

Analyzing Research Articles: A Guide for Readers and Writers¹

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The critical reader of a research report expects the writer to provide *logical and coherent rationales for conducting the study, concrete descriptions of methods, procedures, design, and analyses, accurate and clear reports of the findings, and plausible interpretations and conclusions based on the findings*. The literature review is generally focused on providing two rationales. The first is a rationale for the research question or hypothesis – that the author’s purpose is to generate evidence to answer an important research question. These questions might reflect an addition of knowledge to a field by filling a gap in understanding, a resolution of some controversy, or a practical application of some body of knowledge to remedy some problem. Thus, the first rationale serves to persuade the reader that the author’s selection of a research question is nontrivial and follows from the existing literature on the topic. The second rationale is intended to justify the methods used in the study and their appropriateness for generating valid and reliable evidence to answer the research question posed.

In addition to the two rationales the author presents in the Introduction, the author also typically presents a Methods and Design section in which the process of conducting the research is reported. The author then typically presents the Results or Findings section. This is the part of the study in which the author presents the outcomes of the analyses of the data. While conclusions are not typically included in this section, the analyses and the results of the analyses should provide a response to the research question and be consistent with the type of data collected.

The final element of the study appears in the form of the Discussion, Conclusions, or Interpretation section. The term is frequently dependent on the type of the research and the style of the publication to which the article is submitted. This section is where the author presents the implications of the findings. In this case, the author draws on the evidence, findings, and observations presented in the results section and literature from the field to argue for particular interpretations or set of conclusions. These should be related to the initial research question. Additional arguments may be included that concern the relevance of the findings for future research. In addition, this is the section where the researcher presents potential limitations of the study.

An important part of a careful and critical reading of a research article is understanding and evaluating these elements. The more effectively an author builds each of these elements, the stronger the research paper will be. However, you will find that some authors do not necessarily present strong, valid arguments for the importance of their research question, their methods, and/or their conclusions based on findings. So, in order for you to form reasonable and valid arguments in your own papers, you are well advised to attend to the way other authors craft their arguments. In your literature review, you are ethically bound to read your sources completely and critically and to include only those studies that reflect a scientific approach to inquiry. In addition, you are ethically bound to present divergent perspectives on your topic should you discover such divergence. The following guidelines reflect one perspective on the standards to which readers might hold authors of research articles and standards to which authors might hold themselves.

1. Rationale for the research question. (Introduction and Literature Review)

- **Does the author, in the initial portion of the article, provide an overview of the problem to be addressed in the study?**
 - This might be a statement of the problem or research question following some introductory remarks. This helps the reader form a framework about what is to come in the article and make a decision about whether the article fits the reader's purpose. The structure of this introductory statement of the problem typically provides a sort of outline for the organization of the introduction. This is characteristic of authors who craft articles that appeal to readers.
- **Did the author present evidence of knowledge of the topic of research through references to and descriptions of *relevant* and *current* research?**
 - Knowledgeable authors typically provide evidence in the form of summaries of major empirical findings and positions on some issue. These summaries flow from one to the next as the author builds the case for the importance of the research question or problem. The way the author makes the transition from one topic to the next is also an indication of the level of knowledge the author possesses about some topic. The summaries are well organized and the logical pathway from one topic to the next is smooth and obvious when the author is knowledgeable and the manuscript is prepared and edited with the audience in mind. While in some cases it is important to present historical perspectives, it is critical that the author report the most recent findings related to the problem. Incomplete or out-of-date literature reviews typically receive less than favorable ratings from editors and often lead the author to use designs that are not the most effective.
- **Did the author address the major current theoretical perspectives on the problem at hand?**
 - In addition to relevant and recent empirical studies, if major theoretical issues are being addressed, authors are well advised to present those perspectives in concise, accurate, and fair language. Lengthy discourses on a particular theory when a brief summary with citations for original sources might be sufficient, take away from the impact of the article.
- **How did the author make the case for the importance of the research question?**
 - Did the author convince you of the importance—why? Why not?
 - When you completed reading the introduction, did you feel that the issue(s) addressed in the study was significant given the topic? You might not find the article focusing directly on the topic for which you were searching, but given the theme, did the author make the case for the question or problem being addressed? What was it about the author's work that convinced you? Authors tend to build the rationale for a particular issue by answering important questions. A sample of the goals authors have for their research includes:
 - filling a gap in existing knowledge.
 - resolving a conflict between existing theories/interpretations of data.
 - explaining why conflicting findings have been reported in the literature.
 - determining the impact of some intervention or treatment.
- **Does the author's rationale form a coherent argument for the research problem through the use of sound logic and relevant citations?**
 - Here, the author's arguments for the importance of the question and the author's conceptualization of the issue are the main points. If the author proposes to address a gap in the existing knowledge about some issue, has the author presented arguments to support the

