Chapter 2
Organization of a Research Paper: The IMRAD Format

Abstract Most scientific papers are prepared according to a format called IMRAD. The term represents the first letters of the words Introduction, Materials and Methods, Results, And, Discussion. It indicates a pattern or format rather than a complete list of headings or components of research papers; the missing parts of a paper are: Title, Authors, Keywords, Abstract, Conclusions, and References. Additionally, some papers include Acknowledgments and Appendices. The Introduction explains the scope and objective of the study in the light of current knowledge on the subject; the Materials and Methods describes how the study was conducted; the Results section reports what was found in the study; and the Discussion section explains meaning and significance of the results and provides suggestions for future directions of research. The manuscript must be prepared according to the Journal's instructions to authors.

An important point to keep in mind is that there is no standard or uniform style that is followed by all journals. Each journal has its own style; but they all have their own Instructions to Authors (or other word combinations to mean the same thing). Once you select a journal to which you wish to submit your manuscript, please FOLLOW THE JOURNAL'S INSTRUCTIONS TO AUTHORS, which can usually be found in each volume of the journal (note that a volume may contain several numbers, and there could be multiple volumes in a year), or easily accessed from the journal's webpage. Some authors may not be fully convinced about the logic of some of these instructions, but it is a futile effort to argue with the journal or complain about its instructions. Remember that authors are free to choose from a number of journals in which to publish their papers.

Most scientific papers are prepared according to a standard format called IMRAD, which represent the first letters of the words Introduction, Materials and Methods, Results, And, Discussion. These do not represent the complete list of headings or components of research papers; the missing parts are: Title, Authors,

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Keywords, Abstract, Conclusions, And References. Additionally, some papers include Acknowledgments and Appendix (Appendices). Sometimes, some sections might be represented and/or amplified by others; e.g., "Theory" instead of Materials and Methods. Other modifications include combining Results and Discussion into one section, and including "Conclusions" as the last part of Discussion. A recent trend is to give only the main aspects of the paper and post all the additional or "less important" aspects as "Supplemental Materials" on the journal's website. Review papers do not have "Results and Discussion," and they usually use other headings instead of IMRAD headings. The term IMRAD indicates a pattern or format more than the words covered by the abbreviation. With the American National Standards Institute (ANSI) adopting the term as the standard, first in 1972 and again in 1979 (ANSI 1979), it has become the choice of most research journals.

2.1 Title

The title of the paper will be read more than any other part. The way in which a paper is "browsed" by readers is in the order: Title—Abstract—Results (Tables and Figures)—Full paper. The prevailing trend is said to be that, on average, the number of readers from one section to the next in the above sequence decreases by a factor of 10. That means for every 10 readers who look at the title, one reads the Abstract; for every 10 who read the Abstract, one goes to the Results section, especially Tables and Figures; for every 10 who read the Results, one reads the full paper. Thus, for every person who reads the full paper, 1,000 read the title. Titles are read both by scientists scanning the contents of a journal and by those depending on searches through secondary sources, which always carry the title and author but may or may not carry abstracts. The title may be reprinted in bibliographies and subject indexes, stored in bibliographic databases and cited in other articles. Therefore, the title is an extremely important component of the paper. A good title will attract readers who might not otherwise read the paper and may help future researchers find important information.

A good title of a research paper should:

- Contain as few words as possible: many journals limit titles to 12 words
- Be easy to understand
- Describe the contents of the paper accurately and specifically
- Avoid abbreviations, formulas, and jargon
- Not include any verb
- Not contain low-impact words such as "Some notes on …," "Observations on …," "Investigations on …," "Study of …," and "Effect of …"
- Not be flashy as in newspapers (e.g., avoid statements like "Agroforestry can stop deforestation")
- Report the subject of the research rather than the results
- Follow the style preference of the target journal.

As Nair (2005) argues, a title such as "Plant species found in homegardens in *region A of country B*" was probably appropriate for an article some 20 years ago, but it is uninspiring to a demanding reader today. The readers know that homegardens involve multiple species, and if they know the location of the study site, they can "guess" the species that are likely to be present there. But, if the title suggests an innovative investigation such as "Does nearness to markets affect species composition of homegardens?: A case study from *region A of country B*" or "Species richness and diversity in homegardens: a boon or bane?" it has a much better chance to attract the attention of the discerning, busy reader.

