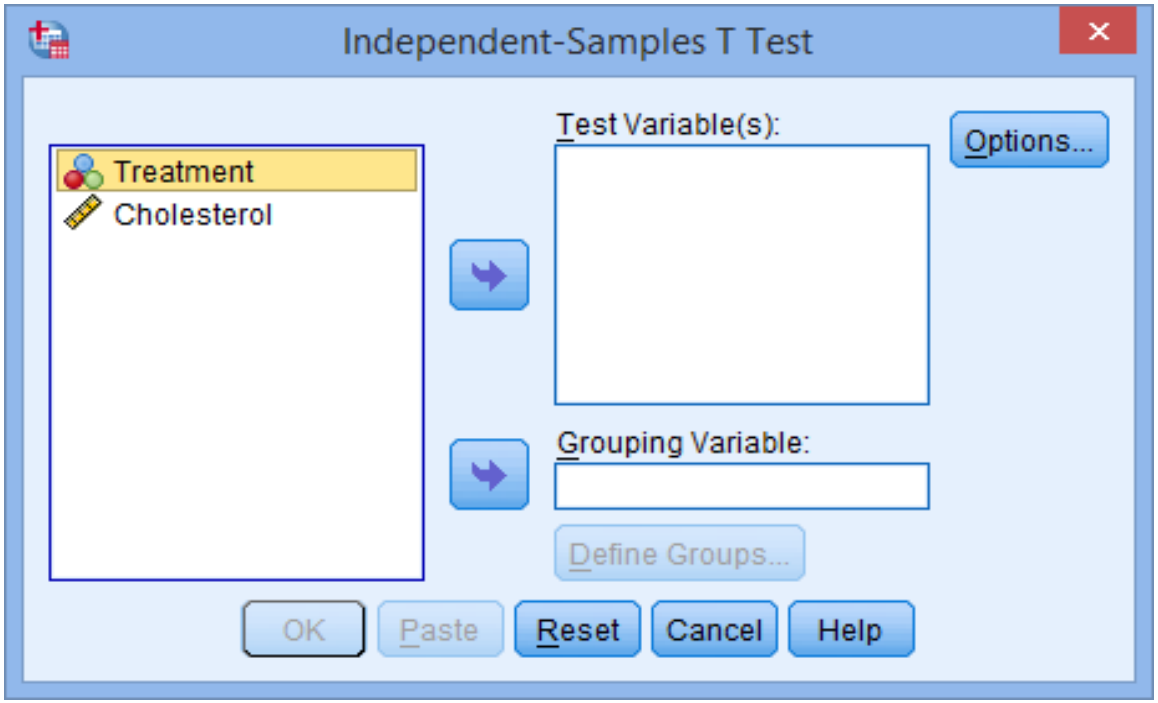
Degrees of freedom for the independent t-Test

