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Education

How to clearly articulate results and construct tables and figures in a scientific paper?

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ABSTRACT

The writing of the results section of a scientific paper is very important for the readers for clearly understanding of the study. This review summarizes the rules for writing the results section of a scientific paper and describes the use of tables and figures.

Key words: Figure; paper; results; table; writing.

Introduction

Medical articles consist of review articles, case reports, and letters to the editor which are prepared with the intention of publishing in journals related to the medical discipline of the author. For an academician to be able to progress in career, and make his/her activities known in the academic environment, require preparation of the protocol of his/her academic research article, and acquiring sufficient information, and experience related to the composition of this article. In this review article, the information related to the writing of the 'Results' section, and use of tables, and figures will be presented to the attention of the readers.

Writing the 'Results' section

The 'Results' section is perhaps the most important part of a research article. In fact the authors will share the results of their research/study with their readers. Renown British biologist Thomas Henry Huxley (1825-1895) indicated his feelings as "The great tragedy of science: the slaying of a beautiful hypothesis by an ugly fact." which emphasizes the importance of accurately, and impressively written results.

In essence results provide a response for the question "What is found in the research performed?". Therefore, it is the most vital part of the article. As a priority, while drafting the 'Results' section of a manuscript one

should not firstly write down methods in the 'Material and Method' section. The first sentence should give information about the number of patients who met the inclusion criteria, and thus enrolled in the study.^[1] Besides information about the number of patients excluded from the study, and the reasons for exclusion is very important in that they will enlighten the readers, and reviewers who critically evaluate the manuscript, and also reflect the seriousness of the study. On the other hand, the results obtained should be recorded in chronological order, and without any comments.^[2] In this section use of simple present tense is more appropriate. The findings should be expressed in brief, lucid, and explicable words. The writing style should not be boring for the reader. During writing process of a research article, a generally ill-conceived point is that positive, and significant findings are more important, attractive, and valuable, while negative, and insignificant findings are worthless, and less attractive. A scientific research is not performed to confirm a hypothesis, rather to test it. Not only positive, and significant results are worth writing, on the other hand negative or statistically insignificant result which support fallacy of a widely accepted opinion might be valuable. Therefore, all findings obtained during research should be included in the 'Results' section.^[1]

While writing the 'Results' section, the sequence of results, tabulated data, and infor-

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Submitted:
18.02.2013

Accepted:
15.05.2013

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mation which will be illustrated as figures should be definitively indicated. In indicating insignificant changes, do not use expressions as “decreased” or “increased”, these words should be reserved for significant changes. If results related to more than one parameter would be reported, it is appropriate to write the results under the subheading of its related parameter so as to facilitate reading, and comprehension of information.^[2] Only data, and information concerning the study in question should be included in the ‘Results’ section. Results not mentioned in this section should not be included in the ‘Discussion’ and ‘Summary’ sections. Since the results obtained by the authors are cited in the ‘Results’ section, any reference should not be indicated in this section.^[3]

In the ‘Results’ section, numerical expressions should be written in technically appropriate terms. The number of digits (1, 2 or 3 digits) to be written after a comma (in Turkish) or a point (in especially American English) should be determined. The number of digits written after the punctuation marks should not be changed all throughout the text. Data should be expressed as mean/median $\pm$ standard deviation. Data as age, and scale scores should be indicated together with ranges of values. Absolute numerical value corresponding to a percentage must be also indicated. *P* values calculated in statistical analysis should be expressed in their absolute values. While writing *p* values of statistically significant data, instead of $p < 0.05$ the actual level of significance should be recorded. If *p* value is smaller than 0.001, then it can be written as $p < 0.01$.^[2] While writing the ‘Results’ section, significant data which should be recalled by the readers must be indicated in the main text. It will be appropriate to indicate other demographic numerical details in tables or figures.

As an example elucidating the abovementioned topics a research paper written by the authors of this review article, and published in the *Turkish Journal of Urology* in the year 2007 (Türk Üroloji Dergisi 2007;33:18-23) is presented below:

“A total of 9 (56.2%) female, and 7 (43.8%) male patients with were included in this study. Mean age of all the patients was 44.3 ± 13.8 (17-65) years, and mean dimensions of the adrenal mass was 4.5 ± 3.4 (1-14) cm. Mean ages of the male, and female patients were 44.1 (30-65), and 42.4 (17-64) years, while mean diameters of adrenal masses were 3.2 (1-5), and 4.5 (1-14) cm ($p_{age} = 0.963$, $p_{mass\ size} = 0.206$). Surgical procedures were realized using transperitoneal approach through Chevron incision in 1 (6.2%), and retroperitoneal approach using flank incision with removal of the 11. rib in 15 (93.7%) patients. Right ($n=6$; 37.5%), and left ($n=2$; 12.5%) adrenalectomies were performed. Two (12.5%) patients underwent bilateral adrenalectomy in the same session because of clinical Cushing’s syndrome persisted despite transsphenoidal hypophysectomy. Mean operative time, and length of the hospital stay were 135 (65-190) min, and 3 (2-6) days, respectively. While resecting 11. rib

during retroperitoneal adrenalectomy performed in 1 patient, pleura was perforated for nearly 1.5 cm. The perforated region was drained, and closed intraoperatively with 4/0 polyglyctan sutures. The patient did not develop postoperative pneumothorax. In none of the patients postoperative complications as pneumothorax, bleeding, prolonged drainage were seen. Results of histopathological analysis of the specimens retrieved at the end of the operation were summarized in Table 1.”

