IJSPT

INVITED COMMENTARY

HOW TO WRITE A SCIENTIFIC ARTICLE

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ABSTRACT

Successful production of a written product for submission to a peer-reviewed scientific journal requires substantial effort. Such an effort can be maximized by following a few simple suggestions when composing/creating the product for submission. By following some suggested guidelines and avoiding common errors, the process can be streamlined and success realized for even beginning/novice authors as they negotiate the publication process. The purpose of this invited commentary is to offer practical suggestions for achieving success when writing and submitting manuscripts to *The International Journal of Sports Physical Therapy* and other professional journals.

Key words: Journal submission, scientific writing, strategies and tips

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INTRODUCTION

"The whole of science is nothing more than a refinement of everyday thinking"
Albert Einstein

Conducting scientific and clinical research is only the beginning of the scholarship of discovery. In order for the results of research to be accessible to other professionals and have a potential effect on the greater scientific community, it must be written and published. Most clinical and scientific discovery is published in peer-reviewed journals, which are those that utilize a process by which an author's peers, or experts in the content area, evaluate the manuscript. Following this review the manuscript is recommended for publication, revision or rejection. It is the rigor of this review process that makes scientific journals the primary source of new information that impacts clinical decision-making and practice.[1,2]

The task of writing a scientific paper and submitting it to a journal for publication is a time-consuming and often daunting task.[3,4] Barriers to effective writing include lack of experience, poor writing habits, writing anxiety, unfamiliarity with the requirements of scholarly writing, lack of confidence in writing ability, fear of failure, and resistance to feedback.[5] However, the very process of writing can be a helpful tool for promoting the process of scientific thinking,[6,7] and effective writing skills allow professionals to participate in broader scientific conversations. Furthermore, peer review manuscript publication systems requiring these technical writing skills can be developed and improved with practice.[8] Having an understanding of the process and structure used to produce a peer-reviewed publication will surely improve the likelihood that a submitted manuscript will result in a successful publication.

Clear communication of the findings of research is essential to the growth and development of science[3] and professional practice. The culmination of the publication process provides not only satisfaction for the researcher and protection of intellectual property, but also the important function of dissemination of research results, new ideas, and alternate thought; which ultimately facilitates scholarly discourse. In short, publication of scientific papers is one way to advance evidence-based practice in many disciplines, including sports physical therapy. Failure to publish important findings significantly diminishes the potential impact that those findings may have on clinical practice.[9]

BASICS OF MANUSCRIPT PREPARATION & GENERAL WRITING TIPS

To begin it might be interesting to learn why reviewers accept manuscripts! Reviewers consider the following five criteria to be the most important in decisions about whether to accept manuscripts for publication: 1) the importance, timeliness, relevance, and prevalence of the problem addressed; 2) the quality of the writing style (i.e., that it is well-written, clear, straightforward, easy to follow, and logical); 3) the study design applied (i.e., that the design was appropriate, rigorous, and comprehensive); 4) the degree to which the literature review was thoughtful, focused, and up-to-date; and 5) the use of a sufficiently large sample.[10] For these statements to be true there are also reasons that reviewers reject manuscripts. The following are the top five reasons for rejecting papers: 1) inappropriate, incomplete, or insufficiently described statistics; 2) over-interpretation of results; 3) use of inappropriate, suboptimal, or insufficiently described populations or instruments; 4) small or biased samples; and 5) text that is poorly written or difficult to follow.[10,11] With these reasons for acceptance or rejection in mind, it is time to review basics and general writing tips to be used when performing manuscript preparation.

"Begin with the end in mind". When you begin writing about your research, begin with a specific target journal in mind.[12] Every scientific journal should have specific lists of manuscript categories that are preferred for their readership. The IJSPT seeks to provide readership with current information to enhance the practice of sports physical therapy. Therefore the manuscript categories accepted by IJSPT include: Original research; Systematic reviews of literature; Clinical commentary and Current concept reviews; Case reports; Clinical suggestions and unique practice techniques; and Technical notes. Once a decision has been made to write a manuscript, compose an outline that complies with the requirements of the target submission journal and has each of the suggested sections. This means carefully checking the submission criteria and preparing your paper in the exact format of the journal to which

you intend to submit. Be thoughtful about the distinction between content (what you are reporting) and structure (where it goes in the manuscript). Poor placement of content confuses the reader (reviewer) and may cause misinterpretation of content.[3,5]

It may be helpful to follow the IMRaD format for writing scientific manuscripts. This acronym stands for the sections contained within the article: Introduction, Methods, Results, and Discussion. Each of these areas of the manuscript will be addressed in this commentary.

Many accomplished authors write their results first, followed by an introduction and discussion, in an attempt to "stay true" to their results and not stray into additional areas. Typically the last two portions to be written are the conclusion and the abstract.

