

Handbook of Biomedical Research Writing: The Title and Keywords

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This edition is currently being revised. Please email suggestions or corrections to jocelyngraf@gmail.com and adamturner7@gmail.com



6.0 The Title and Keywords

6.1 The Title

Like abstracts, titles are difficult to write because of the word limit. The title is the most important part of the article, though. It is the only part that everyone is guaranteed to read and it should clearly communicate the main topic of your research report. Many people search titles in library databases, so important concepts in the paper should be mentioned whenever possible.

Here are a few basic tips for writing titles:

1. It is possible to drop an article (a/an/the) if it is the first word of the title. Other articles should usually be retained.
2. Avoid increasing the length of the title with expressions such as “an investigation of” or “research on.”
3. Try to limit the number of consecutive prepositional phrases (in, of, on, etc.). Most titles include some, but try to avoid long strings like this: [noun] of [noun] of [noun] of [noun].

6.1.1 Title Format

Here are the basic rules for formatting a title.

1. Capitalize all words except a/an/the and prepositions (e.g., for, in, from).
2. Capitalize the first and last words always (including a/an/the and prepositions).
3. The title does not have to be a complete sentence.
4. Generally, do not end the title with a period (.), but a question mark (?), although not common, is acceptable.

(Note that the rules for formatting titles in the list of references at the end of the paper are different from those above.)

Here are a few exceptions to the rules. In the first example, the first word of the title is “p53,” which is not typically capitalized. Therefore, it should not be capitalized in a title either.

Example:

p53 Mutations in Human Cancers

Hollstein M, Sidransky D, Vogelstein B, Harris CC. p53 mutations in human cancers. *Science*. 1991 Jul 5;253(5015):49-53. Review.

In the following example, the word “Anti-inflammatory” is hyphenated, but it is still considered one word, so “inflammatory” is not capitalized.

Example:

Heme Oxygenase-1 Mediates the Anti-inflammatory Effect of Interleukin-10 in Mice

Lee TS, Chau LY. Heme oxygenase-1 mediates the anti-inflammatory effect of interleukin-10 in mice. *Nat Med*. 2002 Mar;8(3):240-6.

Authors may use periods or commas between two phrases in a title. The second phrase lists the number of patients or location and date for a disease outbreak, for example.

Examples:

Pancreaticoduodenectomy for Cancer of the Head of the Pancreas. 201 patients.

Yeo CJ, Cameron JL, Lillemoe KD, Sitzmann JV, Hruban RH, Goodman SN, et al. Pancreaticoduodenectomy for cancer of the head of the pancreas. 201 patients. *Ann Surg*. 1995 Jun;221(6):721-31.

Lack of H5N1 Avian Influenza Transmission to Hospital Employees, Hanoi, 2004

Liem NT, Lim W; World Health Organization International Avian Influenza Investigation Team, Vietnam. Lack of H5N1 avian influenza transmission to hospital employees, Hanoi, 2004. *Emerg Infect Dis*. 2005 Feb;11(2):210-5.

6.1.2 Title Structure

According to Zeiger, there are three common types of biomedical research reports. One group of papers focus on testing hypotheses. A second group includes papers that describe a new structure, such as a molecule or a gene. The final group focuses on a new or improved method, apparatus, or material.

Zeiger M. *Essentials of Writing Biomedical Research Papers*, 2nd ed. New York: McGraw-Hill; 2000.

Hypothesis-testing Papers

Zeiger explains that hypothesis-testing papers can have both independent and dependent variables, or only dependent variables; thus there are two common structures:

1. Effect of [Independent Variable] on [Dependent Variable] in [Population/Animal/Material]
2. [Dependent Variable] in [Population/Animal/Material]

If the population is “humans,” it can be omitted. However, if the population is only a certain group of humans, it should be specified.

Effect of [Independent Variable] on [Dependent Variable] in [Population/Animal/Material]

Examples:

Clinical **Efficacy of** Raloxifene **in** Postmenopausal Women

Agnusdei D. Clinical efficacy of raloxifene in postmenopausal women. *Eur J Obstet Gynecol Reprod Biol*. 1999 Jul;85(1):43-6.

Effect of Conjugated Linoleic Acid **on** Body Composition **in** Mice

Park Y, Albright KJ, Liu W, Storkson JM, Cook ME, Pariza MW. Effect of conjugated linoleic acid on body composition in mice. *Lipids*. 1997 Aug;32(8):853-8.

