Although some journals have a Results and Discussion section, others have a Results section followed by Discussion and Conclusions one, while others have three separate sections. Let us discuss each separately.

**Results**

In case you have a separate Results section, the standard procedure is to pre sent them with little or no interpretation or discussion.

First decide what results are representative. Then, organize them in a sequence that highlights the answers to the aims, hypotheses or questions that you set yourself at the beginning of the paper (What did I find? What did I not find? What did I find that I was not expecting to find [contradicting my hypothesis]?). This involves the use of figures, graphs and tables, which are commented on (not merely described) in the text.

This is the section in which you should mention any important negative results.

If referees cannot understand your results, your contribution to the current knowledge base will be lost.

**How should I begin this section?**

There are two typical ways. The first is to give a general scenario of your surveys, experiments etc., without repeating the details provided in the Methods section.

*.Overall, the results presented below show that…*

*.The three key results of this empirical study are…*

*.The following emergent themes were identified from the analysis: …*

You can also simply go directly to your results, often by inviting readers to look at your figures, tables and graphs:

*.Figure 1 shows the mass spectra obtained from an analysis of the two residues. The first residue reveals a…*

*.A total of 34 wheat genotypes (Table 1) were screened for…Response to increased sunlight varied significantly (Fig. 1)…*

*.An analysis was performed to look for… For this, the average times of x and y were compared… Figures 1-3 show the difference between…*

**How should I structure the rest of this section?**

Before you begin writing, arrange your figures(F), tables (T) and graphs (G) in the most logical order for your readers, and which support your initial aim or the hypothesis you stated in your Introduction. Then associate the key findings with each of the F,T and G, excluding any results not relevant to support your research hypothesis (not those contradicting your hypothesis).

Maeve O’Connor in *Writing successfully in Science* recommends the structure as follows:

1. Highlight those results (including those from controls) that answer your research question(s).

2. Outline secondary results.

3. Give supporting information.

4. Mention any results that contradict your hypothesis and explain why they are anomalous.

**Should I report any negative results?**

Donald Dearborn, of Bates College, comments:

*“Your results may be of importance to others, even though they did not support your hypothesis. Do not fall into the trap of thinking that results contrary to what you expected are necessarily “bad data”. If you carried the work well, they are simply your results and need interpretation. Many important discoveries can be traced back to “bad data”.*

[Remember penicillin.]

**What verb tense should I use?**

Past simple for your findings (most commonly passive), and present simple for descriptions of established scientific facts.

**How can I show my readers the value of my data?**

Instead of using adjectives (interesting, significant, remarkable, relevant) or adverbs (intriguingly, remarkably, significantly), show the readers what they need to know to come to their own conclusions about our results.

**Bad example**: *The large difference in mean size between population C and Population D is particularly interesting.*

**Good example**: *While the mean size generally varies among populations by only a few cm, the mean size in populations C and D* differed by 25 cm*. Two hypotheses could account for this*: …

**How should I comment on my F, T and G?**

Do not merely describe/tell your reader what is in them; focus on the meaning inferred by them. Guide your readers towards the interpretation you want them to have.

**Bad example**: *Figure 4 shows the relationship between the numbers of species A and species B.*

**Good example**: *The abundance of species A and B were inversely related (Fig. 4).*

Be concise and avoid phrases such as *As can be seen*….

You do not need to reiterate each value from a F or T. Just point out the key result or trend that the F or T conveys.

Do not repeat word for word the caption or legend within the main text. Legends should be as short as possible and sufficiently detailed to enable your readers to understand without having to read the text. It is vital to pay attention to legends as some readers may only look at your F T and G, without even reading the paper itself!

**Discussion**

The secret is to sound both convincing and credible at the same time. Be positive about your own limitations and constructive when discussing what you think to be the limitations of others.

Another skill is to interpret your results *without repeating* them.

**How should I structure the Discussion?**

The Results and Discussion section of a medical paper typically has the subsections as follows, which are useful guidelines for any area.

1. Statement of principal findings;

2. Strengths and weaknesses of the study;

3. Strengths and weaknesses in relation to other studies and/or important differences in results;

4. Meaning of the study: possible explanations and implications for other researchers in the field and policy-makers;

5. Unanswered questions and future research.

**How should I begin the Discussion?**

1. Remind readers of your goals, preferably in a single sentence (e.g. *One* *of the main goals of this experiment was to attempt to find a way to predict who shows more task persistence*).

