**Experimental Research**

<https://www.onlinepsychologydegree.info/influential-psychological-experiments/>

Experimental research is commonly used in sciences such as sociology and psychology, physics, chemistry, biology and medicine etc.

It is a collection of research designs which use manipulation and controlled testing to understand causal processes. Generally, one or more variables are manipulated to determine their effect on a dependent variable

**The experimental method:**

It is a systematic and scientific approach to research in which the researcher manipulates one or more variables, and controls and measures any change in other variables.

Experimental research is conducted in the following situations:

* Time is a vital factor for establishing a relationship between cause and effect.
* Invariable behavior between cause and effect.
* The eminence of cause-effect relationship is as per desirability.

The word experimental research has a range of definitions. In the strict sense, experimental research is what we call a true experiment.

This is an experiment where the researcher manipulates one variable, and control/randomizes the rest of the variables. It has a control group, the subjects have been randomly assigned between the groups, and the researcher only tests one effect at a time. It is also important to know what variable(s) you want to test and measure.

A very wide definition of experimental research, or a quasi experiment, is research where the scientist actively influences something to observe the consequences. Most experiments tend to fall in between the strict and the wide definition.

A rule of thumb is that physical sciences, such as physics, chemistry and geology tend to define experiments more narrowly than social sciences, such as sociology and psychology, which conduct experiments closer to the wider definition.

**Aims of Experimental Research**

Experiments are conducted to be able to predict phenomenons. Typically, an experiment is constructed to be able to explain some kind of causation. Experimental research is important to society - it helps us to improve our everyday lives.

**Identifying the Research Problem**

After deciding the topic of interest, the researcher tries to define the research problem. This helps the researcher to focus on a more narrow research area to be able to study it appropriately. Defining the research problem helps you to formulate a research hypothesis, which is tested against the null hypothesis.

The research problem is often operationalizationed, to define how to measure the research problem. The results will depend on the exact measurements that the researcher chooses and may be operationalized differently in another study to test the main conclusions of the study.

An ad hoc analysis is a hypothesis invented after testing is done, to try to explain why the contrary evidence. A poor ad hoc analysis may be seen as the researcher's inability to accept that his/her hypothesis is wrong, while a great ad hoc analysis may lead to more testing and possibly a significant discovery.

**Constructing the Experiment**

There are various aspects to remember when constructing an experiment. Planning ahead ensures that the experiment is carried out properly and that the results reflect the real world, in the best possible way.

**Sampling Groups to Study**

Sampling groups correctly is especially important when we have more than one condition in the experiment. One sample group often serves as a control group, whilst others are tested under the experimental conditions.

Deciding the sample groups can be done in using many different sampling techniques. Population sampling may be chosen by a number of methods, such as randomization, "quasi-randomization" and pairing.

Reducing sampling errors is vital for getting valid results from experiments. Researchers often adjust the sample size to minimize chances of random errors.

Here are some common sampling techniques:

* probability sampling
* non-probability sampling
* simple random sampling
* convenience sampling
* stratified sampling
* systematic sampling
* cluster sampling
* sequential sampling
* disproportional sampling
* judgmental sampling
* snowball sampling
* quota sampling

**Creating the Design**

The research design is chosen based on a range of factors. Important factors when choosing the design are feasibility, time, cost, ethics, measurement problems and what you would like to test. The design of the experiment is critical for the validity of the results.

**Typical Designs and Features in Experimental Design**

 **Pretest-Posttest Design**

 Check whether the groups are different before the manipulation starts and the effect of the manipulation. Pretests sometimes influence the effect.

 **Control Group**

 Control groups are designed to measure research bias and measurement effects, such as the Hawthorne Effect or the Placebo Effect. A control group is a group not receiving the same manipulation as the experimental group. Experiments frequently have 2 conditions, but rarely more than 3 conditions at the same time.

 **Randomized Controlled Trials**

 Randomized Sampling, comparison between an Experimental Group and a Control Group and strict control/randomization of all other variables

 **Solomon Four-Group Design**

 With two control groups and two experimental groups. Half the groups have a pretest and half do not have a pretest. This to test both the effect itself and the effect of the pretest.

* **Between Subjects Design**
* Grouping Participants to Different Conditions
* Within Subject Design
* Participants Take Part in the Different Conditions - See also: Repeated Measures Design
* Counterbalanced Measures Design
* Testing the effect of the order of treatments when no control group is available/ethical
* Matched Subjects Design
* Matching Participants to Create Similar Experimental- and Control-Groups
* Double-Blind Experiment

 Neither the researcher, nor the participants, know which is the control group. The results can be affected if the researcher or participants know this.

 **Bayesian Probability**

 Using bayesian probability to "interact" with participants is a more "advanced" experimental design. It can be used for settings were there are many variables which are hard to isolate. The researcher starts with a set of initial beliefs, and tries to adjust them to how participants have responded

**Pilot Study**

It may be wise to first conduct a pilot-study or two before you do the real experiment. This ensures that the experiment measures what it should, and that everything is set up right.

Minor errors, which could potentially destroy the experiment, are often found during this process. With a pilot study, you can get information about errors and problems, and improve the design, before putting a lot of effort into the real experiment.

If the experiments involve humans, a common strategy is to first have a pilot study with someone involved in the research, but not too closely, and then arrange a pilot with a person who resembles the subject(s). Those two different pilots are likely to give the researcher good information about any problems in the experiment.