$$n1 + n2 - 2$$

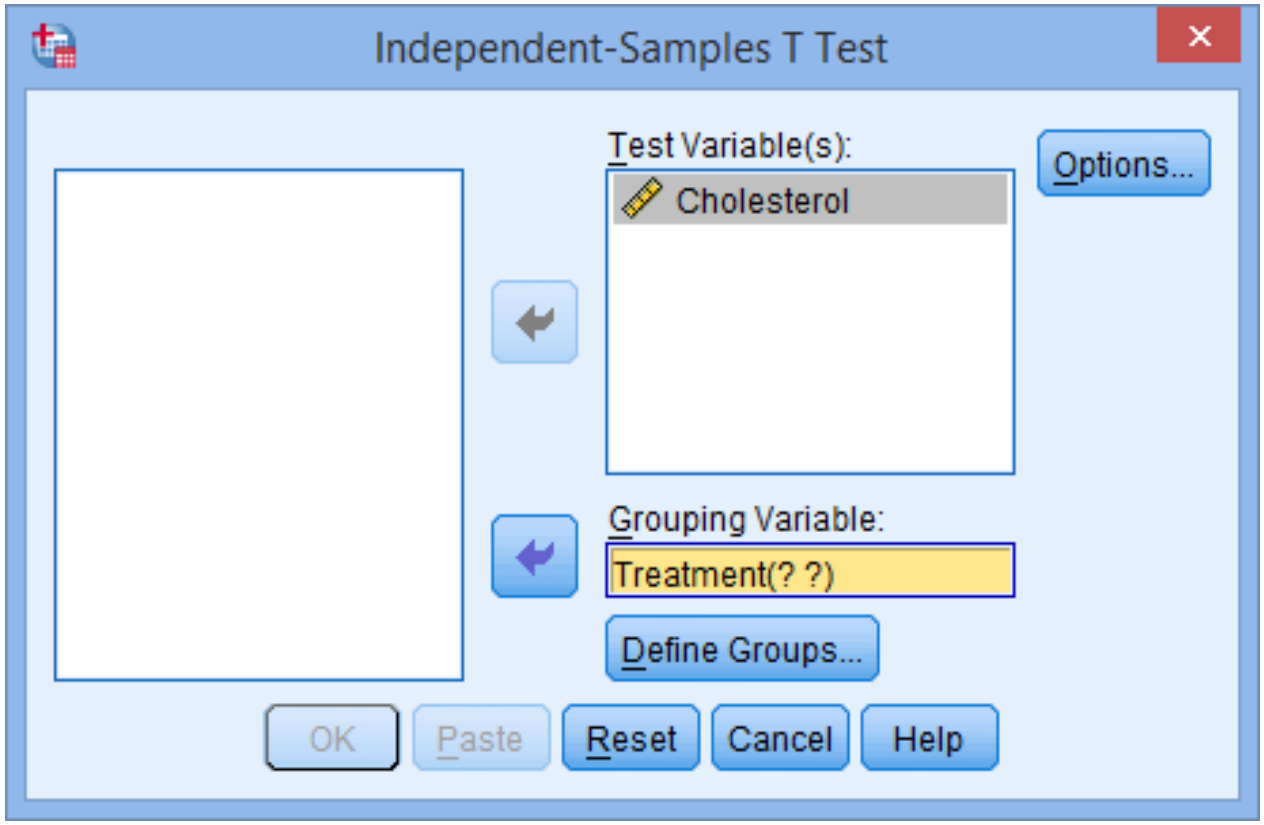
Independent t-Test



Independent t-Test

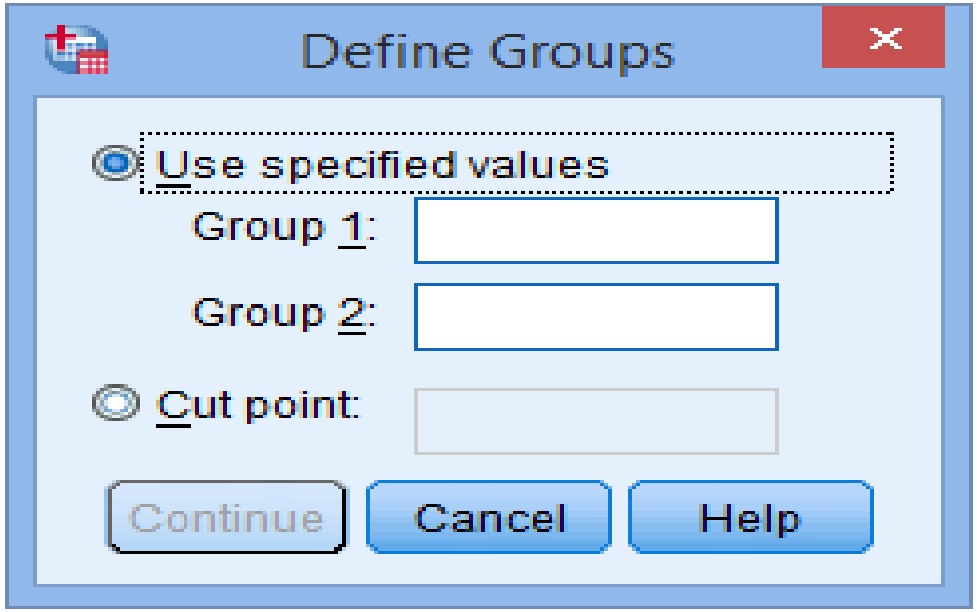


Independent t-Test

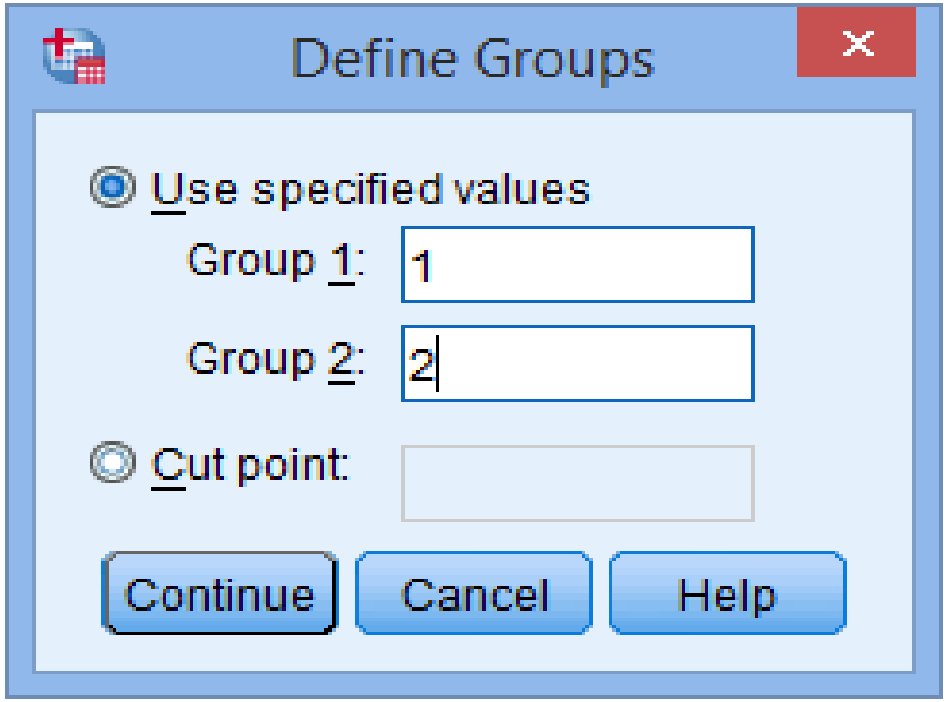


Independent t-Test

You then need to define the groups (treatments). Click on the Define Groups... button



Independent t-Test



Independent t-Test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Cholesterol Concentration	Diet	20	6.1450	.51959	.11618
	Exercise	20	5.7950	.38179	.08537

Independent t-Test

Independent Samples Test

			Cholesterol Concentration	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		.314	
	Sig.		.579	
t-test for Equality of Means	t		2.428	2.428
	df		38	34.886
	Sig. (2-tailed)		.020	.021
	Mean Difference		.35000	.35000
	Std. Error Difference		.14418	.14418
	95% Confidence Interval of the Difference	Lower	.05813	.05727
		Upper	.64187	.64273

Independent t-Test

Effect of Sleep and Caffeine on Memory

A study in which a sample of 24 adult are randomly divided equally into two groups and given a list of 24 words to memorize. During a break, one group takes a 90-minute nap while another group is given a caffeine pill.

The response variable of interest is the number of words participants are able to recall following the break. We are testing to see if there is a difference in the average number of words a person can recall depending on whether the person slept or ingested caffeine

Independent t-Test

Sleep	14	18	11	13	18	17	21	9	16	17	14	15
Caffeine	12	12	14	13	6	18	14	16	10	7	15	10

Which has more effect on the memory?
Sleep OR Caffeine

Independent t-Test

Quiz vs Lecture Pulse Rate

Do you think that students undergo physiological changes when in potentially stressful situations such as taking a quiz or exam? A sample of statistics students were interrupted in the middle of quiz and asked to record their pulse rates (beats for 1-minute period). Ten of the students had also measured their pulse rate while siting in class listening to a lecture, and these values were matched with their quiz pulse rates

Independent t-Test

Student	1	2	3	4	5	6	7	8	9	10
Quiz	75	52	52	80	56	90	76	71	70	66
Lecture	73	53	47	88	55	70	61	75	61	78