existence of a gap in knowledge. If the author is evaluating some intervention or practical application, has the author provided evidence that the application is based on empirical evidence and that it addresses some significant problem?

- **Does the author end the introduction with a concise and focused summary and statement of the problem or research hypothesis?**
 - Authors who are successful in writing research articles tend to end the introduction and literature review with a brief summary of the major points and a statement of the specific question or problem addressed in the study. For quantitative studies, it this is often stated as a statistical hypothesis. However, whether the study focuses on a qualitative or quantitative question, the statement of the particular direction of research is critical for the reader. In most cases this is stated in a sentence or two. As in the initial statement of the problem at the beginning of the introduction, this provides the reader with an anticipation guide for reading and evaluating the sections that follow.
- **Does the Introduction overall make sense logically and empirically?**
 - Upon completing the Introduction, the reader of a well crafted article will have a clear understanding of the research question or problem to be investigated. The reader will be convinced that the author has a clear understanding of relevant and current literature and has presented a clear organization based on that knowledge and logic. Readers, especially new researchers, sometimes become overly concerned that a particular study familiar to the reader has not been cited or that a famous person who has conducted research or written in the area has not been cited. Remember, this is of concern only to the extent that the writer has, by omitting the particular citation, demonstrated a gap in the logic of the rationale. If there is a perspective not addressed, that in itself might be a stimulus for the reader to conduct a study to test that particular perspective.

2. **Methods and design of the study used to answer the research question.**

- This section typically follows the Introduction and Literature Review. The author's task in this section is to provide a clear and concise description of how the study was conducted. In this section, the author typically includes several pieces of information. These are most frequently labeled with subheadings. These sections often include descriptions of the participants, materials or assessment instruments, any interventions or treatments administered to the participants, the procedures used to test or evaluate participants' performance in the study, and, frequently, a section describing the strategies used to analyze the data collected, whether qualitative or quantitative data. The level of description in this section should be sufficient for a reader to repeat the study with a different sample of participants. However, lengthy and quite detailed descriptions might best be placed in an appendix. Another strategy is for the author to provide a footnote noting how a reader might acquire the more detailed descriptions or more complete materials. In the review process, however, editors and reviewers may wish to see such documentation.
 - Participants—This section will provide the reader with a clear description of the individuals who participated in the study—those from whom the data were collected. It is customary in this section to provide data on the characteristics of the participants that are related to the study. So, for example, this section might include average age (with standard deviations) for each relevant group of participants (e.g. males, females;

prisoners in minimum security prisons for different types of crimes; pupils from urban schools or rural schools), frequency data for relevant groups (e.g. number of males or females; number of prisoners in minimum security prisons for different types of crimes; number of pupils from rural or urban schools; proportionate representation of racial or ethnic groups).

The reader is best served when the researcher includes sufficient information to allow the reader to understand how the participants were selected for the study and how principles of ethical research¹ with human participants were followed (e.g. participation was voluntary, participants were informed of their rights to withdraw from the study, anonymity of participants was guaranteed, confidentiality of data was assured). The reader should find the participants selected for the study and the strategies for selecting the participants make sense given the rationale in the Introduction and Literature Review and the research question, problem statement or hypothesis.

