Research Gold

RESEARCH GOLD FIELD GUIDE

Defend Your Statistics with Confidence

The statistical questions committees actually ask, the answers that satisfy them, and the one-page summary that keeps you composed. A defense preparation guide from PhD methodologists.

Written by PhD methodologists researchgold.org

START HERE

A committee is not testing your memory, it is testing your understanding

The statistics portion of a defense rarely fails on a wrong number. It fails when a candidate cannot explain why they chose a method, what its assumptions were, and what the result does and does not mean. Understanding, calmly demonstrated, is what passes.

PRINCIPLE

You do not need to be a statistician to defend your statistics. You need to be able to explain, in plain language, why each choice was reasonable for your design and your data. A confident "here is why" beats a nervous recitation of output every time.

The three layers every committee probes

1. **Why this method**
   Why this test, this model, this approach, given your question and your data. Have a one-sentence reason ready for every analysis in the dissertation.

2. **Did you check the assumptions**
   Every test rests on assumptions. The committee wants to know you checked them, and what you did when one was not fully met.

3. **What does the result actually mean**
   Not the p-value, the meaning. What the finding says about your question, how certain it is, and where its limits are.

THE QUESTIONS

The statistical questions, and answers that satisfy

These come up in defense after defense. Each pairs the question with a calm, specific answer you can adapt to your own study. Replace the bracketed details with yours.

REVIEWER SAYS	A STRONG RESPONSE
Why did you choose this statistical test rather than another?	The test follows from the design and the data. With [outcome type] and [number of groups], and with [assumptions] reasonably met, [test] is the appropriate choice. I also considered [alternative], and the conclusions are consistent, which gives me confidence the result is not an artefact of the method.
How do you know your assumptions were met?	I checked [normality, equal variances, independence, or the relevant assumptions] using [the checks you ran]. Where [assumption] was not fully met, I [used a robust alternative, transformed the variable, or noted the limitation], so the conclusion does not rest on an assumption the data do not support.
Your sample is small. Can you really draw these conclusions?	I was mindful of that. An a priori power analysis indicated [N] was sufficient to detect [effect] at [power]. Where estimates are less precise, I report confidence intervals and have framed the conclusions to match the precision the data support, rather than overstating them.
What does this p-value actually tell us?	It tells us how compatible the data are with the null hypothesis, not the size or importance of the effect. That is why I report the effect size and its confidence interval alongside it, because the practical meaning of the finding is in the magnitude, not the p-value alone.

REVIEWER SAYS	A STRONG RESPONSE
Could there be a confounding variable you missed?	That is a fair concern. I adjusted for [confounders] chosen on theoretical grounds, and the effect held. I cannot rule out unmeasured confounding, which is why I have listed it as a limitation and described the likely direction of any residual bias.
Why did you not use a more sophisticated model?	I chose the simplest model that answers the question well, because it is more transparent and less prone to overfitting with my sample. A more complex model would add assumptions and parameters the data cannot reliably support, which would weaken rather than strengthen the inference.
You ran many tests. How did you guard against false positives?	I distinguished my confirmatory hypotheses, which were specified in advance, from the exploratory analyses, and I treat them differently. For the [family of related tests] I controlled the [family-wise error rate with Holm, or the false discovery rate with Benjamini-Hochberg], and I report the exploratory results as hypothesis-generating rather than confirmed. I would rather label a finding exploratory than dress it up as a planned test.
The reliability of that measure is low. Does that not undermine the result?	It is a real concern, because measurement error attenuates observed associations, so my estimate is more likely conservative than inflated. The reliability was [coefficient], I have reported it openly, and where it matters I note that the true relationship is plausibly stronger than the one I observed. I did not correct for attenuation in the headline result, to keep it on the scale the data were measured on.

REVIEWER SAYS	A STRONG RESPONSE
How do we know you did not just search for a significant result?	My primary hypotheses and analysis plan were fixed before I saw the outcome data [in my preregistration or proposal], and the confirmatory tests map directly onto them. Anything that emerged from looking at the data is reported separately and honestly as exploratory. The effect sizes and intervals are there so the result stands on its magnitude, not on having crossed a threshold.

THE FOUNDATIONS

Know the assumptions behind every analysis you ran

You do not need to memorise formulas. You do need to name the assumptions of each method you used, say how you checked them, and say what you did if one was shaky.

- [ ] For each test or model, you can name its key assumptions in plain words.
- [ ] For each assumption, you can say which check you ran and what it showed.
- [ ] Where an assumption was not fully met, you can explain the adjustment you made and why it was reasonable.
- [ ] You can explain the difference between statistical significance and practical importance for your own findings.
- [ ] You can state the limitations of your analysis before the committee has to point them out.

WATCH OUT FOR

The worst answer to "did you check the assumptions" is "I think the software handles that". The committee reads it as not understanding your own analysis. Know what was checked, by whom, and what the checks showed.

THE TOOL

Build a one-page statistics summary

Walk in with a single page that maps every research question to its analysis, its key result, and its one-line justification. It keeps you composed and shows the committee you own the work.

One-page defense statistics summary (one row per question)

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Research question: [state it briefly]
  Analysis used:         [test or model]
  Why this analysis:     [one-sentence justification]
  Assumptions checked:   [what you checked, what you found]
  Key result:            [effect size, confidence interval, p-value]
  What it means:         [plain-language interpretation]
  Main limitation:       [the honest caveat]
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PRINCIPLE

Preparing this page is the preparation. By the time you have filled a row for every research question, you have rehearsed the exact answers the committee will ask for. The page is the artefact; the understanding it builds is the point.

ON THE DAY

How to handle a question you cannot answer

You will not know every answer, and that is expected. How you handle the gap matters more than the gap itself.

1. **Pause, do not bluff**
   A short silence to think reads as thoughtful. A confident wrong answer reads as not understanding. Committees forgive "let me think" far more readily than a guess.

2. **Reframe to what you do know**
   If you cannot answer the exact question, answer the principle behind it. "I did not test that specifically, but here is how I would approach it and what I would expect" shows reasoning.

3. **Concede honestly when you should**
   If something is a genuine limitation, name it as one. Acknowledging a real weakness is a sign of a mature researcher, not a failing candidate.

BEFORE THE DEFENSE

The defense readiness checklist

Run your preparation through this list. If you can tick every box, the statistics will not be where the defense goes wrong.

- [ ] For every analysis, you can give a one-sentence reason it was the right choice.
- [ ] You can name and explain the assumptions behind each method you used.
- [ ] You can describe how each assumption was checked and what you did if it was not met.
- [ ] You can interpret every key result in plain language, beyond the p-value.
- [ ] You can explain your sample size and the precision your data support.
- [ ] You can separate your confirmatory hypotheses from exploratory ones, and say how you handled multiple comparisons.
- [ ] You can state your main limitations before the committee raises them.
- [ ] You have a one-page summary mapping each question to its analysis and result.
- [ ] You have a calm, honest plan for questions you cannot fully answer.

WHEN YOU WANT THE STATISTICS DONE RIGHT

Walk into the defense knowing the analysis is correct

If you want the right tests chosen for your design, the analysis carried out and checked, committee-ready tables and figures, and a plain-language interpretation so you can explain every result, our PhD methodologists handle dissertation statistics end to end. You stay the author; we make sure the numbers are defensible and that you understand every one of them.

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