An important point to remember is that the title, being the first part of the paper, will be browsed by the busy reader, and therefore must be neat, crisp, and coherent to attract the reader's attention. The important words should be placed first and appropriate words should be used to highlight the significant content of the paper. The words chosen should also be in a form suitable for abstracting and indexing services. Jargons and abbreviations should be avoided and, to the extent possible, common names instead of the Latin names of plants (and other living organisms) should be used in the title.

It used to be a common practice to publish a series of papers on a subject with a main title and several individual papers with separate sub-titles, often designated as parts 1, 2, etc. (example: Biomass decomposition in tropical alley cropping: Part 1, Part 2, …). This practice caused several difficulties. For example, the continuity of reading is seriously hampered when different parts of a series are published in different numbers or volumes of a journal or in different journals, or worst, when one or more parts never get published. Such individual parts of a series of papers do not fulfill the essential requirement that each paper "should present the results of an independent, cohesive study" as stipulated in the Instructions to Authors of most journals. Therefore, the series of papers is now not favored by most journals (Day 1988).

A modification of the series is the "hanging title," which is similar to the series title except that a colon replaces the Roman numeral indicating the part of the series (e.g., Biomass decomposition in tropical alley cropping: comparison of common multipurpose trees); this practice is still accepted by most journals. An advantage of the hanging title is that the most important words of the title could be presented first, and could therefore be an advantage to the reader. Some authors, in an effort to beat the journal's strict word-limit for titles, argue that the hanging title be not counted for the title word count. That will be the editor's decision.

Most journals allow and ask for "Running heads." A running head for a paper is an abbreviated title that will be printed as a header on all or alternate pages. The journal's instructions will specify the nature of running heads and the maximum number of characters, including spaces, allowed. The author should make sure that the running head is appropriate to the article in terms of its contents, especially for review papers and book chapters, where the running head should attract the browsing reader's attention.

2.2 Authors

The authors of a paper are individuals who have made an important contribution to planning and carrying out the research reported, and anyone listed as an author should also have helped in the preparation of the paper. Technicians and other helpers are usually mentioned in the acknowledgments.

The authors are listed in the logical order of importance of their contribution to the work. The person listed first is considered the senior author (unless otherwise specified); others may be listed according to the importance of contribution to the effort. Listing authors in alphabetical order is an old practice that is not followed by journals anymore. It is customary to list the graduate student whose thesis or dissertation forms the basis of a paper as the first author followed by his or her major supervisor as the second author. In some disciplines, however, the major supervisor of a graduate student whose research is published is listed as the last author. The person to whom correspondence concerning the paper may be addressed is marked by an asterisk or some other notation.

Author line-up (who and in what sequence) can be a thorny and contentious issue leading to awkward battles and breach of the high ethical standards that scientists are expected to uphold. Sometimes, the head of a laboratory or institute where the work was done may insist to be listed as an author of all papers coming from the organization. Although this is an objectionable practice, if it has to be done, that person should be listed as the last author. Also, it is not uncommon that some exchange visitors (trainees, exchange scholars, etc.) to overseas institutions publish papers upon their return to home institutions, based on their overseas work, listing their foreign supervisors as coauthors without the knowledge and approval of the latter. In order to avoid such situations, most journals require the final approval of each coauthor before the paper is published.

Author names should be complete enough to ensure proper identification, and be followed by an address including email, presented according to the journal's style. The institution to which the author was attached when the work reported in the paper was conducted should be listed against the author even if the author has left the institution after completing the work (which is common for graduate students and trainees); in such cases, the author's current address could also be listed and properly identified.

2.3 Keywords

These are words by which the paper should be indexed by abstracting services. Words that appear on the title should not be repeated as keywords because titles and keywords are listed together by abstracting services. Most journals allow not more than six keywords; some journals do not allow any keywords; and some journals allow a string of several words as keywords. In any case, the keywords

should be specific to the article; common words such as plants, soils, models, and people are too general to be of any value as keywords.

2.4 Abstract

An Abstract is a mini-version of the paper (Day 1988). The American National Standards Institute says "A well prepared abstract enables readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety" (ANSI 1979). Therefore, it is extremely important that the Abstract be written clearly.

The abstract should be *definitive* rather than *descriptive*; i.e., it should give facts rather than say the paper is "about" something. Since an abstract will usually be read by an average of 100 times more people than will read the full paper, it should convey the information itself, not just promise it (Luellen 2001). For example, avoid phrases such as "… are described" or "… will be presented" in an abstract; instead, describe them, present them (except in Abstracts for conferences or annual meetings, written several months in advance of the event). As Ratnoff (1981) stated, "Reading a scientific article isn't the same as reading a detective story."

