

INVITED COMMENTARY

AVOIDING MANUSCRIPT MISTAKES

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Writing a scientific manuscript can be a consuming, but rewarding task with a number of intrinsic and extrinsic benefits. The ability to write a scientific manuscript is typically not an emphasized component of most entry-level professional programs. The purpose of this overview is to provide authors with suggestions to improve manuscript quality and to provide mechanisms to avoid common manuscript mistakes that are often identified by journal reviewers and editors.

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INTRODUCTION

Writing a scientific manuscript can be a relatively time consuming task, but publishing clinical or research findings is a primary responsibility of a scholarly clinician. Clearly, publishing benefits the profession by documenting clinical methodology, techniques and findings, but there are personal benefits as well. These include seeing your name in print, being acknowledged by other professional peers, and providing a potential for career advancement. In an academic center, career advancement is measured by promotion and tenure and often relies on publication productivity. Clinicians can also benefit from publishing, particularly in a clinical forum and that expectation is shared in other clinical disciplines, specifically nursing and medicine. Unfortunately, some individuals do not consider or pursue publication of their findings. A recent review of abstracts presented at the Combined Sections Meeting of the American Physical Therapy Association showed that less than 25% were published five years later.¹ Although many barriers exist, the low numbers may be associated with the time commitment associated with writing,² a lack confidence with writing ability, or a frustration with the peer-review process. Published manuscripts impact clinical practice and future research, thus manuscripts and ideas that are not shared with others, fail to advance clinical practice.

Most manuscripts are typically derived from ideas or questions. Clearly defined ideas or questions provide the initial framework for scientific discovery and manuscript development. Well-planned and organized research studies often have the initial components of a manuscript (introduction, methods, statistical analysis) in place with the exception of finalized results and the discussion and conclusion(s). Case studies may not have the initial manuscript components in place, but clinicians benefit from foundational knowledge of the topic area and clinical methodology that parallels the components the scientific method (construct hypothesis, test, analyze results, and draw conclusions). The use of consistent assessment methods and standardized outcomes in clinical settings provides clinicians the ability to capitalize on case study opportunities or a report of case series.

Scientific writing is not usually an emphasized component of most professional education programs. Although scientific writing requires foundational knowledge to

understand the topic area, the ability to communicate those thoughts is enhanced with practice. Writing is a skill that develops with practice, not unlike the clinical skills of performing special tests or manual therapy. Writing a scientific manuscript can be simplistically thought of as a blend of storytelling and writing a clinical note. The ability to capture the interest of the reader by providing a systematic and logical flow of relevant information (storytelling) is enhanced by presenting detailed methodology and objective findings (clinical note). The purpose of this overview is to provide authors with suggestions to improve manuscript quality and to provide mechanisms to avoid common manuscript mistakes that are often identified by journal reviewers and editors. The first portion of this paper will focus on general tips for writing manuscripts and the second portion will provide section specific suggestions. A broad overview of common mistakes is presented in Table 1.

GENERAL TIPS

Consider the Reader

Authors should consider the individuals who will read their manuscript once it is published, thus it is essential to know your audience. Although most scientific works are available on-line, most clinicians use paper journals subscriptions associated with their membership fees to stay current in the literature. Some journals are targeted toward a strictly clinical population, some only consider standardized research interventions and some publish only methodological findings. For example, the *International Journal of Sports Physical Therapy* includes clinical commentary, case report, systematic and literature review papers, and original research that are targeted to clinically oriented individuals who treat musculoskeletal pathologies. *Sports Medicine*, however, only publishes invited reviews on clinically relevant topics and *Physical Therapy* includes research only on a pathological patient population. Knowing the guidelines, restrictions and target population for each journal is essential and will save valuable time during the submission and review process.

