A beginner’s guide to research- II

Jethwani KS, Kanodra NM

This article is a continuation of our previous article “A Beginners Guide to Research- I”. In part I of the article, we discussed research methodology; while in this article we have tried to explain difficulties that one could encounter, especially as beginners to this field and how to avoid them, how to tackle data analysis and finally how to present the study in the form of a report.

Foreseeing difficulties

Before embarking on a research project, one should always look out for flaws in the planned methodology that may either reduce its scientific viability or cause inconvenience in execution of the project.

A few common errors are listed below:

**Bias**

It is a systematic error introduced into sampling or testing by selecting or encouraging one outcome or answer over others.[1]

Selection bias, observer bias, subject variation and evaluation bias are a few types of biases that one could encounter.

It helps to plan the project such that bias is minimised. One can use methods such as randomisation and blinding to minimise bias.

**Randomization** is ‘a deliberate haphazard arrangement of observations so as to simulate chance’. [1]

**Blinding** is ‘when a trial is conducted such that the participants and at times even the investigators are not provided with background information that might prejudice the outcome or result of the trial’. [1]

If bias occurs, one should measure its effects, as one would need to adjust the statistics accordingly. [1]

**Attrition rate**

Another factor often overlooked by researchers, especially in studies involving follow up, is the attrition rate. It is defined as the rate of shrinkage in size or number. [6]

This factor plays an important role in studies involving volunteers or those involving a large sample size and multiple follow-ups. Many studies, where a high attrition rate has been seen, are left incomplete, as researchers consider these as failed studies. But these studies are important as one can study the behaviour pattern of the involved sample population and use the experience while planning future projects on similar lines. [7]

In order to reduce the problems that one may face while conducting the study, one can ask an experienced researcher to critique the form and also conduct a pilot test of the form. A pilot study helps one to find out the feasibility of the procedures, any unknown effects and acceptability of all the components. [2]

Data analysis

Once, one is through with the study, the raw data obtained has to be organized and analysed. From the data collected, first identify the variables to be analysed, such that the research question and the objective of the study is answered. Depending upon the nature of the study (sample size, use of a control group, qualitative/quantitative data, paired/unpaired data, number of variables etc.); descriptive statistics, tests such as t test, chi square test etc. can be used to analyse the data. For example Mann-Whitney or unpaired t test can be used to compare two unpaired groups; [8] chi square test is for binomial data (e.g. yes, no) and compares rates, counts, or proportions between subsets.

Data analysis can be done by the investigators of the study themselves or with the help of a professional statistician. Also, it may be difficult to manually analyse a large amount of data and statistical analysis softwares can be used for the same. The various programmes available are Microsoft Excel, XLStat, GraphPad, SPSS, Statistica etc. These programmes offer a variety of functions, which help classify and analyse the data. It is important to know which test is to be used in which...
Writing the report

The report of the study is the final step to any research. By writing a report, one not only documents the findings but also communicates to others the results of the study.

One of the main difficulties faced by a beginner is ‘where to begin?’ Even though one may have all the resources and information in place, the task to begin expressing it in the correct format could seem overwhelming. At this stage, it helps to read the guidelines that the journal you are submitting to. Also, one should refrain from introducing, without explanation, matters that are wholly unfamiliar.

Writing the report has been subsequently mentioned in the respective sections.

The basic structure of the paper should be such that it includes the following components:

Introduction

Introductions are important. They arouse a reader’s interest, introduce the subject and tackle the “So what?” factor. In short, they’re the paper’s “first impression”. [8]

The main premise of the introduction should revolve around the research question and background information on it that will convince the readers of the importance of the study in question.

For an effective beginning, one can start with what this study adds to the knowledge already available on the subject. This could be explained by including a brief account of the literature reviewed and how the research question was arrived at. It also helps to consult experts on the topic and take into account studies underway and unpublished studies (probably due to negative conclusions).

While doing this, the author should avoid going overboard with presenting all gathered information and including material that the reader is likely to be familiar with, like pathophysiology of a disease from a textbook. Also, on the other hand, the authors should refrain from introducing, without explanation, matter that is wholly unfamiliar.

In spite of knowing exactly what to include in this section, getting the structure correctly could be difficult. At this time, using a few journalistic tricks could be useful, like beginning with a quotation, a relevant question, an irony, or an interesting fact or anecdote relevant to the subject. [6]

Review of literature

This section provides the readers background information on the topic in question and should be framed such that it logically explains how this study adds to the knowledge already available. Doing a literature search before embarking on the project helps in fine-tuning the research methodology and also learning from the mistakes other researchers may have made. References of other studies can be presented in two formats. These are the Vancouver and Harvard formats.[7]

The finer details of presenting references vary from journal to journal and these are usually specified by the respective journals.

Materials and Methods

This section should describe, in a logical sequence, how the study was designed, carried out and analysed. This section is better written before starting the study (except the analysis part) and should be detailed enough to convince the readers of the authenticity of the methods used and ensure reproducibility, but at the same time not be a set of instructions, or a step by step guide of your entire procedure. The next important step would be arranging the matter in the correct format. One could begin with the details of the study design, like how randomization was done. Next, the exact method in which the study was carried out should be elucidated. This could include the inclusion and exclusion criteria used, details of materials used, exact drug dosages, ethical considerations etc. Finally, a brief account of the analysis and the statistical tests used should be mentioned.

Observations and Results

The results section should include two main features: an overall description of the major findings of the study and the data should be presented clearly and concisely.[7] Use tables, graphs/charts, flow charts, illustrations wherever appropriate to present the data and also summarize the findings in the text; but avoid unnecessary repetition of data in the text, tables and figures. It is not necessary to present all the data that one has collected, only relevant and representative data should be mentioned. [7] One can start with the positive findings and end with the negative findings (if any). [4] It is imperative to use the correct statistical terms and correct units for all the variables. Also, acknowledge any problems with your study such as small sample size, attrition rate etc.[5] One must avoid manipulation of the data or exaggerating the findings and all information must be presented in a straightforward manner without any ambiguity.

Discussion

Keep this section focussed, confine the discussion to your results and compare your results with other relevant published literature, avoid lengthy rambling discussions. [4] Try and answer the following questions in this section:

a) How do your results relate to the original research question?

b) Does the outcome support your hypothesis?

c) Are your results consistent with what has been previously reported?

d) If your results were unexpected, then why so?[12]
Also discuss the implications of your study and consider other explanations for the results obtained. A common error is repetition of the data mentioned in the results in the discussion section. End the discussion with a precise conclusion and mention if further research work is necessary to answer the questions raised by the obtained results.

Conclusions
The paper ends with the conclusion of your study. This will give the reader a take home message as regards the outcome of your study. This section should answer the aims and objectives of the study. It should be precise and to the point. Whatever maybe the final result of the study, it is important that it is accurate and that you present it well. One must be sure that the conclusions are supported by the results presented and that it is limited to the boundaries of your study.[^5]

An abstract or summary (structured/ non-structured) is requested by most journals. This is an extremely important feature as this may be the only text read by many readers.

Throughout our articles we’ve stressed on how a beginner can go about his first research project and may have skipped details required at a higher level of research. We hope that we’ve answered most of the queries of students who intend to embark upon a research project.

References