Journals have strict limitations on the length of abstracts, usually in the range of 150–250 words, and written in one paragraph (multiple paragraphs for review papers). The Abstract should stand on its own, i.e., be complete in itself. It starts with a statement of rationale and objectives and reports the methods used, the main results including any newly observed facts, and the principal conclusions and their significance. If keywords are not listed separately, the Abstract should contain the keywords by which the paper should be indexed. Because the Abstract is a short version of the full paper, it contains a mixture of tenses representing the tense used in reporting the respective sections of the paper. Thus, in the Abstract, statements referring to the rationale and introduction, interpretation of results, and conclusions are in present tenses, whereas materials and methods and results are in past tense.

The Abstract should ***not*** contain:

- Abbreviations or acronyms unless they are standard or explained
- References to tables or figures in the paper
- Literature citations
- Any information or conclusion not in the paper itself
- General statements
- Complex, winding, verbose sentences.

Furthermore, in order to facilitate smooth reading, excessive quantitative data with statistical details and long strings of plant names should be avoided in the Abstract. Experienced writers prepare or fine-tune their title and Abstract after the rest of the paper is written.

2.5 Introduction

A good introduction is relatively short. It tells why the reader should find the paper interesting, explains why the author carried out the research, and gives the background the reader needs to understand and judge the paper.

Specifically, the Introduction defines the nature and extent of the problems studied, relates the research to previous work (usually by a brief review of the literature clearly relevant to the problem), explains the objectives of investigation, and defines any specialized terms or abbreviations to be used in what follows. Remember that the Introduction leads logically to, and clearly states, the hypothesis or principal theme of the paper.

The Introduction should be relatively brief; most journals recommend less than 500 words. Avoid repetition: do not repeat the Abstract in the Introduction (and Introduction in the Discussion). Do not go into an extensive literature review; two to four most relevant and recent citations should be adequate to corroborate a statement. Do not repeat well-known facts nor state the obvious. For example, it is disappointing that even now, i.e., after more than 30 years of concerted efforts in scientific agroforestry and a large volume of literature in the subject, some manuscripts—and, interestingly, some editors—insist on providing a definition of agroforestry in any article on that subject! The Introduction section also may use different tenses: justification and motivation of the study is presented in present tense ("Soils store relatively large amounts of carbon in terrestrial ecosystems."), whereas the review of literature is presented in past tense ("Studies showed that …"), or in present perfect tense if it is common knowledge ("Studies have shown that …"). The objective is written in past tense ("The objective of the current study was …"). Different journals follow different norms and styles. Some want discussion of literature in the Introduction while some want it in the Discussion section. Some journals require a brief account of the Materials and Methods to be included in the Introduction section, and some may want even the important conclusions presented in the Introduction section, although that tendency is now disappearing.

2.6 Materials and Methods

The purpose of this section is to present in a simple and direct manner what has been done, how, and when, and how the data were analyzed and presented. This section should provide all the information needed to allow another researcher to judge the study or actually repeat the experiment. The simplest way to organize this section is chronologically; include all necessary information, but avoid unnecessary details that the readers are supposed (ought) to know.

The section should include the following though not necessarily in this order:

- Description of the study location (climate, soil—by US Soil Taxonomy and/or FAO system, vegetation, etc., to the extent such information is relevant to the study)
- Design of the experiment with number of replications and sampling procedures used
- Plants or animals involved, with exact descriptions (genus, species, strain, cultivar, line, etc.); include Latin names in italics, even for common plants, upon first mention in text (e.g., maize or corn, *Zea mays* L.)
- Materials used, with exact technical specifications and quantities and their source or method of preparation. Generic or chemical names are better than trade names, which may not be universally recognized. Some journals as well as companies require that the company's name is included in parentheses after the material is mentioned
- Assumptions made and their rationale
- Statistical and mathematical procedures used to analyze and summarize the data.

Methods followed should be described, usually in chronological order, with as much precision and detail as necessary. Standard methods need only be mentioned, or may be described by reference to the literature as long as it is readily available. Modifications of standard techniques should be described. If the method is new it should be described in detail. Do not include excessive description of common procedures. Keep in mind and respect the general level of the readers' understanding and familiarity with your procedures. For example, in a manuscript for a journal targeted at researchers in biophysical aspects of agroforestry, it is not necessary to narrate all minute details of how sampling materials/sites were selected, and how samples were drawn and prepared for analysis, and so on. Remember, however, that the journal's editors may ask for additional details of any item.

