

Effective Medical Writing

Pointers to getting your article published

Ng K H, Peh W C G

Writing the results

ABSTRACT

The purpose of the results section is to present the main data collected and the observations made during the research. It provides interpretation of the analysed data and does not contain details on the methods, materials or discussion. The first step in writing the results section is to review the analysed data and determine which results to present. This can be done by deciding which results are relevant to the question(s) presented in the introduction, and may be supplemented by illustrative tables and figures. The results section guides the reader through the questions investigated in the study and sets the stage for the discussion in the next section.

Keywords: medical writing, results, scientific paper

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INTRODUCTION

At the completion of a study or experiment, a collection of data and observations is produced, which the author will present in the results section of a scientific paper. This section immediately follows the materials and methods section, and its purpose is to present and interpret the main results of the research. Hence, the results section is generally shorter than the other sections of the paper.

ANALYSING AND INTERPRETING THE RESULTS

Before writing the results section, the first step is to review the collected data and determine which results to present. This can be done by deciding which results are relevant to the question(s) presented in the introduction – irrespective of whether or not they support the hypothesis(es) of the experiment. This section does not necessarily have to include every result obtained or observed. However, it is important that the outcome for every item mentioned in the materials and methods

section appears in the results section. Another common error is reporting results for items that are not listed in the materials and methods section. It is a good practice to start analysing and interpreting the results as soon as data collection is completed. Analysis will include data summaries (e.g. descriptive statistics such as mean, median, range, standard deviation) and statistical tests to verify the conclusions.

HANDLING NUMBERS AND STATISTICS

When summarising the data, do not include raw data or intermediate calculations. Raw data refers to the results of individual replicate trials, individual observations, patient records, and other measurements that come directly from the laboratory. If there is a need to do so, include them in the appendix section.

Make sure that the data is accurate and consistent throughout the manuscript. When examining differences in data, specify whether these differences are statistically significant or not. Provide a clear description of the magnitude of a response or difference. If appropriate, use percentage of change rather than exact data. Ensure that all the relevant data required by reviewers or readers of the journal to scrutinise your study and its outcomes is provided.

Summarise the statistical analysis and report actual p-values for all primary analyses. Use the appropriate number of significant figures to report the means and other measured or calculated values. The significant figures should reflect the degree of precision of the original measurement. Since the number of significant figures used reflects the level of precision of the measurement or calculation, it is unnecessary to qualify a measurement or calculation as “about” or “approximate.”

HANDLING TABLES AND FIGURES

Upon completion of the data analysis, prepare the tables and figures based on the data. Many results can be given in illustrative materials like tables or figures, although some data lend themselves better to the text.

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Determine whether the data is best presented in the form of tables, figures, or graphs; the type of presentation chosen is based on how the data best illustrates or supports the findings of the study. Do not duplicate the same data in both tables and figures, or repeat it in the text. Do not present data again in a different way. For example, if the data has been plotted in a graph, then a table of the same data is superfluous.

It is important to carefully plan the tables and figures to ensure that their sequencing tells a story and best enables the reader to reach the same conclusions of the study. Note the one or two key results that each table or figure conveys and use this information as a basis for writing the results section. Each table and figure must be referenced in the text portion of the results. The text should also guide the reader through the main results, i.e. those results which answer the question(s) being investigated. Each table and figure must also be sufficiently complete that it can stand on its own, separate from the text. For example, one should not have to delve into the body of the paper to look for the results of statistical tests on the data, or the rationale behind a curve fit.

Number the tables and figures consecutively in the same sequence they are first mentioned in the text. Depending on the journal's author guidelines, they should appear in consecutive order at the end of the manuscript after the references, or located appropriately within the text of the results section. Give a proper heading/caption/legend for each table and figure; place the heading above the table, and the caption below the figure. The caption with any table or figure should be succinct but include all pertinent information. Details on the preparation of tables and figures will be covered in subsequent articles in this series.

