PS15: STATISTICS FOR PSYCHOLOGISTS

Introduction to Statistics for Psychologists

Three questions to address in this lecture:

(1) Why are we studying statistics on a psychology degree?

(2) What concepts, ideas and skills will we cover in this module?

(3) How can I master the content of this module?

Why are we doing this?

Think about the following situation:

A friend tells you that they have tried a subliminal self-help audio-track. The audio-track is designed to improve memory. Relaxing music can be heard on the track, but there is also a subliminal message (which cannot be heard clearly). Your friend says that the audio-track worked for him/her, and recommends that you try it yourself.

What objections might you have to their evidence?
What will we be doing?

Three examples to illustrate how to make sense of data

**Example 1:** Haller *et al.* (1999) gave a sample of 133 adults a taste test (pure ketchup versus ketchup flavoured with a small amount of vanilla).

\[= \text{person preferring vanilla ketchup, } \diamond = \text{person preferring pure ketchup}\]

People bottle-fed as infants

People breast-fed as infants

Bottle-fed: 20 out of 30 people prefer ketchup with added vanilla

Breast-fed: 30 out of 103 people prefer ketchup with added vanilla


Change in self-esteem score:

<table>
<thead>
<tr>
<th>Type of tape</th>
<th>Individual change scores</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self esteem</td>
<td>12 11 1 15 0 3 24 18 23 8 –4 28 31 24 10 16 43 13 15 31</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>30 9 23 25 13 19 31 14 –1 37 16 25 19 6 4 15 11 0 28 16</td>
<td></td>
</tr>
</tbody>
</table>
Example 3: Data similar to Dabbs et al.’s (1987) study of testosterone and criminal violence: A group of prison inmates, who were serving time for non-violent crimes, were tested for their level of testosterone. The severity of punishment that they received for breaking prison rules (“infractions”) was also obtained from prison records.

<table>
<thead>
<tr>
<th>Prison inmate</th>
<th>Saliva testosterone concentration (ng/dl)</th>
<th>Number of days punishment per infraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>8</td>
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<td>4</td>
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<td>5</td>
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<tr>
<td>15</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Complete this scatter-plot to show the relationship between saliva testosterone concentration and the level of aggression (assessed by the number of days punishment per infraction).

Your description of the pattern:
A brief review of the three examples

1. 
2. 
3. 

Six technical terms

**Variables:** Properties of objects (people, places etc) that can take on different values.

**Score:** An individual value for a variable.

**Population:** A complete set of scores that we might be interested in.

**Sample:** A sub-set of a population – a set of scores that we have obtained

**Parameter:** A number that summarises the (entire set of) scores in a population

**Statistic:** A number that summarises the scores in a sample

What will we be doing?

We will look at **two types of data**

**Categorical** and **Measurement Data**

**Measurement data (quantitative data) –**

A ‘value’ or ‘score’ on a numerical scale

**Categorical data (frequency data or count data) –**

The number of things in a class or category
We will look at two types of ‘pattern’ or ‘phenomena’

**Differences** and **Relationships**

**Differences** –
We look at objects, people, or measurements in different groups or categories.

For a particular variable:
- Are the groups different?
- How different are they?
- Do I trust that there is a “genuine” difference?

**Relationships** –
We look at objects, events or people.

For two variables:
- Do values of one variable correspond or ‘match’ values of the other variable
- How close is the match?
- Do I trust that there is a “genuine” relationship?

We will engage in two types of statistical activity

**Description** and **Inference**

**Descriptive Statistics** –
Summarise samples – giving someone the main points in a simple form

To describe data we will use **graphical** and **numerical (statistical) techniques**

**Inferential Statistics** –
Allow you to evaluate the evidence for a **hypothesis**.

You can then draw conclusions about a population based on the analysis of a sample.
Why are we doing this?

To gain a set of **skills** and techniques for understanding numerical information

To learn a **language** to communicate what we have found out from a set of data

To **understand** and **use** statistical methods to evaluate evidence:

- **Describe**… **Assess** the size of differences or the strengths of relationships
- **Test**… **Evaluate** the strength of evidence for a theory or hypothesis
- **Conclude**… **Decide** whether the evidence supports a particular explanation

To be a **better psychologist**:

- To be able to read, understand and evaluate psychological research.
- To improve your understanding of human behaviour and psychological theories, and to gain a better appreciation of when and how these theories can be applied.
- To be able to conduct your own psychological research.

To be a **better citizen**:

- To be able to evaluate statistical evidence in any domain, and so to understand research and ideas from the numerous fields of science and social science that use statistical methods.
- To learn to argue from evidence in a principled and responsible manner, and to be able to hold others to account in their use of statistical evidence.
- To gain a set of skills which increase your employment opportunities.

