Critically Assessing Original Research Articles

Table of Contents

GCU Glasgow Caledonian University

University for the Common Good

Further information:

Learning Development Centre
School of Engineering and Built Environment
Glasgow Caledonian University

askldc@gcu.ac.uk
+44 (0)141 273 1230
https://www.gcu.ac.uk/ebe/ldc/

Critically assessing the Quality of Original Research

Original research articles are rarely very good or indeed very bad. It is therefore important to determine the quality of a research article yourself. Use the checklist provided to get a better idea. The criteria listed below tell you what a good paper should be like.

1. Overall Structure of the article

Each original research article should have the same structure to make them comparable.

The article contains:	Yes	No	N/A (not applicable)
Title			
Abstract			
Key words			
Introduction			
Methods, design and procedures			
Results			
Discussion			
Conclusion			
Reference List			
Appendix			

2. Overall Structure of the article

2.1. Title

The title:	Yes	No	N/A (not applicable)
...indicates the subject and scope of the study			
...identifies all key variables			
...suggests a relationship between the variables			
...is brief enough (10-15 words)			
...is not too general, i.e. includes "study of..." or "analysis of..."			

A good title would be: *Antireflection coatings for solar panel power output enhancement*

A title that is too general and ambiguous would be: *A study of different factors influencing solar panels*

2.2. Abstract

The abstract is an excellent starting point and gives a first impression of what to expect from the rest of the article. But, it is not enough to read just the abstract, you must read on!

The abstract:	Yes	No	N/A (not applicable)
...gives short information on each section of the article, i.e. aims, variables, design, findings, conclusions			
...is written clearly			

2.3. Introduction

The introduction is a very important part of the research article. It should bring the reader up to speed on the background of the present paper and develop a rationale of why the authors undertook the research.

The introduction:	Yes	No	N/A (not applicable)
...gives background information on the subject, i.e. previous research.			
...evaluates the background information			
...identifies a gap in the existing research			
...states the research question clearly and why it is relevant			
...states the hypothesis of the study clearly, i.e. says what the authors expect to find out			

2.4. Methods, design and procedure

The information given in this section should enable a researcher to replicate the study step by step so the description here needs to be quite detailed. The quality of the research can be assessed by how much information is given, how easy it is to understand and follow but also by what the authors did not include in this section.

The methods section:	Yes	No	N/A (not applicable)
...explains the research method (survey, experiment, observation, modelling etc.) in detail and clearly			
...explains the design of the study clearly			

...explains and justifies the materials/apparatus/ software used			
...describes the participant sample used			
...justifies participant selection (random, not random, characteristics of the group etc.)			
...explains and justifies data collection and pre-processing in detail			
...explains missing or excluded data handling			
...explains and justifies statistical analysis methods used			

Examples:

- If a study were to investigate the effect of tyre A as opposed to tyre B on braking distance it would not make much sense to use a survey of different drivers as research method. Instead a controlled experiment should be used.
- If the purpose of a study is to investigate the effectiveness of a new insulation material and technique in commercial property, than the design should include a comparative property with similar specs in terms of size, utilisation etc. is not using the new insulation material.
- If a study is investigating the effects of online games on learning, it is crucial to include different cohorts of participants in this study. The range should have learners who have extensive knowledge of gaming as well as learners without knowledge of gaming; be of different ages and possibly different socio-economic factors. Otherwise, the results are not generalizable.

2.5. Results

The results section summarises all important analyses the authors have undertaken. It should also state whether they accept or reject their original hypotheses.

The results section:	Yes	No	N/A (not applicable)
...gives descriptive (means, standard deviations) as well as inferential statistics (t-test, ANOVA etc.)			
...states whether the results are statistically significant or not			
...displays important results in tables			
...includes graphs/figures that are appropriately labelled to illustrate findings			
...states whether the original hypotheses are supported or not			

2.6. Discussion

In the discussion section, the findings are evaluated with regards to the overall aim of the study.

The discussion:	Yes	No	N/A (not applicable)
...interprets the results carefully and correctly, i.e. conclusion are supported by the data			
...does not overgeneralise or exaggerate the findings			
...assess the findings in relation to the background, the research question and hypotheses laid out in the introduction			
...discusses the limitations (confounds, biases) of the study, especially the methods used			
...suggests further areas of research			

2.7. Conclusion

The conclusion should summarise the overall finding briefly.

The conclusion:	Yes	No	N/A (not applicable)
...gives short summary of the important findings			
...is written clearly			

2.8. Additional information

Transparency is very important in academia so additional information should be provided to check the authors' claims independently.

Additional information, i.e.:	Yes	No	N/A (not applicable)
...authors' affiliations are given (name and address of institution they work for, contact information for corresponding author)			
...a list of references is given which includes ALL cited sources			
...(depending on the field) appendices are included that detail materials used etc			

NB: Good, open-access journals like Frontiers or PeerJ, are leading the move towards complete transparency because of recurring cases of scientific fraud. This means, authors are being ask to supply their original data and all associated documentation so results can be independently verified. Therefore:

Additional information, i.e.:	Yes	No	N/A (not applicable)
...the original data and all associated documentation are made available			

3. Overall impression

The overall impression you get after reading the article is very important because it will give you an indication of the strengths and weaknesses of the authors' statements. That is, when reading the paper and it is difficult to understand, might the authors be overstating the results and inflate the importance of their findings?

Overall impression is that:	Yes	No	N/A (not applicable)
...the article is easy to follow and understand.			
...the research question is being answered.			
...conflicts of interest are stated, i.e. funding sources are named.			

Critically assessing the Quality of Original Research

Now you have used the checklist, you will be able to evaluate how many criteria of quality research the article you were reading fulfils.