Sidenote on sidedness

If testing a 2-sided hypothesis, use a 2-sided test!

→ **for null hypothesis** $H_o: \mu = 0$ **, then:**

1-sided H_as	2-sided H_as
$H_a: \mu < 0$	$H_a: \mu \neq 0$
$H_a: \mu > 0$	$H_a: \mu < 0$ **or** $H_a: \mu > 0$

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either can be fine
if **prior info**
supports use

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2-sided H_as

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$H_a: \mu < 0$ **or** $H_a: \mu > 0$

logically identical statements, but doing a pair of 1-sided tests without multiple testing correction *necessarily* leads to FPR inflation

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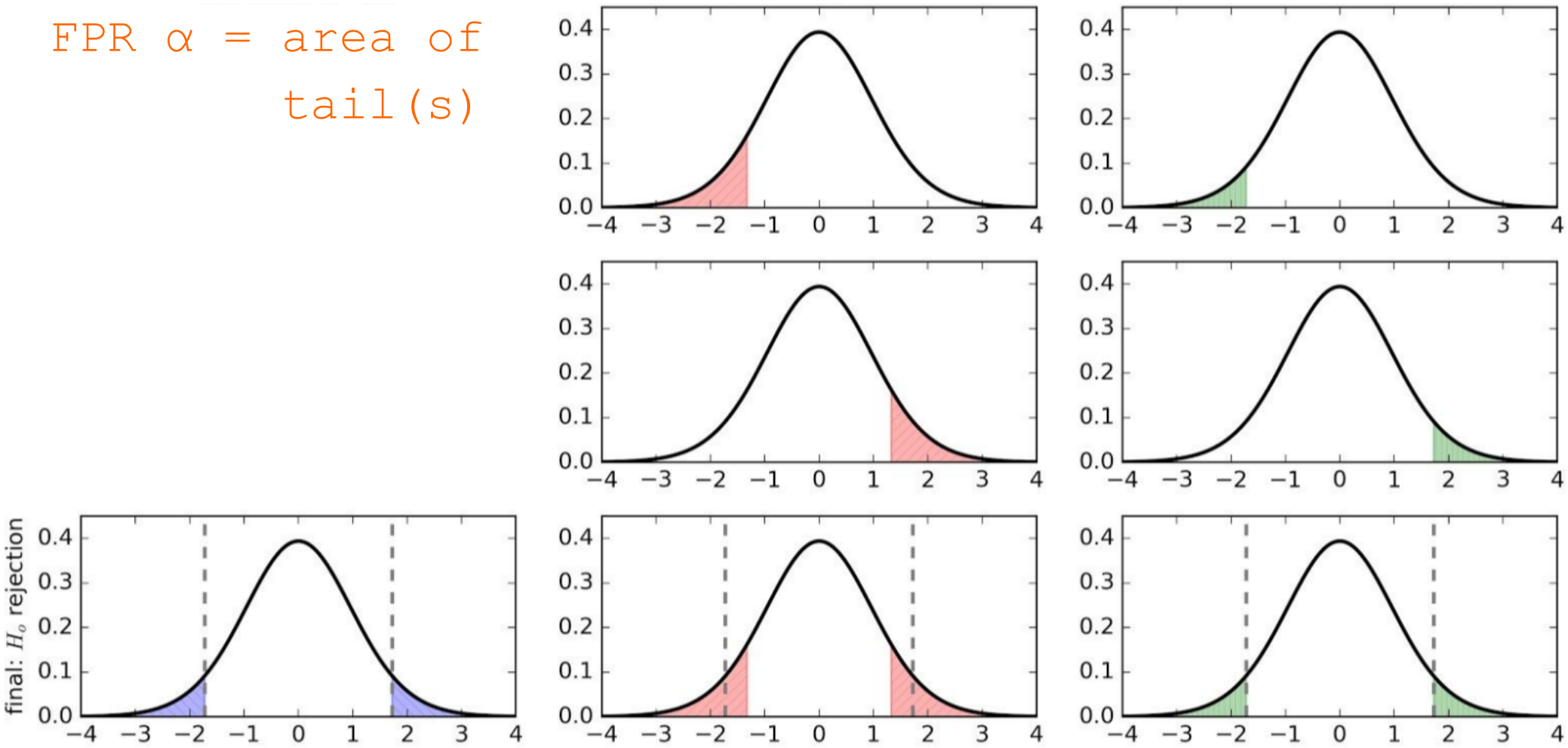
Why FPR inflation if using a pair of 1-sided tests?

