

Writing Discussions



Features and Key Skills



- **For many readers, the part that they find the most interesting is often the Discussion.**
- **For most authors, it is the most difficult part of the paper to write**
- **Try to sound both convincing and credible by being:**
 - **positive about your own limitations, and**
 - **constructive when discussing what you believe to be the limitations of others.**

One more skill: interpret your results without repeating them

How should I structure the Discussion?



1. **Do my data support what I set out to demonstrate** at the beginning of the paper?
2. How do my findings **compare with what others have found**? How consistent are they?
3. What is my **personal interpretation** of my findings?
4. What **other possible interpretations** are there?
5. What are **the limitations of my study**? What other factors could have influenced my findings? Have I reported everything that could make my findings invalid?

How should I structure the Discussion?



6. Do any of the interpretations reveal a **possible defect or error** in my experiment?

7. Do my interpretations **contribute some new understanding** of the problem that I have investigated?

8. What **external validity** do my findings have? How could my findings be generalized to other areas?

9. What **possible implications or applications** do my findings have? What support can I give for such implications?

10. What **further research** would be needed to explain the issues raised by my findings? Will I do this research myself or do I want to throw it open to the community?

A style for clinicians (**Results and Discussion**)



1. Statement of principal findings
2. Strengths and weaknesses of the study
3. Strengths and weaknesses in relation to other studies: important differences in results
4. Meaning of the study: possible explanations and implications for clinicians and policymakers
5. Unanswered questions and future research

How should I begin the Discussion?



Four possible beginnings:

(1) Remind readers of your goals, preferably in a single sentence:

One of the main goals of this experiment was to....

(2) Refer back to the questions (hypotheses, predictions etc.) that you posed in your Introduction:

These results both negate and support some of the hypotheses. It was predicted that greater perfectionism scores would result in greater task persistence, but this turned out not to be the case.

How should I begin the Discussion?



(3) Refer back to papers you cited in your Review of the Literature:

Previous studies conflict with 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:

While not all of the results were significant, the overall direction of results showed trends that could be helpful to learning about who is more likely to persist and what could influence persistence.

How should I compare my work with that of others?



1. Make a general statement regarding your findings
2. Mention another author's work that relates directly to your findings
3. Make a link between her/his work and your work
4. Clearly state how your work differs from her/his work
5. State the conclusions that can be drawn from your results in light of these considerations

An Example



- (1) Our data suggests that UK dairy farmers largely regard their cows as intelligent beings, capable of experiencing a range of emotions. Placing importance on knowing the individual animal and calling them by name was associated with higher milk yields.
- (2) Fraser and Broom [1997] define the predominant relationship between farm animals and their stock managers as fear.
- (3) Seventy-two percent of our commercial respondents thought that cows were not fearful of humans, although their reports of response to an approaching human suggest some level of fear, particularly for the heifers. With both cows and heifers this would appear to be greater in response to an unfamiliar human. Respondents also acknowledged that negative experiences of humans can result in poor behavior in the parlor.
- (4) Hemsworth et al. [1995] found that 30–50% of the variation in farm milk yield could be explained by the cow's fear of the stockperson, therefore recognizing that fear is important for animal welfare, safety, and production.

The structure of the example



- (1): an overall summary of the finding and its implications
- (2): a previous study (by Fraser)
- (3): gives contrasting results to what the author found
- (4): finds further confirmation of Fraser's findings in another study

Two diplomatic approaches to adopt



- Question the findings of other authors in a constructive way:
 - Use their results either **to support your own results** or put your results and their results **in a new light**.
- Constantly clarify for the reader between whether you are talking about your findings or those of other authors

The diplomatic approaches applied



(5) The elaborated responses reported in **our postal survey** contribute some examples of the capacities of cattle, and this contextual human insight may be useful for developing hypotheses for further study.

(6) Most respondents (78%) thought that cows were intelligent. (7) However, a **study by Davis and Cheek** (1998) found cattle were rated fairly low in intelligence. **They** suggested that the ratings reflected the respondents' familiarity with the animals. (8) The stock managers in **our survey** were very familiar with their cattle and had a great understanding of the species' capabilities, through working with them daily. (9) **Stockpersons' opinions offer** valuable insight into this subject, which could enable more accurate intelligence tests to be devised; for example, to test whether cows can count in order to stand at the feed hopper that delivers the most feed.

(10) Hemsworth and Gonyou (1997) doubt the reliability of an inexperienced stockperson's attitudes towards farm animals. **Our** survey found an experienced workforce (89.5% > 15 years).

