

How to Write a Research Paper: Introduction and Discussion

What's the Purpose of an Introduction?

What's the Purpose of an Introduction?

Familiarize and orient

How Does an Introduction Fulfill this Purpose?

How Does an Introduction to a Fulfill this Purpose?

Provides the **context** of your work

Creates your research space, defines gap in knowledge

States your **focus**

i.e., hypothesis, question

Provides **justification** for your work

Why the question is important

Why your work can answer it

*The context, focus, and justification
in the introduction....*

*... set the direction you'll take in
the discussion.*

Macrostructure of a Research Article

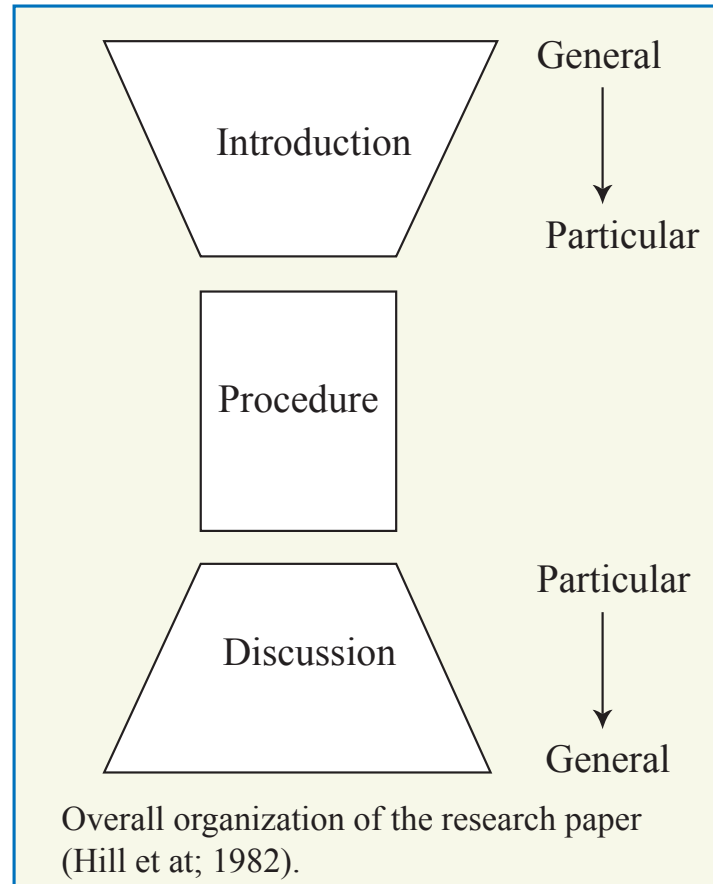


Figure by MIT OCW.

Research Papers Novels

Don't hide your main points or save them for the end... Put your main points up front in the Abstract, Introduction, Results, and Discussion.

What are Some Common Pitfalls in Introductions?

Photo removed for copyright reasons.

What are Some Common Pitfalls of an Introduction Section?

Including **unnecessary background** or being repetitive.

Exaggerating (or understating) the importance of your work.

Using **lackluster** openers and **weak** follow-through in the body of your introduction.

Including **new results** in the introduction section.

Improper tense (Introduction is largely PRESENT tense).

An Example from The New England Journal of Medicine:

- ***New Strains of Bacteria and Exacerbations of Chronic Obstructive Pulmonary Disease*, Sanjay Sethi, M.D., Nancy Evans, R.N., Brydon J.B. Grant, M.D., and Timothy F. Murphy, M.D. NEJM 347:465-471 August 5, 2002**
- Morbidity and mortality among patients with chronic obstructive pulmonary disease are related in large part to acute exacerbations, which occur one to three times per year.^{1,2,3,4,5,6} **Our understanding of the cause and pathogenesis of these exacerbations is incomplete, and the role of bacterial pathogens is controversial.**^{7,8,9,10}
- **In studies performed decades ago**, investigators followed patients with chronic obstructive pulmonary disease longitudinally, with periodic collection of sputum samples for culture, to determine whether there was an association between the isolation of bacterial pathogens in sputum and the occurrence of exacerbations.^{5,6,11} In these studies, the rate of isolation of potential bacterial pathogens from sputum samples during stable disease was identical to the rate during acute exacerbations. This finding led to the conclusion that bacterial pathogens do not cause exacerbations and that their presence in sputum is due to chronic colonization.^{7,12}
- **An increased understanding of the genetic heterogeneity** among strains of a bacterial species exposes a major limitations of the older cohort studies.¹³ At the time of these studies, it was not possible to differentiate among strains of a pathogenic bacterial species. Therefore, all strains isolated from sputum over the course of the study were regarded as identical if they belonged to the same species. This approach did not allow for the detection of changes in strains over time. More recent studies have shown that the immune response to bacterial pathogens after exacerbations of chronic obstructive pulmonary disease is characterized by considerable strain specificity, suggesting the importance of differentiation among strains of bacterial pathogens isolated over time from patients with chronic obstructive pulmonary disease.^{14,15,16}
- **We hypothesized** that the acquisition of a new strain of pathogenic bacterial species in a patient with chronic obstructive pulmonary disease who has no preexisting immunity to the strain leads to an exacerbation. **To test this hypothesis**, we conducted a study in which we obtained sputum samples monthly and during exacerbations in a cohort of patients with chronic obstructive pulmonary disease. Bacterial strains isolated from sputum obtained during periods of stable disease and during exacerbations were subjected to molecular typing. **This report represents the results from the first 56 months of this study.**

Photo of squid removed removed for
copyright reasons.