2. Refer back to the questions (hypotheses, predictions etc.) that you posed in your Introduction (e.g. *These results both negate and support* *some of the hypotheses. The prediction was that greater perfectionism scores would result in greater task persistence, but this showed not to be the case*).

3. Refer back to papers you cited in your Review of the literature (e.g. *Previous studies conflict with/differ from the data presented in the Results: it was more common for any type of feedback to impact participants than no feedback (Shanab et al., 1981; Elawar & Corno, 1985)*).

4. Briefly restate the most important points from your Results (e.g. *While not all of the results were significant, their overall direction showed trends that could be helpful to learn about who is more likely to persist and what could influence persistence*).

You can use any of the four, or combine them.

Some experts recommend that you tell a story to help you build up your theory, in which your variables, data or findings are like characters in a book. Your job as the author is to explain how these “characters” relate to each other, and how each one has (or does not have) its logical place.

**Why should I compare my work with those of others?**

Crucial information in someone else’s study may help you interpret your own data or allow you to reinterpret others’ findings in the light of yours. You should discuss the reasons for similarities and differences between yours and others’ findings. Consider how their results may be combined with yours to derive a new or perhaps better-substantiated understanding of the problem.

**How should I compare my work with those of others?**

1. Make a general statement regarding your findings.

2. Mention other authors’ works that relate directly to your findings.

3. Make a link between their work and your work.

4. Clearly state how your work differs from theirs.

**How should I end the Discussion if I do have a Conclusions section?**

Here are some suggestions:

a) Tell your readers if and how your findings could be extended to other areas. You must provide evidence of this. If you repeated your experiment in a different context, would you get the same result?

*. We only examined a limited number of samples. A larger number of samples could lead to a higher generalization of our results.*

*. Although this is a small study, the results can be generalized to…*

*. Our results may hold true for other countries in Asia.*

b) Suggest ways in which your hypothesis (model, device etc.)

could be improved on.

*. We have not been able to explain whether x=y. A larger sample would allow making more accurate predictions.*

*. A greater understanding of our findings could lead to a theoretical improvement in…*

c) Say if and/or why you ignored some specific areas.

*. Our research only focuses on x, whereas it might be important to include y as well. In fact, theinclusion of y would enable us to…*

*. We did not pay much attention to… as this was not within the scope of our research.* **or** *The reason for this was that…*

d) Admit that you what you have not been able to do and, consequently, cannot provide conclusions on.

*. Unfortunately, our database cannot tell the exact scale of Chinese overseas R&D investment. Consequently, we cannot conclude that…*

e) Reiterate your reasons for choosing your topic of investigation to convince your readers of the validity of what you have said in the Discussion.

*As aforementioned, so far no one appears to have applied current knowledge of neural networks to the field of mass marketing fraud. The importance of our results using such networks thus lies both in their generality and their relative ease of application to new areas, such as counterfeit products.*

**How should I end the Discussion if I do not have a Conclusions section?**

Whether or not you have a Conclusions section, your Discussion should end with a summary of the main points you want your readers to remember. Then you should state any or a combination of the suggestions as follows:

1. What your findings imply.

*The attitudinal information from our survey shows that farmers hold cows in very high regard.*

2. What your recommendations are.

*These results create a positive profile of the caring and respectful attitudes of UK farmers to their stock, and this image should be promoted to the public further recommendation.*

3. How your research could be continued.

*A 56% response rate suggests the respondents are a good representation of UK stock managers. Further on-farm interviews, observations and animal-centered tests are needed to confirm the inferences made from the data collected in this postal survey.*

**How can I bring a little excitement to my Discussion?**

Be upfront, using stronger language and making stronger assertions than in other sections of the paper. If you really want your contribution to be seen and appreciated, you cannot use flat phrases, as the ones you might use to describe materials and methods.

One way to add some passion to your writing is the very occasional and careful use of emotive adjectives, adverbs, nouns (e.g. convincing, indisputable, undeniable, huge, massive, surprisingly, breakthrough, advance) or a combination of them (e.g. a substantial insight, a massive advance).