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



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

We only reported a limited number of samples. A greater number of samples could lead to a higher generalization of our results ...

Our results may hold true for other countries in Asia.

(b) Suggest ways that your hypothesis (model, device etc.) could be improved on.

We have not been able to explain whether $x = y$. A larger sample would be able to make more accurate predictions.

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

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



(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, the inclusion of y would enable us to ...

We did not pay much attention to ... The reason for this was ...

(d) Admit what you have not been able to do and as a consequence 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 in order to convince your readers of the validity of what you have said in the Discussion.

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



(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.

Active or passive? What kind of writing style should I use?



1. In the Discussion you will constantly be **comparing** your work with other author's. Therefore, in every sentence, make it sure the reader is **100% clear** about whose work you are referring to.

2. **Passive** sentences do not reveal the author of the action. To **avoid ambiguity**, use active sentences, wherever possible.

Examples



EXAMPLE

In 2010, *we confirmed* that complex sentences reduce readability [25].

In 2011, *Carter suggested* that complex sentences could also lead to high levels of stress for the reader [36].

In 2011, *it was suggested* that complex sentences could also lead to high levels of stress for the reader [Carter, 36].

In 2011, *it was suggested* that complex sentences could also lead to high levels of stress for the reader [25].

In 2011, *it was suggested* that complex sentences could also lead to high levels of stress for the reader.

COMMENTS

We clearly indicates that you are referring to your own work.

Carter, who is another author, is the subject of the verb. Thus it is clear to the reader that this is not your work.

The passive form means that the reader is not sure until the end of the sentence if it was you or another author. A long literature review or Discussion full of sentences like this is very heavy and annoying for the reader.

Readers cannot know who made the suggestion unless they go to Ref. 25 and see if it was you or someone else.

There is no reference. Readers cannot be sure if you made the suggestion or someone else.

The strategy to anticipate possible objections to our argument



- admit that you might be wrong - sentence (1)
- put forward an alternative interpretation (2)
- reiterate that your data could be used to confirm this alternative interpretation (3)
- give reasons for not agreeing with this alternative interpretation (4)
- propose your own conclusion (5)

Example



(1) We cannot of course be sure that chickens and humans processed the face images in exactly the same way. (2) This leaves open the possibility that, while chickens use some general mechanism, humans possess instead a specially evolved mechanism for processing faces. (3) We cannot reject this hypothesis based on our data. (4) However, there are at least two reasons why we do not endorse this argument. First, it is not needed to account for the data. We believe that the existence of a task-specific adaptation can be supported only with proofs for it, rather than with absence of proofs against. Second, the evolutionary logic of the argument is weak. (5) From observed chicken behaviour and knowledge of general behaviour mechanisms we must in fact conclude that humans would behave the same way with or without the hypothesised adaptation. There would thus be no selection pressure for developing one.

How can I bring a little excitement to my Discussion?



Allow yourself to use **stronger language** and make **stronger assertions** than you might do in other parts of the paper.

Occasionally use **emotive adjectives**: *convincing, exciting, indisputable, undeniable, huge, massive*
powerful nouns: *breakthrough, advance, leap*

Combinations: *a substantial insight, a massive advance*

Examples



S1. These observations provide *compelling evidence* that a massive black hole exists at the center of NGC4258.

S2. *It can be stated that* these experiments have provided *undeniable evidence* of an autonomic link-up of the limbic area.

S3. The latter finding is *particularly important* in the sense that it cannot readily be explained socioculturally, thus presenting a *new and convincing argument* for brain-based etiology of this disorder.

Examples



S4. Major changes in the business processes and the organizational models are, *of course*, *indisputable reasons* for *drastic* decisions regarding the information systems used by the organization.

S5. *To date no work has been published* on the role of circulating miRNAs in breast cancer—an area where, if feasible, their use as *novel* minimally invasive biomarkers would be an *incredible breakthrough* in our management of this disease.

S6. The possibility of contributing to change the way we communicate with machines is a *very exciting proposition*.

How can I use *seems* and *appears* to admit that I have not investigated all possible cases?



- It *appears* that stochastic processes for which $x = y$ can produce finite dimension values.
- This completes the proof of Theorem 1. Note how this enables us to determine all the Xs and Ys at the same time. Thus *it seems that* some natural hypotheses can be formulated as ..

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



Three areas to call into question regarding the work of other authors:

- Hypotheses that have never really been tested. You want to test them.
- 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 these limitations.

