confidence intervals for paired data

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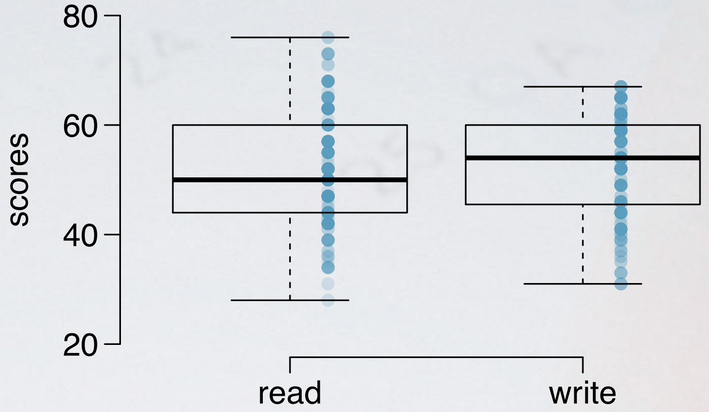
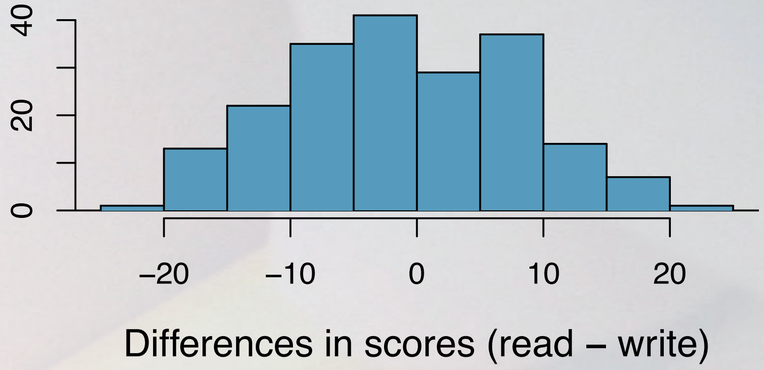
high school and beyond

	ID	read	write	diff
1	70	57	52	5
2	86	44	33	11
3	141	63	44	19
4	172	47	52	-5
…	…	…	…	…
200	137	63	65	-2

dependent

$$\bar{x}_{diff} = -0.545$$
$$s_{diff} = 8.887$$
$$n_{diff} = 200$$





$$H_0 : \mu_{diff} = 0$$
$$H_A : \mu_{diff} \neq 0$$
$$p - value = 0.384$$
$$\text{Fail to reject } H_0$$

estimating the difference between paired means

point estimate ± margin of error

$$\bar{x}_{diff} \pm z^{\star} SE_{\bar{x}_{diff}}$$

$$\bar{x}_{diff} \pm z^{\star} \frac{s_{diff}}{\sqrt{n_{diff}}}$$

practice

Would you expect a 95% confidence interval for the average difference between the reading and writing scores to include 0? yes!

Calculate the 95% confidence interval for the average difference between the reading and writing scores.

$\bar{x}_{diff} = -0.545$

$s_{diff} = 8.887$

$n_{diff} = 200$

$SE = 0.628$

$\bar{x} \pm z^* SE = -0.545 \pm 1.96 \times 0.628$

$= -0.545 \pm 1.23$

$= (-1.78, 0.69)$

interpreting a CI for the difference between paired means

95% confidence interval for $(\mu_{read} - \mu_{write}) = (-1.78, 0.69)$

We are 95% confident that the difference between the average reading and writing scores is between -1.78 and 0.69 points.

We are 95% confident that high school students score 1.78 points lower to 0.69 points higher, on average, on their reading compared writing.