

THE PSYCHOLOGY SERIES

USER'S GUIDE

Introduction to Designing Experiments



This programme is the first in a series of four on research methods and statistics. The Guide is written for teachers and will be particularly helpful for new teachers of psychology.

It is designed to be read before viewing and a brief overview of the content and structure of the video / DVD is given to assist with planning and lesson preparation.

There are three breaks with a Pause The Video screen. These provide time for the programme to be paused while students consider and discuss relevant issues.

Graphics which appear on the video / DVD are copied below and these notes may be photocopied for use with students.

**The video / DVD is under copyright law
and may not be duplicated**

Running time: 23 minutes

We hope you find the video / DVD a useful teaching tool.

Aim of the Series

Many students of social sciences approach ‘anything to do with maths’ with trepidation. The aim of this Series is to try to nurse them gently through the process of preparation, analysis and testing in experiments whilst teaching them all the basic terms and techniques required by the examination boards.

This first programme takes a relatively light-hearted look at design and methods.

Content

Adam, a psychology student, decides to test an idea. His theory is that people with less hair will choose a very hairy dog to compensate. He goes to the local park with no clear idea of how he is going to record data or control variables. Things go wrong due to lack of planning.

We meet Adam again in his kitchen with more experience and another idea. This time he stresses the need for preparation and takes us through each stage of the planning from the development of hypotheses to the debriefing of participants.

The Hypotheses

Adam explains that his mother cooked spaghetti bolognese for his friends last week and they thought it was very good. He thinks that he can cook the same recipe (replicate) but add shitake mushrooms (IV) and his friends will score it more highly (DV).

The Experiment

First, he develops a simple Null Hypothesis so that he can ‘prove himself wrong’

Hypotheses
Null Hypothesis
There will be no difference between my spaghetti bolognese and my mum’s spaghetti bolognese

Alternative (or experimental) Hypothesis
There will be a difference between my spaghetti bolognese and my mum’s spaghetti bolognese

Non-directional / Two-tailed hypothesis
better with mushrooms ← → worse with mushrooms

Then a preliminary Alternative Hypothesis pointing out that it is a two-tailed one as it doesn’t state direction.

An improved Null Hypothesis is then formulated.

Hypotheses
Null Hypothesis
There will be no difference between the spaghetti bolognese with shitake mushrooms and the spaghetti bolognese without them

The students are then asked to operationalise the Alternative Hypothesis.

After discussion about possible scoring methods, final hypotheses are decided on.

Alternative (or experimental) Hypothesis
Higher scores out of 10 will be given for the spaghetti bolognese with shitake mushrooms than the spaghetti bolognese without them

Null Hypothesis
There will be no difference between the scores out of 10 given for the spaghetti bolognese with shitake mushrooms and the spaghetti bolognese without them

Adam explains the conditions under which he may have used a one-tailed hypothesis

Pause the Video (1)
Alternative (or experimental) Hypothesis
There will be a difference between my spaghetti bolognese and my mum's spaghetti bolognese
Try to operationalise this hypothesis

Null Hypothesis
There will be no difference between the scores out of 10 given for the spaghetti bolognese with shitake mushrooms and the spaghetti bolognese without them

Later, when we have the results, the Null Hypothesis is rejected.

Alternative (or experimental) Hypothesis
The spaghetti bolognese with shitake mushrooms will be scored more highly out of 10 than the spaghetti bolognese without them
Directional / One-tailed hypothesis

The Design

Adam talks us through most aspects of design including:- field/lab experiments, sampling methods, repeated/independent measures, counterbalancing, standardised instructions, order effects, confounding variables, primacy/recency effects, constant/random errors, experimenter effects, demand characteristics.

Two further pauses allow the audience time to discuss the sampling method and pick up possible sources of error and bias in his experiment.

Pause the Video Screens

These occur at the following approximate times:-

- 5 minutes Pause 1
- 10 minutes Pause 2
- 17 minutes Pause 3

Take a Break (2)

Discuss the problems with
a. the sample Adam is using
b. the basic design

Take a Break (3)

What error and bias
could have affected the scores?

The guests arrive and Adam serves them his spaghetti bolognaise avoiding experimenter bias as he eats with them. Afterwards he presents them with a scoring sheet.



Adam delivers standardised instructions and the presentation of the scoring sheets is counterbalanced with half scoring Adam's first and half scoring his mum's first.

The Results

Adam has now got some quantitative data. He does the 'eyeball test' and concludes that, as the sum of the scores for his spaghetti bolognaise was highest, he can reject the Null Hypothesis and accept the Alternative Hypothesis.