**How can I show the pitfalls of other works in the literature?**

When criticizing other authors’ work, do not undermine their credibility – respect to be respected. Do not be mean, as the work you criticize might belong to one of your referees! This is how you can manage:

- You want to test hypotheses that have never been tested in depth.

- Other studies have only been conducted very generally or in one specific field. You want to apply this research to a new area.

- Other studies have limitations you are trying to overcome.

**How should I discuss the limitations of my research?**

Discuss limitations and failures in a positive way. Using words such as *Although, However, Only* may reduce the negative impact.

*Although the two surveys were not conducted at the same period, this will only affect our results in terms of…*

Try not to use the word *limitation* more than once or twice. Use synonyms such as: *shortcoming, drawback* and *disadvantage*.

Be clear about what your limitations and their implications are, discussing possible remedies, if appropriate.

*Two of our samples were contaminated. This occurred because… We thus plan to repeat our experiments in future work. However, our analysis of the uncontaminated samples (24 in total) supported our initial hypothesis that…*

**Conclusions**

A conclusion must be clear and concise, and leave the reader with a good impression. If your structure and English are poor here, this will have a negative impact on the referees/editor and may affect their final decision as to whether to accept your paper.

The key skills are in knowing what referees and readers expect to find in the Conclusions, not repeating exactly the same phrases and information from your Abstract and Introduction, and in providing a clear and high-impact take-home message for readers.

**- How should I structure the Conclusions?**

Incorporate one or more of the following:

1. A very brief revisit of the most important findings/outcomes pointing out how these advance your field from the present state of knowledge.

2. A final judgement on the importance and significance of those findings/outcomes in terms of their implications and impact, along with possible applications to other areas.

3. An indication of the limitations of your study (the Discussion session may be a more appropriate place to do this).

4. Suggestions for improvements (perhaps in relation to the limitations).

5. Recommendations for future work (either for the author and/or the community).

6. Recommendations for policy changes (if applicable).

**- How does it differ from the Abstract and Introduction?**

- It does not provide background details.

- Gives more emphasis to the findings/outcomes (point 2)

- Talks about limitations, which are not normally mentioned outside the Discussion and Conclusions (point 3).

- Covers three additional aspects (points 4-6)

**- How can I differentiate my Conclusions from the last paragraph of my Discussion?**

If your journal has a separate section for Conclusions, i.e. the conclusions are not included in the Discussion, then it may be best to shift any overall conclusions you may have made in your Discussion to your Conclusions. This means that the final paragraph of your Discussion may just be a conclusion regarding one specific point, rather than an overall summary of the whole paper.

**- What can I do in case I do not have any clear Conclusions?**

Sometimes you cannot provide clear conclusions regarding the contribution of your work – maybe your method showed to be inappropriate and your results were not as brilliant as you were hoping for. In such cases, simply say what you have learned about the problem and suggest possible lines of future research. Such a final section is generally entitled Concluding Remarks.

If you do not have clear conclusions, do not present your findings in an exaggerated light, or say something uninteresting or irrelevant. Readers may still be able to benefit from using hedging devices.

**- How can I end my Conclusions?**

You can show your work *could* be applied to another area (use *could* as a hedging device). Yet you might like to say where they could *not* be applied for the moment.

Another way is suggesting future work. There is general agreement that the use of *will* refers to your planned work, and that *should* refers to the work that you believe could be addressed by the general community.

Your Conclusions can also make a recommendation. A good structure to be used is:

We suggest/ recommend/ propose that someone/something

a) should + infinitive without to (give)

b) infinitive without to (give)

c) should be + past participle (given)

d) be + past participle (given)

something.

Adapted from: Wallwork, Adrian **English for Writing Research Papers**, Springer 2011.

In sum, these components may appear in a Conclusion. Number 3 is a *must* and has to be highlighted/ made clear.

|  |  |
| --- | --- |
| 1 | REVISITING PREVIOUS SECTIONS  SUMMARIZING/REVISITING GENERAL OR KEY RESULTS |
| 2 | MAPPING (RELATIONSHIP TO EXISTING RESEARCH) |
| 3 | ACHIEVEMENT/ CONTRIBUTION  REFINING THE IMPLICATIONS |
| 4 | LIMITATIONS  CURRENT AND FUTURE WORK  APPLICATIONS |

Adapted from: Glasman-Deal,Hilary **Science Research Writing for non-native speakers of English** – Imperial College Press, 2009