20.109
Writing Introductions and Discussions

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Macrostructure of a Research Article

- **Introduction** provides general field or context.
- **Methods** follows a particularized path.
- **Discussion** moves from specific findings to wider implications.

![Diagram](image.png)
What is the form and function of an Introduction?

- An introduction is a method to familiarize and orient your readers.
- The content of an introduction depends on its purpose and the audience.
- All models share a direct approach. Don’t hide your main point or save it until the end of the paper.

Introductions across disciplines contain the essential elements of context, focus, and justification.

**Context**: Orient your reader to the published literature related to the topic and to essential background information.

**Focus**: Define the research space, stake out territory. What questions are you addressing? What is your hypothesis?

**Justification**: Show how your work fits into and extends previous work. Argue for the importance of your work.

Swales (1990)
CARS Model of Introductions

Create a Research Space

1. Re-establish significance of research field.

2. Situate actual research in these terms.

3. Show how this niche will be occupied and defended.

Swales (1990)

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.
- Not grounding the work in a **context** that will be important to your reader.
- Not **focusing** on a clear and compelling research question or hypothesis.
## Tips on Writing Introductions

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### CONTENTS

**What is the problem?**
- Describe the problem investigated.
- Summarize relevant research to provide context, key terms, and concepts so your reader can understand the experiment.

**Why is it important?**
- Review relevant research to provide rationale. (What conflict or unanswered question, untested population, untried method in existing research does your experiment address? What findings of others are you challenging or extending?)

**What solution (or step toward a solution) do you propose?**
- Briefly describe your experiment hypothesis(es), research question(s); general experimental design or method; justification of method if alternatives exist.

### REQUIREMENTS, ADVICE

| Move from general to specific: |
| The problem in real world/research literature → your experiment |

**Engage your reader:** answer the questions, “What did you do? and “Why should I care?”

**Make clear the links** between problem and solution, question asked and research design, prior research and your experiment.

**Be selective,** not exhaustive, in choosing studies to cite and amount of detail to include. (In general, the more relevant an article is to your study, the more space it deserves and the later in the Introduction it appears.)

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### Guidelines for Introductions from Two Scientific Publishers:

**From the International Committee of Medical Journal Editors:**
State the **purpose** of the article and summarize the **rationale** for the study or observation. Give only strictly pertinent references and **do not include data or conclusions** from the work being reported.

**From the American Society for Microbiology:**
The introduction should **supply sufficient background information** to allow the reader to understand and evaluate the results of the present study without referring to previous publications on the topic. The introduction should also **provide the hypothesis that was addressed or the rationale** for the present study. Use only those references required to provide the most salient background rather than an exhaustive review of the topic.

Guidelines for Introductions are consistent across journals and, often, scientific fields.
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. Our understanding of the cause and pathogenesis of these exacerbations is incomplete, and the role of bacterial pathogens is controversial. 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. 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.

An increased understanding of the genetic heterogeneity among strains of a bacterial species exposes a major limitation of the older cohort studies. 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.

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.

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 Previous Volume 347:465-471 August 5, 2002
What is the Purpose of a Discussion Section?

- **Summarize findings** presented in the results section.
- **Cite supporting literature.**
- **Explain discrepancies** between your findings and previous reports.
- Point out **shortcomings** of your work and define unsettled points.
- Discuss **theoretical and practical implications** of your work.
- End with a short **summary or conclusion** about the work’s importance.

Questions You Will Address in a Discussion Section:

1. What did you expect to find, and why?
2. How did your results compare with those expected?
3. How might you explain any unexpected results?
4. How might you test these potential explanations?
Tips for Writing a Discussion Section

“This is the place to interpret your results against a background of existing knowledge. Explain what is new in your work, and why it matters. Discuss both the *limitations* and the *implications* of your results, and relate observations to other relevant studies. State new hypotheses when warranted, clearly labeled as such. Include recommendations, when appropriate.”

More Tips from the UW-Madison Writing Center

<table>
<thead>
<tr>
<th>Questions to address:</th>
<th>How to address them:</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do your observations mean?</td>
<td>• <strong>Summarize</strong> the most important findings at the beginning.</td>
</tr>
<tr>
<td>What conclusions can you draw?</td>
<td>For each major result:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Describe</strong> the patterns, principles, relationships your results show</td>
</tr>
<tr>
<td></td>
<td>• <strong>Explain</strong> how your results relate to expectations and to literature cited in your Introduction.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Explain</strong> plausibly any arguments, contradictions, or exceptions.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Describe</strong> what additional research might resolve contradictions or explain exceptions.</td>
</tr>
<tr>
<td>How do your results fit into a broader context?</td>
<td>• <strong>Suggest</strong> the theoretical implications of your results.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Suggest</strong> practical applications of your results.</td>
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<tr>
<td></td>
<td>• <strong>Extend</strong> your findings to other situations or other species.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Give</strong> the big picture: do your findings help us understand a broader topic?</td>
</tr>
</tbody>
</table>
Eight Common Components of a Discussion Section

1. Background information
2. Statement of results
3. (Un)expected outcome
4. Reference to previous research
5. Explanation
6. Exemplification
7. Deduction and Hypothesis
8. Recommendation

What is the Purpose of a Conclusion?

“Besides presenting an analysis of the key results in the conclusion sections, you also give a future perspective on the work. In some documents that future perspective might be recommendations. In other documents that future perspective might be a nod to the direction in which your research will head. A third kind of future perspective is to mirror the scope and limitations that you presented in the beginning of the document.”
What are the Pitfalls of a Discussion/Conclusion Section?