- Materials and assessment instruments used in the study—This section will provide the reader with information about any tests, observation checklists, instruments, surveys, questionnaires, or interview items selected or developed for the study. Several questions about the materials and instruments should be answered for the reader. These include:
 - Are the materials and assessment devices consistent with the research question or hypothesis?
 - Do materials and assessment devices match the characteristics of the participants?
 - Is there evidence for the validity and reliability of the instruments?
 - If the author developed the instruments, how did the author determine their validity and reliability?
 - How are the instruments or measures used in the study analyzed or scored? The response to this question should include clear and concise descriptions of scoring schemes. If the scoring requires multiple raters, the author is advised to include descriptions for obtaining inter-rater reliability or inter-rater agreement.

For other materials such as videotapes, texts, or any instructional materials designed for or used in the study, a description that includes how the materials were developed or selected and their relevance for the research question, problem statement, or hypothesis are typically provided. The materials themselves may not necessarily be included, but authors typically provide instructions for the reader to gain access to the materials.

- Procedures for collecting the data and conducting the study--Here the author's purpose is to provide the reader with a description of the participants' experiences in the study and the ways the author and other researchers interacted with the participants. Articles typically include descriptions of the setting. (E.g. in the participant's home; a classroom in a school; a face-to-face interview in a room located in a university building) in sufficient detail to allow the reader to judge whether the setting was consistent with the research question and the characteristics of the participants. In addition, the steps in the process of collecting data and interacting with the participants are also included. Again, descriptions are best when they are clear, concise, and provide the reader a picture of what occurred in the research setting (E.g. surveys were given to participants during a group meeting; participants were asked to read a text and then write what they could remember; pupils were observed during regular classes).

The author of the study is well advised to provide other information necessary for the reader to understand how the data were collected and how the participants were involved in the study. Remember, the purpose of this section is twofold. First, the reader relies upon this section to evaluate the adequacy of the procedures in leading to an answer to the research question. Second, should the reader wish to repeat the study, the information within this section will provide adequate information for doing so.

- Analysis of the Data—This section sometimes is placed in the Methods section and is sometimes included as an introductory paragraph of the Results section. The decision about where to place this section depends on the flow of the article or the format favored by the journal selected. One way to make the decision about the placement of this section is to refer to articles published in the journal to which the article is to be submitted. Should the work be for a thesis or dissertation, the author might refer to style guides adopted by the university in question. Regardless, in this section the author describes the strategies used to analyze the data. Whether the data are qualitative and in the form of narratives or quantitative data in the form of measurements or frequencies, the author is well advised to describe in some detail the strategies for analysis of the data. The author's work is strongest when the following questions are addressed:
 - Do the analysis schemes reflect the research question, problem statement or statistical hypothesis?
 - Is the analytical plan appropriate for the type of data collected? (e.g. Are the assumptions required for the analytical schemes met by the data collected?)
 - When the planned analytical strategies are changed, does the author provide a rationale for the change and a description of the alternative plan?
 - Is the sample size reasonable for the analytical strategy?
 - Do the design of the study and analytical strategy account for rival explanations?
- Overall Methods and Design of the Study: Does the design of the study including selection of the participants, instruments and materials, procedures, and analytical strategies address the research question, problem statement, or research hypothesis?
- Does the design allow the author to rule out alternative explanations when appropriate? Does the design reflect the nature of the study (description, prediction, explanation, testing applications)? Does the design of the study follow from the Introduction and the Literature Review?

3. Results or Findings of the Study

- In this section the author reports the results of the analyses of the data, whether quantitative or qualitative. Ethics and professional responsibility dictate that the researcher make a complete and accurate report of the findings even when those findings deviate from the predictions made, perspectives held, and personal and biases held by the researcher or the sponsoring institution.

Findings are most effectively reported when they are organized around the research question, problem statement or statistical hypothesis. A clear and unambiguous report of the findings serves both the author and the reader well. The initial paragraph of the Results section should contain a restatement of the research question, problem statement, or statistical hypothesis. This will provide the reader with a guide for reading the Results section.