**Conducting the Experiment**

An experiment is typically carried out by manipulating a variable, called the independent variable, affecting the experimental group. The effect that the researcher is interested in, the dependent variable(s), is measured.

Identifying and controlling non-experimental factors which the researcher does not want to influence the effects, is crucial to drawing a valid conclusion. This is often done by controlling variables, if possible, or randomizing variables to minimize effects that can be traced back to third variables. Researchers only want to measure the effect of the independent variable(s) when conducting an experiment, allowing them to conclude that this was the reason for the effect.

**Analysis and Conclusions**

In quantitative research, the amount of data measured can be enormous. Data not prepared to be analyzed is called "raw data". The raw data is often summarized as something called "output data", which typically consists of one line per subject (or item). A cell of the output data is, for example, an average of an effect in many trials for a subject. The output data is used for statistical analysis, e.g. significance tests, to see if there really is an effect.

The aim of an analysis is to draw a conclusion, together with other observations. The researcher might generalize the results to a wider phenomenon, if there is no indication of confounding variables "polluting" the results.

If the researcher suspects that the effect stems from a different variable than the independent variable, further investigation is needed to gauge the validity of the results. An experiment is often conducted because the scientist wants to know if the independent variable is having any effect upon the dependent variable. Variables correlating are not proof that there is causation.

Experiments are more often of quantitative nature than qualitative nature, although it happens.

**Examples of Experiments**

**The Asch Experiment**

It was a series of studies conducted in the 1950's

The Asch Experiment, by Solomon Asch, was a famous experiment designed to test how peer pressure to conform would influence the judgment and individuality of a test subject.

The experiment is related closely to the Milgram Experiments, in that it tries to show how perfectly normal human beings can be pressured into unusual behavior by authority figures, or by the consensus of opinion around them.

For the experiment, eight subjects were seated around a table, with the seating plan carefully constructed to prevent any suspicion.

Only one participant was actually a genuine subject for the experiment, the rest being confederates, carefully tutored to give certain pre-selected responses. Careful experimental construction placed a varying amount of peer pressure on the individual test subject.

Asch Experiment - The experiment was simple in its construction; each participant, in turn, was asked to answer a series of questions, such as which line was longest or which matched the reference line.

The participants gave a variety of answers, at first correct, to avoid arousing suspicion in the subject, but then with some incorrect responses added.

This would allow Asch to determine how the answers of the subject would change with the added influence of peer pressure.

The Asch Experiment results were interesting and showed that peer pressure could have a measurable influence on the answers given.

The control group, those not exposed to peer pressure where everybody gave correct answers, threw up only one incorrect response out of 35; this could probably be explained by experimental error.

The results for the other groups were interesting; when surrounded by people giving an incorrect answer, over one third of the subjects also voiced an incorrect opinion.

At least 75% of the subjects gave the wrong answer to at least one question, although experimental error may have had some influence on this figure. There was no doubt, however, that peer pressure can cause conformity.

It was debated whether this is because people disbelieve the evidence of their own eyes or if it was just compliance, that people hide their opinions.

Follow ups to the Asch Experiment showed that the number of dissenting voices made a difference to the results, as did the forcefulness of the confederates.

One incorrect confederate made little difference to the answers, but the influence steadily increased if two or three people disagreed.

The figures did not change much after this point; more confederates made little difference. The number of people in the group also made a difference; the influence of dissenting voices leveled off for groups of more than six or seven people.

The experiments also showed that, even if only one other participant disagreed with the confederates, the subject was more likely to resist peer pressure; it appears to be more difficult to resist the majority if isolated.

The Asch Experiment showed that one voice can make a difference amongst many.There have been a number of criticisms of Asch's experiments; the subjects were all young males, and they tend to be much more impressionable than older men. More mature people have had enough experience of life, and more mental strength; they are more likely to hold true to their convictions.

Another criticism, that the experiment lacks ecological credibility and does not relate to real-life situations, is one that can be leveled at many psychological experiments, including the Milgram Experiment and the Stanford Prison Experiment.

Other follow up experiments, where the subjects were allowed to write down responses anonymously, showed far fewer incorrect answers. The comfort of anonymity made sure that looking foolish became much less of a pressure.

Study Conducted By: Jane Elliott

**Study Conducted in 1968 in an Iowa classroom**

**Experiment Details:**Jane Elliott’s famous experiment was inspired by the assassination of Dr. Martin Luther King Jr. and the inspirational life that he led. The third grade teacher developed an exercise to help her Caucasian students understand the effects of racism and prejudice.

Elliott divided her class into two separate groups: blue-eyed students and brown-eyed students. On the first day, she labeled the blue-eyed group as the superior group and from that point forward they had extra privileges, leaving the brown-eyed children to represent the minority group. She discouraged the groups from interacting and singled out individual students to stress the negative characteristics of the children in the minority group. What this exercise showed was that the children’s behavior changed almost instantaneously. The group of blue-eyed students performed better academically and even began bullying their brown-eyed classmates. The brown-eyed group experienced lower self-confidence and worse academic performance. The next day, she reversed the roles of the two groups and the blue-eyed students became the minority group.

At the end of the experiment, the children were so relieved that they were reported to have embraced one another and agreed that people should not be judged based on outward appearances. This exercise has since been repeated many times with similar outcomes.