

Section 5. Discussion as an IMRD component

Unit 2. Discussion: Grammar
peculiarities

Today we are going to talk about Grammar peculiarities of the Discussion section. This unit will cover three language areas which are important for the Discussion: *Tenses, Hedging and Modal Verbs*.

First, let's consider Tenses. In the Discussion/Conclusion section of a research paper, various Tenses are commonly used to present and discuss the findings, summarize the study, and draw conclusions.

Now, I would like you to find the instances of the Tenses in our model. So, what Tenses are used and why?

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

Now, when you are back, check if you have identified the same Tenses as I did. From what we have seen, we can conclude that there are typically three Tenses used in the Discussion: Present Simple, Present Perfect and Past Simple.

The **Present Simple** Tense is often used to state *general truths, facts, or established knowledge*. It is used to *discuss findings that are universally accepted or do not change over time*. For example: “The results **show** that the alloy exhibits improved corrosion resistance.” Or: “The study **confirms** that temperature **has** a significant effect on the material’s mechanical properties.”

The **Present Perfect** Tense is used to *describe actions or events that have occurred in the past but have relevance or implications in the present*. It is often used to discuss recent research or findings. For example: “Previous studies have demonstrated the influence of alloy composition on the material’s electrical conductivity.” Or: “Several experiments have been conducted to investigate the effect of heat treatment on the alloy’s microstructure.”

The **Simple Past** Tense is used to *describe actions, experiments, or observations that were completed in the past*. It is commonly used to present *specific results or findings*. For example: “The tensile strength of the alloy increased with the addition of carbon.” Or: “The corrosion rate decreased when the alloy was subjected to the protective coating.” Etc.

It’s important to note that the choice of Tense depends on the specific context and the nature of the research being discussed. That is why in a quality research paper the Tenses are used consistently and appropriately throughout the Discussion/ Conclusion section to ensure clarity and coherence.

Hedging in research papers *refers to the use of cautious language to express uncertainty or to qualify statements.* It is a common practice to use *hedging in all parts of a research paper*, including in the Introduction, Methods, Results, and Discussion sections. This allows researchers to acknowledge limitations, alternative interpretations, or potential variability in their findings. It helps to maintain objectivity and credibility by avoiding overly definitive or absolute claims.

Here are some common ways hedging is employed in research papers:

1. Modal Verbs
2. Adverbs and Adjectives
3. Tentative Language
4. Comparative Language
5. References to Previous Studies

Let's see how these ways can be expressed in research writing.

Number 1. **Modal verbs** such as “may,” “might,” “could,” and “can” are often used to indicate *possibility, uncertainty, or limited generalizability*. We will have a closer look at the modals later in this video. The examples may include: “The results suggest that the alloy may exhibit improved mechanical properties.” Or: “These findings could be attributed to variations in the experimental conditions.” Etc.

Number 2. **Certain adverbs and adjectives** can be used to *hedge statements by indicating a degree of uncertainty or caution*. Some examples include: “The observed trend is **generally** consistent with previous studies.” Or: “The observed trend in the data indicates **a relatively** strong correlation between the alloy composition and the electrical conductivity.” Etc. We discussed these Grammar peculiarities in more detail in the Results section.

Number 3. **Tentative Language** means *using phrases that convey tentativeness or caution can also contribute to hedging*. Examples include: “It is worth noting that **further investigation is needed** to confirm these findings.” Or: “The evidence suggests a potential relationship between the variables, **but additional studies are required** to establish causality.” Etc.

Number 4. **Comparative language** can be used *to indicate relative degrees of certainty or to acknowledge alternative explanations*. Examples include: “The results are somewhat consistent with...” Or: “The observed results are similar to those reported in the literature...” Etc.

Number 5. **Referring to previous research** can provide *a context for hedging*. It allows researchers *to align their findings with existing knowledge while acknowledging potential differences or limitations*. For example: “Our results are in line with prior studies, but some discrepancies exist.” Or: “The current findings support and build upon previous research, but with certain nuances.” Etc.

Hedging is important as it demonstrates a balanced and cautious approach to drawing conclusions. However, it is essential to strike a balance between expressing uncertainty and maintaining clarity. **Overuse** of hedging **can weaken the impact of the research.** That is why researchers usually carefully consider the appropriate level of hedging based on the nature of their study and the specific context in which their findings are presented.

Now, let's do some practice! Try to find the instances of Hedging in our sample Discussion section (see the picture above). And — yes, you were right if you have the same instances highlighted as the ones on your screen now.

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

Discussion

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Now, we have come to the **Modal Verbs**, a really intriguing Grammar topic. Can you find modal verbs in our model Discussion section? Great! You can do it now, and then continue watching the video to check yourself! You are right — there is only one modal verb here, the verb *should* in sentence 12.

The modal verbs that are commonly used **in science writing** are: *may, might, could, can, should, ought to, need to, have to and must*.

Modal verbs modify the “truth level” of a sentence.

