

Section 5. Discussion as an IMRD component

Unit 1. Discussion: Structural analysis

Today we are here to talk about the structure of the last section and you will learn *Basic components of the Discussion section of a research paper and how this section is structured*.

The title *Discussion* may vary from journal to journal. As we have discussed before, some journals may finish with Discussion, some — end with a subsection titled *Results and Discussion*. And others end with a subsection titled *Conclusions*. In the first two cases the elements that are to be included in the *Discussion* are similar. In journals ending with a *Conclusions* section. The *Conclusion* is short, usually of one or two paragraphs focusing on specific aspects of the Discussion.

The graphic representation of **the structure of a research paper**, as mentioned earlier, is symmetrical because many of the elements of the Introduction occur again in the Discussion/Conclusion in approximately reverse order. The Introduction moves from a general, broad focus to the narrower “report” section of the paper, and the Discussion/Conclusion moves away from that narrow section to a wider, more general focus. The Discussion looks back at the points made in the Introduction on the basis of the information in the central report section.

Let’s have a look again at the **four components of the Introduction**. The Introduction helps us, readers, move into the research article. It establishes the significance of the research topic, provides background information and so on. Following the same pattern in reverse, the Discussion helps us move out of the article.

In the Introduction, the researcher writes about the work of other researchers, creating a kind of research map for the reader to know what kind of research there is in the field.

In the Discussion section, the writer positions his/her study in relation to this research map. **The Introduction** identifies research gaps or describes problems related to existing research. **The Discussion** tells readers to what extent the researcher responded to this gap and resolved the issue. At the end of the **Introduction**, the author provides an overview of the current paper and creates an interface with the content of his research so that the reader can proceed to the main reporting part of the paper. As we will see, in the **Discussion** these elements are revisited in reverse order, which allows the reader to leave the central report section.

Let's have a closer look at the parts of a sample **Discussion section** analyzing **what the writer is doing in each sentence of** the sample.

The best way to figure out what the writer is doing in a sentence is to look **at the grammar and vocabulary clues**. Ask yourself:

- What is the main verb tense?
- What is this tense usually used for?
- Is the tense the same as the previous sentence?
- If not, why did the author change the tense?
- What words did the author choose?

Now, I would like you to read a sample Discussion section that you can see on your screen. The title of the paper is *The Impact of an Extended Stress Reduction Program on Quality of Alloys: Evidence for Long-Term Effectiveness and Future Considerations*. Try to answer the questions mentioned. Continue watching to check yourself.

A sample Discussion section

The Impact of an Extended Stress Reduction Program on Quality of Alloys: Evidence for Long-Term Effectiveness and Future Considerations Discussion

1 Previous research has demonstrated the effectiveness of interventions in improving the quality of alloys (QoA) and reducing stress in metals with various issues; Smith et al.¹⁸, for example, have shown that metals participating in intervention programs experienced improvements in QoA measures such as strength and durability. **2** However, these studies have either been of short duration or have not specifically focused on metals with stress-related disorders. **3** The aim of this study was to investigate the impact of an extended three-month stress reduction program on QoA among a group of metals being treated for stress-related issues, such as corrosion. **4** We found that participation in the three-month stress reduction program was associated with significant improvements in the skills required to enhance QoA in almost all cases. **5** These results extend those of Smith, confirming that a longer and more intensive period of stress reduction training tends to yield more effective skills compared to shorter-term interventions utilizing different methods. (Smith et al., 2011) **6** In addition, the improvements observed in our study were not influenced by factors such as composition or origin of the metals. **7** This therefore suggests that the benefits gained from stress reduction interventions may be applicable to a wide range of metals. **8** Importantly, this study is the first to our knowledge to investigate the effectiveness of extended interventions in metals with stress-related disorders. **9** Our results provide compelling evidence for the long-term involvement with such metals and suggest that this approach appears to be effective in counteracting stress that may exacerbate the issues. **10** However, it is important to acknowledge some limitations. **11** Although our hypotheses were statistically supported, the sample was not reassessed once the program was over. **12** Therefore, future research should include follow-up studies designed to evaluate the long-term retention of skills and their continued impact on QoA in metals.