Writing Style

Writing a manuscript is analogous to telling a story and individual statements should flow to subsequent components or paragraphs. Following a logical sequence

Table 1. *Ten Common Manuscript Mistakes.*

1. Ignoring standardized format specifications
2. Introduction does not logically progress to a clear purpose statement
3. Use of single sentence paragraphs or bullet points
4. Use of clinical jargon or terminology that may not be understood by the reader
5. Overuse of abbreviations or use of abbreviations that may not be familiar to the reader
6. Use of terminology reserved for discussing statistical analyses (e.g. significant, relationship)
7. Formatting the introduction or discussion in a manner consistent with that of an annotated bibliography
8. Not providing estimates of reliability, validity, or clinical utility for outcome measures
9. Not including a sample size estimate
10. Overgeneralization of findings

with simplistic writing will help the reader better understand the author's thoughts and this method improves reader interest. The use of simple words and short relevant sentences is encouraged and authors should note that they are not writing a novel. Sentences should be complete coherent thoughts and contribute to the content within the paragraph.³ Paragraphs should also consist of multiple sentences, not stand-alone single sentences or fewer than 3 sentences.

When constructing paragraphs it is helpful to have strong first and last sentences, which are used to transition from the previous or subsequent paragraph or section. Careful use of headings and subheadings can improve the flow of the manuscript if a logical progression between thoughts is not possible. A good test to determine if the manuscript is reader-friendly is to have someone who is unfamiliar with the topic read the manuscript and provide candid feedback and suggestions regarding the flow of information.

Albert Einstein has been quoted as saying "Everything should be made as simple as possible, but not one bit simpler." Although we previously stated that authors should attempt to use simple words, we discourage the use of clinical jargon or terminology that may not be understood by other clinicians (including those external to physical therapy). This commonly occurs when describing therapeutic exercise (e.g. birddog, clamshell). Authors are also encouraged to minimize abbreviations throughout the manuscript. The use of common abbreviations, such as ACL (anterior cruciate ligament) or LBP (low back pain), are often familiar enough to readers and do not distract from the context of the sentence. Uncommon abbreviations or abbreviations specific only to the manuscript may confuse the reader

and require consistent referral to the original use to remember the meaning.

Language

The *International Journal of Sports Physical Therapy* encourages submissions from individuals around the world and appreciates that English may not always be the author's primary language. At times, even the best ideas may be *lost in translation*. As previously stated, scientific writing is a skill that is not often an emphasized component of most professional education programs. In instances where authors may not have as much experience with scientific writing or when the English language is not the author's primary language, authors are encouraged to obtain assistance from an individual who can contribute to the writing quality. Often that individual with scientific writing skills can be a co-author or recognized in the acknowledgements section of the manuscript for their assistance. Fee-based services also exist to facilitate the production of manuscripts for publication, but there should be some acknowledgement of individuals or entities that may have an interest in publishing findings. Industry support and any potential conflict of interest should be disclosed. Authorship, however, should be consistent with the guidelines of the International Committee of Medical Journal Editors (www.icmje.org)⁴ and all listed authors should have made significant contributions to the design, interpretation and dissemination of the results.⁵

Another component of scientific writing skills is the ability to interpret and convey information relative to the statistical analysis portion of the manuscript. Although this will be further discussed in the Specific

Components section of this manuscript, there are common misuses of terminology reserved for describing statistical analyses. Often authors will use the words significant, associated, or relationship in a manuscript when describing things other than a statistical analysis. “Significance” implies statistical significance and can often be substituted with the word substantial or considerable. Statistical significance indicates a low possibility that the results were not found by chance, thus, if the study was repeated, similar results would likely be found. Statistical significance does not imply importance. Association and relationship are used to describe the correlation between two variables. If a definitive relationship exists between two variables, a point estimate of the correlation should be provided using a referenced manuscript. If the relationship between two variables has not been established in the literature, or based on clinical intuition, authors are encouraged to state a “relationship may exist.” Finally it should be stated that research does not *prove* anything, nor is there an implication of cause and effect. A common example is the relationship between shoe size and cognitive ability in children, but large feet do not cause a person to be smarter (but older children have bigger feet and thus, perform better on some tests).

Finally, the interpretation of the results should not be overstated. A mistake that many young investigators make is to conclude that there was an effect when the results demonstrated otherwise. Or, the author may indicate that a significant difference is interpreted as an important change. An example of the latter is when an intervention resulted in a 3-degree range of motion change of the shoulder. Although the results are statistically significant, the author should interpret the meaningfulness of that change in relation to the error associated with the measurement technique or related to a clinical context. The minimal detectable change⁶ and minimal clinically important difference⁷ will be further discussed in a subsequent section. Reviewers are very cautious about the interpretation of the analysis and the clinical conclusions that may be drawn.

