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## **Navigating the Peer-reviewed Journal Article**

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Peer reviewed research articles serve as the backbone of knowledge and best practice. However, they are not the easiest articles to wade through. Often, the authors assume a level of education in the field and a basic understanding of statistics. This can limit a person's ability to utilize these tools that could ensure they are on the forefront of the field. The first step to reading these articles is learning how to navigate them and what is stated in each part.

### **Abstract**

Typically, the first part of most journal articles is the abstract. In short, this is a brief summary of the work. In reality, it is a compressed version of the major findings and conclusions. The topic and background of the research or article is not discussed in depth. The main steps of the procedure and major data are briefly included along with pertinent statistical figures.

However, it is important to note that this by no means is a substitute for the content in the article. Typically, not all the data is included. As a result, it is difficult to tell to what extent the article addresses the question. Similarly, not all of the methods are provided, which could be pertinent. And, no background information is provided.

With this in mind, the abstract can be a powerful piece of text. Rather than reading an entire article to find out if the contents are relevant, a small section provides sufficient information to indicate if further reading would be beneficial. The content can also help with organizing ideas and research.

### **Introduction**

In a primary research article, the first section is a combination of an introduction as well as a review of literature. In this, the author provides pertinent background information on the topic this includes past research and its findings, why the topic is of interest, and the benefit hoped to be gained by the current work.

The review of past research is a valuable tool. First, it can catch the reader up on explaining the topic and any new findings. The difficulty with this comes with that the reviews of literature are not necessarily at the introductory level and may require extensive knowledge. For instance, a research article looking at the immune system would likely be written for an audience who understands what surface antigens are on cells. This section of the paper usually highlights conflicting data and research on the given topic. This not only informs the reader that there are discrepancies, but also highlights the limitations that may be imposed in the selected article. The review of literature often identifies weaknesses in past studies as well. This can include the research not translating to an application setting, a study not being sufficiently controlled to isolate the variables, and inherent design flaws. The writing style is not insulting or condescending when identifying these limitations, but allows for identification of what the work does and does not provide.

The final section of the introduction typically deals with the study being presented. The hypothesis being tested is stated and any not yet identified variables are defined. This is usually the last paragraph of this section. At this point, the authors do not typically provide arguments for or against their hypothesis as this has been addressed in the previous text.



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## Methods

The methods section may seem like nothing more than a long narrative, but it provides large quantities of information as to what the data represents, how it can be applied, and the validity of the study. One item of concern is the statements on volunteer population and how they were acquired. For instance, a subject pool of twenty volunteers from a local cycling club in winter can be very different than ten volunteers from a racing team at the end of a season. For some variables, this can be a substantial difference, while not affecting others. In training studies, exercise prior to the study is often addressed in this portion as well as any normalization of the diet. The methods also include how measurements are made and any calibrations to equipment. Often, the equipment and methods require a high level of technical knowledge. While it is not regularly acceptable to assume that the designers of the study performed the technical procedures appropriately, at times this practice is necessary. This section of information also serves for the researchers to eliminate any arguments on their findings that could be attributed to procedural compliance.

The actual study design is also explained in this section. This is significant as not all methods are created equal. The least powerful compares data at two different points in time. This can indicate a possible interaction between variables, but does not indicate any form of causality. While this is a useful tool, caution has to be used when interpreting data due to the lack of researcher intervention. Another design measures a variable in a group, performs some sort of treatment, and then compares the variable afterwards. This, however, still leaves the effects of various outside influences on the data. The preferred methods involve a minimum of two groups—a treatment group and a control group. All the participants are treated the same except the treatment groups receive an intervention and a control group is given a placebo. This limits the number of outside factors affecting the data. There are variations of this design, but the strongest designs require these two groups at a minimum.

In the methods section, statistical analysis of the data is also often included. There are a number of tests that can be run for various research designs. While these methods are important to understand for proper interpretation of the data, this topic is well beyond the scope of this article.

## Results

The results section lays out what the data actually was. It does not, however, interpret the data. It has to be remembered that the data is the information about the groups in the studies, not the individuals. As a result, most information is posted as the mean for the group with a subsequent standard deviation, often typed in the format of mean (standard deviation). The standard deviation shows how much variation is within a group. For example if the mean (SD) age of two groups are 21 (2), and 22 (9), the first group has most of its members around the mean age while the second group has a wider spread of ages. Typically, basic descriptive values about the groups tested are given. This can include, age, height, mass, and other pertinent variables. Values on testable variables are also given, even if they may not be directly related to the actual measurements. For example, a baseline  $VO_2$ max may have been measured and reported in a study to see if an intervention decreased one mile run times. Up to this point, the mean (SD) format can be very useful to a reader. It offers the opportunity to evaluate if the participants fit the description of the authors. For example, if it was stated that the participants were well trained athletes, one would expect a  $VO_2$ max higher than 45 ml/kg/min in a study looking at cyclists. It also provides information on how alike the participants are, which can have implications later on in data interpretation.