Revised from: Glasman-Deal, H. (2009). Writing for Non-Native Speakers of English. Imperial College Press, UK. pp. 156-157

I can see that you are back with us! So, what is the writer doing in each sentence of this sample?

In sentence 1 **the writer revisits previous research.**

Why does the writer revisit previous research? Well, two common approaches to accomplishing this were covered in the unit on Results: providing an overview of the section by previewing the content of that subsection with some general statements. And referencing something from the previous sections *to connect the new one with the old.*

As we saw in the Results section, the author may start by *summarizing or making reference* to the procedure or resources used. *Giving an overview of the Discussion* is, however, all but impossible. This is so because, in contrast to the Methodology or Results, the Discussion deals with a wide range of topics.

As a result, many Discussions/Conclusions start off by **mentioning something from the earlier sections**. This can be done in **three ways**: by revisiting the Introduction to restate the aims of the paper, important background factual information, etc.; or *by returning to the Methodology for a review of the justification* for the steps taken or a summary of the steps; or by returning to the Results for a summary of the outcomes attained by the author or by others.

In sentence 2 **the writer goes back to the Introduction to recall a particular methodological flaw in earlier studies**.

Why should the writer revisit the flaws? The writer revisits the gap or problem in the Introduction to remind readers of the flaws in prior methodology that have been addressed in the present work before moving on to the specific distinctions between the Methodology in the present work and that of earlier work, which is the contribution of this paper. *To re-establish the justification or motivation for the research*, the writer repeats significant background factual information at this point in the Discussion. Actually, throughout the Discussion section of research papers, providing background factual information is surprisingly common.

In Sentence 3 the writer **revisits the Methodology used in this study**. To make the reader remember the fundamentals of the method the writer uses the same language as in the Methodology, and frequently mentions important aspects of the method in the Discussion. Note that normally, the Past Simple, Present Simple, or Present Perfect are used in the Discussion section to describe the method or the findings.

For instance: “In this study, Titanium *is used/has been used/was used* to define the size and shape of the turbulent structures. *The Present Perfect or Present Simple* are typical in case there is *a brief Conclusion*. For example: “We *use/have used* Titanium to reconstruct the three-dimensional structure”.

In sentence 4 **the writer revisits and summarizes the results.**

Why revisit the results? One of the main purposes of the Discussion is to move beyond the results, to guide the reader away from an immediate and narrow focus on the results and toward the conclusions and broader implications or generalizations that can be drawn from those results. Do you remember the diagram at the beginning of this video and the reasons why it is symmetrical? Then you can see this.

In sentence 5 the **writer demonstrates the location and integration of the current work** into the overall “map” of this field’s research. This is a feature of the Discussion that has not happened before in any section of the paper. The writer painted a picture of the current state of research in their field for the reader in the brief literature review in the Introduction. The next step is *to demonstrate to the reader how and where this study fits into that overall picture* and how it modifies or affects the research “map” in this field. It is the responsibility of the writer to explicitly state in the Discussion section how their study relates to other published work.

There are many **ways the writer’s work might fit into the framework of current studies:**

- It may have employed a different methodology to arrive at comparable results, which would have an impact on how existing methodologies are perceived; it could have confirmed the findings of a prior study
- It may have contradicted and thus invalidated findings of a prior study

- It may have offered a wholly new or alternative methodology
- It can have extended the findings and thus confirmed the implications of earlier studies, as in this example

Moving on to sentence 6. Here, **the writer recalls one aspect of the results that represents a positive outcome or contribution of this research.** Another very important feature of the Discussion is *a clear focus on the achievement or contribution* of the work. In this sentence, the nature of the achievements is specified through positive language that clearly states the advantages. Although normally writers are aware of what is good about their work and the results obtained. *If they fail to state it explicitly, the reader may not see how valuable the achievements are.*

Is it the same as mapping? *It's similar in intention, but different in content.* The *achievement* itself is frequently stated separately so that the reader can see the value of what has been done and found in this study independently of how it affects the current state of knowledge. *Mapping* identifies where the achievement fits into the overall research picture in this field.

