







Computing the dependent t

Here are the formulas. Dependent t is easy to compute. First you find the difference between each pair of scores. You find the mean and standard deviation of those differences and plug them into the formulas. TA DA!

$$t_{\bar{X}_D} = \frac{\bar{D}}{SE_{diff}}$$

$$SE_{diff} = \frac{SD_D}{\sqrt{n_{pairs}}}$$

Example dependent t $\bar{D} = 0.6$

Each person rates the attractiveness of two faces

Pair	Y_1	Y_2	Diff
1	4	2	2
2	2	3	-1
3	8	7	1
4	6	6	0
5	4	3	1
\bar{X}	4.8	4.2	0.6

$s_D = SD_{Diff} = 1.14$
 $SE_{diff} = \frac{SD_D}{\sqrt{n_{pairs}}}$
 $.51 = \frac{1.14}{\sqrt{5}}$
 $t_{\bar{X}_D} = \frac{\bar{D}}{SE_{diff}}$
 $1.18 = \frac{.6}{.51}$

$Df = n_{(pairs)} - 1; t_{crit} = 2.776, n.s.$

Six Steps

1. Set alpha. Set at .05.
2. State hypotheses:
Null hypothesis $H_0: \mu^1 = \mu^2$
Alternative (substantive) hypothesis $H_1: \mu^1 \neq \mu^2$
3. Calculate the statistic. $t_{\bar{X}_D} = \frac{\bar{D}}{SE_{diff}} = 1.18$
4. Determine the critical value. We are looking for a value of t in the table. $N = 5, df = 5 - 1 = 4, \alpha = .05, 2 \text{ tails}$. The critical value is 2.776.

Six Steps

5. *State the decision rule.* If the absolute value of the sample t is greater than or equal to critical t , then reject H_0 . If not, then fail to reject H_0 . In this case $|1.18| < 2.776$, so we cannot reject H_0 .

6. *State the conclusion.* In our sample, t is not significant. Based on the results of this study, there is no evidence that people with blue eyes are judged more attractive than those with green eyes.

Example 2 – Marital Satisfaction

Husband	Wife	Diff
8	6	2
9	6	3
5	2	3
2	3	-1
7	5	2
6	3	3
\bar{x} 6.17	4.17	2

$\bar{D} = 2$

$s_D = SD_{Diff} = 1.55$

$SE_{diff} = \frac{SD_D}{\sqrt{n_{pairs}}}$

$.63 = \frac{1.55}{\sqrt{6}}$

$t_{\bar{x}_D} = \frac{\bar{D}}{SE_{diff}}$

$t = 3.16 = \frac{2}{.63}$

Six Steps

1. *Set alpha.* Set at .05.

2. *State hypotheses:*
 Null hypothesis $H_0: \mu^1 = \mu^2$
 Alternative (substantive) hypothesis $H_1: \mu^1 \neq \mu^2$

3. *Calculate the statistic.* $t = 3.16 = \frac{2}{.63}$

4. *Determine the critical value.* We are looking for a value of t in the table. $N = 6, df = 6 - 1 = 5$, alpha = .05, 2 tails. The critical value is 2.571.

Six Steps

5. *State the decision rule.* If the absolute value of the sample t is greater than or equal to critical t , then reject H_0 . If not, then fail to reject H_0 . In this case $|3.16| > 2.776$, so we reject H_0 .

6. *State the conclusion.* In our sample, t is significant. Based on the results of this study, husbands are happier with their marriages than are their wives. (Data are fictitious!)

Advantages

- Dependent (matched) samples control for confounding variables. Ultimate is repeated measures.
- If there is a strong association of scores across groups, the dependent t will be more powerful than in independent t
- Repeated measures may require less people (less money)

Disadvantages

- Matching can be a problem
 - Finding the pool
 - Never seem to match on everything
- Reactivity for repeated measures
 - Practice effects
 - Order effects
 - Demand characteristics