How should I discuss the limitations of my research?



S1. *The limitation of this paper is that the two surveys were not conducted in the same period. This will affect our results in terms of ...

S2. Although the two surveys were not conducted in the same period, this will only affect our results in terms of ...

How should I discuss the limitations of my research?



S3. *One limitation of our research was the sample size, which was too small.

S4. *The unfortunate contamination of a few of our samples may mean that some of our con-clusions are somewhat misleading.

S5. One limitation of our research was the sample size. Clearly 200 Xs are not enough to make generalizations about Y. However, from the results of those limited number of Xs, a clear pattern emerged which ...

S6. 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 ...

What other ways are there to lessen the negative impact of the limitations of my study?



Analytic expressions for the density (1) were not derived, (2) because their interaction depends on the relative orientation of the spheres, (3) thus making integration considerably more complex. (4) Similar complications in the analytical determination of the density, using the same approach that we used, were experienced by Burgess [2011].

- (1) explain the pitfall (i.e. the limitation in your work)
- (2) give reason for the pitfall
- (3) outline consequence of the pitfall
- (4) refer to a similar pitfall experienced by another author

Attribute your limitations to the fact that current knowledge is unable to solve....



(1) A full treatment of our problem using Gabbertas's theory (GT) is complicated to handle in our case, (2) given the complex geometry. (3) In fact, the expressions derived by GT are only available for a few simple geometries [Refs]. (4) Moreover, GT is not well suited to describing the upper regions. (5) An additional problem is that a theoretical description of X is still the target of active experimental and theoretical research. (6) There is little experimental or theoretical information available for the properties of X [Refs]. (7) At the same time, the properties of Y can be described by Burgess's model, (8) however its ability to well describe X is still under investigation.

Conclusions



They must be *clear* and *concise*, and leave the referee with a *good impression*.

The key skills are in knowing what referees and readers expect to find in 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?



1. a very brief revisit of the most important findings
2. a final judgment on the importance and significance of those findings in term of their implications and impact
3. an indication of the limitations of your study (though the Discussion 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

How should I begin my Conclusions? How can I increase the impact of my Conclusions?



S1.* We have here described a linear model with an error specification that is considered appropriate for the estimation of ... We have found significant Evidence of ...

S2.* In this paper we have presented a statistical study of the nature of ... We have shown that it is possible to reason about ...

S3.* In this paper it has been shown how X can be applied to a wide range of ... A novel approach has been introduced to ...

S4.* In this work it has been attempted to analyze simple feedback loops with ... It has been shown that for ...

*: little impact

More examples



ORIGINAL VERSION (OV)

- 1 In this study it is concluded that compression plays an important part in ... It was found that ...
- 2 This work has demonstrated that a number of compounds present in X are responsible for delaying the onset of ...
- 3 We have shown that the crystal structure of X reveals that ...
- 4 It has been suggested in this paper that the localization of X in neurons is a good marker for neuronal viability.

REVISED VERSION (RV)

- Compression plays an important part in ...
In fact, it was found that ...
- A number of compounds present in X are responsible for delaying the onset of ...
- The crystal structure of X reveals that ...
- The localization of X in neurons suggests that it is a good marker for neuronal viability.

How can I differentiate my Conclusions from my Abstract?



Abstract: An increase in storm frequency and intensity is expected for the Mediterranean area. The aim of this study is to assess **the risk of soil erosion** in sub-basin croplands in Tuscany, Italy.

Conclusions: We assessed **the risk of soil erosion** in the Trasubbie (Tuscany, Italy) subbasin croplands by using a scenario analysis.

An important point to keep in mind



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 **into 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.

Use the present simple to refer to established knowledge



- ❖ The theorem *states* that the highest degree of separation is achieved when ...

- ❖ The lemma *asserts* that, for any given strategy of Player 1, there is a corresponding ...

limitations of previous work and the novelty of your work



- *Generally speaking*, patients' perceptions are *seldom* considered.
 - Results often appear to *conflict* with each other ...
 - So far **X** *has never been applied* to **Y**.
 - *Moreover*, no attention has been paid to ...
 - These studies have *only* dealt with the situation in **X**, *whereas* our study focuses on the situation in **Y**.
-
- *As far as we know*, there are no studies on ...
 - *To [the best of] our knowledge*, the literature has not discussed ...
 - *We believe that this is the first time* that principal agent theory has been applied to ...

The End



Thanks for Listening