'We can be fairly sure that this wasn't due to chance or error – that is, that the Independent Variable really did make a difference to the result. To be even more certain we need to do a bit of number-crunching but we'll worry about that in the next programme.'

<i>Results</i>	
<i>Mum's SB</i>	<i>My SB</i>
5	6
7	7
5	10
6	9
9	8
<hr/>	<hr/>
32	40

Conclusion

The participants had been told that this was a social psychology experiment and Adam concludes by questioning the ethics of deceiving those who take part in experiments.

Finally, he debriefs them over a cup of coffee.

We hope that this first programme enthuses students and gives them confidence to carry out their own experiments - if Adam can, so can we!

The Null Hypothesis Debate

You may be aware of the ongoing debate amongst academics about the use of the Null Hypothesis significance testing. It is a complex issue and, although many alternatives to NHST have been offered there is no generally accepted single alternative model that we can teach our students, nor are there any yet discussed in text books widely used at A level. We have therefore not confused the issue by introducing it at this early stage. If you want to read more we suggest:

Early Criticisms of NHST

Rozeboom, W W (1960) The Fallacy of the Null Hypothesis Significance Test, *Psychological Bulletin*, 57, 416-128

Bakan, D (1966) The Test of Significance in Psychological Research, 66, 423-427

Contemporary Criticisms of NHST

Cohen, J (1944) The Earth is Round ($p < 0.5$), *American Psychologist*, 49, 997-1003

In Defence of NHST

Hagen, R L (1997) In Praise of the Null Hypothesis Statistical Test, *American Psychologist*, 52, 15-24

Abelson, R P (1997) On the Surprising Longevity of Flogged Horses. Why There is a Case for the Significance Test. *Psychological Science*, 8, 12-15

The second video in the series builds on the design and method decisions already touched upon and looks at organising and summarising data. It includes averages, standard deviation, the normal/abnormal distribution and choosing appropriate graphs.

Finding books, resources and materials

Teachers often struggle with the Methods and Statistics part of the course or, at least, with the teaching of it and with finding stimulating resources for their students.

There are now a large number of textbooks specialising in this topic as well as excellent chapters in general textbooks.

We give a few personal favourites below:-

Clegg, Frances (1982) *Simple Statistics* Cambridge

An oldie, but has helped generations overcome their fears and may well be in its umpteenth edition.

Coolican, Hugh (2004) *Introduction to Research Methods and Statistics in Psychology 4th Edition* Hodder Arnold

The new edition of a modern favourite which covers all syllabus content.

Howitt, Dennis and Cramer, Duncan (2000) *First Steps in Research and Statistics* Routledge

Clear explanations and graphics. Very beginner-friendly.

Two other very useful books for research studies are:-

Flanagan, Cara (1998) *Practicals for Psychology* Routledge

Ideal for teachers to find ideas for practicals. Students can select from 20 practical reports and learn how to design, conduct and write up their own report.

Full of useful teaching points and advice for students including ethical issues, questionnaires and examiner's comments.

Banyard, Philip and Grayson, Andrew (1996) *Introducing Psychological Research* Macmillan

This is a marvellous handbook for teachers (may have run into further editions by now!). It contains over 60 detailed summaries of well-known research studies covering most syllabus topic areas. Questions for students with suggested answers.

Recommended websites

Search engines will list a myriad of psychology related websites but we have found very few that are really useful.

Try these!

www.s-cool.co.uk (click psychology then research methods - cool site!)

www.revisiontime.com/alevel_psychology.html (really, really useful site)

www.courseworkbank.co.uk (formerly essaybank.co.uk)

www.socialpsychology.org/methods.htm (USA site full of interesting material but only for those who love mazes)

The ATP have a list of web links which we won't duplicate here.

(www.theatp.org)

New teachers of this topic are well advised to get in touch with the Association for the Teaching of Psychology (ATP) who have highly experienced teachers and examiners ready to give advice and assistance. They can recommend textbooks and resources that will get you started.

ATP Helpline:- Dorothy Coombs

work: dorothycoombs@pursglove.ac.uk 01287 280800

home: dorothycoombs@24whinchat.freemove.co.uk 01287 636502

Association for the Teaching of Psychology

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Annual Conference

The ATP holds an excellent Conference for members each July.

As well as lectures and workshops, there is an opportunity to meet the examiners and to browse all the latest books and resources.

Materials, Videos, DVDs

Uniview has a large collection of resources for most areas of psychology, biology and sociology.

Other titles in the Psychology Live series include:

- The Study of Attention
- The Study of Memory
- Perception: the theories
- Classical and Operant Conditioning
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- Cognitive Development
- Language Development
- Evolution by Natural Selection
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