Sometimes, it is not necessary to use the whole pattern. This example has both dependent and independent variables. However, instead of “Effect of the anti-Fas antibody on mortality in mice,” the exact effect is specified. The anti-Fas antibody kills the mice. Therefore, it is shorter and simpler to add the word “lethal” to the beginning of the title.

Example:

Lethal **Effect of** the anti-Fas Antibody **in** Mice

Ogasawara J, Watanabe-Fukunaga R, Adachi M, Matsuzawa A, Kasugai T, Kitamura Y, et al. Lethal effect of the anti-Fas antibody in mice. *Nature*. 1993 Aug 26;364(6440):806-9.

Similarly, in the next example, “in humans” was eliminated and “human” acts as an adjective describing the dependent variable, “endothelial cells.”

Example:

Direct Proinflammatory Effect of C-Reactive Protein on Human Endothelial Cells

Pasceri V, Willerson JT, Yeh ET. Direct proinflammatory effect of C-reactive protein on human endothelial cells. *Circulation*. 2000 Oct 31;102(18):2165-8.

This title contains even more detail. In addition to the dependent and independent variables and the animal studied, it describes the findings. When results are presented in the title, it often takes the form of a complete sentence with a subject and verb.

Example:

Heme Oxygenase-1 Mediates the Anti-inflammatory Effect of Interleukin-10 in Mice

Lee TS, Chau LY. Heme oxygenase-1 mediates the anti-inflammatory effect of interleukin-10 in mice. *Nat Med*. 2002 Mar;8(3):240-6.

[Dependent Variable] in [Population/Animal/Material]

Here are a few examples of titles for papers that test a hypothesis but have no independent variable.

Examples:

p53 Mutations **in** Human Cancers

Hollstein M, Sidransky D, Vogelstein B, Harris CC. p53 mutations in human cancers. *Science*. 1991 Jul 5;253(5015):49-53. Review.

Bioluminescent Indicators **in** Living Mammals

Contag PR, Olomu IN, Stevenson DK, Contag CH. Bioluminescent indicators in living mammals. *Nat Med*. 1998 Feb;4(2):245-7.

Distributed Hierarchical Processing **in** the Primate Cerebral Cortex

Felleman DJ, Van Essen DC. Distributed hierarchical processing in the primate cerebral cortex. *Cereb Cortex*. 1991 Jan-Feb;1(1):1-47. Review.

Functional Anatomy of the Mental Representation of Upper Extremity Movements **in** Healthy Subjects

Stephan KM, Fink GR, Passingham RE, Silbersweig D, Ceballos-Baumann AO, Frith CD, et al. Functional anatomy of the mental representation of upper extremity movements in healthy subjects. *J Neurophysiol*. 1995 Jan;73(1):373-86.

Descriptive papers

For papers that newly describe a structure, Zeiger recommends that the name of the structure be the first word of the title. Descriptive titles can be in the form of a noun phrase (a noun with the words that describe it) or a whole sentence.

Examples:

Avian Influenza—A Challenge to Global Health Care Structures

Hien TT, de Jong M, Farrar J. Avian influenza—a challenge to global health care structures. *N Engl J Med*. 2004 Dec 2;351(23):2363-5.

A New Protein Containing an SH2 Domain That Inhibits JAK Kinases

Endo TA, Masuhara M, Yokouchi M, Suzuki R, Sakamoto H, Mitsui K, et al. A new protein containing an SH2 domain that inhibits JAK kinases. *Nature*. 1997 Jun 26;387(6636):921-4.

Review articles generally fall into the descriptive category:

Examples:

Intravenous Magnesium Sulfate Treatment for Acute Asthma in the Emergency Department: A Systematic Review of the Literature

Rowe BH, Bretzlaff JA, Bourdon C, Bota GW, Camargo CA Jr. Intravenous magnesium sulfate treatment for acute asthma in the emergency department: a systematic review of the literature. *Ann Emerg Med.* 2000 Sep;36(3):181-90.

Dopamine in Schizophrenia: A Review and Reconceptualization

Davis KL, Kahn RS, Ko G, Davidson M. Dopamine in schizophrenia: a review and reconceptualization. *Am J Psychiatry.* 1991 Nov;148(11):1474-86. Review.