WRITING THE RESULTS SECTION

Before starting to write the results section, consider the sequence. Should the results be organised following the chronological order and structure set in the materials and methods section? Or should they be presented in the order of the most important finding to the least? As the author, decide on which sequence offers the best presentation of the results. Within each paragraph, record the most important results first, followed by the least important. Provide the results of control experiments and include observations that are not presented in a formal figure or table, if appropriate.

Introductory sentences are very important in the results section. Tell the reader the objective and rationale behind the experiment. Thus, common ways to start new

paragraphs are: "In order to determine whether....." or "Results from the previous experiment suggest that the C terminus of the protein binds DNA. To more precisely map the DNA-binding region, deletion mutants were constructed as follows."

In describing the experiment, refer to the materials and methods section, e.g. "Western analysis was performed as described in materials and methods, using antibody RM 203 as a probe." The details here should not be too specific, unless necessary. Often, some of the specific details about the individual experiment can be included in the figure legend; e.g. "Relative bovine tendon signal intensities plotted against different SE PD-W TE values, with tendon orientated at 55° to Bo. TR is constant at 2,000 ms." State briefly what the data tells the readers, e.g. "The cauda equina (Fig. 1) were much better seen on FSE PD-W images (mean grading 1.92) than on SE T1-W images (mean grading 1.00)."

As the results section presents observations that have been made, it should be written in the past tense. This section should not be combined with the discussion section unless the journal to which the article will be submitted has a specific house style that combines both results and discussion into one section.

Box 1. Common errors:

- Illogical sequence of data presentation
- Inaccurate data
- Repetition of data
- Expected data from the materials and methods section not reported
- Misplaced information between the materials and methods and results sections
- Inappropriate presentation of data – overuse and abuse of tables and figures
- Attempts to draw conclusions – this should be covered in the discussion section

SUMMARY

The results section of a scientific paper presents the data collected from the experiment or observation. This section contains some text, as well as illustrative tables and figures, and guides the reader through the main results that answer the questions investigated in the materials and methods section.

Box 2. Take home points:

1. Present relevant data collected from the experiment.
2. Present the main results without going into the discussion and conclusion.
3. Prepare the analysed data in the form of a table, figure, or in text form.

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200812A)

- | | True | False |
|--|--------------------------|--------------------------|
| Question 1. Before writing the results section, the author should: | | |
| (a) Review the collected data and decide what results to present. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Analyse the data. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Not be concerned about the sequence. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Write the discussion section. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 2. The purpose of a results section in a scientific paper is to: | | |
| (a) Present the analysed data. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Discuss the analysed data. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Report background information. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Set the stage for the discussion section. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 3. When reporting results | | |
| (a) If the data is plotted in a graph, then a table presenting the same data is unnecessary. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Provide raw data that was collected. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Choose an illustrative method that best represents the data. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Write the most important results first, followed by the least important. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 4. Common errors made while writing the results section are: | | |
| (a) Presenting data in an illogical sequence. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Reporting on items that appear in the materials and methods section. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Repeating data. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Using inappropriate presentation of data – overuse and abuse of tables and graphs. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 5. When presenting tables and figures: | | |
| (a) Number the tables and figures consecutively in the same sequence they are first mentioned in the text. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Carefully plan the tables and figures to ensure that their sequencing tells a story. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Do not reference the table or figure in the text. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Give a proper heading/caption and legend for each table and figure. | <input type="checkbox"/> | <input type="checkbox"/> |

Doctor's particulars:

Name in full: _____

MCR number: _____ Specialty: _____

Email address: _____

SUBMISSION INSTRUCTIONS:

(1) Log on at the SMJ website: <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions. (2) Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

RESULTS:

(1) Answers will be published in the SMJ February 2009 issue. (2) The MCR numbers of successful candidates will be posted online at www.sma.org.sg/cme/smj by 15 February 2009. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

Deadline for submission: (December 2008 SMJ 3B CME programme): 12 noon, 25 January 2009.