

Lab #3 The paired t-test

Null hypothesis: The population mean difference is zero

Alternative hypothesis: The population mean difference is not zero (two-sided)

Order	Steps in the t-test	Symbol or name	Formulae	R code
1	Calculate the differences, their average and standard deviation	Y, \bar{Y}, s	$\sum_{i=1}^n Y_i$ $\sqrt{\sum_{i=1}^n \frac{(Y_i - \bar{Y})^2}{n-1}}$	mean(diffs) sd(diffs)
2	Calculate the standard error of the average	$SE(\bar{Y})$	$\frac{s}{\sqrt{n}}$	sd(diffs)/sqrt(length(diffs))
3	Calculate the degrees of freedom	d.f.	$n - 1$	length(diffs) - 1
4	Compute the t-ratio, under the null hypothesis	t-statistic	$\frac{\bar{Y} - 0}{SE(\bar{Y})}$	(ybar - 0) / se
5	Find the proportion of values in a t_d.f. distribution that are as far or further from zero that the t-statistic	p-value		2*(1- pt(t.statistic,df))
6	Find the 97.5% quantile of the t distribution with the appropriate degrees of freedom	$t_{n-1}(0.975)$		qt(0.975, df)
7	Add and subtract an appropriate multiple of the standard error of the average from the average	95% confidence interval	$\bar{Y} \pm t_{n-1}(0.975)SE(\bar{Y})$	ybar + qt(0.975, df) * se ybar - qt(0.975, df) * se