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How will we be doing this?

We will focus on: **Concepts and understanding rather than purely on mathematics**

We will use: **Computers to avoid taking too much time with computation**

We will learn: **Skills in data analysis, not only theory or knowledge of concepts**
How will we be doing this?

PS115 *Statistics for Psychologists* includes a varied programme of study that includes:

**Lectures** (a 2-hour lecture each week)

**Practical classes** (a 1-hour class each week with the activities to be completed by the following week’s class; the year-group is split into three separate groups for these classes)

**Workshops** (a 1-hour session twice a term; in your practical class groups)

**Reading** (set weekly on the lecture content, to be completed before the following week’s lecture)

**Weekly exercises** (set weekly to consolidate the lecture material, to be completed before the next lecture; answers are provided so that you can mark your own work and check your own progress)

**Other questions and activities**

This varies from week to week, but includes:

- Self assessments
- Tutor-marked homeworks which are returned marked and with written feedback from staff
- Specimen papers and practice papers to help you prepare for the coursework tests and the end-of-year examination

**Further opportunities for collaborative working and additional contact with staff**

- The lecturers have weekly office hours when you can see them without booking ahead.
- The lecturers are happy to be contacted if you wish to make an appointment to see them.
- There is a weekly free tutoring session where a member of the teaching team will be available.
- You can email lecturers with a question, or – better still – post your question on the on-line forum (on *Moodle*) where everyone can benefit from the lecturer’s answer and other students can make contributions.
- You are encouraged to work collaboratively with other students on the module.
- The Department’s facilities are open to psychology students each weekday 0900-1700 in and out of term time.

If you have questions about this lecture, please email Dr Tim Rakow *(timrakow@essex.ac.uk)*
Reading for the PS115 Introductory Lecture

{This book is the main part of your Custom Text}

Chapter 1: pages 1-16
{Pages 1-14 if you are using the 2011 7th edition, instead}

Learning Checklist
You should understand what is meant by the following:
- Variable
- Score
- Population
- Sample
- Parameter
- Statistic
- Measurement data and categorical data
- Differences and relationships
- Descriptive statistics and inferential statistics

Weekly Exercises
Complete these before the next lecture – working with someone else on the course if you like – and mark the work yourself.


Pages 16-17, Exercises 1.8: Questions 1.9, 1.10, 1.12, 1.13, 1.15 & 1.16
Answers to odd-numbered questions are given on page 615.
See the final page of this handout for my answers to the even-numbered questions.

{If, instead, you are using the 2011 7th edition: Pages 14-15: Exercises 1.6: Questions 1.9, 1.12, 1.13, 1.14, 1.15 & 1.16. Answers on page 620.}
These are my answers to the exercises for which Howell does not provide an answer in the textbook:

**Question numbers are for the 8th edition of the book** (Question numbers for the 7th edition are in brackets)

**Comment on question 1.9 (1.9):** The second in the set of three examples from the lecture might be a good example of this. A change in self-esteem score of 12 or 28 or 43 may not mean much to us – and so we may not be very interested to learn that the average for one group was 16. But as long as we know that higher positive scores represent greater increase in self-reported self-esteem, then we will be interested to know whether one group had an average that was clearly higher than the other group.

1.10 (1.12) The greater the variability of the scores that make up the population the larger the sample needs to be to maintain accuracy or “precision” when estimating a population parameter (e.g. an average score, or the percentage of people in a category).

[This is an important point – we will do a lot of work that relates to this idea.]

1.12 (1.14) Categorical data = “Data representing counts or number of observations in each category”

My three examples:
(There are many possible answers, you can ask via email if you are unsure of your own answers.)

1. The number of men (or women) participating in a study

2. The number of people responding ‘yes’ (or ‘no’) to a question

3. The number of people in each of these categories:
   A) Those returning their questionnaire before receiving a reminder letter
   B) Those returning their questionnaire after receiving a reminder letter
   C) Those not returning their questionnaire

1.16 (1.16) My two examples:
(There are many possible answers, you can ask via email if you are unsure of your own answers.)

1. Are there sex-differences in verbal ability? (i.e., Do men and women perform at different levels on tasks requiring verbal ability).

[This compares two “naturally occurring” groups.]

2. Can you improve memory by teaching people a strategy to help them remember things (a ‘mnemonic strategy’). Group 1 are not taught the strategy but are given instruction in some other activity; Group 2 are taught a strategy – performance on a test of memory is measured and compared.

[This compares two groups (“conditions”) that are created for the purpose of the study.]