

Structure of a Scholarly Manuscript: 66 Tips for What Goes Where

Kenneth L. Knight, PhD, ATC; Christopher D. Ingersoll, PhD, ATC

Objective: To share with potential authors tips for constructing a scholarly manuscript and for organizing information in various types of scholarly manuscripts: experimental reports, literature reviews, case reports, and clinical techniques.

Description: The goal of writing a scientific/technical/medical article is to communicate new information that hopefully has clinical relevance and will improve health care. This information must be organized and presented clearly and

logically. We present 66 tips for organizing a scholarly manuscript. We tell not only what goes where in the manuscript but also how to construct each of the elements so as to logically communicate the author's message. The tips are numbered to facilitate referencing.

Conclusion: By becoming familiar with these tips, potential authors can avoid making mistakes that may hinder publication of their manuscripts.

There are three major elements to a journal manuscript: content, structure, and clarity of presentation. A manuscript may have Nobel Prize caliber content, but if it is not presented logically and with clarity, readers may not understand the content. Logical delivery enhances completeness (ie, all information is there) while avoiding redundancy.

There are many different types of scholarly manuscripts, each with a slightly different structure or format. In this article, we will address the structures of the four types of manuscripts most commonly published in the *Journal of Athletic Training*: Experimental Reports, Literature Reviews, Case Studies, and Clinical Techniques.

Be sure to consult and adhere to the "Authors' Guide" of the specific journal. We have chosen to organize this material in a numbered list format to facilitate reference of specific points by educators and editors as they work with authors. Our experience is that numbered points are easier to locate than concepts within the text.

ORGANIZATION

1. All manuscripts should contain the following, organized in the order listed below, with each section beginning on a separate page:
 - a. Title page (Tips 3–6)
 - b. Acknowledgments
 - c. Abstract, including Key Words (first numbered page) (Tips 7–11)
 - d. Text (body of manuscript) (Tips 12–40)
 - e. References (Tips 41–48)
 - f. Tables, each on a separate page (Tips 52–58)
 - g. Legends to illustrations
 - h. Illustrations (Tips 59–64)

Kenneth L. Knight is a professor of Physical Education at Brigham Young University in Provo, UT and Retiring Editor-in-Chief of the *Journal of Athletic Training*.

Christopher D. Ingersoll is an assistant professor and Chair of the Athletic Training Department at Indiana State University in Terre Haute, IN 47809.

The only difference among manuscript types is how text (body of the manuscript) is handled.

2. All pages from Abstract (page 1) through Illustrations should be numbered.

TITLE PAGE

3. Titles should be brief within descriptive limits (a 16-word maximum is recommended). The name of the disability treated should be included in the title if it is the relevant factor; if the technique or type of treatment used is the principal reason for the report, it should be in the title. Often both should appear.
4. Current thought among scientific/technical/medical editors is to reflect the study's outcome in the title. For example, "Cooling the peroneals does not affect agility test times."
5. The phrases "The Effects of," "A Comparison of," "The Treatment of," and "Reports of a Case of" should not be used in the title.¹
6. The title page should also include the names, credentials, titles, and affiliations of each author, and the name, address, phone number, fax number, and e-mail address of the author to whom correspondence is to be directed.

ABSTRACT

7. A comprehensive abstract of 75 to 300 words is required by most scholarly journals. Number the abstract page one, type the complete title (without the authors' names) at the top, skip two lines, and begin the abstract. It should be structured as outlined in Tip 8 and should succinctly summarize the major intent of the manuscript, the major points of the body, and the author's results and/or conclusions.
8. Structured Abstracts
 - a. **Literature Reviews**

Objective—What was the purpose of the review?

Data Sources—What sources did you search to find the studies you reviewed? Include key words and years searched.

Data Synthesis—Summary of the major themes, organized by themes-not by authors.

Conclusions/Recommendations—Advice for the athletic trainer and other related professionals and clinical applications of the information.

Key Words—Three to six words to describe the article.

b. **Experimental Reports**

Objective—Problems or need for the study.

Design and Setting—How was the study set up? Where did it take place?

Subjects—Characteristics of the subjects.

Measurements—What was being measured? What types of tests were used? How were the subjects distributed within the study?

Results—Of the tests and measurements.

Conclusions—Major conclusions, particularly related to theory and clinical application of the information.

Key Words—Three to six words to describe the article.

c. **Case Reports**

Objective—Problem or need for the case to be presented.