- Including **too much information** (wordy arguments, not focused, meandering, etc.).
- **Failure to follow** arguments set up in the *introduction*.
- **Failure to** focus on the *current results*.
- **Speculating** too much or not enough.
- **Improper tense** (Discussion largely in present tense).
- **Hedging** excessively.

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**Excessive Hedging**

“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

<table>
<thead>
<tr>
<th>nouns</th>
<th>adverbs</th>
<th>verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>supposition</td>
<td>presumably</td>
<td>appear</td>
</tr>
<tr>
<td>idea</td>
<td>probably</td>
<td>postulate</td>
</tr>
<tr>
<td>speculation</td>
<td>possibly</td>
<td>suggest</td>
</tr>
<tr>
<td>conjecture</td>
<td>apparently</td>
<td>seem</td>
</tr>
<tr>
<td>possibility</td>
<td>not unlikely</td>
<td>may be</td>
</tr>
<tr>
<td>inference</td>
<td>seemingly</td>
<td>speculate</td>
</tr>
</tbody>
</table>

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**Neurobiology**

*Cortical auditory signal processing in poor readers*

(Dystonia / specific language impairment / auditory cortex /
ssh/magnetoencephalography / enterocinaphography)

Srikanth Nagarajan*†, Henry Mahncke*, Tanya Salz*, Paula Talbott*†, Timothy Roberts*, and Michael M. Merzenich*†*†
DISCUSSION

The study results show that the auditory response functions differ in several respects from the ordinary case, and in particular that the individual and subject effects are similar. It demonstrates that an individual's response function is not identical to that of another, but is significantly different. The study also shows that the individual's response function is not identical to that of another, but is significantly different. The study also shows that the individual's response function is not identical to that of another, but is significantly different. The study also shows that the individual's response function is not identical to that of another, but is significantly different. The study also shows that the individual's response function is not identical to that of another, but is significantly different. The study also shows that the individual's response function is not identical to that of another, but is significantly different.

How do these aspects of the response function observable in the study relate to the one observed in previous experiments? An initial stimulus event appears to generate strong but normal natural inhibition. Subsequently, the response to the second stimulus is delayed. Along with smaller initial natural inhibition visible in Fig. 3 (c), we have a 200 ms delay. Whereas after the first event, there is a large difference in the distribution response of humans and the subject's response, e.g., in the level of initial sound produced, this difference is not visible in this figure. Clearly, these findings directly relate to experiments on the response function of human subjects and the 'temperament' of individual species, which have been conducted only in normal conditions (16-18).

The average response function observable in this case is a superposition of the independent responses of different species, as well as the interactions between species, and may be interpreted in terms of the fundamental principles of natural selection. A more detailed analysis is needed in order to understand the underlying mechanisms that govern these phenomena. The results obtained so far are consistent with the general idea that the response function is a fundamental property of the system under study. However, further investigation is necessary to understand the mechanisms underlying these phenomena in more detail.

Additional experiments are needed to confirm these results and to understand the underlying mechanisms. Further studies are necessary to determine the factors that influence the response function and to understand the mechanisms underlying these phenomena. The results obtained so far are consistent with the general idea that the response function is a fundamental property of the system under study. However, further investigation is necessary to understand the mechanisms underlying these phenomena in more detail.
CONCLUSION

This study provides little evidence that prenatally exposed individuals have an emerging "deficit" in their neural processing abilities not readily accessible by way, paralleled by a fundamental difference in the fidelity of neural processing of delayed differences by our memory and rapidly changing association rules. Where adapted with robust psychophysical and electrophysiological studies, these data clearly suggest that this abnormal early-processing "problem" in at least one myelinating impaired small is lifelong. We emphasize that the disconnection at a critical early developmental time points and the contribution of "top-down" effects on receptive deficits. Differences could potentially arise at a developmental point or within multiple cognitive systems derived from general language learning and usage or both fundamental deficits impact memory, or awareness critical for language development and processing. Nevertheless, because the auditory cortex represents a major gateway for acoustic information entering the neural speech production system, these findings strongly suggest that auditory speech in terms apparatus while develop within the corporal process of the human brain. Such findings indicate that deficits in language learning and usage could more widespread consequences for speech and language learning, representation, and usage and it adds to the evidence of a biological and molecular basis for speech and language learning, representation, and usage.

ACKNOWLEDGEMENTS

Figure 11 from the study and Mary Mote provided excellent technical assistance for their experiments. This work has been supported by Grant 5R01 DC001744-07 from the National Institute on Deafness and Other Communication Disorders. We thank Drs. Janice Mote and Arvind Venkataraman for insightful and helpful comments on the manuscript. This research was supported by the National Institute on Deafness and Other Communication Disorders.

Data Set: Annual Deaths in the United States from Substance Abuse, 1988

<table>
<thead>
<tr>
<th>Substance</th>
<th>Annual Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>346,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>125,000</td>
</tr>
<tr>
<td>Alcohol &amp; Drugs</td>
<td>4,000</td>
</tr>
<tr>
<td>Heroin/Morphine</td>
<td>4,000</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2,000</td>
</tr>
<tr>
<td>Marijuana</td>
<td>75</td>
</tr>
</tbody>
</table>

Task: Draw three conclusions from these data.