Consider peer-review process

A component of manuscript publication is peer-review, which requires a reviewer to read the manuscript, provide comments and suggestions, and make recommendations for publication, revision, or rejection. Generally an editor assigns the manuscript to two or

more reviewers and they may or may not be blinded to the authors’ identity, depending on the journal and its policy. Reviewers are chosen based on expertise, familiarity and work in a specific area, and availability. Since manuscript reviewers are volunteers who typically have other primary jobs, life obligations such as family and friends, as well as hobbies beyond reviewing manuscripts, authors are encouraged to take steps to facilitate the review process.

The *International Journal of Sports Physical Therapy* has developed specific Instructions to Authors (http://www.spts.org/assets/files/Instructions_IJSPT_7_11.) that provides readers with submission standards and author resources. Potential authors should familiarize themselves with these guidelines. The instructions outline specific criteria relevant for each manuscript category (Original Research, Systematic Review of the Literature, Clinical Commentary/Current Concept Review, Case Reports, Clinical Suggestion/Unique Practice Technique, Technical Note) and include relevant checklists to ensure authors address all necessary components of manuscript submission.

Regardless of the manuscript type, all submissions should follow format specifications outlined by the journal. A summarized version relevant to the *International Journal of Sports Physical Therapy* is outlined in Table 2. Potentially the most critical aspect to facilitate peer-review is the inclusion of page and line numbers that allows the reviewer to provide the author with line-by-line content, writing, or organizational suggestions. The feedback that can be provided on a line-by-line basis is far more valuable for the author than general comments. This method also allows authors to specifically address reviewer comments on a line-by-line basis, thus facilitating manuscript resubmissions. Since reviewers are not copy editors, authors are also encouraged to ensure there are minimal spelling or grammatical errors prior to submission. These errors tend to detract from the reviewers’ ability to review the content of the manuscript. Thus, having an individual proof read the manuscript prior to submission is encouraged.

SPECIFIC SECTIONS

Introduction

The introduction is a critical component that provides the relevant background information and the

Table 2. *International Journal of Sports Physical Therapy Standardized Format Specifications.*

1. Font: 12-point Times New Roman
2. Double spaced
3. One inch margins
4. Page numbers- consecutively numbered starting with the title page
5. All pages should be line numbered, starting with line one on the title page
6. Tables and Figures should be submitted as separate documents, not embedded within the manuscript.

rationale for the study. A concise review of information pertinent to the topic of the manuscript should be provided. The intent is not to present a comprehensive review of all knowledge related to the topic of interest. A common error is to format the introduction similar to an annotated bibliography where specific studies are discussed in detail without attempting to summarize findings across a number of studies. Review papers generally include a more thorough overview of a topic area, and should be submitted in an appropriate format to journals that accept that type of manuscript.

The introduction should logically progress to the purpose statement. The analogy of a funnel is helpful when thinking of the introduction, which follows a logical sequence from broadly presenting the concept to focusing on a specific knowledge gap, discrepancy between studies, or research question that leads to the purpose statement. The purpose statement should be clearly defined based on the knowledge gap, discrepancy between studies, or the problem. Try to hide the purpose statement and guess what it will be after reading the introduction. This test will determine whether the introduction was adequate since the reader should essentially have an idea of what the purpose of the study will entail. Authors are also encouraged to include a directional hypothesis that includes all outcome variables of interest, as appropriate. For example, the authors should be able to hypothesize that there will be an increase in range of motion following an intervention, rather than merely stating that the intervention would have an effect on range of motion.