In a sentence like: “The decrease in mechanical strength **was** due to the presence of a crack in the alloy” — there is no modal verb, just the Past Simple tense. This means to us, readers, that the writer is telling us what caused the decrease in mechanical strength. He has some empirical evidence to prove it.

The decrease in mechanical strength **may** have been due to the presence of a crack in the alloy — means that *there is a possible cause for the drop in pressure*; perhaps it was due to a crack in the alloy — and perhaps not.

The decrease in mechanical strength **must** have been due to the presence of a crack in the alloy — which means that *the writer is almost 100% sure that the decrease was caused by the crack* but there is no evidence to prove it.

Modal verbs are extremely useful in both the Results and Discussion sections, where the writers offer the reasons, interpretations and implications of their findings that can be possible, obvious or probable.

Furthermore, modal verbs can imply the following meanings:

- Ability/capability
- Possibility/options
- Probability/belief/expectation
- Virtual certainty
- Advice/opinion
- Necessity/obligation

Now try to classify each modal verb by meaning. Fill in the table and then continue watching to check yourself.

Should, must, can, ought to, may, could, need to, might, have to, cannot/could not	
Meaning	Modal verbs
1. Ability/capability	can
2. Possibility/options	
3. Probability/belief/expectation	
4. Advice/ opinion	
5. Virtual certainty	
6. Necessity/obligation	

Yes, I hope everything is correct and you have exactly the same answers as I do:

- Can** belongs to ability/capability
- May, might, could**, can refer to possibility/options
- Should** and **ought to** belong to probability/belief/expectation as well as to advice/opinion
- Must** and **have to**, and **cannot** or **could not** to virtual certainty
- Must, need to** and **have to** belong to necessity/obligation

Modal verbs are sometimes called “**defective verbs**”. And they are called so for a number of reasons. Firstly, some modal verbs have more than one meaning, like should. Secondly, most modal verbs do not follow standard grammar rules. Some verbs may disappear and others change their meaning in the negative form, or in a different tense. For example: “You must add this to the mixture” means the same as “You have to add this to the mixture”.

But “You must not add this to the mixture” means that “you are not allowed to do so”, which is not the same as “You don’t have to add this to the mixture”. The latter means you can, but it’s not really necessary.

You may be surprised but **can not** and **cannot** don’t mean the same thing at all! *Can not* means possibly not in the same way as may not or might not, but it is rarely used except in structures such as “this can not only damage the sample, it may even destroy it completely”. *Cannot*, on the other hand, means something completely different: it doesn’t mean possibly not, *it means impossible*, like could not.

Modals do not change in tenses. But what if we need to speculate about the past? Then we need to add a Perfect Infinitive (have + the third form of the verb) to the Modal verb. For example: This may be due to the fall in pressure (we speculate about what we see, in general). This may HAVE been due to the fall in pressure – and we refer to something that happened in the experiment, something that we try to explain.

Modals of probability/belief/expectation imply that *we expect something to happen or not to happen under certain conditions*. As in the examples on the screen.

1. Titanium should remain stable if it is kept below 30°C.
2. Titanium should not decompose unless heated above 100°C.
3. By the time the cobalt is added, the crystals should have dissolved in Titanium.
4. This was unexpected; Titanium should not have decomposed at this temperature.

Now try to do some practice and complete the sentences using *could, must, may, should, might, ought to, need to, can, have to*. Make sure you use the right tense and don't forget to use negative forms where necessary. Sometimes more than one option may be possible.

Could, must, may, should, might, ought to, need to, can, have to

1. Perhaps the alloy's weakness was caused by improper composition.

→ The alloy's weakness ***may have been/might have been/could have been caused*** by improper composition.

2. We felt sure that the alloy's weakness was caused by improper composition.

→ The alloy's weakness _____ by improper composition.

3. No way was the alloy's weakness caused by improper composition.

→ The alloy's weakness _____ by improper composition.

4. We don't expect improper composition to weaken the alloy.

→ Improper composition _____ the alloy.

5. It's possible that the alloy's weakness wasn't caused by improper composition.

→ The alloy's weakness _____ by improper composition.

6. I advise you to use a different alloy.

→ You _____ a different alloy.

7. I don't think it was a good idea to use that alloy.

→ It _____ with that alloy.

And, yes, you were right if you have come up with the following options:

1. The alloy's weakness **may have been/might have been/could have been caused** by improper composition.
2. The alloy's weakness **must have been caused** by improper composition.
3. The alloy's weakness **cannot have been/couldn't have been caused** by improper composition.
4. Improper composition **should not weaken** the alloy.
5. The alloy's weakness **may not have been or might not have been caused** by improper composition.
6. You **should/ought to use** a different alloy.
7. It **shouldn't have been used** with that alloy.

To sum up, we have discussed three main tenses used in the Discussion section: Present Simple, Past Simple and Present Perfect. Some ways of hedging to be scientifically diplomatic with interpretations. And meanings and tricks of modal verbs in research writing.

Do some practice tasks and see you in the next video on Vocabulary features of the Discussion section.