Chapter 9: Hypothesis Testing

Discussion Point

The relationship between ***Type I*** and ***Type II*** errors is simple and straightforward. It is an inverse relationship. As you reduce the risk of one, you increase the risk of the other. The following brief discussion explains why that is the case.

- At $p<0.05$ there is a 5% or less chance that you will reject a correct hypothesis and accept the null hypothesis. If you want to reduce this risk, you must reduce the significance threshold, say to 0.1

- At $p<0.01$ you are now applying a much stricter threshold for accepting a research hypothesis. This increases the risk of a ***Type I*** error because you are now saying that the research result you obtained has a less than 1% probability of occurring by chance alone. These are pretty low odds being at the extreme range of possibilities resulting from chance. By reducing the risk of accepting a false hypothesis (i.e. a ***Type II*** error) you are also increasing the risk of rejecting a true hypothesis (i.e. committing a ***Type I*** error).

For this reason it is important to select the most appropriate threshold for accepting or rejecting *hypotheses* in your research. This will depend on the consequences of acceptance or rejection. For example, if the consequences of accepting a reseach hypothesis will lead to massive, and most likely very expensive and irreversible' changes in policy you would want to reduce the risk of a Type II error, i.e. you would want greater certainty that the decision is a good one and so may impose a probability threshold of $p < 0.1$. On the other hand, a risk of a Type II error is preferable if the risk of rejecting a correct hypothesis could lead to very damaging effects. For example, you may apply a probability threshold of $p < 0.05$ in a study of the helath effects of particular environments on the social development of children. The risk of rejecting a correct hypothesis may be deemed so dire that the risk of accepting a false one is preferable.