SPSS
tutorial for beginners

chillibreeze publication

Chillibreeze

a chillibreeze publication

SPSS Tutorial for Beginners

So you are going to be working on SPSS. Welcome to a whole new world of figures, data and statistics. We understand that it is natural to be a little apprehensive before you start using this program to analyze your data or for your class. You must have realized that it is not child's play to use the multiple features that SPSS has to offer. Don't worry. Our SPSS tutorial will help you navigate through the whole process and take you through a journey that covers the basic features of SPSS that everyone uses. You might not turn into a pro overnight, but you will definitely be much more comfortable using SPSS. Our examples and exercise problems will help you understand the features even better. This tutorial will be especially helpful for students of biology.

Contents

SECTION I

Back to Basic

SECTION II

SPSS at Last

SECTION I

Back to Basic

A Review of the Statistics that you learnt (or did not learn?) in College

Before we start to work on the actual software, we think it is necessary to go through some basics of the statistics involved. We included this section because it is not enough to know to use SPSS. You need to know what test to use in what situation and how to plan your research. If you think, you already know this stuff, that's fine. Just skip it or consider it a review before you plunge into actually using the software. Here are a few things that will be included in "The basics of Statistics" section.

- Research Design
- Evaluation of Measuring Instruments
- Sampling and Sample Size
- Mean, variance, Standard deviation, Degrees of freedom
- T-test
- Analysis of variance
- Correlation and Regression
- Chi-square test, Sign test, Man-Whitney U test etc
- Statistical abuses

I. Research Design

In order to get good data, you need good research design skills. Even if you are reading someone else's research, to understand it better, it helps to know something about correct and incorrect research design. There are lots of ways to design a research project and not all of it is documented. Here, we will describe some of the more common methods plus will give you a few tips for your research design too.

A. ANIMAL RESEARCH

Most biomedical research is first conducted using animal models. Much of this initial animal research cannot be performed in humans due to ethical, cost and/or time considerations.

a) Selection of species

The particular species to be used as a model is chosen for one/more of the following reasons:

1. Similarity of the organ system, disease, metabolic pathways, etc. to the equivalent in human beings.
2. Small size for ease and economy in housing, feeding, manipulation, etc.
3. Relatively short life span to allow for life-time studies, studies over more than one generation, etc.
4. Comparisons to work of other investigators in the same or similar model.

b) Selection of controls

This is one of the most important considerations in the design of an animal experiment. Let us say the investigator is performing a study to determine the deficiency of a particular nutrient on some measurable parameter. Animals in the experimental group would be fed a diet containing required amounts of all known nutrients except the nutrient under study (or the diet would be low in the nutrient). The control group would receive a normal (same in all respects but with the nutrient present) diet.

The controls need to be similar to the experimental animals in all respects like weight, age, genetic strain, etc. In fact, a group of animals need to be randomly divided into experimental animals and controls. To avoid bias, someone other than the principal investigator can perform the actual separation.

c) Feeding of controls

Some animals will consume less of an incomplete diet than they will of a nutritionally complete diet. If the experiment is run as designed above, the investigator may get false results that show that deficiency of the nutrient influences the variable being measured. In reality, the variable may have changed because of the low quantity of food consumed by the experimental animals. To avoid this, it may be best to have a second control group that is "pair-fed" to the experimental group. The amount of food that is consumed by the experimental group is measured and then that amount of the control diet is fed to the pair-fed controls. In another approach, the mean intake of food eaten by the experimental animals is calculated each day and all of the control animals are fed this amount the following day.

d) Treatment of controls

Do unto your controls as you would do unto your experimental animals. Basically, try and eliminate other factors which might be different between experimental and control animals. If some procedure like an injection or a surgery is performed on the experimental animals, the controls too should receive a sham procedure. Other variables to consider in animal experiments are: water consumption, non-dietary sources of nutrients (e.g. zinc from nibbling on cage bars), time of day procedures are done, amount of space allocated to the animals, amount of exercise, location within the cage, number of animals per cage, nature of animals in neighboring cages, etc. Also, there should be concern for diseases that the animals might transmit to each other or to the investigator and for diseases that the investigator might transmit to the animals.