Background—On the particular injury or illness.

Differential Diagnosis—What was it or what could it possibly have been?

Treatment—What was done for it? What is normally expected for this condition?

Uniqueness—What was different from the expected, or was it the same?

Conclusions—Clinical applications of the information.

Key Words—Three to six words to describe the article.

d. **Clinical Techniques**

Objective—Problem or need for the information.

Background—Injury or illness, and normal treatment and rehabilitation.

Description—Of the technique, purpose of use.

Clinical Advantages—Why and when should this technique be used? How does the technique compare with standard practice?

Key Words—Three to six words to describe the article.

9. Do not confuse the abstract with the introduction; the abstract is a summary of the entire manuscript while the introduction develops and proposes the manuscript's problem or purpose.
10. It is unacceptable to state in the abstract words to the effect that "the significance of the information is discussed in the article." Instead, succinctly tell the reader why the information is important.
11. Following your abstract, list three to six key words or phrases that can be used in a subject index to refer to your paper.

INTRODUCTION

12. In a scientific manuscript the introduction serves two purposes: to stimulate the reader's interest and to outline the reason for the study, that is, the controversy or "knowledge gap" that prompted the study.
13. Begin the text of the manuscript with an introductory paragraph or two in which the purpose or hypothesis of the article is clearly developed and stated. Tell why the study needed to be done or the article written and end with a statement of the problem (or controversy).
14. Introductions are usually much too long. Authors tend to follow the traditional thesis format, which includes a complete review of the literature before the methods. While this is good policy for novice researchers, it is not recommended for scientific manuscripts.^{3,4}
15. The introduction is not the place for great detail. Highlights of the most prominent works of others as related to the subject at hand are often appropriate for the introduction, but a detailed review of the literature should be reserved for the discussion section. Identify and develop the magnitude and significance of the controversy (or problem) with *brief* specific statements (referenced, of course). This is often done by pointing out differences among others' results, conclusions, and/or opinions. Remember to keep the detail in the discussion.
16. The following two examples from Thomas & Nelson⁴ illustrate the above principles. They clearly and concisely acquaint the reader with the problem, provide some background and necessary information, bring out areas of needed research, and then skillfully and logically lead to the specific purpose of the study. (NOTE: In this and other examples, the references are for example only. They do not refer to the references at the end of this paper.)
 - "Vertical jumping ability is of considerable importance in numerous athletic events, and coaches and physical educators have used various training methods to improve this ability. Two of the most recent training methods are isokinetic and plyometric exercises. The purported advantage of isokinetic exercises is that they allow the muscles to work at maximal force throughout the entire range of motion for each and every repetition, thereby providing a greater training stimulus. The effectiveness of such exercises in improving vertical jumping performance has been demonstrated in several studies during the past decade (7,11,25,27)."
 - "Plyometric exercise is a relatively new concept of training that applies the information specificity principle regarding the preset stretch condition of the muscle before explosive contraction (18). The effects of plyometric exercises in increasing vertical jumping performance have been studied experimentally (3,7,22), but no attempt has been made to determine if they are more effective than isokinetic exercises."

BODY OF MANUSCRIPT

17. The body or main part of the manuscript varies according to the type of article you are writing (examples follow); however, regardless of the manuscript type, the body should include a discussion section in which the importance of the material presented is discussed and related to other pertinent literature. Liberal use of headings, sub-headings, charts, graphs, and figures is recommended.
18. The body of an **experimental report** consists of a methods section, a presentation of the results, and a discussion of the results.

Methods

19. The term “methods” is more appropriate than “methodology.” “Methodology” suggests a study of methods, whereas “methods” suggests a description of methods used, which is what the section is.
20. Begin with a description of the experimental design, which will serve as a roadmap to the entire section. Follow with descriptions of subjects, instruments, procedures, and statistical analysis. Confusion is often introduced when authors combine the instruments and procedures sections. Describe the instruments used in the instruments section, but describe how they were used in the procedures section.
21. The methods section should contain sufficient detail concerning the methods, procedures, and apparatus used so that others can reproduce the experiment.
22. Methods used by others to study problems such as yours should be reviewed and referenced in your paper. Reference the methods of others as well as reliability and validity information in the methods section. The pros and cons of various methods and why you chose one over another should be discussed and referenced in the discussion section.