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The most sought after section of the results involves the tested parameters and corresponding statistics. In an experimental design, the mean (SD) of the studied measurements are given pre and post treatment. The values in the corresponding statistical test are also stated. These values reveal if there was a difference between the two given measurements. The figure given corresponds to the type of statistical test run with p,t,r,  $r^2$ , and other figures provided. These are often stated in the format of t=123. At the very basic level, the most common and applicable figure is the p value. The definition of this value would require an in-depth explanation of type I and type II errors, but, in a very simplified explanation, it indicates if the value between the two groups was significantly different. In order to be considered significantly different, the p value must be less than 0.05, unless otherwise stated. What this means is that there was a consistent measurable difference between the two groups. Caution has to be used with the term “significant difference” as this is relative to the statistical analysis. A significant difference could be the average 5K run time decreasing by 3 seconds. Significant, in this sense, does not mean larger, but rather measurable across the group. Much more time can be spent on appropriate statistical tests and analysis, but these abbreviated definitions should suffice for the individual new to reading scientific literature.

## Discussion

While the results state what the data is, the discussion portion states what it could mean. It may be the inclination to skip to the discussion section when reading these papers, but that could be detrimental due to the fact that this is the author’s interpretation of the data. Essentially, the researchers make an argument for what they feel their data demonstrates. This does not necessarily mean that is what it says. As a result, it is imperative to read the entire article to identify strength and weaknesses in the author’s discussion.

In this section, authors compare their data to previous works and demonstrate where the information fits in to the current body of knowledge. This can include pointing out that their information is not consistent with the results of another study and possible explanations. The practical aspect of the study is also given. Sure, we now know what the study shows, but what can we do with this knowledge? And, how can it affect current practice?

The researcher’s perceived strengths and weaknesses of the study are also identified. And with this goes recommendations for future works. This can range from redoing the current study with a minor variation or performing significantly different studies to evaluate a factor that may have inadvertently affected the data. It has to be remembered that most of the time the results from one study are not significant enough to change practice, but rather serves as a small part shaping policies and procedures.

## References

Throughout the article, works are cited to give appropriate credit to authors as well as identify where the researcher drew his or her information. This ensures the arguments made are sound and have data to back them. The reference section gives the full citation of these works and can be a valuable tool. First, it allows a reader to have a listing of works on similar topics for further research. This is significant when attempting to look in to a topic in depth. Additionally, if there is doubt in the claims an author makes, a reader can then find the original source and verify the claims. While this section does not directly contribute to the content, it is essential in providing validity to claims

Each part of an article serves a distinct purpose. Understanding each role can make understanding the data easier



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as well as allow for quicker referencing. Even with a firm grasp on the organization of these articles, it is important to read with a critical eye in an attempt to discern what the data truly says.



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## Quiz Questions

Name:

USAC #:

Email:

1. The hypothesis being tested is typically found in
  - a. beginning of the methods
  - b. end of the introduction
  - c. results/data section
  
2. What is a weakness of observational studies that do not have researcher intervention?
  - a. They require a large number of participants
  - b. Statistical analysis is not possible
  - c. Causality is not tested
  - d. Researches often misinterpret the data
  
3. If blood was drawn in a study, what section would be checked to insure the samples were spun at the proper velocity?
  - a. Methods
  - b. Introduction
  - c. Discussion
  
4. When comparing the one repetition max in a study, the control and treatment groups have mean (SD) values of 85kg (7) and 86 (4), respectively, at the conclusion of the study. Statistical analysis revealed  $p= 0.048$ . Which of the following is the best interpretation of the data?
  - a. The treatment led to a significantly higher one repetition max in the treatment group.
  - b. The treatment did not cause a significant change in the one repetition maximum between groups.
  - c. The treatment group started out with a higher one repetition max than the control group.
  
5. The discussion section:
  - a. identifies what the data is interpreted to mean.
  - b. only identifies perceived weaknesses of the study.
  - c. serves as summary of the article.
  
6. What section can I read to verify that a calibration procedure was appropriate for the equipment used in a study?
  - a. Introduction
  - b. Methods
  - c. Discussion
  - d. Abstract



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7. An individual finds the incidence of skin cancer has dropped every year over the last fifteen years. They also note that the number of cars with tinted windows has increased annually over the same period. These data indicate:
- Tinting car windows causes a decrease the incidence of skin cancer
  - The two follow an inverse trend and may have a relationship
  - The two have nothing in common as one is increasing while the other is decreasing
8. If I'm having trouble remembering what results of the study mean, I should return to:
- The introduction
  - The results
  - The discussion