



# Research-Based Learning: Instructions for the course “Sensation and Perception”

**Note:**

These instructions were developed at UCF and are included in the CREATES Toolkit Co-creative Learning as an example for how to implement Research-Based Learning. For more information and additional educational tools, visit: <http://europe-creates.eu>

## Instructions Research Project

This memo summarizes some of the most important points you need to consider when conducting your research project. Also refer to the slides I presented on the second day of class. If you need support at any point of the project, don't hesitate to get in touch with me - ideally during my office hours which you can find on ILIAS.

### Assignment

The assignment for this course is to plan, conduct and analyze the data of an experimental study on sensation and perception and present the study in a final report. You can follow the procedure of an experiment that has been carried out before and was published by someone else, but you need to collect your own data and analyze it with respect to your research question.

The goal of the assignment is that you get practical experience in planning, conducting, analyzing, interpreting and presenting a primary research project. Of course your results will probably not be published, but the assignment provides the opportunity for you to get hands-on experience in research including all the decision to be made and the things that could go wrong.

### Deciding for a Topic

The easiest way to find a topic is the replication of an experiment that has been published by one author or even replicated by another. This will raise the probability (although it doesn't guarantee) that you will get reliable results. I have outlined potential projects in the lecture, most notably the study by J.R. Stroop. You can get inspiration from the following two websites

- <http://gocognitive.net>
- <https://www.psychtoolkit.org>

Both websites do not only provide references to the original studies from the fields of sensation and perception but they also give contextual and background information. Most importantly they allow you to do the original experiments (or variants of it) in your web browser. Both websites provide access to participant data after the experiment is completed. You can use this data for your analysis.

- You can either replicate one of the experiments as they are provided on the website, meaning that you use the demo of one of the experiments to record data from participants you recruit. Or you use the source code (only provided on <https://www.psychtoolkit.org>) to adapt the experiment to your own research question.

If you decide to come up with your own research question, think about the goal of your study. What do

you want to show and why do you want to show it? Why is it interesting?

## **Planning and Preparing the Study**

Once you have decided for a topic and read the relevant literature, phrase a concrete research question and a hypothesis about your expectations. The hypothesis reflects your reasoning behind the study and prevents you from arbitrary post-hoc explanations when interpreting the results of your study.

If you investigate a concept that is not directly observable, you need to operationalize the concept. This means that you need to find phenomena that are observable with the method you decide to use. For example Stroop (1935) operationalized the concept of cognitive task interference by investigating the interference of two specific tasks (word reading and color naming). In addition, he operationalized the strength of interference as the time to complete the task and the number of errors made.

For the research design, determine the independent and the dependent variable(s) you are investigating. In the Stroop study the independent variable is congruency (with levels word-color- congruency and word-color-incongruency; in the original study he named them differently, though). Remember, that you can compare the behavior of participants with respect to two experimental conditions (like Stroop did) and/or with respect to different groups of participants (e.g. young adults and elderly persons). The dependent variable is the one you observe, in this case time to complete the task and errors made.

For this course I recommend to stick with a simple two- or three-group comparison, at most a 2x2- design to keep the analysis and interpretation of data as simple as possible.

## **Informed Consent and Instructions**

Ask your participants for informed consent and provide a detailed explanation of the task they are supposed to carry out. Also, include a debriefing after they have participated in the experiment in which you explain the goals of your study. Always remember that participants are voluntarily taking part in your experiment and that they may quit participation without providing a reason at any time. Ask the participants to provide their consent in written form by signing the informed consent form. A template is available on ILIAS which you need to adapt to your study.

Provide instructions in written form (so that it is exactly the same for all participants) and phrase them clearly without ambiguities. Before using the instructions, test them with a friend or classmate with respect to any sentences that may be vaguely phrased or ambiguous. Before participants start the experiment and after they have read the instructions, ask participants whether they understand the task and offer them to answer questions.

## **Collecting Data**

Once you have prepared the material, you need to decide how to record the data. Both websites record a number of variables for you. These variables are important for the experiment in the form in which it is provided (e.g. which stimulus is presented, time needed for each trial, whether the task was solved correctly or incorrectly etc.). Make sure to copy these data to your own spread sheet as the website will not store the data permanently. In fact, the data will vanish once you leave the final screen of the experiment.

If you decide to conduct a variant of a given experiment, make sure that you record data for all variables that are important for the analysis. Remember that, once you conducted the experiment there is no way to get missing data, so think about this part carefully before you start collecting data.

Collect all data in a spread sheet (e.g. MS Excel or Open Office Calc). Give every participant a number (or some other unique code) that is not associated with their name. Choose this number in a way that anonymity of each participant is ensured.

## **Analyzing Data**

After the data collection process is complete you need to prepare data for analysis. As stated above, to keep things simple, I suggest carrying out a two- or three-group comparison or a design with two independent variables with two conditions each. You may want to go back to the material from your introductory statistics class to select the appropriate statistical method, but a t-test for independent samples or an analysis of variance may suffice.

## **Interpretation, Conclusion, Report**

Interpret the results of the data analysis primarily in the context of your research question. Is your hypothesis confirmed or does the evidence suggest a different result? Why do the results look like they do? Were there confounding variables you didn't consider before? What other factors could have influenced the outcome?

In your report you should reflect on these questions and clearly state what conclusion you may draw from the result and which not. For further details on the final report and grading criteria, refer to the syllabus.

## References

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of experimental psychology*, 18(6), 643. MacLeod, C. M. (1991). Half a century of research on the Stroop effect: an integrative review. *Psychological bulletin*, 109(2), 163.