FPR α = area of tail(s)



one 2-sided
α = 0.1

two 1-sided
α = 0.1

two 1-sided
α = 0.1/2

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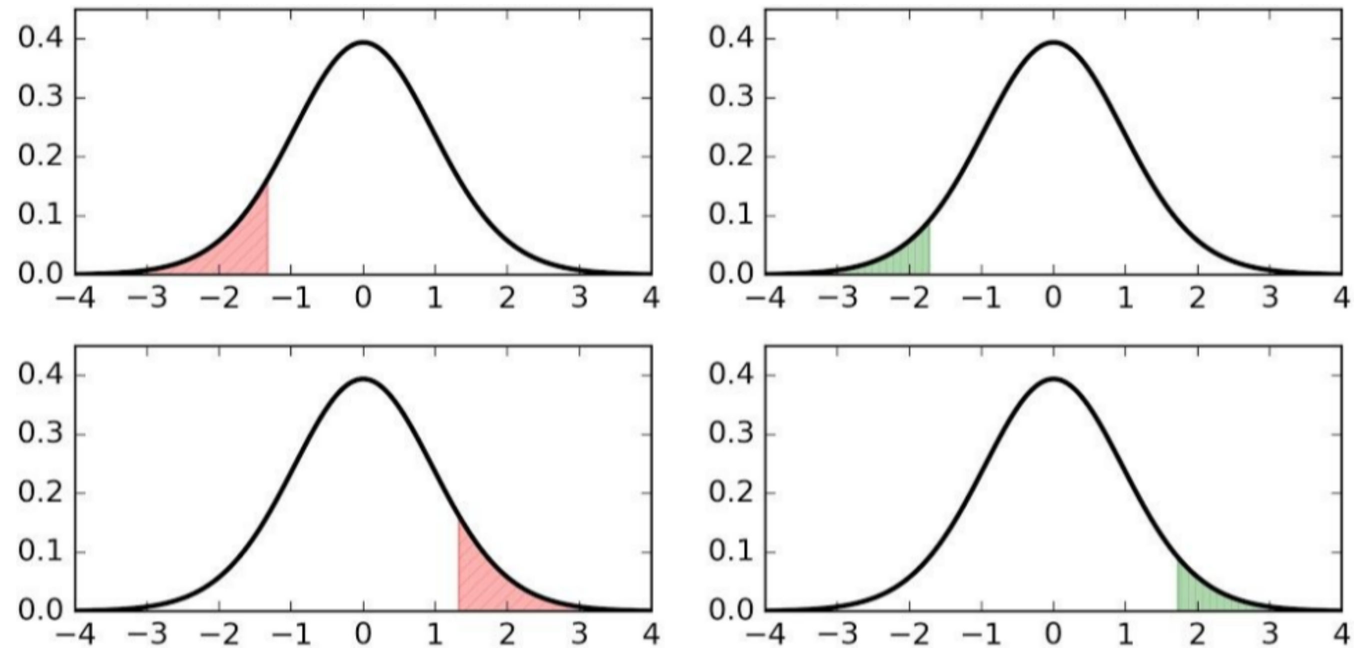
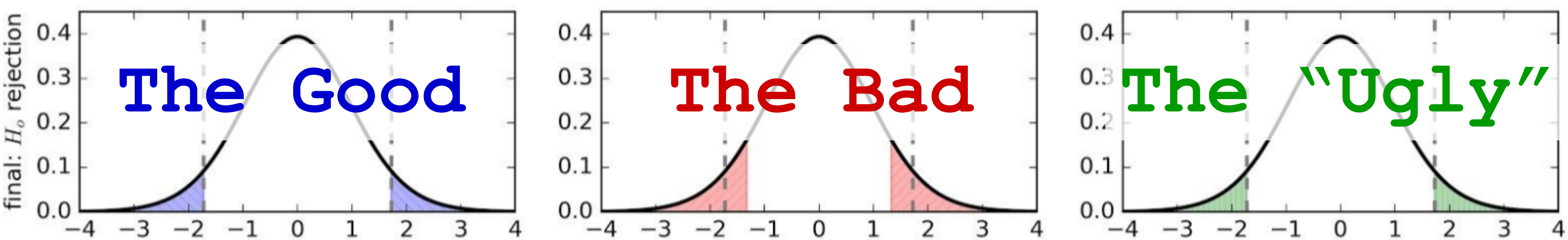




