Research Course- sheet 4

From last lecture (lecture 3):

Some clarifications:

Using words from an article is considered Plagiarism unless you do one of the following:

1. You put quotation marks around the part you want to use and end the sentence by putting the year at the end and the page number .
2. Paraphrasing: rephrase what you want to take from a paper in your own words without putting quotation marks. You must follow that with the authors name and the year the paper was published as a citation.

Chapter 9: Research Design

A. **Experimental research:** when an intervention is applied to a test group and a control group. The researcher aims to maintain control over as many factors as possible in order to determine the causality of two variables. T

- Control: The researcher can control the sample, the environment, the selection of participants from the sample for each group, etc. The more controls are in place in your design, the more one can trust the research findings. Control reduces confounding values and effects.

B. Quasy experimental research design

C. **Non-experimental research design:** more important and essential if this type of study hasn't done before.

A. **Experimental design**: Has the highest level of control.

Some definitions:

- Subject: the people you approach in hopes they would agree to participate in your research.
- Participants: subjects who have agreed to participate in your research.

- Within group comparison: same group/sample is tested before and after some event/intervention or without an intervention at two different times.
- Between group comparison: you have two different groups/samples which are tested at one time.

Time frame related design:

1. Cross-sectional design: you do your study at one point of time. No follow-up involved. E.g. give out survey and gather information at one time, you don't collect information again after that.
2. Longitudinal design cohort type: data collected at two or more times from the same group.
3. retrospective study: you go back to file and charts of patients and take data from there. All data is already recorded.

4. Prospective: data will be collected in the future.
Correlational design: to correlate or find a relationship between variables, one independent and the other dependent.

Dependent vs Independent variables examples:

- Independent variable: smoking. Dependent variable: lung cancer.
- Independent variable: age. Dependent variable: memory loss.
- Independent variable: fat intake. Dependent variable: cholesterol level.

Experimental study: involves manipulation, control, and randomization.

- Setting: the environment the study is done is. If the experiment is done in a laboratory setting could include a certain temperature setting

- **Manipulation:** the intervention done on the sample. If there is no intervention, it can't be an experimental study design. The intervention can be a new drug, new surgery, new education program, etc.

- **Control:** researchers need two groups in the study:
    - Interventional group: the group you apply the intervention on/the group you manipulate.
    - Control group: you don't use an intervention on them. This group is used to compare the effects of the intervention on the interventional group to the control group to determine whether the intervention's effects are statistically significant.

  You do the study on both groups and compare the outcomes to see if they are the same or different. The control group should be as similar to the interventional group as possible in every way other than the intervention. There must be at least two groups and one of them has to be a control group. You can't use one group as both a control group and an interventional group. It wouldn't be an experimental design, it would be called a pre/posttest design.

- **Randomization:** to reduce the subjectivity/bias of the researcher in the assignment of participants to either group (control or interventional). in experimental design, what is meant by randomization is that the sample is divided into two groups. In order to reduce the external/confounding effects, you have to divide your sample into two groups randomly to reduce any bias that could weaken your results' validity.

If the total sample is 120, the control and interventional groups must each be 60. This division must be random and can be done either in a computerized way or can do it manually. To do it manually, assign each participant a number, put these numbers on papers and put them into a bowl. Mix them and the first number you choose will be in the control group, the second will be in the interventional group, the third in the control, etc. There are also special tables designed to help. They are computer generated and randomly

mix the patients numbers up and you can either close your eyes and randomly point to a number and distribute them like that, or you can go up and down or any other direction and use whatever number you get to. Once you have the two groups, you need to compare both groups. They must be as equal as possible to one another. You need to compare the basic characteristics of both groups statistically. Compare education, income level, gender, and other factors. However, random assignment should take care of all that and prevent groups from being different from each other (e.g. more females in one group than another, etc). In case after random assignment you end up with two groups that are different in some way, state that in your paper and repeat the random assignment.

Types of Experimental Design:

- pretest/posttest or before/after test designs: both groups are tested before and after intervention. There is considerable confidence that any differences between the two groups are because of the intervention.

*There's a design called "after only", only tests group after intervention but it isn't an experimental design, it's a quasy-experimental design. You can read more about it in the book if you want but it's not required for us.

- Crossover design: a longitudinal study, repeated over time. Groups receive a sequence of different treatments/exposures (from Wikipedia).

- Factorial design: it's one of the most complicated and strongest designs. 2x2 or 3x3 design, 2 rows and 2 columns, or 3 rows and 3 columns. Youre dividing the sample into 4 or 9 groups respectively.

e.g. could be used to determine the effect of an intervention at different times after administration. After 3 minutes, 10 minutes, 20 mins etc.

e.g. In the table below you have a 2x4 factorial design. 1,2,3,4 can be alternative interventions applied to two groups (A and B). One of these interventions can be a placebo, but the study has to be ethical. This means that you need to explain to subjects that they will be assigned either an intervention or a placebo randomly before they become participants in your study.

1,2,3,4 could also be different times a response to a certain intervention is measured.

	factor levels	
trial	A	B
1	+	−
2	+	+
3	−	−
4	−	+

B. **Quasy-Experimental design:** Advantages include that its more feasible if we can't apply all conditions of experimental studies but we still need to do a study. We have an intervention and two groups but either randomization wasn't done or there is no control group. You have to state why you couldn't do randomization or didn't have a control group.

It's easier and more practical than doing two experiments. However, you can't determine causality through it. The only study design you can determine causality from is an experimental design. It's the only way to find out if the independent variable causes the dependent variable. Quasy-experimental cannot tell us that.

The result of the quasy-experiment is reported but it's not trusted as much as the results of an experimental study. Results could be attributed to the variations between the two groups if there is no randomization. That's one reason why we can't determine causality from quasy-experimental design.

C. **Non-experimental design:** no intervention on participant
   1. Correlational design: the aim is to find whether there is a relationship between variables. E.g. is there a relationship between anxiety levels and student performance? The relationship must be statistically significant.
   2. Descriptive design: results describe certain phenomena. There is no correlation, no interpretation and no predictions taken from results. Use descriptive statistics: standard deviation, frequencies, median, mode.

The rest should have been discussed in lecture 5