Discussion and Conclusion

The squid technique:

The author is doubtful about his or her facts or reasoning and retreats behind a cloud of ink.

What's the Purpose of a Discussion Section?

Photo removed for copyright reasons.

What's the Purpose of a Discussion Section?

Photo removed for
copyright reasons.

Marcia Angell, Former Editor-in-Chief,
New England Journal of Medicine.

Summarize findings presented
in the results section.

Cite supporting literature.

Explain discrepancies between
your findings and previous
reports.

Point out **shortcomings** of your
work.

What's the Purpose of a Discussion Section? (continued)

Define unsettled points.

Discuss **theoretical and practical implications** of your work.

End with a short **summary or conclusion** about the work's importance.

From Day, Robert A. *How to Write and Publish a Scientific Paper*. 5th ed. Phoenix, AZ: Oryx, 1998. ISBN: 1573561657.

Scanned text removed for copyright reasons.

Source: International Committee of Medical Journal Editors (ICMJE), "Uniform Requirements for Manuscripts Submitted to Biomedical Journals (Updated October 2001)."

Remember This?

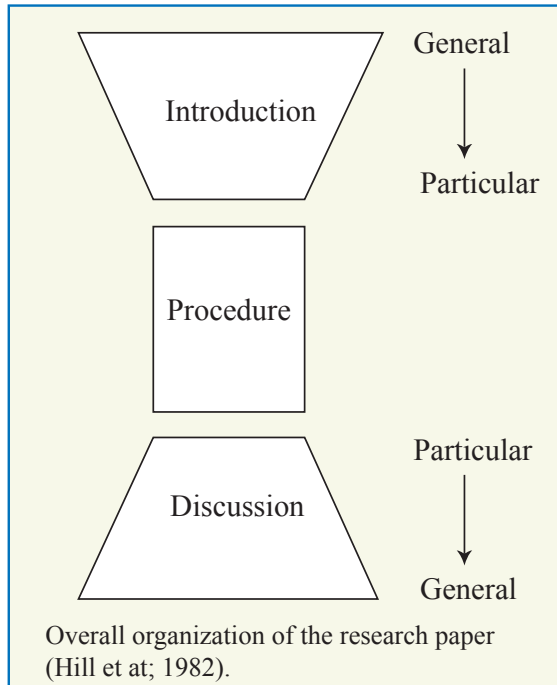


Figure by MIT OCW.

- The Introduction and Discussion are like **bookends** around your Methods and Results.
- They **integrate** your original findings with the literature and current knowledge.
- **Context, Justification, and Focus** addressed in the Introduction are echoed in the Discussion section:
 - **Focus = Summary of findings**
 - **Context = How do findings fit in?**
 - **Justification = Implications of your work** (and next steps).

What Makes a Discussion Section Tough to Write?

The discussion section is **harder to define** than other sections of a research paper.

Figure removed for
copyright reasons.

It requires **perspective, knowledge, and thought.**

You may have begun **writing before the conclusions were formulated.**

Your data may be weak or **inconclusive**

What are the Pitfalls of a Discussion Section?

Long, wordy arguments that **lack of focus** and meander.

Failure to follow through with arguments begun in the introduction.

Failure to **focus on current results**.

Speculating too much or not enough.

Improper tense - Discussions are written in the present tense.

Hedging excessively.

Excessive Hedging

from *Successful Scientific Writing*, 2nd ed.

Photo of hedgehog removed for
copyright reasons.

“The cause of the degenerative changes is unknown
but *possibly* one cause *may* be infection by a
presumed parasite.”

Rule of thumb: One hedge word per sentence!

Common Hedging Words

from *Successful Scientific Writing*, 2nd. Ed.

nouns	adverbs	verbs
supposition	presumably	appear
idea	probably	postulate
speculation	possibly	suggest
conjecture	apparently	seem
possibility	not unlikely	may be
inference	seemingly	speculate

Introduction Checklist

- ❑ **Summarize** pertinent **literature** and use it to define a **gap in knowledge (context)**.
- ❑ Make the gap in knowledge the **focus** of your work expressed as a specific **question** or **hypothesis**.
- ❑ Justify this investigation - what might it add to the literature, why is this important or novel?

Discussion Checklist

- ❑ **Summarize findings** presented in results.
- ❑ **Cite supporting literature.**
- ❑ **Explain discrepancies.**
- ❑ Point out **shortcomings** of your work.
- ❑ Define unsettled points.
- ❑ Discuss **theoretical and practical implications.**
- ❑ End with a short **summary or conclusion.**

Good Luck