









How to write materials & methods section of a research protocol

Objectives:

1. Understand the importance of materials and methods.
2. Identify the contents of materials and method.
3. Using subheadings of materials and methods section appropriately.
4. Being able to identify and avoid common problems in writing materials.

18th lecture

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Writing materials and methods

This slide is from girls' slides

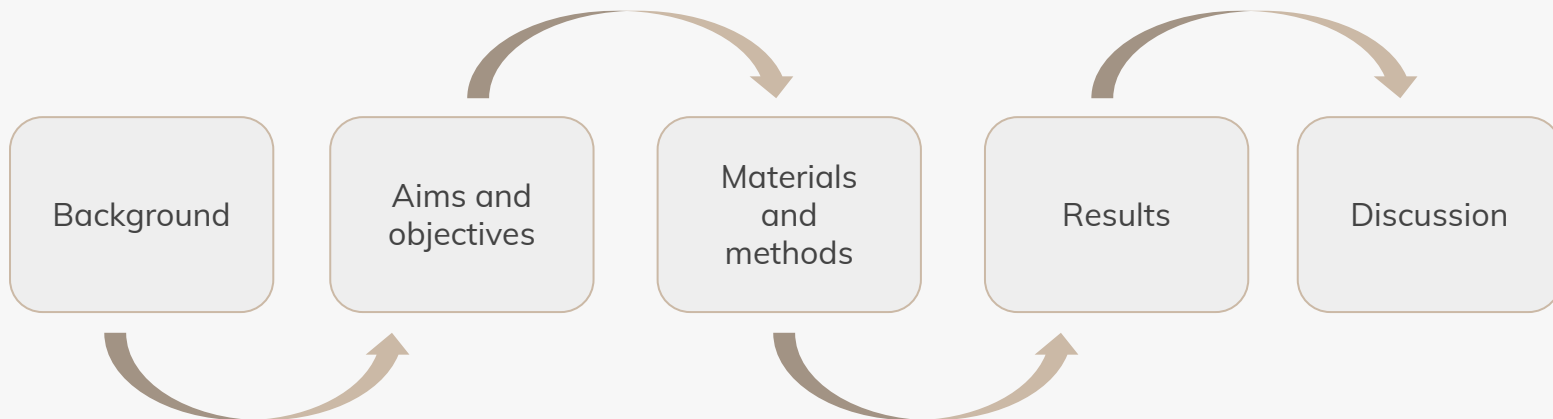
Full account

- A Full account is a description of every step actually used in the lab to achieve your results.
- Its written in **sequential** or in a **temporal** order.
- Intended to tell the complete story of your work.

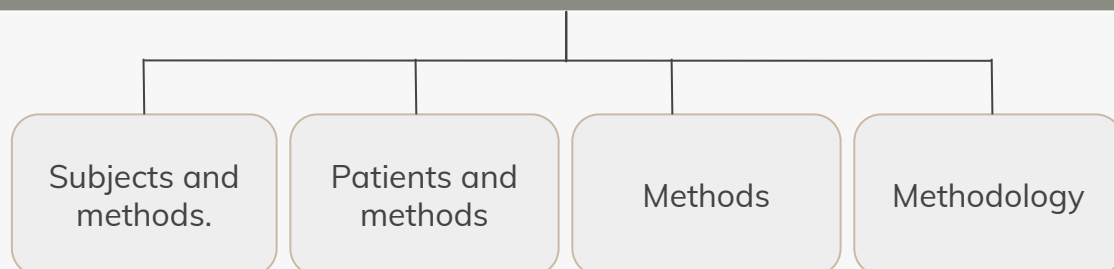
Methods

- A method section is a series of steps already completed and is written in past tense.
- Its written in a logical order. (if its logical it can be written in sequence)
- Intended for the reader to replicate the experiment.

Structure of a scientific journal article of the original research type



Minor variations exist among different journals :



Always check 'instruction to authors' or 'author to guidelines'. They all depend on the journal you will publish in

Q1) Why is Materials and methods is the most important part of a manuscript?

A: Validity (Most read part of the manuscript) / Q1: does it actually measure what i want to measure?

Q2) What is the main purpose of the Materials and methods section?

A: Repeatability

Writing materials and methods

This slide is from girls' slides

The component of material & methods section should compose the following:

01

What was done? How was it done? How will the data be analyzed? Which type of study, location of the study, and the period and duration of the study?