In sentence 7 the writer focuses on **the meaning and significance of the findings** of this study.

Doesn't it repeat the Results? In the video on *the Results section* we **highlighted the importance of drawing implications from research results**, as it helps in developing the direction of the research article towards the Discussion/Conclusion section. Merely restating the results in different words is not sufficient in the Discussion section. It is the responsibility of the writer to provide explanations, suggestions, and implications for why the results occurred as they did, and to discuss the mechanisms behind the findings and observations.

In research writing, the aim is **not** only to obtain and describe results but also to make sense of those results in the context of existing knowledge and provide useful insights about their implications. Researchers should consider how the results relate to the original question or problem, whether they align with previous findings, and if unexpected, offer explanations for the unpredictable outcomes. It is essential to inform readers about what they can reliably take away from the study.

While the Results section focuses on presenting the results themselves, the Discussion section is where the meaning and implications of the results are explored and explained.

In the **Discussion** section, **the language used to state implications is similar to that used in the Results section**, with phrases like “seems that”, “suggesting that”, and “indicating that”. Modal verbs such as “may” and “could” are also frequently employed. This *cautious language* reflects the understanding that scientific research is an ongoing process, and new studies will refine and expand upon previous findings. Therefore, *scientists are careful not to make unqualified generalizations*. The writer of the discussed article follows this approach, as evident from the highlighted words in bold.

In sentence 8 **the writer mentions this work’s novelty**. This sentence shows that *mapping* and *achievement* can be very *similar*, as one of the achievements of this work is the fact that a study of this type has not been done before. However, *none can be 100% sure* there was nothing of the like before in the field of research.

As we can see in this sentence, although effort has been made, the writer still uses the phrase “to our knowledge”. The writers do it in case they have overlooked a study accidentally.

Let’s move on!

In Sentence 9, **the writer elaborates on the implications of the findings**, including potential applications. In this case, the results imply that *long-term involvement should be an aspect of future treatment*. However, it is quite possible that sometimes the work may not have a clear application. You see, some fields, such as engineering, are more practical than others — and research can have many functions: *clarifying a theory rather than looking for an applicable method*.

In Sentences 10 and 11 **the writer outlines the constraints that ought to guide future research**. *The reason for mentioning the limitations of a research in the Discussion section is to give direction to future research*. Therefore, research should be considered in terms of limitations that future research can address rather than limitations inherent in the research field or problems unlikely to be resolved in the near future.

Any time limitations are mentioned in a research paper, positive outcomes like “our hypotheses were supported statistically”, are given close to the limitation to lessen its negative impact. In this example the positive outcome is mentioned in the same sentence.

In the last sentence of this sample **the writer proposes a particular area for future research**. The most insightful studies suggest new lines of inquiry. Numerous **purposes** can be served by asking the research community to follow the work in a particular way. First of all, *it offers researchers a clearly defined project*, which is more appealing than a general suggestion and therefore more likely to be carried out. *It promotes a direct line of continuity from the research*, and studies that directly follow this work will cite this paper, elevating the status of the study. In addition, a study that addresses the shortcomings or challenges of this work *may yield information that is helpful for both ongoing and future research*.

So, based on our sample, here are **the functions of the sentences in the Discussion** section. We can group them into **four basic components**:

- Revisiting previous sections and revisiting general or key results
- Mapping — relationship to existing research
- Achievement, contribution and refining the implications
- Limitations, current and future work and applications

To sum up, we have identified the basic components of the last section of a research paper in IMRD format — DISCUSSION. We have also learnt that:

- Discussion is a reverse order of elements in Introduction
- Discussion helps the reader to distance from the main report and see a bigger picture of the work in the field
- Discussion suggests further steps for the research community and see a bigger picture of the work in the field
- Discussion suggests further steps for the research community

That's all for today. Do some practice tasks and see you in the next video on Grammar peculiarities of the Discussion section.