- Presentation of summary data in the form of tables appropriate for the type of data collected (e.g. means, standard deviations, frequencies) typically provide an initial overview for readers of quantitative, and in some cases qualitative articles. Any tables or figures used to present the data must be discussed in the text. Coupled with reports of statistical tests, tables allow readers to draw their own conclusions about the findings. You might refer to particular journal or professional guidelines for format and presentation of tables in the article.
- Typically authors will present the results in the same order in which the key variables were addressed in the Introduction and in the Methods Sections. Establishing a consistent order of presentation throughout the article makes the reader's task easier.
- When reporting results of statistical tests, it is customary to report the type of test, the particular groups being compared, the obtained value of the statistic, the degrees of freedom, effect size, and obtained probability of error.
- When statistical tests are conducted and no significance is obtained the author is best advised to state that clearly and concisely. Typically authors omit the presentation of the actual test information for non-significant outcomes. Some authors use the Results section to explain *nearly significant differences* or *non-significant trends*—this typically weakens the author's article. Such discussions might best be placed in the final section of the paper (Conclusions or Discussions).
- When the research question or problem statements dictate that authors use qualitative methods, the findings typically follow one of two formats or a combination of the two. One format is organized around categories developed from the review of the literature and the other is based on categories that arise from the data (see Levi-Straus's work on *grounded theory*).
 - In the first case, the categories of information that are used to guide the analysis of narrative or other qualitative data are most convincing when they are derived from the review of the literature.. The author is ethically bound to include findings that contradict presence of predicted categories. When presenting the categories, authors of qualitative studies typically include examples from the data. These are in the form of direct quotes and include information that defines the context in which the data were collected and the type of data (e.g. participants' own words, author's field notes). The information must be sufficiently complete to allow the reader to judge the validity of the categorical membership.
 - When categories are derived from the data as in grounded theory work, authors serve the reader well when they present the process for identifying categories and constructing theories from those categories. In this case, as the author constructs the Results or Findings section, additional literature review is often presented to provide support for the categories arising from the data and the author's theory about the categories. In the case of grounded theory work, authors typically account for all data. That is, work with the data typically continues until categories account for the entire body of data.
 - Providing the reader with sufficient information on the validity and reliability of the findings of qualitative research is a much different task than with quantitative research. There are several ways to address this issue. Two are presented here:
 - Participant checking—here the researcher returns to participants or a representative sample of the participants with the emerging categories and theory to verify that the categories and theory accurately reflect the meaning intended by the participant. When disagreements occur between the author and participant's perspectives, the author is ethically bound to present both perspectives and construct a discussion of

possible reasons for the differences.

- Multiple readers and raters—here the researcher enlists individuals who have not had contact with the participants to read and categorize the data. Whether the researcher is using existing theories drawn from research or grounded theory approaches, once the data have been categorized by the researcher, others are asked to complete a categorization of the data or a sample of the data. Typically, inter-rater agreement or inter-rater reliability is presented.

4. Conclusions drawn based on research findings.

- What conclusions did the author draw?
- Do these conclusions answer the original question posed?
- How did the author use the research findings to support the conclusions drawn? That is, which findings were used to support the conclusion(s) and why do such findings support this conclusion (rather than some other conclusion).
- What *other conclusions* (if any) might be proposed that would also be supported by these findings? (Just because an author prefers one set of conclusions does not imply that these are the only reasonable conclusions that might be drawn.)
- How do the author's conclusions compare with findings from other studies?
- From the author's perspective, what are the next questions to be answered?
- From your perspective, what additional questions come to mind?

These ideas might guide both reading and writing. Given one tenet of the scientific enterprise is that the work of a scientist, whether in the field of biology, education, chemistry, or psychology is that the scientific process is available for public scrutiny. The clarity of the written product and the care with which the arguments are developed support this public scrutiny and ultimately lead to greater potential impact on the field.

For the purposes of our work, the guide for typical psychological research is found in the *Publication Manual of the American Psychological Association*, 5th edition (2001).

¹Please see the websites below for ethical standards in the treatment of human participants:

- American Psychological Association: <http://www2.apa.org/ethics/code2002.doc>
- American Educational Research Association: <http://www.aera.net/about/policy/ethics.htm>.