Methods

The methods section should detail the specific study design and provide the reader with a step-by-step process of the methodology utilized in the study. The methods section should also be of sufficient detail that the reader could reproduce the methods used in the

study. The use of standardized criteria and checklists will ensure authors include all required elements. Specific criteria are dependent on study design and include; randomized clinical trials CONSORT (Consolidated Standards of Reporting Trials),⁸ cohort, case control, cross-sectional studies STROBE, diagnostic accuracy STARD (STAndards for the Reporting of Diagnostic accuracy studies),⁹ and systematic reviews and meta-analyses PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses).¹⁰ Case reports have a checklist developed by the *International Journal of Sports Physical Therapy* editorial board. Figures, tables, and appendices can enrich reader understanding while minimizing text. Since case reports often develop in a retrospective manner clinicians are encouraged to use consistent examination techniques and standardized outcomes forms.

A specific statement should be included that clearly indicates subjects gave informed consent and that the study was approved by an institutional review board or similar committee. Case reports should include a statement that the patient was informed that information concerning the case would be submitted for publication and all identifying characteristics should be stripped from the paper. Clinical trials should be registered (clinicaltrials.gov) and there should be a mechanism to track trials using a unique case number that is often reported in the acknowledgements. Finally, any potential conflict of interest and funding should be disclosed and acknowledged.

When utilizing outcome measures it is helpful to provide the reader with information regarding validity and reliability. Reliability measures should include specific point estimates (e.g. $ICC_{3,1} = .97$) versus simply stating "good reliability". This method provides the reader with sufficient evidence that the measures are appropriate and provides context for meaningful changes. Authors should also consider including minimal detectable

change (MDC)⁶ or minimally clinically important difference (MCID)⁷, if known, in order to provide contextual meaning to the outcome measures utilized in the study.

It is also necessary to provide information related to the sample size estimate. Although the sample size estimate is computed in the planning stages of the study, it provides the reader with an idea of the expected change in the outcome variables and how many subjects are needed to observe that change within a particular confidence range. Studies that do not determine sample size prior to data collection may not have a sufficient number of subjects to demonstrate changes that may occur throughout the study.

Results

The results section should be dedicated to reporting the results, not the interpretation of the results. It is important to note here that statistics do not “find” or “reveal” things, but may be used to “demonstrate” or “indicate.” The statistical analysis utilized should be based on study design and outcome variables. A good way to determine a logical flow is to examine the methods and analysis and look for parallels in the presentation. For example, if several dependent variables will be examined, use the same order in all three sections, then the reader is expecting a sequential presentation of the results. Authors that may not have strong statistical backgrounds are recommended to consult with another individual with greater expertise, such as a statistician. It is recommended to simply report results as significant or not significant. It is not appropriate to report “almost significant” and authors are encouraged to use caution when reporting trends. When reporting the statistical analysis specific values derived should be provided. An example is to include a specific P-value (i.e. $P = .04$) versus a generic P-value (i.e. $P \leq .05$). Reliability studies should include point estimates (i.e. $ICC_{3,1} = 0.97$) when discussing reliability, not simply stating “good reliability”. Studies with multiple independent and dependent variables often include data that is better presented in a table or graph format. The use of tables or graphs is encouraged when presenting data, but should not duplicate the results in the text.

In addition to reporting statistical significance authors are encouraged to report effect sizes as well as the

results in context to the minimal detectable change (MDC)⁶ or minimal clinically important difference (MCID).⁷ Effect size, minimal detectable change, and minimal clinically important difference provide context to the results and can be used as a comparison between studies. Effect sizes are also a good way to describe the result in a meaningful manner and should be used in conjunction with traditional statistical measures to examine an intervention.

Discussion

The purpose of the discussion is to provide context for the results of the study and is often the most difficult portion to write. The discussion should provide an interpretation of the results of the current study as well as a comparison of the findings (corroborate/conflict) with previous studies. Especially important is a scholarly, critical, and referenced analysis of the outcomes or suggestions related to previous evidence and clinical practice. Authors should consider why outcomes occurred and cite with references based on previous evidence.

A common error is that occurs in the discussion section is when authors overgeneralize their study findings. This often occurs when discussing the results of a study involving individuals without pathology and suggesting that there is now evidence that a particular intervention is beneficial in a population with a specific pathology. Similarly, defending a conclusion or non-significant statistical results is discouraged. The results reveal whether the difference was potentially due to chance, or from the intervention. If the intervention did not produce the desired outcome, limitations of the study should be presented, but the conclusion should support the statistical results. The discussion section also provides the opportunity to discuss study limitations and suggestions for future studies.

