

Writing Research Articles

How to Write the Results Sections

The purpose of the Results section is to **describe what you found**.

1. Often, a Result paragraph starts with a reminder of the question or hypothesis that the experiment addresses (either the paper's main question/hypothesis, or a more specific question corresponding to a step in your experimental approach.)
2. Then comes the description of the experiment or approach, which should give only the amount of methodology required to understand the experiment's logic (methodology details go in the M&M section).
3. Then come the findings or observations, with references to the figures and tables that support the findings.
4. At the end, a conclusion sentence gives the take-home message of the experiment.
5. Sometimes, you need to start a result paragraph with a little bit of background, for instance to justify an experimental approach or link the experiment to the result that preceded.
6. **In some papers, the Results contain only the observations** (see sample 2). The Question/Purpose of the study is stated in the Introduction, the Conclusions are stated in the Discussion, and the Experimental Approach is described in the Methods.

Common Problems:

1. Confusion between results and data. Data go in the tables, graphs and figures. The results should **extract a message** from the data, not just reiterate the numbers or observations contained in the figures and tables. For instance, summarize numerical data by describing a fold or percent increase/decrease between experimental subjects and controls.
2. Discussing a result. Discussion is for the Discussion section! Just give the immediate interpretation or conclusion for the experiment; don't mention studies that contradict or support your result. You might mention other studies in a Results section, but most of the time that will be to justify your approach or set up your specific question at the beginning of the result section.
3. The exception to the point above is if you are following a format that combines Results and Discussion.
4. Repeating the experimental details: just give the gist of the experimental approach. "To examine the effects of the mutation on the cytoskeleton, we stained the cells with antibodies against actin and tubulin. Actin filaments appeared normal in the mutant (Figure 3, A, B) but tubulin filaments were very disorganized (Figure 3 C,D)." In the Method section, you will have written: "For antibody staining, cells were washed in XXX, fixed in YYY, and incubated with antibody in buffer B for 3 hours at 20°C. Anti-actin antibody (Sigma) was used at a 1:5,000 dilution. Anti tubulin and anti-myosin antibody (BRL) were used at 1:10,000."

Tips to write the Results section

1. **Organize your results** in a manner that makes sense scientifically, which may not be the order in which you did them. What matters is that they progressively bring you closer to answering your main question. Some simple principles:
 - a. Most important to least important result
 - b. Most relevant (to the question asked by your paper) to least relevant



c. Chronological order—in particular if one experiment led to the next

2. Most of the time, you will **compose your figures first**, and then write the results. Follow the same organizing logic for Results as you did for Figures.

3. Writing your results

- a. Indicate the purpose of the experiment using **signals**:
 - i. **“To test whether** X induces Y, we measured Y after treating samples with increasing concentrations of X.”
 - ii. **To determine whether..., To assess if, To eliminate the possibility that, To confirm that**
- b. Give a brief justification for your experiment, or a few words of background information, if necessary. “The results described above suggested that X might also disrupt Y. To test this hypothesis, we performed...”
- c. Describe what you did in the **past tense**: ...we measured X in the presence of Y.” “..., we stained X with Y”, “..., we counted
- d. Avoid sentences like: “Figure 1 shows the effect of X on Y.” They take space and contain very little interesting information. Replace them by: “We found that X had little effect on Y at 4°C but increased Y two-fold at 25°C (Figure 1).”
- e. If your results are complex, take several sentences to explain them, keeping to the “one-idea-per-sentence” motto. “The animals treated with X fell into two categories. In the first category, the heartbeat rose quickly and came back to normal after 10 minutes. In the second category, the heartbeat rose and stayed high for 2 hours after treatment.” **Short sentences are easier to understand (and often easier to write too!)**
- f. Conclude briefly. “These results suggest that X increases the response of Y to Z.” **The conclusion of a result section should mirror the purpose stated at the beginning** (“To determine whether X affects the response of Y to Z, we treated...”)
- g. Give a title to each subsection (either the description of the experiment, or the main result or conclusion of the experiment). **Use present tense in the title.**