Reminders about *a priori* Power Analyses

We start an a priori power analysis with 3 pieces of info ...

1 -- Estimation/Guess of the effect size you expect to find --- r
2 -- Decision about what p-value you will use for significance testing --- .05
3 -- The power you would like to have --- .80 is considered "industry standard" in many research areas

...and estimate a fourth
4 -- the suggested sample size

Please Note:
The power is an ESTIMATE of the probability of rejecting the null hypothesis, given the p-value, effect size and sample size estimates you start from
1 -- If the effect size from your sample is less than the estimated effect size you stated with, your power estimate will be an overestimate and you have less than an 80% chance of rejecting the null
2 -- If you set a more conservative p-value (say .01, or do some sort of correction for multiple comparisons), your power estimate will be an overestimate and you have less than an 80% chance of rejecting the null
3 -- If your sample size is smaller than the suggested amount, your power estimate will be an overestimate and you have less than an 80% chance of rejecting the null

various other things can "interfere" with the estimation and lead you to retain the null
1 -- a sample that doesn't represent the target population
2 -- a measurement of either of the analyzed variables with limited reliability and/or validity
3 -- any confounds that are "changing" the relationship between the variables being analyzed

Perhaps the most common sources for retaining the null, even after using the sample size estimated from an a priori power analysis are

-- setting the power threshold too low -- 80% is the minimum standard in most research areas - be sure to check your research community standards
-- the effect size you obtain from your sample is less than the effect size estimate you used in your power analysis
-- you sample size is less than what was suggested by the power analysis
-- in order to obtain the sample size suggested by the power analysis, you were forced to "expand" the population definition and are actually now sampling from a population that has an effect size smaller than the estimate you used for the a priori power analysis