The ability to accurately describe ideas, protocols/procedures, and outcomes are the pillars of scientific writing. Accurate and clear expression of your thoughts and research information should be the primary goal of scientific writing.[12] Remember that accuracy and clarity are even more important when trying to get complicated ideas across. Contain your literature review, ideas, and discussions to your topic, theme, model, review, commentary, or case. Avoid vague terminology and too much prose. Use short rather than long sentences. If jargon has to be utilized keep it to a minimum and explain the terms you do use clearly.[13]

Write with a measure of formality, using scientific language and avoiding conjunctions, slang, and discipline or regionally specific nomenclature or terms (e.g. exercise nicknames). For example, replace the term "Monster walks" with "closed-chain hip abduction with elastic resistance around the thighs". You may later refer to the exercise as "also known as Monster walks" if you desire.

Avoid first person language and instead write using third person language. Some journals do not ascribe to this requirement, and allow first person references, however, IJSPT prefers use of third person. For example, replace "We determined that…" with "The authors determined that….".

For novice writers, it is really helpful to seek a reading mentor that will help you pre-read your submission. Problems such as improper use of grammar, tense, and spelling are often a cause of rejection by reviewers. Despite the content of the study these easily fixed errors suggest that the authors created the manuscript with less thought leading reviewers to think that the manuscript may also potentially have erroneous findings as well. A review from a second set of trained eyes will often catch these errors missed by the original authors. If English is not your first language, the editorial staff at IJSPT suggests that you consult with someone with the relevant expertise to give you guidance on English writing conventions, verb tense, and grammar. Excellent writing in English is hard, even for those of us for whom it is our first language!

Use figures and graphics to your advantage. Consider the use of graphic/figure representation of data and important procedures or exercises. Tables should be able to stand alone and be completely understandable at a quick glance. Understanding a table should not require careful review of the manuscript! Figures dramatically enhance the graphic appeal of a scientific paper. Many formats for graphic presentation are acceptable, including graphs, charts, tables, and pictures or videos. Photographs should be clear, free of clutter or extraneous background distractions and be taken with models wearing simple clothing. Color photographs are preferred. Digital figures (Scans or existing files as well as new photographs) must be at least 300dpi. All photographs should be provided as separate files (jpeg or tif preferred) and not be embedded in the paper. Quality and clarity of figures are essential for reproduction purposes and should be considered before taking images for the manuscript.

A video of an exercise or procedure speaks a thousand words. Please consider using short video clips as descriptive additions to your paper. They will be placed on the IJSPT website and accompany your paper. The video clips must be submitted in MPEG-1, MPEG-2, Quicktime (.mov), or Audio/Video Interface (.avi) formats. Maximum cumulative length of videos is 5 minutes. Each video segment may not exceed 50 MB, and each video clip must be saved as a separate file and clearly identified. Formulate descriptive figure/video and Table/chart/graph titles and place them on a figure legend document. Carefully consider placement of, naming of, and location of figures. It makes the job of the editors much easier!

Avoid Plagiarism and inadvertent lack of citations. Finally, use citations to your benefit. Cite frequently in order to avoid any plagiarism. The bottom line: *If it is not your original idea, give credit where credit is due*. When using direct quotations, provide not only the number of the citation, but the page where the quote was found. All citations should appear in text as a superscripted number followed by punctuation. It is the authors' responsibility to fully ensure all references are cited in completed form, in an accurate location. Please carefully follow the instructions for citations and check that all references in your reference list are cited in the paper and that all citations in the paper appear correctly in the reference list. Please go to IJSPT submission guidelines for full information on the format for citations.

CONTENT

Abstract

Sometimes written as an afterthought, the abstract is of extreme importance as in many instances this section is what is initially previewed by readership to determine if the remainder of the article is worth reading. This is the authors opportunity to draw the reader into the study and entice them to read the rest of the article. The abstract is a summary of the article or study written in 3rd person allowing the readers to get a quick glance of what the contents of the article include. Writing an abstract is rather challenging as being brief, accurate and concise are requisite. The headings and structure for an abstract are usually provided in the instructions for authors. In some instances, the abstract may change slightly pending content revisions required during the peer review process. Therefore it often works well to complete this portion of the manuscript last. Remember the abstract should be able to stand alone and should be as succinct as possible.[14]

Introduction and Review of Literature

The introduction is one of the more difficult portions of the manuscript to write. Past studies are used to set the stage or provide the reader with information regarding the necessity of the represented project. For an introduction to work properly, the reader must feel that the research question is clear, concise, and worthy of study.

A competent introduction should include at least four key concepts: 1) significance of the topic, 2) the information gap in the available literature associated with the topic, 3) a literature review in support of the key questions, 4) subsequently developed purposes/objectives and hypotheses.[9]

When constructing a review of the literature, be attentive to "sticking" or "staying true" to your topic at hand. Don't reach or include too broad of a literature review. For example, do not include extraneous information about performance or prevention if your research does not actually address those things. The literature review of a scientific paper is not an exhaustive review of all available knowledge in a given field of study. That type of thorough review should be left to review articles or textbook chapters. Throughout the introduction (and later in the discussion!) remind yourself that a paper, existing evidence, or results of a paper cannot draw conclusions, demonstrate, describe, or make judgments, only PEOPLE (authors) can. "The evidence demonstrates that" should be stated, "Smith and Jones, demonstrated that…."

