

10 simple rules for best experimental design in ecology

A quick set of rules on how best to execute an experimental design in ecology. From having a clear hypothesis to obtaining accurate statistics, this guide will help make sure authors are on the right track before publishing. The 10 simple rules are based on articles written to help readers and editors learn more about experimental design and how to avoid any unseeable pitfalls. These rules act as a checklist for authors to go through to make sure they have created the best experimental design for their procedure.

10 Simple Rules for Best Experimental Design in Ecology

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These are just a few helpful rules for designing an experimental design and execution.

Rule 1: Make sure you have a clear hypothesis and predictions

Having a clear hypothesis and testable predictions will allow for better understanding in what is being studied and eliminates any uncertainty. Hulbert states that even if the experiment is conducted well, it will be of little value if the hypothesis is not clear (Hulbert 1984).

Rule 2: Have your sample units independent of your samples (define terms)

Define what your samples and samples units are and correctly identify the lowest possible sample unit before moving on to statistics (Hurlbert 1984).

Rule 3: Make sure to specify controls

Hulbert states that having controls allows for the separation of the different factors that are being studied (Hulbert 1984). This can tell you whether the treatment being studied has an effect.

Rule 4: Make sure your samples are randomized

Randomizing samples will reduce researcher bias and allow for more validity in the results (Hulbert 1984).

Rule 5: Replicate samples

Replicating samples allows for more accurate results as it reduces noise and eliminates chance events.

Rule 6: Reduce flexibility

Reduce flexibility by clearly defining the parameters of the study. This eliminates any error and bias (Ioannidis 2005).

Rule 7: Try to avoid pseudoreplication

Pseudoreplication provides results for inappropriate data towards your hypothesis (Hurlbert 1984). Unless there is a barrier or if you are able to maximize location, avoid using pseudoreplication.

Rule 8: Use the right method of statistics

Know whether to use regression or ANOVA, or any other type of statistics to provide the most accurate results (Cottingham et al. 2005).

Rule 9: Do not base entire study and results on the p-value

The p-value will tell you the likelihood of failure but nothing about the biological or ecological value of difference. Thus, provide an effect size measure to convey the efficacy of the treatment (Sterne and Smith 2001).

Rule 10: Be innovative and insightful

Having a good experimental design is not just about technical skill, but also about being innovative and making good judgment calls (Hurlbert 1984). Do not be boring.

References

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