Panax Ginseng Pharmacology: A Nitric Oxide Link?

Gillis CN. *Panax ginseng* pharmacology: a nitric oxide link? *Biochem Pharmacol.* 1997 Jul 1;54(1):1-8. Review.

Methods Papers

When the main focus of the article is a new or improved method, or a device or material, it should be mentioned in the title. Most biomedical engineering papers will require this type of title. It will also be common in surgery.

Examples:

Engineering Hybrid Genes without the Use of Restriction Enzymes: Gene Splicing by Overlap Extension

Horton RM, Hunt HD, Ho SN, Pullen JK, Pease LR. Engineering hybrid genes without the use of restriction enzymes: gene splicing by overlap extension. *Gene.* 1989 Apr 15;77(1):61-8.

Pancreaticoduodenectomy for Cancer of the Head of the Pancreas. 201 patients.

Yeo CJ, Cameron JL, Lillemoe KD, Sitzmann JV, Hruban RH, Goodman SN, et al. Pancreaticoduodenectomy for cancer of the head of the pancreas. 201 patients. *Ann Surg.* 1995 Jun;221(6):721-31; discussion 731-3.

A Comparison of Four Models of Total Knee-replacement Prostheses

Insall JN, Ranawat CS, Aglietti P, Shine J. A comparison of four models of total knee-replacement prostheses. *J Bone Joint Surg Am.* 1976 Sep;58(6):754-65.

Heart Wall Motion: Improved Method of Spatial Modulation of Magnetization for MR Imaging

Axel L, Dougherty L. Heart wall motion: improved method of spatial modulation of magnetization for MR imaging. *Radiology.* 1989 Aug;172(2):349-50.

6.1.3 Informal Titles

The journals with the largest circulation tend to be much more oriented toward marketing and making a profit. One result is that some have transformed the titles of their articles into a more informal style. They often include jokes and word play that are difficult for English learners to understand. They also contain little information about the actual content of the articles. In fields of study such as literature and history, such titles are common, but in science, an uninformative title may prevent other researchers from finding your work in the library databases or recognizing its relevance. Do not copy this style of title. If you plan to submit an article to a journal that uses this type of title, write a regular title and let the editor rewrite it.

Examples of titles from the journal *Cell*:

The Sunny Side of p53

Autophagy Calls in the Garbage Man

N-WASP Generates a Buzz at Membranes on the Move

Neurons Set Their Sights on Jelly Belly

Do BRCA1 Mice Lead a Normal XISTence?

Primase Halts in the Name of Hunger

6.1.4 Recommended Reading

For more information about writing titles, see the “Titles” chapter in Mimi Zeiger’s excellent book *Essentials of Writing Biomedical Research Papers*, which is available in English, Korean, and Japanese.

Zeiger M. *Essentials of Writing Biomedical Research Papers*, 2nd ed. New York: McGraw-Hill; 2000.

6.2 Choosing Keywords

In many journals, it is possible to submit a short list of keywords that will appear at the end of your abstract. The keywords are useful for library database searches and, along with the title, can help readers identify the main topics of the paper quickly.

Tip

Here are some strategies for selecting keywords:

- Choose only relevant words from title: Be careful not to choose general words like “function” or “investigation.”
- Obey the word limit: Many journals have a limit between 3 and 10 words.
- Don’t combine terms: Make sure that the word or phrase represents only one idea.
- Use MeSH (Medical Subject Headings) or your field’s keyword list: Go to the US National Library of Medicine website (<http://www.nlm.nih.gov/mesh/authors.html>) for more information, or contact a medical librarian for assistance.

Use the following list excerpted from Hughes as a guide as you think of possible keywords. For example, if your research report describes an improved laboratory procedure, the name of the procedure might be a good keyword choice.

- Discipline: Useful in interdisciplinary journals or publishing outside the journals of your field.
- Methods
- Phenomenon
- Data source
- Location
- Unit of Analysis

Hughes W. “How should we choose our keywords?” *ARCOM Newsletter*. 2005 20 (2). <http://www.arcom.ac.uk/publications/Newsletter-2005-21-1.pdf> . Retrieved March 2007.

On the other hand, if you have developed a brand new procedure, theory, or device, or have discovered a new phenomenon or health condition, you probably should not use a new name as one of your keywords. No one would think of searching for it, and the word would not exist in the database keyword lists.