It's always in past tense

02

When the study has been completed:

- The Materials and methods is usually the first section to be written during manuscript preparation.
- Should be in a chronological order.
- **Passive voice and third person in the past tense is recommended for writing this section.**

Example : The sample was incubated at 37C for 3 days **NOT** I incubate the sample at 37C for 3 days

03

Describe the materials, measures, equipment, or stimuli used in the experiment. This may include testing instruments, technical equipment (It explains to the reader why you chose it instead of anything else).

- The source population should be defined.
Where did you get the population from? It has to be mentioned
- The sampling method used should be described in details.
- Both **inclusion and exclusion** criteria used for recruitment of the study group should be clearly stated.
- Selection of the control group and how they relate to the study group, should be described (e.g. Matched by age, gender, ethnicity, clinical condition).

04

Details are important for animal subjects details such as genus, species and strain, age, gender, nutritional state, physiological or pathological status (e.g. pregnant, castration), diet and name of supplier are expected.

- Methods in details
- Precision of measurements (what are the units that you have used/ how did you round the numbers)
- Statistical analysis It's important to write how you did your analysis, you have to relate it to your study and manuscript
- All apparatus and equipment details
- Drug or chemical details
- Tissue details

Writing materials and methods

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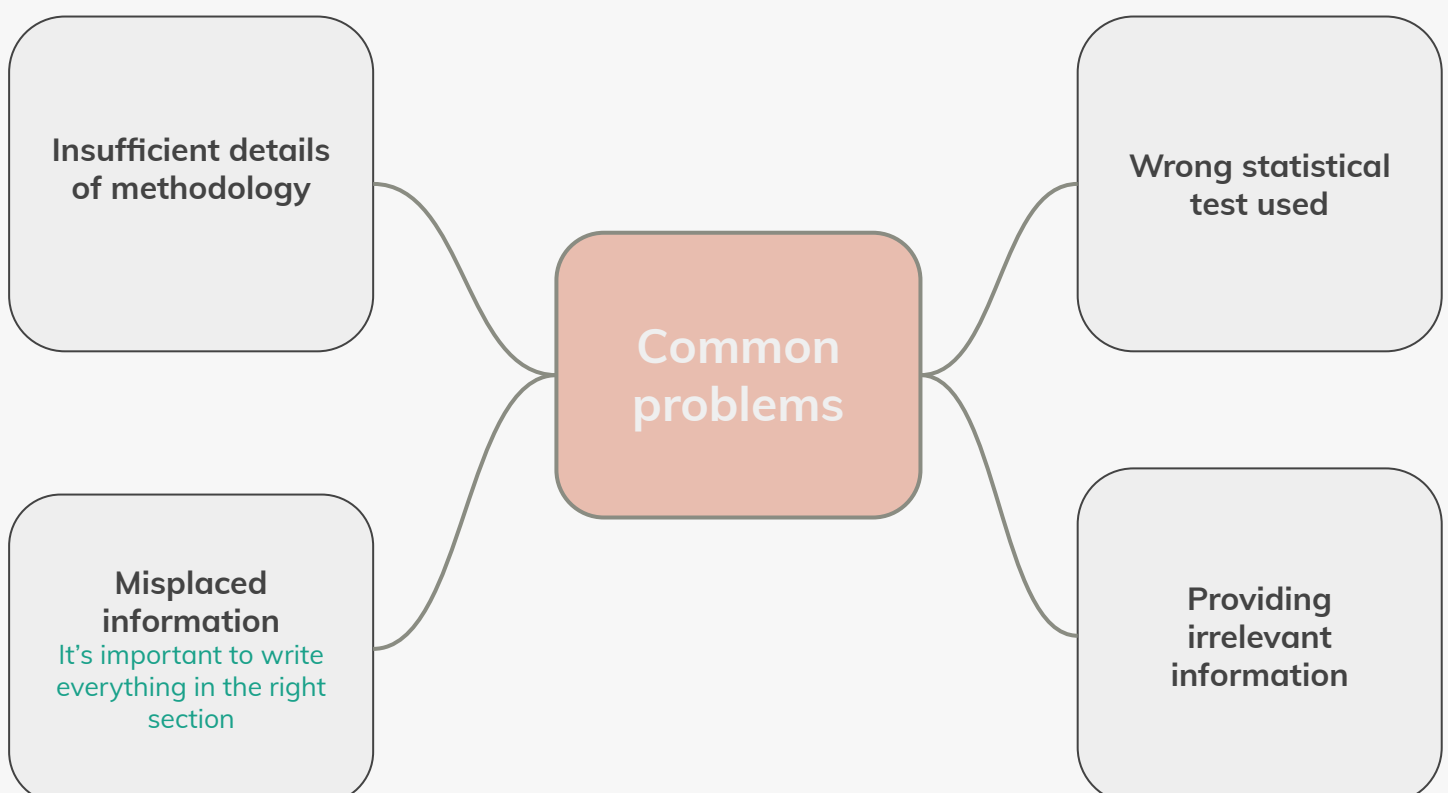
Evaluation of the method used:

- It should be comprehensively described.
- For example:
 - Number of observer
 - Blinded or not
 - Independent or by consensus
 - The exact time period between readings
 - The grading system
 - How were evaluation recorded

Medical research involving human subjects:

- Approval from the IRB or ethics committee is required for all studies involving humans, medical records, and human tissues.
- Informed consent from participants of the study should always be sought, if this not possible, the IRB should decide whether this is ethically acceptable.

Example: Ethical approval and informed consent from parents: The study protocol was approved by the hospital scientific and ethics committees & Written parental informed consent was obtained before randomization



The Structure of the Methods Section in a Research paper

This slide is from girls' slides

1. Design

1. The type of design used in the experiment .
2. Retrospective or prospective
3. Specify the variables as well as the levels of these variables.
4. Identify your dependent and independent variables.

2. Settings

1. Describe the place you recruited your participants from.
2. Describe the system **Example:** took it from a hospital which is known to be the best....

Settings & System (S with S)

3. Participants

1. Describe those who were involved in the investigation (inclusion and exclusion criteria).
2. Focus on the following criteria depending on the subject:
 - ❖ Age
 - ❖ Race
 - ❖ Gender
 - ❖ Education
3. Describe the place or method the participants were recruited and if they were compensated.
4. **Do not use the term "subject" the word "participant" is preferred.**

4. Data Collection

1. How did you approach the participants (clinics or waiting area)
2. When? (before or after appointment)
3. All sufficient measures of the experiment
4. The number of questions or statements
5. The interpretation of the format (what the high and low results mean)
6. The reliability of the materials
7. Describe the process if you have created your own measure
8. How the participants responded
9. Need to discuss how the data was collected
10. Make sure that any other person will be able to repeat the experiment after your note

5. Data Analysis

1. Which test? Why? In what data? To determine what?
2. Statistical package used and its version

6. Ethical consideration

The study protocol was approved by the reference number.

The Structure of the Methods Section in a Research paper

this slide is from boys' slides

Type and purpose of Research designs

Purpose of the study	Study design
Determine frequency and burden of a disease	<ul style="list-style-type: none">• Cross sectional survey (Prevalence)• Cohort study (Incidence)
Identify the risk factors	<ul style="list-style-type: none">• Cohort study• Case-Control study
Determine prognosis of a disease	<ul style="list-style-type: none">• Cohort study
Determine efficacy/ effectiveness of new treatment	<ul style="list-style-type: none">• Clinical trials• Community intervention
Evaluate community programs	<ul style="list-style-type: none">• Evaluation

Why is it important to know the study duration ?

1. know how much resources will be used
2. manage the research within study duration

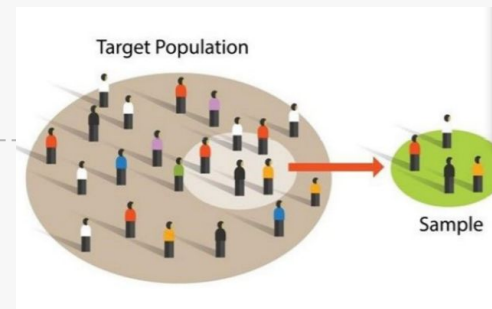
It is important to manage suitable study setting. Ex hospital, school ect..

Target Population/Sample Size



Target Population/Sample Size

- Who is selected to participate in the study?
- Proper definition of eligibility, inclusion, exclusion and discontinuation criteria of the study subjects should be stated.
- The inclusion and exclusion criteria should be clearly defined.
- Sample size calculation is recommended for economical and ethical reasons.
- The calculation of the sample size must be explained, including the power of the sample.
- The sampling technique should be mentioned, e.g., randomization that will be used in order to obtain a representative sample for your target population.
- Each step involved in the recruitment of the study subjects should be described according to the selection criteria (inclusion and exclusion criteria).



The Structure of the Methods Section in a Research paper

this slide is from boys' slides

Study Variables



Variable can be defined as

characteristic which is subject to change and can have more than one value such as age, intelligence, motivation, gender, etc

Dependent and Independent Variables

Independent variables : are variables which are manipulated or controlled or changed , It is what the researcher studies to see its relationship or effects , Presumed or possible cause

Dependent variables : are the outcome variables and are the variables for which we calculate statistics , The variable which changes on account of independent variable is known as dependent variable.

