

Research Methodology



by

Dr. Ranj Nadhim Jalal

*BDS, Hawler Medical University, College of Dentistry
Professional Diploma in Dental Implantology
PhD in Dental Implantology (University of Plymouth/UK)*

3rd lecture, 21/10/2019

Methods of Research

- Experiments
- Surveys
- Questionnaires
- Interviews
- Case studies
- Observational studies
- Clinical trials

Experiments

- Tests the hypotheses of causal relationships between variables.
- Normally has **control** and **treatment** groups.

Principles of experimental design

- The principle of replication.
- The principle of randomization.
- The principle of local control.

The principle of replication

- **Replication:** the repetition of a test or complete experiment.
- The experiment should be repeated more than once. Thus, each treatment is applied in many experimental units instead of one. By doing so the statistical accuracy of the experiments is increased.
- **Why?? Because** replication reduces variability in experimental results, increasing their significance and the confidence level.

Example

- To test the efficacy of a **certain antibiotic** to treat a **certain disease**,
5000 people are given the antibiotic
5000 people are given placebo

Because of the large sample size, the effectiveness of the drug would most likely be observed.

Replication increases reliability

Thus

More confident conclusions



The principle of randomization

- Is a type of experiment in which subjects (participants) get randomly chosen to be part of either the **control** or **experimental treatments**.
- indicates that we should design or plan the experiment in such a way that the variations caused by extraneous factors can all be combined under the general heading of “chance.”
- There is an assumption held by the researcher that any **external factors** will influence the treatments equally.

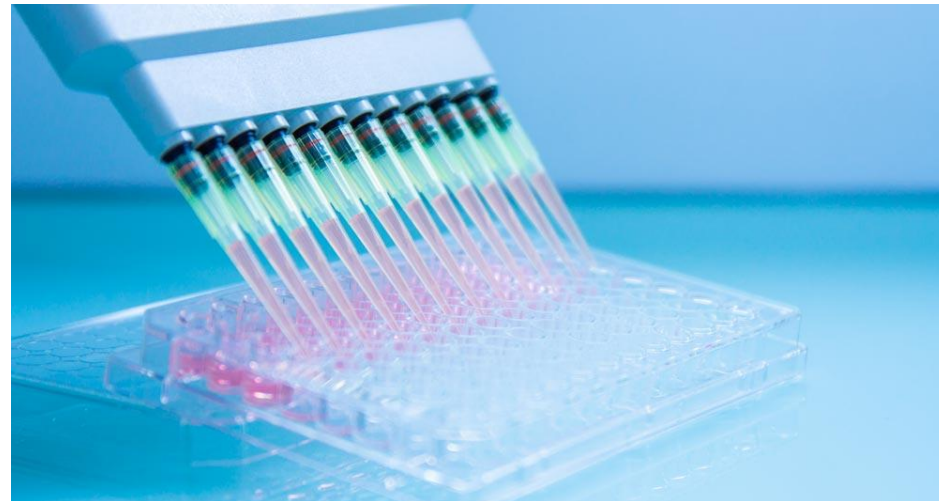
The principle of local control

- It is another important principle of experimental designs.
- through the principle of local control, we can eliminate the variability due to extraneous factor(s) from the experimental error.

In vitro vs *In vivo* experiments

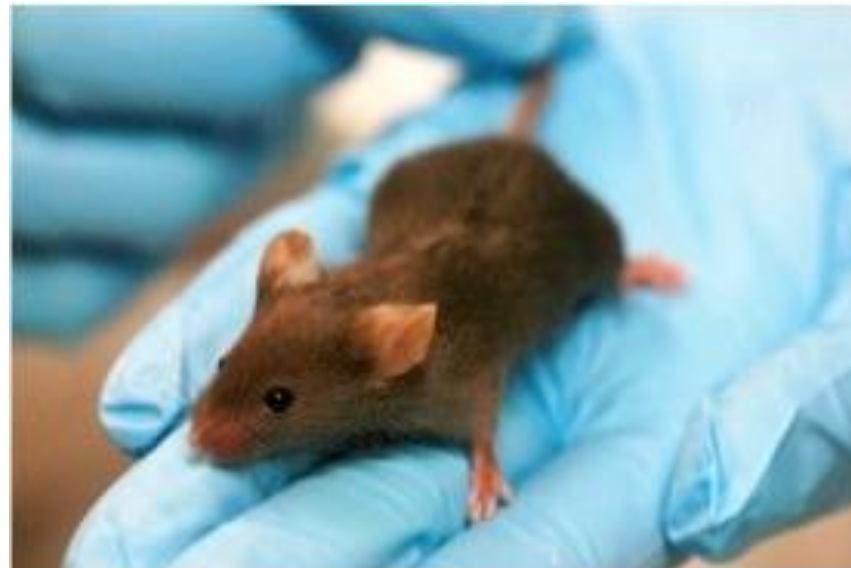
- *In vitro*

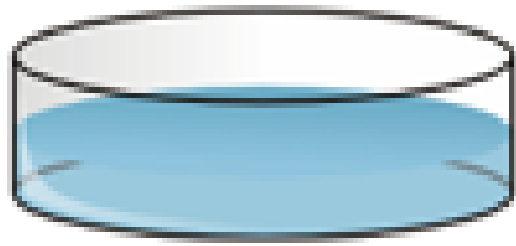
- Experiments conducted in laboratory (outside living organism). It is a Latin word which means (within the glass).
- Artificial conditions provided by the researcher.



