

Independent Samples t-test

t-test Assumptions

- 1) Normality
- 2) Independence
- 3) Equal Variance/Homogeneity of Variance
- 4) DV is interval or ratio

A researcher wanted to know if people (speakers) tend to be egocentric or take another person's perspective into account when giving directions to another person (listener). In order to test this question, the researcher randomly assigned participants (the speaker) to one of two groups. Participants in the first group were randomly assigned to the mistake condition and the second group was randomly assigned to the control condition. In the mistake condition, participants provided a listener with 48 instructions to move objects around a screen, but the listener would randomly make 12 mistakes throughout the experimental session (after the speaker gave the instruction). The control condition consisted of a participant (speaker) giving 48 instructions to a listener, but was given no visual cues to miscommunication. Of the 48 instructions, 24 were inherently ambiguous and required the participant (speaker) to clarify their instruction. The researcher thought that providing a visual mistake to a speaker would increase the probability that they would attempt to be clearer when the instruction was inherently ambiguous.

IV: mistake (Categorical Variable)

DV: frequency of clarity (frequency/24; Continuous Variable)

H_0 : Mistake = Control or Mistake – Control = 0; There is no significant difference in responding when participants (speakers) are shown a mistake or not shown a mistake.

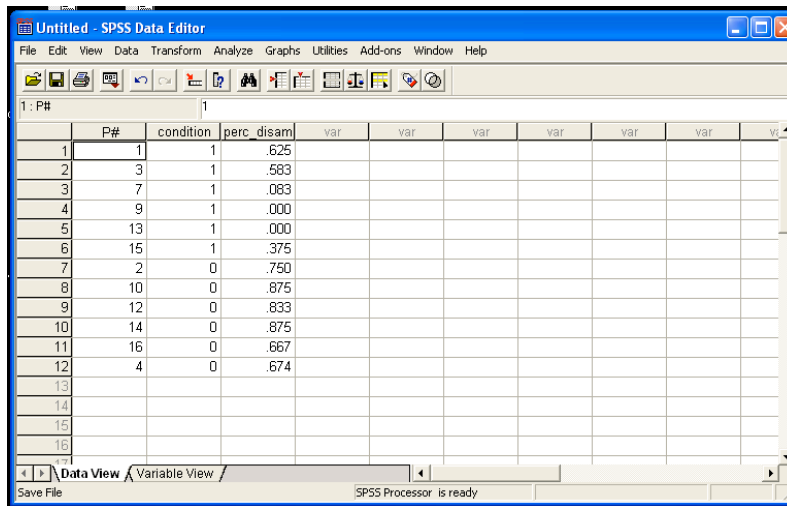
H_a : Mistake \neq Control or Mistake – Control \neq 0; Participants in the mistake condition should have a higher probability of disambiguating than participants in the control condition.

P#	condition	%
		disambiguation
1	1	0.625
3	1	0.5833333333
7	1	0.0833333333
9	1	0
13	1	0
15	1	0.375
2	0	0.75
10	0	0.875
12	0	0.8333333333
14	0	0.875
16	0	0.6666666667
4	0	0.6736111111

1 = Mistake Condition
0 = Control Condition

SPSS

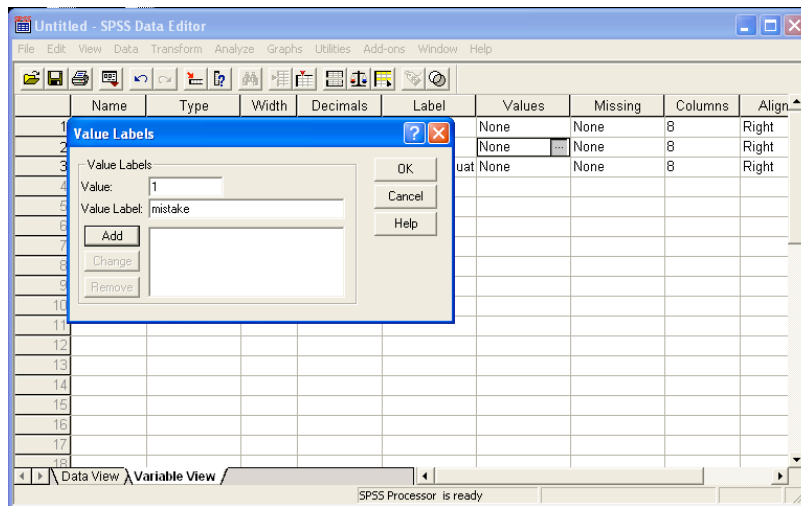
Data Structure



The screenshot shows the SPSS Data Editor window with a data table. The table has columns for P#, condition, perc_disam, and several empty var columns. The data is as follows:

	P#	condition	perc_disam	var	var	var	var	var	var	var
1	1	1	.625							
2	3	1	.583							
3	7	1	.083							
4	9	1	.000							
5	13	1	.000							
6	15	1	.375							
7	2	0	.750							
8	10	0	.875							
9	12	0	.833							
10	14	0	.875							
11	16	0	.667							
12	4	0	.674							
13										
14										
15										
16										

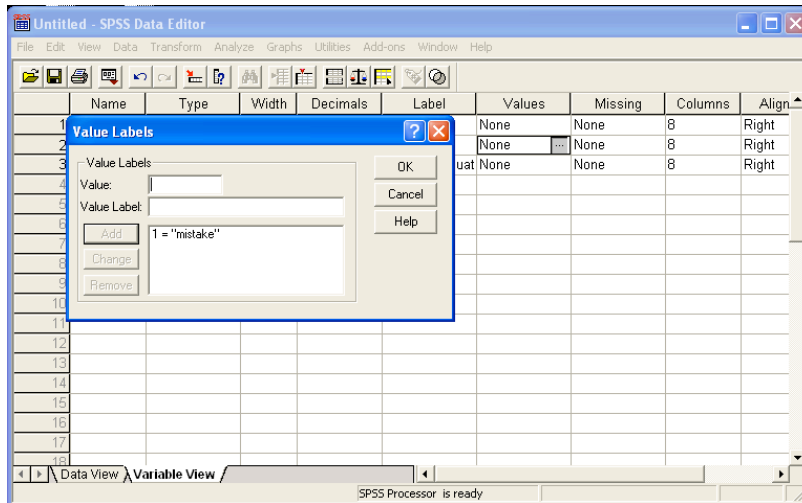
Variable View: Label your Groups



The screenshot shows the SPSS Variable View window with a dialog box for labeling values. The dialog box is titled "Value Labels" and has the following fields:

- Value: 1
- Value Label: mistake

The dialog box also has buttons for "Add", "Change", "Remove", "OK", "Cancel", and "Help". The background shows the Variable View table with columns for Name, Type, Width, Decimals, Label, Values, Missing, Columns, and Align.



Syntax

T-TEST

GROUPS = condition(0 1)
 /MISSING = LISTWISE
 /VARIABLES = perc_disam
 /CRITERIA = CI(.95) .