Special attention may be paid to ensure that:

- Ambiguities in abbreviations or names are avoided
- All quantities are in standard units
- All chemicals are specifically identified so that another scientist can match them exactly in repeating the work
- Every step is explained, including the number of replications
- All techniques are described, at least by name if they are standard, or in as much detail as needed if you have modified a standard technique or devised a new one
- Irrelevant and unnecessary information that does not relate to the results or confuses the reader is avoided.

The Materials and Methods section is presented in past tense. There is no standard "rule" on the use of active or passive forms ("I/we took ten samples" vs. "Ten samples were taken"); follow the journal's norms, and if the journal is not strict about it, use your personal preference.

The SI system (*Le Système International d'Unités*) is used for reporting measurements in all research publications. But this general rule has some exceptions especially when it comes to applied disciplines such as agroforestry. For example, in scientific publications with a regional focus, locally popular, non-SI units may be used if that would help clarify interpretation or understanding of the data, but such units should be explained in relation to SI units at their first mention in text (see Sect. 4.2 for more on the use of units).

2.7 Results

This section presents the new knowledge; therefore, it is the core of the paper. Note that the Introduction and Materials and Methods sections are needed and designed to say why and how the author/s arrived at what is presented in this section, the meaning of which will then be explained in the Discussion section. Thus, the value of the paper depends on what is contained in this (Results) section, and it must be presented in an absolutely clear manner in just the right number of words, neither more nor less. It is usually easiest to follow the results if they are presented in the same order as the objectives are presented in the Introduction.

Some guidelines on presenting the results are given below:

- Present the results simply and clearly
- Report only representative data rather than (endlessly) repetitive data
- Do not report large masses of data; reduce them to statistically analyzed summary forms and present in tables or figures along with essential statistical information to facilitate understanding and comparing them
- Repeat in the text only the most important findings shown in tables and graphs; in other words, do not repeat in the text all or many of the data presented in tables and figures
- Include negative data—what was *not* found—only if useful for interpreting the results
- Cite in the text every table and figure by number
- Include only tables and figures that are necessary, clear, and worth reproducing
- Avoid verbose expressions: e.g., instead of saying "It is clearly shown in Table 2 that the presence of tree canopy reduced light transmission to ground …," say "Light transmission to ground was reduced by the presence of tree canopy (Table 2)."

Tables and figures are an integral part of a well-written scientific paper, and they appear in the Results section (but there are exceptions). While tables present accurate numbers, figures show trends and features. Do not present the same data in tables and graphs.

More on tables and figures are presented in Chap. 3.

2.8 Discussion

This is the section where the authors explain meanings and implications of the results. The section pulls everything together and shows the importance and value of the work and is therefore the most innovative and difficult part of the paper to write. The authors' skill in interpreting the results in the light of known facts and using the results as evidence for innovative explanations of the observed behavior should push the frontiers of knowledge and arouse the readers' enthusiasm. Without such an engaging discussion, the reader may leave saying "So what?" and move on to other, more interesting papers.

A good discussion should:

- Not repeat what has already been said in the review of literature
- Relate the results to the questions that were set out in the Introduction
- Show how the results and interpretations agree, or do not agree, with current knowledge on the subject, i.e., previously published work
- Explain the theoretical background of the observed results
- Indicate the significance of the results
- Suggest future research that is planned or needed to follow up
- Deal with only the results reported in the study
- Stay away from generalizations and conjectures that are not substantiated by the results presented
- State conclusions with evidence for each.

The Discussion section is written in both present and past tenses. Current knowledge (from literature) is stated in present tense, whereas the work being reported and discussed in the paper (your own work) is presented in past tense; e.g., "Treatment A was better than Treatment B, which suggests that …."

Mismatch between stated objectives and discussion/conclusion is a very common problem in many manuscripts. Analytical insight is what we should strive for in the Discussion section, but unfortunately, it is difficult to describe how to accomplish that. Lack of such insight is evident when authors simply state—often repeat—the results, and make superficial statements such as "this work agrees with the work of author X (some unknown author's work, published several years earlier)" as though the objective of research was to see if the results agreed with some other author's (obscure) work published 20 or more years earlier.