Conclusion

The conclusion provides a summary of the current study findings. This is not the section to discuss study limitations, introduce new study findings or to discuss future research directions. The conclusion should be brief and to the point.

References

The reference section should be contemporary, high quality (meta-analyses/systematic reviews, random-

ized control trials) sources when possible. References for the *International Journal of Sports Physical Therapy* should be in the correct format (American Medical Association). Additionally, references should be relevant to the manuscript, keeping in mind that more references are not necessarily better. Authors are also encouraged accurately convey information related to each reference and avoid utilizing secondary references, which can lead to errors and overgeneralized suggestions. Authors are encouraged to use referencing software and format to the specifications for the specific journal.

Tables and Figures

Tables and figures should be easy to read and contribute to the manuscript by enriching reader understanding while minimizing text. Appropriate formatting guidelines are outlined in the Instructions to Authors (http://www.spts.org/assets/files/Instructions_IJSPT_7_11.pdf). Tables should include group means and statistical measure of variation, such as standard deviation, standard error of the mean, or confidence intervals.

Figures also provide advantages when describing methods or statistical analyses. Photos should have a professional appearance and be taken with a high quality camera in high resolution when possible. Although most mobile phones have integrated cameras the image quality is often inferior to a traditional digital camera. In addition to focusing on the foreground of the figure, authors should also consider the background of the figure. Often photos are taken in busy clinic or laboratory settings and authors should avoid busy backgrounds or other factors that may detract from the original purpose of the photo. The use of a neutrally colored wall or cloth as a backdrop can eliminate busy or unprofessional backgrounds.

CONCLUSION

The purpose of this manuscript was to provide suggestions for authors to improve manuscript quality and to avoid common manuscript mistakes prior to submission for review. This was not intended to be a comprehensive resource for scientific writing. Readers are encouraged to also utilize other resources highlighting publication of scientific manuscripts,¹¹ manuscript structure,^{11,12} and tips to improve writing clarity.³ By avoiding common manuscript mistakes authors will ultimately produce higher quality initial

submissions, allowing reviewers to focus on content related comments and suggestions, and produce high quality manuscripts.

REFERENCES

1. Smith HD, Bogenschutz ED, Bayliss AJ, Altenburger PA, Warden SJ. Full-text publication of abstract-presented work in physical therapy: Do therapists publish what they preach? *Phys Ther*. 2011;91(2):234-245.
2. Sprague S, Bhandar M, Devereaux PJ, et al. Barriers to full-text publication following presentation of abstracts at annual orthopaedic meetings. *J Bone Joint Surg Am*. 2003;85(1):158-163.
3. Knight KL, Ingersoll CD. Optimizing scholarly communication: 30 tips for writing clearly. *J Athl Train*. 1996;31(3):209-213.
4. Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication. 2010; <http://www.icmje.org/>. Accessed June 1, 2012.
5. Strange K. Authorship: why not just toss a coin? *Am J Physiol Cell Physiol*. 2008;295(3):C567-C575.
6. Weir JP. Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. *J Strength Cond Res*. 2005;19(1):231-240.
7. Wright A, Hannon J, Hegedus EJ, Kavchak AE. Clinimetrics corner: a closer look at the minimal clinically important difference (MCID) *J Man Manip Ther*. 2012.
8. Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. *BMC Med*. 2010;24(8):18.
9. Bossuyt PM, Reitsma JB, Bruns DE, et al. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. *BMJ*. 2003-01-04 00:00:00 2003;326(7379):41-44.
10. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *Ann Intern Med*. 2009;151(4):W-65-W-94.
11. Cook C, Brismee J, Courtney C, Hancock M, May S. Publishing a scientific manuscript on manual therapy. *J Man Manip Ther*. 2009;17(3):141-147.
12. Knight KL, Ingersoll CD. Structure of a scholarly manuscript: 66 tips for what goes where. *J Athl Train*. 1996;33(3):201-206.