e) Ethical guidelines

Ethical guidelines should be followed meticulously to ensure that research is done in a humane fashion. Animals and their cages should be kept clean, temperature should be correct, undue and unnecessary distress should be avoided, etc. Usually, there are committees on campuses that oversee the treatment of animals. Also, your university is bound to have courses that you need to take before you take on an animal experiment.

B. HUMAN RESEARCH

In human research, there are a lot of other guidelines and considerations. One can divide the types of research design into

1. OBSERVATIONAL STUDIES where the investigator does not alter the natural occurrence of events but records them and formulates hypotheses and/or conclusions about what he/she observes. Observational studies are of several types including:
   - Case histories
   - Descriptive studies
   - Prospective studies (Cohort studies)
   - Retrospective studies (Case-control studies)

2. INTERVENTIONAL STUDIES As opposed to the passive role of the investigator in observational studies, the researcher takes an active part in these studies. In interventional studies, the subjects are exposed to (or denied exposure to) a factor or method of treatment and followed over time to determine the outcome. Individuals may serve as their own controls or separate groups of control individuals may be used. These kind of studies have several research design methods:
   - Open trials
   - Cross-over trials
   - Blind trials
   - Double-blind cross-over trials
   - Metabolic studies
   - In vitro studies

Let us have a closer look at these different kinds of research designs and what information each can provide us with. This is important for statistical analysis because, in order to interpret your data, you need to know the usefulness and limitations of each kind of study and how to classify any particular study. Let's say you have results of a Retrospective study and you ask the statistical program to compute Absolute Risk, this would be meaningless because Retrospective studies can only measure Relative Risk.

a) Case histories

These studies are often referred to as anecdotal evidence. They are widely used as testimonials in advertising. In science, they may not be of much value as data, but they do provide an insight into areas of possible further research. But case histories cannot give definitive evidence that a certain factor is causal for a certain disease or tat a certain treatment is effective. Many journals separate these articles into a different section of each issue. These studies serve as a method of rapid communication of clinical findings and hypotheses to the scientific community and help generate new leads for future research.

Example:

In a recent report, a physician described a case-history in which a patient with Common cold, experienced complete remission of symptoms following one week of supplementation with Vitamin C. Let us examine this closely.

- Does this report demonstrate that Common cold is caused by Vitamin C deficiency? No. This evidence is not sufficient for a conclusion of this magnitude. Doing that would be equivalent to saying an infection is caused by an antibiotic deficiency.

- Does this report demonstrate that most common cold patients can be treated successfully with Vitamin C? No. The study has been performed on a single patient and the results cannot be extrapolated to a population.

- Does this report show that this particular patient was cured by Vitamin C? No/Maybe. The patient may have been cured due to other factors/drugs/his own immunity/other remedies etc. There was no control for this case. There is no way of knowing if the patient would have been cured without intervention.

b) Descriptive studies

These are often large population studies in which data on lots of different variables is collected. It is somewhat like a census. Statistical analyses on the data collected may show various relationships that lead to hypotheses for further study. They may also provide estimates of the magnitude of a particular problem and the frequency of certain behaviors among the population. Sometimes they may also generate meaningless correlations (example: most alcoholics in a particular area send their children to private schools) that need to be neglected. Descriptive studies are also referred to as epidemiological studies or surveys.

c) Prospective studies (cohort studies)

A prospective study consists of two samples, one of which has been exposed to the suspected risk factor (a + b) and one not exposed (c + d). The two samples are followed through time to determine which group has the higher incidence (or cause-specific mortality). In other words, a prospective study compares the absolute risk (of illness or