

Beyond Statistics: Part 3: Getting started with Research

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LM Sykes,¹ F Gani,² AJ Jagathpal³

INTRODUCTION

If you have read this far – then you are ready to Research! So where, and how do you start? This paper is intended to guide and to stimulate novice researchers to take the plunge and delve into the exciting world of research and publication. A brief look at the “Instructions to Authors” of any reputable journal will give an indication of the many different types of papers that can be written, ranging from: Research and Education; Clinical Research; Case Reports; Dental Techniques; Material Sciences; Systematic Reviews; down to interesting or helpful Tips From Readers. The first step is to identify a problem, a clinical dilemma, a need, a new material or product to test, a novel idea, or an interesting clinical patient scenario to report on. You are now on your way to become the SMARTTEST researcher – this acronym will be used as a guide on how to proceed.

S - SPECIFIC

Before beginning, you need to have a clear idea of the topic that you wish to investigate. Be specific, and narrow the focus to a particular field or issue of interest.¹ At the same time consider whether it is a subject that you will be able to manage with your level of experience, technical ability and expertise.² Note that an idea alone does not lead to research. Within that topic, there must be a well-crafted question which identifies what the research hopes to discover.³ It should be possible to write this out in the AIM as a (problem) statement in one concise sentence. This is almost a declaration of your belief, and the research will then consist of an investigation aimed at supporting and defending, or refuting this notion.² At this stage, avoid making assumptions or postulations in anticipating the results. These expectations could result in investigator bias and the researcher may subconsciously influence all the subsequent stages of the investigation. The Objectives are then written in the format of a “To do” list with an explanation, given in a step-by-step manner, of

the procedure that will be followed in order to pursue the Aim. This is an introduction for the Materials and Methods section that follows, and should link in with the more detailed description.

M – MEASUREABLE

This aspect is related to the Materials and Method that will later be used. Consider what is going to be done, to whom, how it will be done, and how will the results be measured and interpreted? At this stage a thorough literature review is needed. This will reveal if, and what, studies have already been carried out in this field. There may be merit in duplicating previous designs in order to verify or refute the findings, add more information, or test a different product / method against the currently accepted “gold standard”. It makes sense to keep and use what is acceptable and alter only those aspects where you have identified an inadequacy. i.e. don't re-invent the wheel. However, if you are duplicating someone else's work or ideas, they must be given full credit, and their publication needs to be clearly cited and referenced.

Some tips to help during the literature search: Use keywords taken from your Aim to help narrow down the search.¹ Before even reading a paper, examine the reference sources critically. Consider the authors. Are they well known and respected in their field? Is the particular work in their area of research? Is there any evidence that they may have a bias which could skew their argument? This is particularly relevant in studies that have been sponsored. Look too at the publication information: who was the publisher and was it published in a book, newspaper, on a website or blog, or was it in a peer-reviewed journal, and if so, what kind of journal, and what is its impact factor?¹ Try to restrict references to the latter, a more scientifically acceptable practice. Also take note of when the article was written to be sure that it is still up to date. Be careful when quoting .com (commercial) sites as many of these are sponsored by manufacturers and are basically advertisement sites carrying information which has been drafted by the manufacturers themselves.²

The plan should be detailed enough to allow others to replicate the procedures. The chosen method and data collection will vary according to the type of research being conducted.⁴ However there still needs to be explicit details regarding what data will be collected, how it will be measured, what instruments will be used for measuring, how issues of standardisation and calibration will be addressed,

1. **Leanne M Sykes:** BSc, BDS, MDent (Pros). Department of Prosthodontics, University of Pretoria.
2. **Fatima Gani:** BDS, MSc. Department of Prosthodontics, University of Pretoria.
3. **Avish J Jagathpal:** BDS, PDD (Ortho). Department of Prosthodontics, University of Pretoria.

Corresponding author

Leanne M Sykes:
Department of Prosthodontics, University of Pretoria.
E-mail: leanne.sykes@up.ac.za

and the statistical methods that will be used for analysis of the results (even if it is a descriptive study, the statistical tests need to be stated). If data collection sheets are used, they must be standardised, specific and applicable to that form of study. Establish who will be collecting the information and filling in the forms. Calibration of all involved may be a requirement to ensure reliability and repeatability. When using questionnaires, one can make use of internationally accepted and recognised collection sheets. However, if none are available it is wise to carry out a pilot study amongst people who are representative of the study's target population. This will establish whether the questions are clear, relevant, and understandable, and will also indicate whether the responses do answer the research question.

