

Lab 9 example *t*-tests

Mammologists want to know if access to extra grass supplies affect the number of territorial displays per day that they observe in pikas. They collect data in two years: in 2007 they supply extra hay near the pikas and count the number of displays in 7 pika populations in Wyoming. In 2008 they do not supply hay, and count the # of displays in 7 populations in Colorado.

hay	no extra hay	Differences	
31.36	37.82	-6.46	
34.08	36.33	-2.25	
30.11	56.94	-26.83	
36.16	61.21	-25.05	
41.27	47.91	-6.64	
33.24	35.89	-2.65	
34.44	44.03	-9.59	
$\bar{y}_1 = 34.38$	$\bar{y}_2 = 45.73$	$\bar{d} = -11.35$	$s_p^2 = 58.3398$
$s_1^2 = 13.2312$	$s_2^2 = 103.4484$	$s_d^2 = 105.8357$	
$s_1 = 3.6375$	$s_2 = 10.1710$	$s_d = 10.2876$	

Q#1 Is the hypothesis test paired?

Q#2 Is there a flaw in this experimental design?

As Practice: you can conduct the hypothesis test and state conclusions (we'll post the answers on blackboard or you can ask your TA).

Ornithologists are interested in whether bill length differs among male and female dusky flycatchers (*Empidonax oberholseri*). They collected birds over six years. For their measurements of bill length, they randomly select one male and one female from each year's collections.

Collection Year	male bill length(mm)	female bill length(mm)	Differences	
2001	7.98	7.92	0.06	
2002	7.98	7.85	0.13	
2003	8.02	7.94	0.08	
2004	8.00	7.87	0.13	
2005	7.96	7.89	0.07	
2006	8.02	7.90	0.12	
	$\bar{y}_1 = 7.99$ $s_1^2 = 0.0006$ $s_1 = 0.0242$	$\bar{y}_2 = 7.89$ $s_2^2 = 0.0011$ $s_2 = 0.0327$	$\bar{d} = 0.10$ $s_d^2 = 0.0010$ $s_d = 0.0319$	$s_p^2 = 0.0008$

Q#3 Is the hypothesis test paired?

As Practice: you can conduct the hypothesis test and state conclusions (we'll post the answers on blackboard or you can ask your TA).

Researchers would like to know if a camera they have attached to an animal affects the amount of time it spends actively foraging. They monitor 7 individuals and measure their time foraging (hrs/day) before and after the camera is attached:

before	after	difference	
19.81	19.14	0.67	
11.69	11.24	0.45	
11.80	11.49	0.31	
13.57	13.01	0.56	
12.61	12.30	0.31	
14.86	14.34	0.52	
18.28	17.82	0.46	
$\bar{y}_1 = 14.66$	$\bar{y}_2 = 14.19$	$\bar{d} = 0.47$	$s_p^2 = 10.0597$
$s_1^2 = 10.3430$	$s_2^2 = 9.7765$	$s_d^2 = 0.0170$	
$s_1 = 3.2161$	$s_2 = 3.1267$	$s_d = 0.1306$	

Q#4 Is the hypothesis test paired?

As Practice: you can conduct the hypothesis test and state conclusions (we'll post the answers on blackboard or you can ask your TA).

Crop scientists are interested in whether a new fertilizer increases production of tomatoes. The mass of fruit produced (kg) is measured in five plants that receive fertilizer and five that do not receive fertilizer:

Fertilized	No fertilizer	Differences	
0.11	0.06	0.05	
0.28	0.22	0.06	
0.26	0.09	0.17	
0.23	0.11	0.12	
0.18	0.29	-0.11	
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$\bar{y}_1 = 0.21$	$\bar{y}_2 = 0.15$	$\bar{d} = 0.06$	$s_p^2 = 0.0070$
$s_1^2 = 0.0047$	$s_2^2 = 0.0094$	$s_d^2 = 0.0112$	
$s_1 = 0.0683$	$s_2 = 0.0971$	$s_d = 0.1057$	

Q#5 Is the hypothesis test paired?

Practice: conduct the hypothesis test and state conclusions (we'll post the answers on blackboard or you can ask your TA).