

Writing Research Articles

How to Write the Materials & Methods Section

Materials and Methods (M&M):

Function of the Materials & Methods section: It answers the question: “What did you do?” As such, it should describe the techniques and reagents you used or developed for your paper in enough detail for someone else to be able to evaluate your work or reproduce your experiments.

It should include: (list adapted from American Physiological Society Professional Skills Course)

- Subjects
 - Animal, cell line, human
 - Source and strain
 - Size gender age
 - How handled (diet housing, etc)
 - Protocol/procedure review
 - IACUC or IRB review
- Experimental design/Study design
 - Rationale
 - Treatments/experimental groups/controls
 - Protocol for data collection
 - Sources of reagents or materials—or method of preparation
 - Variables measured, number of replicates
 - Statistical procedures used

Some tips to write the M&M section:

1. Often the first thing you write, in particular if your paper describes a new approach (Methods Paper) or relies on a complex Study Design. If not, a good thing to write when you run out of inspiration while working on your Introduction or Discussion.
2. Should contain enough details for someone else to reproduce your experiments, so take good notes while you are carrying out your experiments or measurements.
3. Better yet: write your Method section after you just completed the experiment.
4. Do not include any result or data—just the methods. But there are exceptions to this rule:
 - a. If you are writing a Methods paper, you will describe experiments that test your new method in the Methods section.
 - b. The description of the Study Design may include experiments and data.
5. Do not repeat the details of an already published protocol. Include the reference to the publication and only mention the modifications you made to the protocol. “Cells were washed, stained and fixed as previously described (ref) except for the addition of a 15-minute incubation in XX...”
6. Indicate the origin of experimental strains, chemicals and other reagents, instrumentation, etc.
7. **Write in the past tense.**
8. **Use the passive voice to your heart’s content!** “To induce recombination in the fetuses, pregnant mice were fed XXChow (Chow Maker, Chowtown, MA) containing tetracycline (Sigma) at xx mg/ml, starting one day after mating...”
9. Write M&M in the order in which the experiments are presented in the result section. Or, group M&M by theme: “Animal strains” “Histology” “Quantitative PCR” “Statistical analysis”
10. Use short but informative subtitles.



If you developed a complex Study Design, the M&M is the place to describe it (rather than the Introduction or the Results.)

11. Describe your experimental design clearly. Be sure to include the *hypotheses* you tested, *controls*, *treatments*, *variables* measured, how many *replicates* you had, what you actually *measured*, what form the *data* took, etc. Always identify treatments by the variable or treatment name, NOT by an ambiguous, generic name or number (e.g., use "2.5% saline" rather than "test 1".) (from The Structure, Format, Content, and Style of a Journal-Style Scientific Paper;

<http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWsections.html#experimentaldesign>)