Example:

Higher education typically leads to higher income

Higher education -> (Independent variable) Higher income -> (Dependent variable)

Ethical Considerations

- The study will be conducted after Institutional Review Board (IRB) approval.
- Informed consent will be given to the subjects before taking the decision to participate, the privacy and confidentiality of subjects' information will be guaranteed and protected by researchers.
- The collected data is going to be used only for research. The information will be kept anonymous, and the participation is voluntary.

Data Collection/Data Source

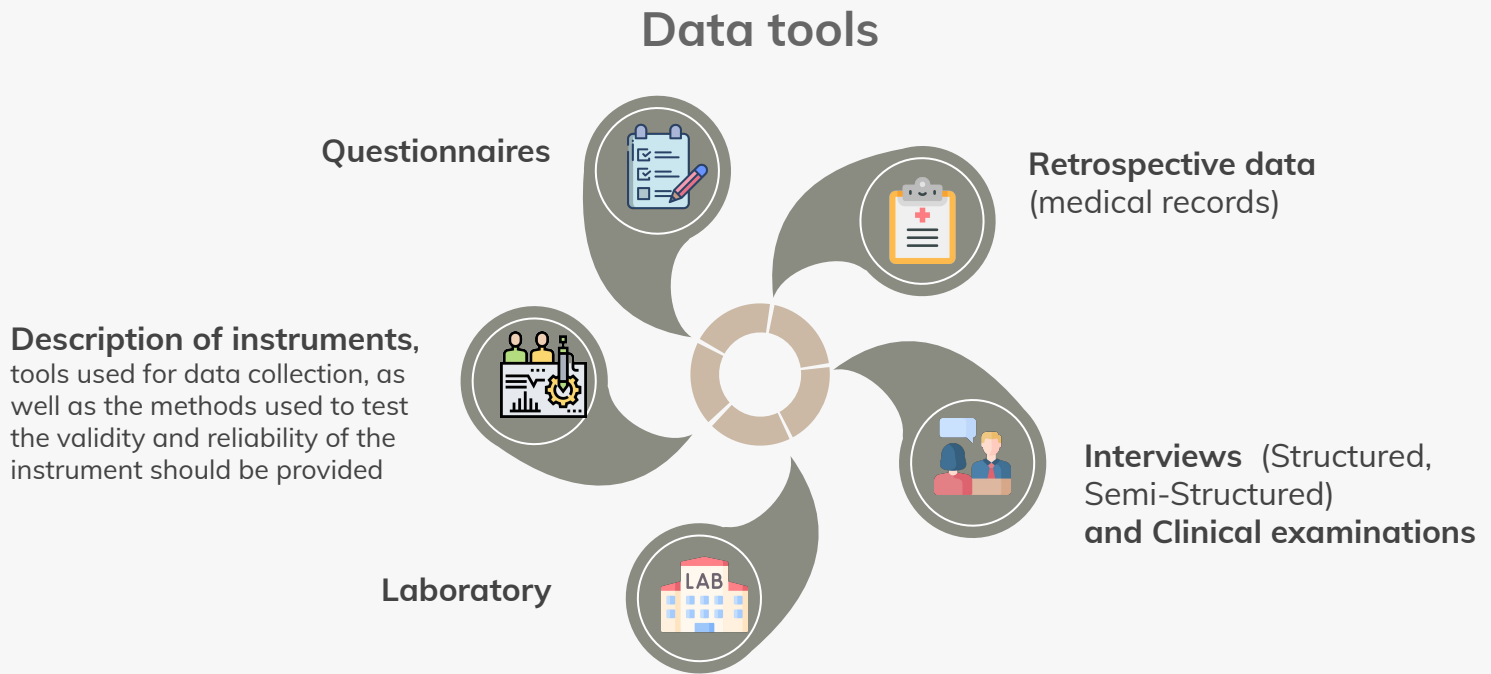
- Qualitative Deals with descriptions , Data can be observed Data can not measured e.g. -Colour.
- Quantitative Deals with numbers 'Data which can be measured. e.g. -height , weight , length.

Sources of Data

1. External sources
2. Internal sources
3. Primary data
4. Secondary data

The Structure of the Methods Section in a Research paper

this slide is from boys' slides



Data Management and Analysis



- This section should be written following statistical advice from a statistician.
- The analysis plan and which statistical tests will be used to check the significance to the research question/hypothesis with appropriate references should be described.
- Names of variables that will be used in the analyses and the name of statistical analysis that will be performed to assess the outcome should be listed.
- If computer programs are to be applied, it is important to mention the software used and its version.

