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Structure, style and writing of a scientific paper: the way in which researchers acknowledge their peers

Estrutura, estilo e escrita de artigo científico: a maneira com que pesquisadores reconhecem seus pares

The style of a scientific paper indicates to reviewers and readers whether the authors are familiar with the science. In this respect, systematically reading scientific publications is excellent training for beginning researchers. Scientific publications are documents that need to contain sufficient information for readers to understand the authors' observations and decide whether the conclusions are justified by the data, as well as giving them the ability to repeat the experiment.

All clinical research starts with a "doubt", a question that cannot be answered based on the current knowledge found in the literature. Starting from this question, the research paper is structured as follows:

1. *Introduction* – What question has been asked?
2. *Methods* – How was it studied?
3. *Results* – What has been found?
4. *Discussion* – What do these findings mean?

The Introduction should be short (three or four paragraphs) and should clearly convey the question that the authors will try to answer with the study. For the reader to understand the relevance of the authors' question, the paper should start with a brief literature review to provide the context and justify the study, showing that it is needed to fill the current gaps in knowledge. In case the subject matter has already been approached in previous publications, the new study can be justified by showing that it can be better than the previous ones (highlighting methodological flaws, limitations in sample size, etc.). It should be noted that publishers do not want to publish, authors do not want to cite, and readers do not want to read studies that simply repeat what has already been done several times before.

Thus, in the Introduction, the brief literature review should start from what is already known about the subject in order to justify the study's objectives. Ideally, the description of existing knowledge should progressively centre on the gap that the study intends to fill. For example, if the research question is related to the existence of emotional factors that could influence cataract patients in their decision to undergo surgery, the Introduction should start by citing the importance of vision and the fear of becoming blind, followed by an explanation of the social problem of cataract blindness, and the visual benefits and risks of corrective surgery. Finally, it could point out the fact that persons with low vision may avoid cataract surgery due to emotional reasons (fear of becoming blind due to surgical complications), thus stressing the study's importance as a way to identify such situations and to inform awareness campaigns (1).

All information included in the Introduction should be backed by previous studies, and references should always be provided. Authors should avoid writing about what readers are already likely to know; instead, priority should be given to explaining what readers do not know. This requires knowing the target audience and having an idea of the type of journal the paper will be submitted to. Thus, in the previous example (1), if the readers are physicians, there is no need to explain what cataract is. Finally, the Introduction should describe the study design and clearly state the study's objective (e.g. "a prospective, randomised, double-blind study to determine the efficacy and safety of…"). When planning a study, it can be interesting to write the Introduction before starting data collection, so that researchers remain focused on their original goals.

The Methods section describes how the data were collected and how the study was conducted. The more the methods are described in a detailed and objective manner, the greater the confidence of reviewers and readers on the study results. If the methods used to answer the research question are unsound, the study results and conclusions will be limited.

If the research involves a new procedure or test, it should be described in detail so that the study can be reproduced in the future. Standard measurement methods described in previous publications, unless considered unsound, should be used

again (and the source should be mentioned) to facilitate data comparison among different papers. For example, if the study that inspired the authors to research the visual performance of a different intraocular lens model used a certain wavefront sensor, a measurement chart, and a visual satisfaction questionnaire, the new study should ideally use the same assessment methods. This helps minimise the influence of other variables in the comparison of results across studies (2,3).

The Methods section should start by presenting the study design, describing the type of study, its randomisation and blinding. The place and date where the study was conducted should also be mentioned. An explanation of how the study was conducted should then follow: sample selection, inclusion criteria, approval by a research ethics committee, a precise description of materials and drug dosages, a description of the treatment, and a presentation of study variables. Finally, the statistical analysis of data should be described. Thus, while the Introduction explains "what" has been studied and "why", the Methods section describes "how", "when" and "where" the study was conducted.

Authors should never believe that their methods are immune to criticism, as no study is flawless; instead, they are expected to avoid gross errors and to highlight the study's limitations, so that readers can judge the validity of the results based on their own reality and needs. Ideally, the reader should first have their interest aroused by the topic presented in the Title (in response to the research question presented by the authors) and then read the Introduction in order to understand the study's context and relevance. Next, the Methods section should be read carefully to make sure that the sample was collected and the study was conducted in a way that meets the reader's reality and requirements. For example, a study assessing the population's knowledge about cataract surgery in a developing country will probably not influence clinical practice in developed countries (4).

A critical analysis of papers through careful assessment of the methodology allows readers to identify biases (methodological errors) that might invalidate or limit the results. Readers should not simply trust that every article published in a scientific journal is methodologically correct, even if the journal has a high impact factor (5).

The Results section should present the data obtained in the study. It should not contain the authors' interpretations or opinions. Tables should be used to group important data, and statistical analysis should be done to validate comparisons.