Another common problem in Discussion sections is the tendency to move away from the stated objectives and try to "solve all problems." Admittedly, agroforestry and natural resource management researchers are often under pressure from funding agencies and administrators to produce fast and easy results and technologies for immediate dissemination. Authors therefore tend to "please" the authorities by indulging in pedantic discussion and conclusions that do not emanate logically nor are substantiated by the results presented. For example, if the title suggests that the study is on insect populations in a mixed-plant system, the paper should focus on that, not on, say, reporting and discussing yield of crops and

elucidating how adopting such a practice can reduce deforestation. Some amount of speculative discussion, however, is in order to elicit excitement and motivate future research. The line between "optimum" and "excess" is often faint; the scientist has to do some balancing to separate rote from reasoning (Nair 2005).

Several hilarious stories are available to describe how the interpretation of observed results—the essence of Discussion—could be "interpreted." Two are worth mentioning here.

First, the classic joke of "Sherlock Holmes and the mystery of stars":

> Mr. Sherlock Holmes and his sidekick Dr. John H. Watson went on a camping trip. After a good meal and a bottle of wine they lay down for the night, and went to sleep. Some hours later, Holmes awoke and nudged his faithful friend.
>
> 'Watson, look up at the sky and tell me what you see.'
>
> Watson replied, 'I see millions and millions of stars.'
>
> 'What does that tell you?'
>
> Watson pondered for a minute. 'Astronomically, it tells me that there are millions of galaxies and potentially billions of planets. Astrologically, I observe that Saturn is in Leo. Theologically, I can see that God is all powerful and that we are small and insignificant. Meteorologically, I suspect that we will have a beautiful day tomorrow.'
>
> 'What does it tell you?' Watson asked.
>
> Holmes was silent for a moment, then spoke:
>
> 'Watson, you idiot, somebody has stolen our tent'.

The second story is about the elementary school science experiment to show the danger of alcohol:

> The teacher set up two glasses, one containing water and the other containing gin. A worm was dropped into each glass. The worm in gin died immediately while the worm in water swam around merrily. When the teacher asked the pupils what the experiment showed, little Johnny blurted out "If you drink gin, you won't have worms."

2.9 Conclusions

Conclusions should, rather than just repeating results, state well-articulated outcomes of the study and briefly suggest future lines of research in the area based on findings reported in the paper. In poor writing, it is not uncommon to find conclusions such as "more research is needed before conclusions can be drawn." In that case, why publish a paper from which conclusions cannot be drawn? Some journals do not allow a separate Conclusion section. In that case, the last paragraph or a few sentences of the Discussion can be used to state the conclusions.

2.10 Acknowledgments

This short section is for thanking the institutions and individuals who helped significantly in the work reported in the paper. This may be in a general way to a granting agency that supplied funds or a laboratory that supplied materials, or in a

specific way to a person or persons who gave you advice or helped you in data collection or analysis, or any other significant manner. This is also the place to mention the genesis of the paper, i.e., if it arose from a thesis or dissertation. If there is no separate acknowledgments section, such material and appreciation could be introduced at the end of the text, or in the Introduction or as a footnote or endnote.

2.11 References

Preparing a proper reference list is one of the most tedious aspects of finalizing a manuscript for publication. Part of the problem is that there is no standard or uniform format for citing literature, except that "All citations in the text, and only those, must be listed in the References." In other words, the References section and text citations should match perfectly. Although the saying that "there are as many reference-citation styles as there are journals" is an exaggeration, there seem to be as many reference-citation styles as there are publishers. Standardization of reference-citation style has been talked about for a while, and some progress has been made. The best rule to follow—as for many other aspects of scientific writing—is: follow the journal's instructions! Some software programs are available that aide in creating/formatting reference sections.

2.11.1 Common Styles of Literature Citation

References in biological and natural resource sciences are presented in one of the three common styles: name and year system, numbered alphabetical list, and citation-sequence system; the last one is used most frequently in medical sciences.

Name and Year system ("Harvard system"): The first author's last name and year of publication are given in parentheses in the text; the list is arranged in alphabetical order. In this system, it is easy to add or delete the references, which is an advantage to the author. To the reader, however, it is tedious when several citations are listed in the same sentence or paragraph, as in the Introduction and Discussion sections. It also adds to the word count: if "Scientist and Reader (2013)" can be replaced by "(6)" (a number), it saves space and printing cost.