Conclude your introduction with a solid statement of your purpose(s) and your hypothesis(es), as appropriate. The purpose and objectives should clearly relate to the information gap associated with the given manuscript topic discussed earlier in the introduction section. This may seem repetitive, but it actually is helpful to ensure the reader clearly sees the evolution, importance, and critical aspects of the study at hand See Table 1 for examples of well-stated purposes.

Methods

The methods section should clearly describe the specific design of the study and provide clear and concise description of the procedures that were performed. The purpose of sufficient detail in the methods section is so that an appropriately trained person would be able to replicate your experiments.[15] There should be complete transparency when describing the study. To assist in writing and manuscript preparation there are several checklists or guidelines that are available on the IJSPT website. The CONSORT guidelines can be used when developing and reporting a randomized controlled trial.[16] The STARD checklist was developed for designing a diagnostic accuracy study.[17] The PRISMA checklist was developed for use when performing a meta-analyses or systematic review.[18] A clear methods section should contain the following information: 1)

Table 1. *Examples of well-stated purposes by submission type.*

Type of Submission	Example purpose
Original Research	Therefore, the purpose of this study was to describe the volume of pitching for pitchers from multiple college teams at the Division I level.
Systematic Review of the Literature	Therefore, the purpose of this systematic review was to investigate the association between training characteristics and running related injuries.
Clinical Commentary/Current Concepts Report	The purpose of this clinical commentary is to examine the risk factors contributing to the high recurrence rate of hamstring injuries, and propose a unique rehabilitation strategy addressing these factors in order to decrease the rate of reinjury.
Case Report	The purpose of this case report is to describe the non-surgical management of a professional athlete with the characteristic signs and symptoms of a sports hernia.
Clinical Suggestion	The purpose of this clinical commentary is to review types of integumentary wounds that may occur in sport, and their acute management.

the population and equipment used in the study, 2) how the population and equipment were prepared and what was done during the study, 3) the protocol used, 4) the outcomes and how they were measured, 5) the methods used for data analysis. Initially a brief paragraph should explain the overall procedures and study design. Within this first paragraph there is generally a description of inclusion and exclusion criteria which help the reader understand the population used. Paragraphs that follow should describe in more detail the procedures followed for the study. A clear description of how data was gathered is also helpful. For example were data gathered prospectively or retrospectively? Who if anyone was blinded, and where and when was the actual data collected?

Although it is a good idea for the authors to have justification and a rationale for their procedures, these should be saved for inclusion into the discussion section, not to be discussed in the methods section. However, occasionally studies supporting components of the methods section such as reliability of tests, or validation of outcome measures may be included in the methods section.

The final portion of the methods section will include the statistical methods used to analyze the data.[19] This does not mean that the actual results should be discussed in the methods section, as they have an entire section of their own!

Most scientific journals support the need for all projects involving humans or animals to have up-to-date documentation of ethical approval.[20] The methods section should include a clear statement that the researchers have obtained approval from an appropriate institutional review board.

Results, Discussion, and Conclusions

In most journals the results section is separate from the discussion section. It is important that you clearly distinguish your results from your discussion. The results section should describe the results only. The discussion section should put those results into a broader context. Report your results neutrally, as you "found them". Again, be thoughtful about content and structure. Think carefully about where content is placed in the overall structure of your paper. It is not appropriate to bring up additional results, not discussed in the results section, in the discussion. All results must first be described/presented and then discussed. Thus, the discussion should not simply be a repeat of the results section. Carefully discuss where your information is similar or different from other published evidence and why this might be so. What was different in methods or analysis, what was similar?

As previously stated, stick to your topic at hand, and do not overstretch your discussion! One of the major pitfalls in writing the discussion section is overstating the significance of your findings[4] or making very strong statements. For example, it is better to say: "Findings of the current study support…." or "these findings suggest…" than, "Findings of the current study prove that…" or "this means that….". Maintain a sense of humbleness, as nothing is without question in the outcomes of any type of research, in any discipline! Use words like "possibly", "likely" or "suggests" to soften findings.[12]

Do not discuss extraneous ideas, concepts, or information not covered by your topic/paper/commentary. Be sure to carefully address all relevant results, not just the statistically significant ones or the ones that support your hypotheses. When you must resort to speculation or opinion, be certain to state that up front using phrases such as "we therefore speculate" or "in the authors' opinion".

Remember, just as in the introduction and literature review, evidence or results cannot draw conclusions, just as previously stated, only people, scientists, researchers, and authors can!

Finish with a concise, 3-5 sentence conclusion paragraph. This is not just a restatement of your results, rather is comprised of some final, summative statements that reflect the flow and outcomes of the entire paper. Do not include speculative statements or additional material; however, based upon your findings a statement about potential changes in clinical practice or future research opportunities can be provided here.

CONCLUSIONS

Writing for publication can be a challenging yet satisfying endeavor. The ability to examine, relate, and interlink evidence, as well as to provide a peer-reviewed, disseminated product of your research labors can be rewarding. A few suggestions have been offered in this commentary that may assist the novice or the developing writer to attempt, polish, and perfect their approach to scholarly writing.

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