Use of tables, and figures

To prevent the audience from getting bored while reading a scientific article, some of the data should be expressed in a visual format in graphics, and figures rather than crowded numerical values in the text. Peer-reviewers frequently look at tables, and figures. High quality tables, and figures increase the chance of acceptance of the manuscript for publication.

Tables

Number of tables in the manuscript should not exceed the number recommended by the editorial board of the journal. Data in the main text, and tables should not be repeated many times. Tables should be comprehensible, and a reader should be able to express an opinion about the results just at looking at the tables without reading the main text. Data included in tables should comply with those mentioned in the main text, and percentages in rows, and columns should be summed up accurately. Unit of each variable should be absolutely defined. Sampling size of each group should be absolutely indicated. Values should be expressed as values $\pm$ standard error, range or 95% confidence interval. Tables should include precise *p* values, and level of significance as assessed with statistical analysis should be indicated in footnotes.^[2] Use of abbreviations in tables should be avoided, if abbreviations are required they should be defined explicitly in the footnotes or legends of the tables. As a general rule, rows should be arranged as double-spaced. Besides do not use pattern coloring for cells of rows, and columns. Values included in tables should be correctly approximated.^[1,2]

As an example elucidating the abovementioned topics a research paper written by the authors of this review article, and published

Table 1. Histopathological examination results of the patients

Histopathological diagnosis	Men n (%)	Women n (%)	Total n (%)
Adrenal cortical adenoma	5 (31.3)	6 (37.6)	11 (68.8)
Pheochromocytoma	1 (6.2)	1 (6.2)	2 (12.6)
Ganglioneuroma	1 (6.2)	-	1 (6.2)
Myelolipoma	-	1 (6.2)	1 (6.2)
Adrenal carcinoma	-	1 (6.2)	1 (6.2)
Total	7 (43.7)	9 (56.2)	16 (100)

Figure 1. a The mean SHIM scores of the groups before and after treatment. SHIM sexual health inventory for male. b The mean IPSS scores of the groups before and after treatment. IPSS international prostate symptom score

Figure 2. Flowchart showing patients' progress during the study. SHIM sexual health inventory for male, IIEF international index of erectile function, IPSS international prostate symptom score, QoL quality of life, Q_{max} maximum urinary flow rate. PRV post voiding residual urine volume

in the *Turkish Journal of Urology* in the year 2007 (Türk Üroloji Dergisi 2007;33:18-23).is shown in Table 1.

Figures

Most of the readers priorly prefer to look at figures, and graphs rather than reading lots of pages. Selection of appropriate types

of graphs for demonstration of data is a critical decision which requires artist's meticulousness. As is the case with tables, graphs, and figures should also display information not provided in the text. Bar, line, and pie graphs, scatter plots, and histograms are some examples of graphs. In graphs, independent variables should be represented on the horizontal, and dependent variables on the vertical axis. Number of subjects in every subgroup should be indicated. The labels on each axis should be easily understandable.^[2] The label of the Y axis should be written vertically from bottom to top. The fundamental point in writing explanatory notes for graphs, and figures is to help the readers understand the contents of them without referring to the main text. Meanings of abbreviations, and acronyms used in the graphs, and figures should be provided in explanatory notes. In the explanatory notes striking data should be emphasized. Statistical tests used, levels of significance, sampling size, stains used for analyses, and magnification rate should be written in order to facilitate comprehension of the study procedures.^[1,2]

Flow diagram can be utilized in the 'Results' section. This diagram facilitates comprehension of the results obtained at certain steps of monitorization during the research process. Flow diagram can be used either in the 'Results' or 'Material and Method' section.^[2,3]

Histopathological analyses, surgical technique or radiological images which are considered to be more useful for the comprehension of the text by the readers can be visually displayed. Important findings should be marked on photos, and their definitions should be provided clearly in the explanatory legends.^[1]

As an example elucidating the abovementioned issues, graphics, and flow diagram in the 'Results' section of a research paper written by the authors of this review article, and published in

the *World Journal of Urology* in the year 2010 (World J Urol 2010;28:17-22.) are shown in Figures 1, and 2.

In conclusion, in line with the motto of the famous German physicist Albert Einstein (1879-1955). ‘If you are out to describe the truth, leave elegance to the *tailor*.’ results obtained in a scientific research article should be expressed accurately, and with a masterstroke of a tailor in compliance with certain rules which will ensure acceptability of the scientific manu-

script by the editorial board of the journal, and also facilitate its intelligibility by the readers.

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