Results

23. Writing results is similar to writing a review of literature; you state facts and then reference your source. In a results section, the statistics are your evidence or reference for the facts (conclusions) you reach. **The results should summarize the important results of the experiment, using descriptive and inferential statistics and a few well-planned and carefully constructed illustrations.**
24. Report results by stating your conclusions in clear, concise statements that a layperson could understand. Don't use jargon or statistical terms.
25. Too often writers make the statistical test the focus of the sentence (as in the “statisticalese” example following). Writing in statisticalese often obscures the conclusions you derive from the results by emphasizing the method rather than the meaning. The important information is the meaning of the results themselves, not the statistical tests

used to analyze them. Those readers who are interested in the statistics can read the methods that describe the statistical tests used and the statistical test results at the end of the sentence.

- **Statisticalese:** Tukey post-hoc testing revealed a significant decrease ($p < .05$) in perceived pain in groups that received cold, TENS, or the combined treatment.
 - **Clearer:** Perceived pain was less in the cold, TENS, and combined treatment groups than in the control group (Tukey post-hoc, $p < .05$).
26. Reference your evidence for making the conclusion (ie, your statistics) in parentheses following each conclusion. Note that the reference includes the statistical test, degrees of freedom (in parentheses), the test results, and the degree of probability. This format gives the most important information from the test and eliminates the need for a statistical table. For example:
 - There was no difference between the three training groups ($F(2,32) = 1.09, p = .23$).
 - Football players had higher test anxiety scores than basketball players ($t(15) = 4.62, p < .01$); or ($F(3,25) = 3.62, p = .003$).
 27. If you have many variables, they can usually be presented more clearly in tables (see Tips 52–58 for information on compiling).

Statistics

28. Statistics don't indicate or prove anything; they simply provide you with support for making a decision. When you are reviewing literature, you make a statement and reference others' writings to support your statement. Use an analogous approach when reporting results; make a statement and then reference that statement with your statistical results as illustrated in Tip 26.
29. Statistical tests don't **find** differences. They provide evidence that a difference between groups is probably real. Looking at the group means tells you if the groups are different; however, you must decide if the differences are real or if they occurred by chance. Real differences mean they were caused by your experimental intervention (ie, the independent variable) and not by chance. By chance means the differences were caused by variables other than your independent variable.
30. The symbol “*p*,” when used to refer to the level of probability, is written italicized and in the lower case.
31. When indicating the level of significance or probability, use only two numbers if the first is not a zero (ie, .36 not .364). If the first number is a zero, continue numbers until the first nonzero (ie, .0002; not .00 or .00023).

Discussion

32. Put your results in perspective with your expectations and compare your results with the rest of the world. Don't repeat or rehash the results; discuss them.

33. The emphasis of a discussion should not be on other authors but rather on what they reported and how it relates to your work.
- For example: “The greater use of . . . by athletes in my study agrees with others (1, 7) who reported . . . but disagrees with those (4) who”
34. The discussion must address the contribution the study makes toward theory. Another brick in the brickyard is of little value; it should be placed into the sidewalk of understanding.
35. The last part of the discussion must suggest how readers might apply the information presented. While the application may be apparent to you, it may not be apparent to first-time readers unless you point it out.

Bodies of Other Types of Manuscripts

36. The body of a **review of the literature** article should be organized into subsections in which related thoughts of others are presented, summarized, and referenced. Each subsection should have a heading and brief summary, possibly one sentence. Sections must be arranged so that they progressively focus on the problem or question posed in the introduction.
37. The body of a **case study** should include the following components: personal data (age, sex, race, marital status, and occupation when relevant—but not name), chief complaint, history of present complaint (including symptoms), results of physical examination (example: “Physical findings relevant to the rehabilitation program were . . .”), medical history (surgery, laboratory results, exam, etc.), diagnosis, treatment, and clinical course (rehabilitation until and after return to competition), criteria for return to competition, and deviation from the expected (what makes this case unique). NOTE: It is mandatory that the *Journal of Athletic Training* receive, with the manuscript, a release form signed by the individual being discussed in the case study. Case studies cannot be reviewed if the release is not included.
38. The body of a **clinical technique** should include both the *how* and *why* of the technique, a step-by-step explanation of how to perform the technique supplemented by photographs or illustrations; and why the technique should be used. The discussion of *why* should review similar techniques, point out how the new technique differs, and explain the advantages and disadvantages of the technique in comparison with the other techniques.

