Tutorial 1: Speaking Notes

Hello everyone, my name is Luke, and I am your TA for this course. Before we begin, I would like everyone to introduce yourself to me, so that I can get to know everyone's names.

I am not sure how much Dr. Greenwood has told you about the tutorials and assignments/exams, but I will just give an overview of the purpose behind each.

The tutorials were designed to help you all with the assignments and exams by walking you through what we want from you for the assignments and what the process is for working through an assignment. If you have any questions, don't hesitate to ask. I can't garauntee I will have the answer, but I will try my best to find out the answer and tell you in the next tutorial. Also, as a warning, I may ask any of you a direct question in any of the tutorials. It's ok if you don't know the answer, but it will help you for the assignments/exams if you can try to work through the question and answer as best you can. And its really ok if you are wrong. The point is getting you to think and work through how you would answer the question.

The purpose of the assignments and exams are to get you critically thinking and processing how you would answer the question given the information you have have been provided. We want to get you all to take statistical information (which by the way, you don't need to know statistics for this course) and convert that into interpretation and application

Now, I will likely be repeating this tips and suggestions throughout the tutorials, but I will just put them up here to get you thinking about them. [Read off of slides]

[Move on to Julie's slides] Now, I will be moving on to the components of experimentation so that you get a better understanding of how studies are conducted, how to read them and understand what is going on. The first component is the research question. This is the part of the study that is basically the lighthouse, the beacon, for the rest of the study. It is used to direct the methodology and analysis, as well as the interpretation and discussion.

The second component is the experimental design. The design of an experiment is critically important to the analysis and interpretation of the results. A badly designed study will not provide very good scientific answers to the research question. The design needs to be structured around a set of conditions in a way that will control other potential effects so that we can attribute the results to the treatment rather than to some other cause. Some questions to ask regarding the treatment conditions are do they appropriately test the hypothesis? Do the results answer the original research question? Are there other variables that may account for the results (a confounder by the way is a variable which may explain some of the results of the study)?

Then there is data collection, which is pretty important as the data may not be collected as consistently as it should be.

The interpretation of the results involves determining whether the results were due to a chance finding, or due to a real effect or observation. We determine this with statistics, which use probability and math to test how probable the results are. This and the next component are what you all will be mostly doing in the assignment and exams.

After interpreting the results, you need to assimilate them into the existing body of knowledge. Some questions you should ask include what do the results mean in the context of the existing knowledge base? How do the results fit in with the current theories? If they don't fit, how can you explain them theoretically? Just out of curiousity, can anyone tell me what a scientific theory is? (A scientific theory is a well defined set of consistently repeated and predictable observations and experiments. It is the highest form of the accumulated scientific evidence in a certain area. The strongest theories are those that are able to predict a range of observations, such as the scientific theory of evolution is able to predict a range of characteristics and behaviours in all life) The reason I ask is that it is often confused with the philosophical meaning of theory.

Anyway, in experimental design, want to control for as much of the conditions as possible, but obviously that is impossible. There are methods to minimize this, such as having everything done in the same room, with the same temperature, with the same food, with the same experimenter, equipment, etc. You can also control through randomization.

Some basic experimental designs include between subjects design, where subjects are randomized to treatment to help minimize variability. [Read rest of slide]

Within-subject design or repeated measures is when all subjects are exposed to the treatment, but at different times. [Read slides]

The basic statistics that you all will likely come across are mean and standard deviation, with some basic statistical tests of significance. Tests for significance determine whether the response is due to the treatment, or the independent variable, or merely due to chance. A significant result is when the probability value, or p-value, is less then 0.05.

[Read next slide] Remember, look to the legend. You, tell me which groups are had the biggest difference?

[Read next slide] Again, look to the legend. Your turn, which variables had a difference between treatments?

[Read next slide] Note, that a significant ANOVA finding doesn't tell you which of the groups is signficant, you need to use a post-hoc test to determine that. Again, you don't need to know these tests, just a basic understanding of what they test for. Any information in the assignments and exams will be given to you. But the better you understand what the tests mean, the faster you will be able to answer the questions and move on to the next one, which will be important for the exam.

[Read slide, walk through it one by one]

[Read next slide] You, which one is the highest in variable A? And you, what can you tell me about variable C? Also, can anyone tell me something that is missing from this study? (no control group) Therefore, when you interpret these findings, you can only relate them back to treatment 1, and not to a normal condition.

Interpretation of results also depends on what type of study was conducted (was it experimental or was it observational?). If it was experimental, the observed results are most likely to be causes and you can state with greater certainty that what the results found are what may be actually occurring biologically and mechanistically. If it is an observational study, you will need to rely more on the statistics to determine the strength of the association. You also can't be as confident about the results as you can with an experimental study. However, observational studies are very useful in real world contexts as experimental designs are highly controlled and don't usually reflect real-world conditions. So, what about the results?

State the significant (as in the p-value or probability value is less than 0.05) or non-significant differences and their direction.

Describe which groups were compared, and be specific. State exactly what the results found. Lastly, what difference was compared? How were the variables compared, was it a change over time within the subject or was it a difference between two groups?