A-ACHIEVABLE

This involves considering whether YOU will be able to carry out the research. Consider realistically whether the scope and scale of the project are within your ability to tackle.³ The research should be specific and within the broader area of your expertise, or something that you are interested to learn more about. Try to confine the number of aspects under investigation, and develop a research question to explore each one.¹ Consider what type of research will need to be used to answer the questions e.g. literature review, a laboratory experiment, patient related assessment, clinical trial, questionnaire. Then map out a research plan, including issues such as time frames, budget, facilities and technical expertise needed, required patient pool or records, and what authorisation or permission may be needed, if applicable. It is imperative that whenever patients, participants, clinical records or human tissue are used, there is a signed consent form from the person(s) involved. In the case of minors the legal guardian must sign for consent, and the child must give assent.⁵ Compare this with the resources you have at your disposal. Do you have access to people, statistics, or documents from which to collect the data you need? Will you be able to relate the concepts of your research question to these observations, phenomena, indicators or variables?³ Will the findings produce Results that are in accordance with the Aim, and can these data be accessed within the limited time and resources you have available?³

This will help one decide if the objectives are achievable and if the study can be managed. Team work and collaboration with other more experienced researchers or experts is beneficial to all. However, in any joint venture it is imperative that the role of each person is clearly defined, understood, agreed upon and documented before beginning the study. This also applies to the rights to retention of study material and authorship.

R – RELEVANT

The research question must be of academic, intellectual or clinical interest to people in the field you have chosen to study, usually arising from issues raised in the literature or experiences in practice.³ Re-look at your literature review to ensure the research is needed and whether the results will make any meaningful contribution to that field. From this point onwards – keep a record of all references i.e. a full bibliography including author, title, and place of publication, date, publisher details, and page numbers. For internet sources quote URLs, creation dates, and your date of access. Be vigilant in correctly citing and accrediting any quotes or sources – plagiarism is one of

the worst publication offenses. Remember that a paper without an accurate bibliography is useless since it will have no citations of the reference source material and the information cannot be verified.²

T – TIME DEPENDENT (TENTATIVE DRAFT)

Create a draft outline of the study. This will help ensure that each step follows in a logical sequence. Try to estimate the time, resources and budget that will be needed for each stage. This will vary tremendously depending on the type of study. A literature review may be labour intensive, but only requires dedicated time and access to the Internet. An experimental study could require materials, facilities and help from other skilled people including a statistician. Patient-centred research / clinical trials are the most difficult and time consuming to conduct. There are often limitations and difficulties that may not be anticipated up front. They usually require approval from a Human Ethics Committee, patient consent, a control group, an intervention, patient co-operation, a variable length of time to monitor effects, and patient recall to collect the results. Drop out is high and this must be anticipated when initially estimating sample size. It is disheartening to complete a study and then discover the results are null and void because the sample was not representative or not large enough, or that there was not a comparative control group. This further emphasises the need to consult a statistician during the planning stage. However, long-term clinical research is high up on the evidence ladder, and is well respected.⁴

E-ETHICAL

The ethics of research goes beyond the four principles of medical ethics set out by Beauchamps & Childess in 2001.⁶ While autonomy, beneficence, non-maleficence and justice are key issues, the ethics of conducting research aim to safeguard the scientist, protect the participants and maintain objectivity. This topic will be the focus of Paper Four. However, a few points on “What makes research unethical can be mentioned beforehand. Consider them as the four DEADLY don't's, and the seven DEAR do's: (Note the 4:7 ratio: Thus it is easier to be ethical than NOT!)

Don't:

1. Don't Ever Alter Data
2. Don't Extract or Add Details (if not found in your research)
3. Don't Exclude Adverse events to Deceive
4. Don't Erase Alternative Discoveries

Do:

1. Detail Exact Actions for Replication (allow others to copy the study)
2. Document Everything Accurately in Results
3. Declare Errors And pProblems
4. Discuss Each Aspect of the Results
5. Deliver Evidence-based Appropriate Recommendations
6. Declare Each Author's Role
7. Declare External Aid or Rands (donor's contributions and conflicts of interest)

S – STIMULATING

The chosen topic must excite and intrigue you as the researcher, and the question must be able to maintain your interest throughout the project.^{3,7} If it does not, there's little chance that it will appeal to anyone else either, less

chance that it will be done well, and even less that it will ever see completion. Think about what aspects you find the most interesting, if there is scope for investigation into that area, try to formulate the question in different ways, and finally, once you are happy with the question, try to tie it in with the Aim, Objectives and Problem statement.⁷ Finally, formulate a concise, applicable title that will attract and entice the reader.

T- TRENDING

Science and technology are advancing at such a rate that is almost impossible to keep up to date with all the new developments in any field. This is one of the main reasons for beginning with a literature search. One of the most deflating experiences is to carry out an intricate study, collect data and then discover that the results have already been published by others. Or worse still, to find that new and better techniques, materials, drugs etc. are available. However, avoid “fad” issues which will not maintain yours or anyone else’s interest.

CONCLUSIONS

Research is not just for academics. Many people unwittingly carry out investigations on a daily basis – for example, consider how much time is spent deciding on a simple task such as purchasing a new cellular telephone. So then why not expend the same amount of energy conducting research in your chosen profession? The basic

principles are the same! For both you may ask yourself: Is this something I/others care about? Are there pros and cons that must be considered? Is it arguable? Is it a new spin on an old idea? Does it solve a problem? Is it too broad or too narrow? Is it within reasonable time frames, budget, resources, capabilities and location? Is the information accessible or researchable?⁵ If you can answer all of these in the affirmative – Well done! Go for it, YOU can do research.

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1 We need talented

to start

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2 For further information:

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