The Results section should start by characterising the population represented by the sample and, if there is more than one study group, by determining whether they are homogeneous. Homogeneous groups indicate that the randomisation method was adequate, because if all study subjects have the same chance of being in either group, then characteristics such as gender and age should be equivalent, on average. This kind of information can be grouped into a table and will help assure readers that personal characteristics did not influence the study results. For example, in the case of a study assessing the effectiveness of two capsulorhexis techniques in intumescent cataract (6), the study sample represents the population of patients suffering from this type of cataract, so the results are only valid for this type of patient. As regards study groups (supposing each group was operated with a different capsulorhexis technique), if randomisation has been performed correctly, i.e., if all participants had the same chance of being randomly assigned to either group, then personal characteristics (sex, age, axial length, etc.) should be similar, thus indicating that individual variations probably did not influence the results.

In a study, data are represented by numbers and the results represent the meaning of those numbers; thus, results should be described in writing, while data should be presented in tables. Paragraphs should start by describing the results and then refer the reader to a table, indicating what can be found in it. Tables should always be self-sufficient, presenting all the information the reader needs to understand them without the need to read the rest of the article. Whenever possible, results should be accompanied by statistical analysis, which provides credibility to comparisons (7).

Qualitative, subjective terms such as "very", "large", "only", and so on should be avoided; instead, the text should focus on quantitative information, such as absolute numbers and percentages. It is important to cite all the data related to the study variables and described in the Methods section, i.e. all study items listed in the Methods should appear in the Results and be mentioned in the Discussion.

In the Discussion section, research findings should be correlated with data from the literature and their significance should be interpreted. The Discussion should only quote relevant studies (confirming or contradicting the present study); it is not necessary to analyse the entire literature. Data already presented in the Results should not be repeated in the Discussion. All the findings presented in the Results should be commented in the Discussion, and only the main numbers or percentages should be mentioned.

The Discussion should begin with a summary of the main findings, discussing possible methodological flaws. Findings should then be compared to those of previous studies, and their clinical implications should be discussed. This is where the strengths of the study should be emphasised, and previous studies can perhaps be criticised. In the Discussion, authors should express their opinions.

Even if the authors believe their study will change clinical practice, its importance should not be exaggerated, because studies in general only provide a limited contribution to any subject matter, and a subject can hardly be exhausted in a single work. The Discussion should end with a short summary of the main findings and their implications (conclusion). It is interesting to conclude with suggestions for future studies.

Scientific writing is different from spoken scientific language. It should avoid jargon and superlatives, and words should be carefully chosen. The greatest desire of any author is to have their work read and cited by as many people as possible. Thus, the text should be pleasant to read and easy to interpret, otherwise readers can easily lose interest in the paper. In scientific writing, sentences should be simple and straightforward, stating what the reader needs to know in the shortest possible way. All abbreviations should be explained at the beginning of each section (Introduction, Methods, Tables, etc.), because readers will not necessarily read the article in the order it is presented.

In the Methods section, drugs should always be referred to by their active principle, and where trade names are used, the laboratory's name and the place of origin should always be mentioned.

In the Results section, numbers should, whenever possible, be followed by a percentage, thus helping readers understand the scale of the data. In tables, calculations should be double checked, with special attention to percentages, because depending on the approximation of decimals, they may not add up to 100%. Authors should check that all tables are mentioned in the text, that the same terms are used in the table and the text, and that the header is self-sufficient.

Once the paper is finished, it should be read by physicians not involved in the study before being submitted for publication; alternatively, authors should save the article for a few days and then read it again. Some authors are so familiar with the subject matter that they may write in a way that is not clear enough for readers.

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References

1. Marback, R.F.;TEMPORINI, E. R. ; Kara-Junior, N. . Emotional factors prior to cataract surgery. Clinics (USP. Paper version), v. 62, p. 433-438, 2007.
2. HIDA, W. T. ; MOTTA, A. P. ; et al. Estudo comparativo do desempenho visual e análise de frente de onda entre as lentes intra-oculares multifocais difrativas Tecnis ZM900 e Acrysof Restor SN60D3. Arquivos Brasileiros de Oftalmologia (Paper version), v. 71, p. 788-792, 2008.
3. Santhiago M ; NETTO MV ; BARRETO jr J ; et al. A contralateral eye study comparing apodized difrative and full difrative lenses: wavefront analysis and distance and near uncorrected visual acuity. Clinics (USP. Paper version), v. 64, p. 953-60, 2009.
4. Kara-Junior, N. ; HOLZCHUH, N. ; KARA-JOSE, N. . Popular beliefs regarding the treatment of senile cataract. Revista de Saúde Pública, v. 36, n.3, p. 343-349, 2002.
5. CHAMON, Wallace. **Plágio e condutas inadequadas em pesquisa: onde chegamos e o que podemos fazer.** *Arq. Bras. Oftalmol.* [online]. 2013, vol.76, n.6, pp. V-VI. ISSN 0004-2749.
6. Kara-Junior, N. ; Santhiago M ; Kawakami A ; Carricondo, P., C. ; HIDA, W. T. . Mini-rhexis for white intumescent cataracts. Clinics (USP. Paper version), v. 64, p. 309-312, 2009.
7. LOPES, Bernardo et al. **Biostatistics: fundamental concepts and practical applications.** *Rev. bras.oftalmol.* [online]. 2014, vol.73, n.1, pp. 16-22. ISSN 0034-7280.