Numbered Alphabetical listing: The list in the numbered alphabetical system is arranged in the same order, but the references are numbered. The citation in the text is by number in parentheses rather than name and year. The disadvantage—objection, rather—of the system is that many authors would like to see the author's name and year of publication right away while reading a text without having to sift through the reference list at the end. Some of this problem can be overcome by incorporating such details in the text for selected citations that are deemed more important than others: "The first textbook in agroforestry (12) …" can be stated more vividly as "Nair's 1993 book (12), the first textbook in agroforestry …"

Citation-Sequence system: Each citation in the text is given a number, usually as a superscript, in the order it is first mentioned in the text; the reference list is arranged sequentially by number and is not alphabetical. Obviously, addition or deletion of references is not easy and that could be a big problem for authors of papers with several references. The numbering in the order in which citations are listed will also separate out various references by the same author, which could also be a disadvantage.

Within these systems there are many variations, some minute, such as whether to enclose the parentheses, whether to put periods (full stops) after authors' initials, whether to write journal titles in full or abbreviate them, and so on. Interestingly, the *CBE Style Manual* (by the Council of Biology Editors) and the *Chicago Manual of Style*, two powerful and respected style manuals, have opposing views on style: the former adopts the number-alphabet system, while the latter endorses the alphabetical order of listings. In any case, the style being recommended by most science editors is to produce easily understood citations with a minimum of punctuation marks. Thus journal abbreviations are becoming almost uniform. Nowadays, "J" with or without a period after the letter is the accepted abbreviation for "Journal" (which used to be listed as "Journal" or "Jour."), and all "ology" words are abbreviated deleting the last "ogy" part ("Bacteriol" for "Bacteriology"; "Physiol" for "Physiology"; and so on). Note, however, that one-word titles of journals (*Science*, *Biochemistry*) are not abbreviated.

2.11.2 Some Other Issues of Reference Citation

- With the same name(s) and year, use 'a', 'b', after the year (example: Scientist 2009a, 2009b, etc.)
- Alphabetize 'Mc' following the order of the letters, not as if it were written out 'Mac': MacBrayne, Mackenzie, McDonald
- Alphabetize "St" in the same way, not as if it were written out "Saint" (or Street!): List "Stanley, St. Vincent, Sundar …" (not "St. Vincent, Stanley, Sundar …")
- While listing names with prefixes such as "de," "van," "von," and so on, use the form in which the name is listed by the author concerned, or follow the journal's directives
- Be specific and clear when referring to somebody's work or opinion (avoid the so-called "hand-waving reference"): do not refer to "Smith's classic work" without specifying what Smith's work was or how it is related to what is being reported
- When multiple authors are cited in a sentence, each for a specific work mentioned in the sentence, the relevant author should be listed against that specific work, rather than putting all citations together at the end of the sentence; for example "During the 1980s and 1990s, significant progress was made in identifying the numerous multipurpose trees used in indigenous

agroforestry systems and understanding the role of trees in soil productivity enhancement."[1,2,3,4] These citations become more appropriate and clear when the sentence is presented as "During the 1980s and 1990s, significant progress was made in identifying the numerous multipurpose trees used in indigenous agroforestry systems[1,2] and understanding the role of trees in soil productivity enhancement."[3,4]

2.12 Appendix

Any additional information that is relevant to the paper, but is of secondary importance, may be added as Appendix, subject to the journal's policy. These include details of ecological factors such as weather, soil, and plants; socioeconomic data; survey instruments such as questionnaires; procedures of any special laboratory analyses and statistical treatment of data; computer programs; and such other details that are useful for full explanation and understanding of the results, but are too bulky and complex to be included in the main text of the paper. Some journals encourage authors to present such data as "Supplementary Information" on the journal's webpage with due reference to the paper.

The IMRAD Format—Main Sections of a Scientific Paper

Section	Purpose
Title	What the paper is about
Authors	Names and affiliations of authors
Keywords	Words other than those in title that best describe the paper
Abstract	A stand-alone, short narrative of the paper
Introduction	***Why this paper?*** The problem, what is not known, the objective of the study
Materials and methods	***How was the study done***?
Results	***What did you find?***
Discussion	***What does it mean? What next?*** Interpretation of results and future directions
Conclusion	Possible implications
Acknowledgments	***Who helped and how; what was the funding source?***
References	Details of papers cited
Appendices	Supplementary materials

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