In vivo experiments?

- Experiments conducted inside living organism. It is a Latin word which means (within the living).
- **animal testing** and **clinical trials** are major elements of *in vivo* research





In Vitro



In Vivo

Differences between them?

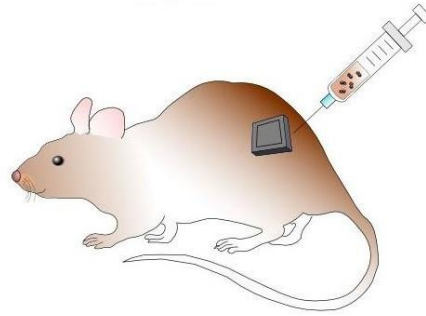
In vitro	In vivo
Less expensive	More expensive
Less time consuming	More time consuming
Less precise	More precise
Fewer restrictions	More restrictions

Testing new drugs or biomaterials require:

In vitro experiments
to ensure safety and
efficacy



In vivo animal
studies (mice, rats or
rabbits)



Clinical trials (human
studies)



Surveys

- A Survey is defined as a research method used for collecting data from a pre-defined group of respondents to gain information and insights on various topics of interest.

Sample and sample determination

- A sample is a selection of respondents from a population in such a manner that the sample represents the total population as closely as possible.
- **Types of sampling**
- Probability sampling
- Non-probability sampling

- **Probability sampling:** is a sampling method where the respondent is selected based on the theory of probability. The major characteristic of this method is that each individual in a population has an equal chance of being selected.
- **Non-probability sampling:** is a sampling method where the researcher selects a sample of respondents purely on the basis of their own discretion. There is no predefined selection method.

Questionnaires for the survey

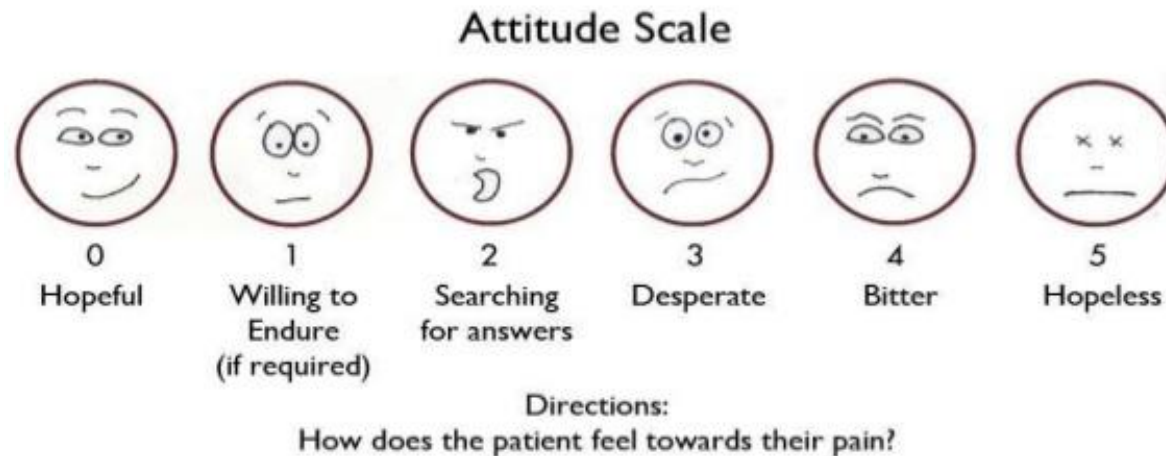
- Multiple choice questions are most commonly used in surveys

Types of multiple choice questions

- Single select multiple choice question.
- Multi select multiple choice question.
- Drop down menu multiple choice question.
- Attitude scale.
- Star rating multiple choice question.
- Push to social multiple choice question.
- Numeric slider multiple choice question.

Attitude scale

- An attitude scale, is a tool prepared for the purpose of measuring people's attitude to an issue is called attitude scale.
- An attitude scale is designed to provide a valid, or accurate measure of an individual's social attitude.



Star rating

How satisfied are you with the following:

Website



Customer Service



Overall



[Add Row](#)

Numeric slider

Roughly what percentage of your monthly budget goes towards the following areas?

0 10 20 30 40 50 60 70 80 90 100

Food



Entertainment



Housing



>>

- Close ended questions

Questions that can be answered with **Yes/No**

- Open ended questions

Questions that cannot be answered with **Yes** or **No**

Open ended questions are statements which require a **response**.



Thank you!