one 2-sided
α = 0.1

two 1-sided
α = 0.1

two 1-sided
α = 0.1/2

correct

2-sided test
p = 0.001,
α = 0.05

incorrect

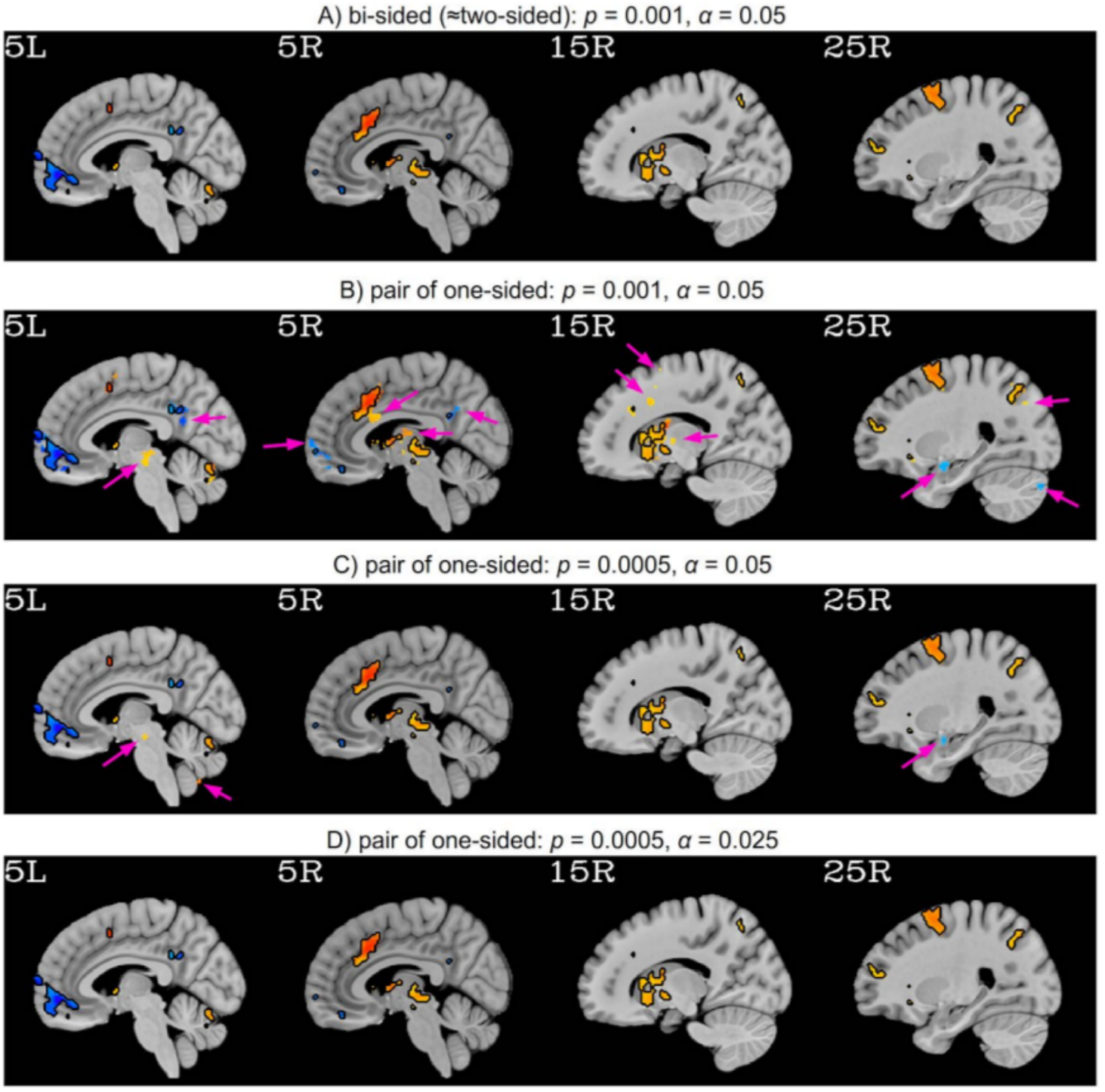
1-sided tests
p = 0.001,
α = 0.05

incorrect

1-sided tests
p = 0.001/2,
α = 0.05

OK, but why??

1-sided tests
p = 0.001/2,
α = 0.05/2



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Sidenote on sidedness

If testing a 2-sided hypothesis, use a 2-sided test!

Morals of the sidedness (or tail) tale:

+ A single, 1-sided test is fine if one has prior information *and* makes *a* 1-sided hypothesis.

+ For all other cases, use *a* 2-sided test.

+ A pair of 1-sided tests with FPR = α is equivalent to one 2-sided test with FPR = 2α, i.e., inflation without correction(s). *Just use 2-sided!*

***+ Also*, please report chosen test (+ rationale).**

For more gruesome detail, see Chen et al. (2018) in bioRxiv (https://www.biorxiv.org/content/10.1101/328567v1) and in HBM (https://onlinelibrary.wiley.com/doi/full/10.1002/hbm.24399)