

**Student Data Set #1. Previous class data and paired-sample t test results.**

Data and paired-sample t test results from one of my past general ecology classes are provided below. In this experiment, 20 snails occurred in each aquarium. Aquaria were 19-L capacity and had structurally-complex habitat in the form of a pile of patio stones (1 L) and two ceramic tiles (15 X 15 X 1 cm) placed on top of the stones. Initial (X1) and final (X2) numbers of vulnerable snails occur in columns two and three of each table. Other data and statistics were generated using procedures described in steps 13-25 of Overview of Data Collection and Analysis Methods.

**Predator-free treatment data table (with results)**

Group number	Initial number vulnerable (X1)	Final number vulnerable (X2)	Difference values (d = X1 - X2)	$d - \bar{d}$	$(d - \bar{d})^2$
1	12	12	0	0.8	0.64
3	11	14	-3	-2.2	4.84
5	10	14	-4	-3.2	10.24
7	15	11	4	4.8	23.04
9	8	9	-1	-0.2	0.04
			$\sum d = -4$	$\sum (d - \bar{d}) = 0$	$\sum (d - \bar{d})^2 = 38.8$

**Predator-free treatment worksheet (including work and answers)**

n = number of student groups or aquaria (i.e., replicates) = 5

$$\bar{d} = \sum d \div n = -4 \div 5 = \underline{-0.8}$$

$$DF = n - 1 = 5 - 1 = \underline{4}$$

$$s^2 d = \sum (d - \bar{d})^2 \div DF = 38.8 \div 4 = \underline{9.70}$$

$$sd = \sqrt{s^2 d} = \sqrt{9.70} = \underline{3.11}$$

$$s\bar{d} = sd \div \sqrt{n} = 3.11 \div \sqrt{5} = \underline{1.39}$$

$$t = \bar{d} \div s\bar{d} = -0.8 \div 1.39 = \underline{-0.58}$$

Critical t value (students elected to conduct a two-tailed test) = 2.78 for  $\alpha = 0.05$

What do you conclude? Initial and final numbers of vulnerable snails do not differ.

**Predator-cue treatment data table (with results)**

Group number	Initial number vulnerable (X1)	Final number vulnerable (X2)	Difference values (d = X1-X2)	$d - \bar{d}$	$(d - \bar{d})^2$
2	12	7	5	-3.6	12.96
4	13	2	11	2.4	5.76
6	15	5	10	1.4	1.96
8	9	3	6	-2.6	6.76
10	14	3	11	2.4	5.76
			$\sum d = 43$	$\sum (d - \bar{d}) = 0$	$\sum (d - \bar{d})^2 = 33.2$

**Predator-cue treatment worksheet (including work and answers)**

n = number of student groups or aquaria (i.e., replicates) = 5

$$\bar{d} = \sum d \div n = 43 \div 5 = \underline{8.6}$$

$$DF = n - 1 = 5 - 1 = \underline{4}$$

$$s^2d = \sum (d - \bar{d})^2 \div DF = 33.2 \div 4 = \underline{8.30}$$

$$sd = \sqrt{s^2d} = \sqrt{8.30} = \underline{2.88}$$

$$\bar{sd} = sd \div \sqrt{n} = 2.88 \div \sqrt{5} = \underline{1.29}$$

$$t = \bar{d} \div \bar{sd} = 8.6 \div 1.29 = \underline{6.67}$$

Critical t value (students elected to conduct a two-tailed test) = 2.78 for  $\alpha = 0.05$

What do you conclude? Initial and final number of vulnerable snails differed. The initial number of vulnerable snails was greater.