SUMMARY

39. The manuscript does not need a separate summary section; the abstract serves as a summary. It is appropriate, however, to tie the article together with a summary paragraph or list of conclusions at the end of the discussion section.
40. Some authors write a summary as the last part of the manuscript and then compare it with the abstract. If information is present in the summary that is absent from the abstract, they add it. Then they throw away the summary.

REFERENCES/CITATIONS

41. Each citation in the text of the manuscript takes the form of a superscripted number that indicates the number assigned to the citation. It is placed directly after the reference or the name of the author being cited. References should be used liberally. It is unethical to present others' ideas as your own. Also, use references so that readers who desire further information on the topic can benefit from your scholarship.
42. The reference page(s) accompanying a manuscript should list authors numerically and in alphabetical order and should be in the following form: a) Articles: author(s) (list all) with the family names then initials, title of article, journal title with abbreviations as per *Index Medicus* (italicized or underlined), issue month if journal is not consecutively paged from issue to issue, year, volume, inclusive pages; b) Books: author(s), title of book (italicized or underlined), city and state of publication, publisher, year, inclusive pages of citation. Examples of references to a journal, book, and presentation at a meeting are illustrated below. See the *AMA Manual of Style* for other examples.
- a. Knight KL, Ingersoll CD. Optimizing scholarly communication: 30 tips for writing clearly. *J Athl Train.* 1996;31:209–213.
 - b. Day RA. *Scientific English: A Guide for Scientists and Other Professionals.* 2nd ed. Phoenix, AZ: Oryx Press; 1995:73–74.
 - c. Leadbetter WB. An introduction to sport-induced soft-tissue inflammation. In: Leadbetter WB, Buckwalter JA, Gordon SL, eds. *Sport-Induced Inflammation.* Park Ridge, IL: American Academy of Orthopaedic Surgeons. 1990:3–23.
 - d. Stone JA. Swiss ball rehabilitation exercises. Presented at the 47th Annual Meeting and Clinical Symposium of the National Athletic Trainers' Association; June 12, 1996; Orlando, FL.
43. All statements and ideas of others must be referenced. If the author(s) is (are) not mentioned by name, the reference should be placed after the phrase or first mention of the idea.
44. Anytime you mention another author by name he/she must be referenced immediately after his/her name.
- “Jones (21) reported . . . four.”, not “Jones reported . . . four.” (21).
45. When referring by name to a work with multiple authors do the following:
If two authors, use both names.

- “Smith and Jones” (21) or “Smith & Jones” (21)
If there are three or more authors, use the name of the first author and “et al,” which means “and others.”
- “Black et al (5) reported . . .”

46. When the reference is at the end of a sentence, it should be placed after the period and after any quotation marks.
- “body.” (23) not “body (23).”
47. It is often appropriate, especially in an introduction or discussion, to refer to ideas or results from numerous authors in the same sentence. The following illustrates how to do so:
- “Most people prefer red apples, (6, 9, 21, 33) but some prefer yellow (6, 10, 21) or green (6, 9, 24, 30) ones.”
Note: All three of the ideas in this sentence were mentioned by reference #6, and two of the three ideas were mentioned by reference #21.
48. Always refer to the research and writing of others in the past tense (“Jones believed” not “Jones believes”; “Smith reported” not “Smith reports”). Maybe that person has changed his mind since the article was written.

OTHER INFORMATION

Department of Redundancy Department

49. Put things where they belong and don’t repeat them elsewhere. For instance, don’t rehash results in the discussion section.

Headings

50. Subheadings should be used liberally. Main or first level headers should be placed flush left, typed in all capitals, bolded, and not underlined. If the information under a header needs to be subdivided into two or more sections, use second-level or subheaders. These should be flush left and bolded with the first letter of each word capitalized. If third-level headers are needed to further subdivide information, they should be identical to a second-level header except they are indented and part of the paragraph. The first sentence of the paragraph begins on the same line, immediately after the header.

Page Numbering

51. Begin numbering the pages of your manuscript with the abstract page as #1; then, consecutively number all successive pages including illustrations.