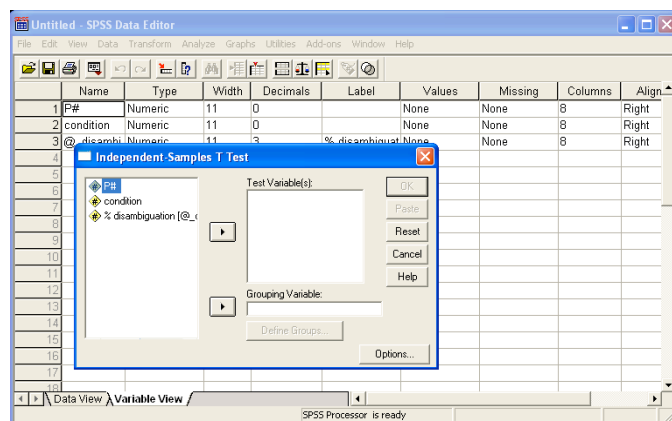
Drop Down Method

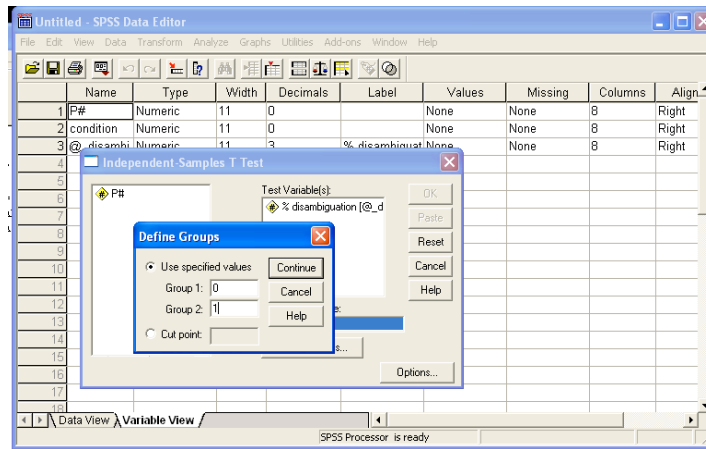
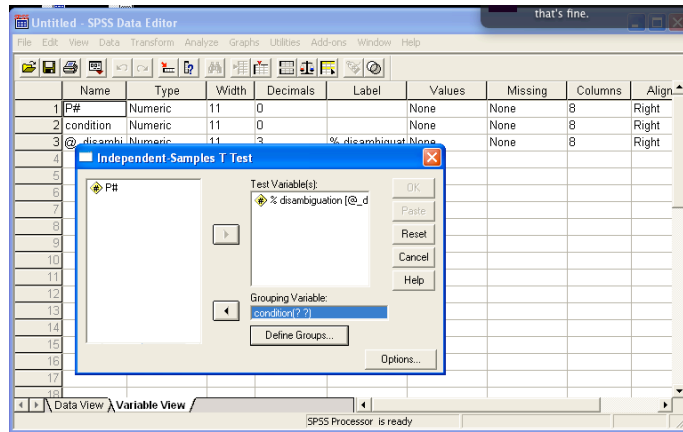
Analyze →

Compare →

Independent Sample T test

- 1) Test Variable = Percent Disambiguation (DV)
- 2) Grouping Variable = Condition (IV)
 - a. Define Groups
 - b. This is the way you entered your group data: 1 = Mistake, 0 = Control.
- 3) Click Ok when all of this is done





OutPut

Group Statistics

	condition	N	Mean	Std. Deviation	Std. Error Mean
% disambiguation	mistake	6	.77894	.095865	.039137
	control	6	.27778	.288274	.117687

This table gives you the descriptive information about your data.

N = 6 per group (12 participants total).

Mean:

Mistake = .779, Participants in the mistake group disambiguated their instructions 77.9% of the time when they were presented with a mistake by the listener.

Control = .278, Participants in the control condition disambiguated their instructions 27.8% of the time, on their own.

Standard Deviation: the amount of variability between the scores, converted back to the original metric.

Mistake = .096; 9.6% variability in the frequency of disambiguation between participants
Control = .288; 28.8% variability in the frequency of disambiguation between participants

As you can see, the variance between the two groups is nowhere near equal. This is not a good thing, but it will be considered and handled below.

Standard Error: the estimation of the standard deviation of a smaller sample from a larger population. Since different samples from a population could yield different values, then we need to estimate the standard deviation (this will be a more precise measure of variance). Mistake: .039; 3.9% ; Control: .118; 11.8%

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Equal Variance									Lower	Upper
% disa	assumed	18.391	.002	4.041	10	.002	.501	.124	.224	.777
	not assumed			4.041	6.093	.007	.501	.124	.198	.803

As seen above, the variability between the two groups is really different (9.6% vs. 28.8%); we have violated the assumption of equal variance.

Equality of Variance: (a.k.a. Homogeneity of Variance). The t-test with equal variance assumed is unreliable if the assumption of equal variance is violated. When comparing groups like this, their variances must be relatively similar for the first t-test to be used (Levene's test checks for this). If the significance for Levene's test is 0.05 or below, then the "Equal Variances Not Assumed" test (the one on the bottom) is used. Otherwise you'll use the "Equal Variances Assumed" test (the one on the top). In this case the significance is .002, so we have violated the assumption of equal variance, and must report "Equal Variance Not Assumed".

Write up:

Participants in the mistake group disambiguated their statements significantly more (mean difference = 50.1%) than participants in the control group ($t(6.093) = 4.041$, $p < .01$; see Table 1 & Figure 1, for means and standard errors). The researcher is 95% confident that the population mean will fall between 19.8% and 80.3%. This is a pretty

large, so we may not want to use the independent samples t test for this data. However, if we have the time, we could run more participants to reduce the size of the interval (see Central Limit Theorem).

Table 1. Means(standard errors) for the proportion of disambiguation during an instruction giving task.

Condition	Mean(SE)
Mistake	.779(.039)
Control	.278(.118)

Figure 1. Graphical representation of means(standard errors) for the proportion of disambiguation during an instruction giving task.