Strengths and Limitations



- It is important to mention the strengths or limitations of the study,
- what study can achieve or cannot achieve is important,
- so as to prevent wasteful allocation of resources.

Lecture Summary For girls slides

Structure of a scientific journal article of the original research type

Background	Aims and objectives	Materials and methods	Results	Discussion
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Structure of the Methods Section in a Research paper

Design	<ol style="list-style-type: none"> 1. The type of design used in the experiment . 2. Retrospective or prospective. 3. Specify the variables as well as the levels of these variables. 4. Identify your dependent and independent variables.
Settings	<ol style="list-style-type: none"> 1. Describe the place you recruited your participants from. 2. Describe the system.
Participants	<ol style="list-style-type: none"> 1. Describe those who were involved in the investigation(inclusion and exclusion criteria). 2. Focus on the following criteria depending on the subject: <ol style="list-style-type: none"> a. Age b. Race c. Gender d. Education 3. Describe the place or method the participants were recruited and if they were compensated. 4. Do not use the term "subject" the word "participant" is preferred.
Data Collection	<ol style="list-style-type: none"> 1. How did you approach the participants 2. When? 3. All sufficient measures of the experiment 4. The number of questions or statements 5. The interpretation of the format(what the high and low results mean) 6. The reliability of the materials 7. Describe the process if you have created your own measure 8. How the participants responded 9. Need to discuss how the data was collected 10. Make sure that any other person will be able to repeat the experiment after your note
Data Analysis	<ul style="list-style-type: none"> • Which test? Why? In what data? To determine what? • Statistical package used and its version
Ethical consideration	The study protocol was approved by the reference number

Lecture Summary For boys slides

<p>Type and purpose of Research designs</p>	<p>Purpose: determine frequency and burden of a disease) Study design:Cross sectional survey (Prevalence) ,Cohort study (Incidence) Purpose: identify the risk factors Study design: Cohort study , Case-Control study Purpose : determine prognosis of a disease Study design :Cohort study Purpose: determine efficacy/effectiveness of new treatment Study design :Clinical trials ,Community intervention Purpose: evaluate community programs Study design :Evaluation</p>
<p>Study Variables</p>	<p>Definition: characteristic which is subject to change and can have more than one value such as age, intelligence, motivation, gender, etc</p> <p>Independent variables : are variables which are manipulated or controlled or changed , It is what the researcher studies to see its relationship or effects , Presumed or possible cause</p> <p>Dependent variables : are the outcome variables and are the variables for which we calculate statistics , The variable which changes on account of independent variable is known as dependent variable.</p>
<p>Ethical Considerations</p>	<ul style="list-style-type: none"> - The study will be conducted after Institutional Review Board (IRB) approval. - Informed consent will be given to the subjects before taking the decision to participate, the privacy and confidentiality of subjects' information will be guaranteed and protected by researchers. - The collected data is going to be used only for research. The information will be kept anonymous, and the participation is voluntary.
<p>Data tools</p>	<ul style="list-style-type: none"> ● Questionnaires ● Laboratory ● Interviews and Clinical examinations ● Retrospective data (medical records) ● Description of instruments,
<p>Data Collection</p>	<ul style="list-style-type: none"> - Qualitative Deals with descriptions , Data can be observed Data can not measured e.g. –Colour. - Quantitative Deals with numbers 'Data which can be measured. e.g. –height ,weight , length.
<p>Sources of Data</p>	<ol style="list-style-type: none"> 1. External sources 2. Internal sources 3. Primary data 4. Secondary data

Questions

(1) “describing the system” is attributed to which part of methods and material section?

- A) Data collection
- B) Data analysis
- C) Setting
- D) Participants

(2) “a description of every step actually used in the lab to achieve your results” is the definition of?

- A) Methods
- B) Full Account
- C) Background
- D) Results

(3) Why is Materials and methods is the most important part of a manuscript?

- A) Validity
- B) Repeatability
- C) Shows the ethical consideration

(4) What is the main purpose of the Materials and methods section?

- A) Validity
- B) Repeatability
- C) Shows the ethical consideration

(5) Methods is Intended for the reader to replicate the experiment ?

- A) True
- B) False

(6) What is the independent variable in this example “Higher education typically leads to higher income” ?

- A) Higher education
- B) Higher income

Answers:

1: C | 2:B | 3: A | 4:B | 5:A | 6: A



Thank you for checking our work!

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