Tables

52. The purposes of tables are to centralize large amounts of data, to save space, and to eliminate long paragraphs of forced and redundant text.
53. Tables must not be redundant of text. Put your information either in the text or a table, not both. You must refer the reader to the table. You should point out the highlights in the table so as to stimulate interest, but do not ramble on in the text concerning information that is in the table.
54. Don’t put information in a table that can more easily be presented in the text. For instance, height, weight, and age of subjects are often necessary but should be placed in the text rather than in a separate table as illustrated in the following sentence:
- Ten male volunteers (age = 21.3 ± 2.1 yr, ht = 67.3 ± 4.2 in, wt = 183.4 ± 10.3 lb) were the subjects for this study.
55. Readers must be able to understand the information in the table without referring to the text.
56. Tables should contain no vertical lines and only three full-length horizontal lines (one between the title and header descriptions, one between the column headers and the first line of data, and one following the last line of data). Smaller horizontal lines may be used in the header to separate a general heading from subheadings under it, or in columns of data to indicate a break between a column of numbers and a total or average of that column of numbers (see Table).
57. Identify the units of measurement of the tabled data in the most general way possible. If all data in the table have the same unit of measurement, that unit should be in parentheses following the table title. If the columns or rows have different units of measurement, but all data in a particular column or row have the same unit, identify the unit (within parentheses) as part of the column header or row identifier.

Example of a Table (With Units of Measure)*

Header 1	Header2			Header3		Header 4
	Sub2a	Sub2b	Sub2c	Sub3a	Sub3b	
Row identifier	Info	Info	Info	Info	Info	Info
Row identifier	Info	Info	Info	Info	Info	Info
Row identifier	<u>Info</u>	<u>Info</u>	<u>Info</u>	<u>Info</u>	<u>Info</u>	<u>Info</u>
Total	Info	Info	Info	Info	Info	Info

*See Tip 57 concerning units of measure.

58. When a table contains data that have been averaged, report the mean \pm SD (or SE) [eg, 24.6 ± 3.7].

ILLUSTRATIONS

59. Illustrations are often helpful in presenting concepts that are difficult to describe, such as testing set-ups, x-ray abnormalities, and trends within data.
60. Each illustration should have a legend that describes the illustration and emphasizes its important points. Legends should be consecutively numbered according to the illustration's placement in the text. A list of legends should be typed on a separate page following the last table.
61. Photographs should be glossy black and white prints. Graphs, charts, or figures should be of good quality and clearly presented on white paper with black ink in a form that will be legible if reduced for publication. Do not use paper clips, write on photos, or attach photos to sheets of paper. Carefully attach a write-on label to the back of each photograph so that the photograph is not damaged.
62. All artwork to be reproduced should be submitted as camera-ready black and white line art. If artwork is to be reproduced in black plus a second (or more) color, it should be submitted as black and white line art. Clearly mark each area of color, or areas of shading or screening (a percent or tint of black or a color), on a separate photocopy. The author pays for color.
63. If preparing illustrations on the computer, do not include frames, titles, or other markings that are not used by the journal. Consult a recent issue of the journal you are submitting to if unsure about what is included.
64. Only one original copy of illustrations is necessary; however, include xerox copies of all illustrations with each copy of the manuscript, including the original.

HELPFUL RESOURCES

65. The following three texts amplify the above tips and present much more helpful information for writers of all skill levels. In fact, skilled writers are the ones who consult such resources most often. We encourage you to become familiar with them.
- Day's *How to Write and Publish a Scientific Paper*.³ This is the best "how-to" manual on writing we've seen. It should be required reading for every writer. Time spent reading this will be repaid in time saved in writing and revising your manuscript.
 - A style manual is a collection of rules and regulations that editors get tired of repeating to authors. The answers to most questions can be found here. The *AMA Manual of Style*¹ has been adopted as the official style manual for the *Journal of Athletic Training*. However, *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers*² has some information not found in the *AMA Manual of Style*. We often consult it also.
66. Structure is only half the battle. Grammar and style are equally important. See the accompanying article, "Optimizing Scholarly Communication: 30 Tips for Writing Clearly," for clear writing tips.

REFERENCES

1. Iverson C, Dan BB, Glitman P, et al. *American Medical Association Manual of Style*. 8th ed. Baltimore, MD: Williams & Wilkins; 1989.
2. Style Manual Committee, Council of Biology Editors. *Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers*. 6th ed. Cambridge, UK: Cambridge University Press; 1994.
3. Day RA. *How to Write & Publish a Scientific Paper*. 4th ed. Phoenix, AZ: Oryx Press; 1994.
4. Thomas J, Nelson J. *Research Methods in Physical Activity*. 2nd ed. Champaign, IL: Human Kinetics Books; 1990:54-56.