Discovering Statistics

Module Convenor: Professor Andy Field

• NOTE: Most of the questions you need answers to about this module are in this document. Please read it fully and carefully before your first lecture.

• NOTE: This document concerns the structure and content of the module. If you have questions about procedures, please consult the School of Psychology Administration Office in Pev1 2A13 or via psychology@sussex.ac.uk.
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Module Overview

Discovering Statistics is a 15 credit module that runs during the Autumn term (T1).

Discovering Statistics two components: (1) statistical analysis and (2) empirical research. The empirical project enables students to carry out independent research that will develop skills in experimental research. This project helps to prepare students for their final empirical research project. The statistical analysis parts of the module build upon existing knowledge of statistical theory to enable students to analyse more complex data structures through understanding the general linear model (regression, ANOVA etc.). Practical classes compliment the lectures by providing guidance on applying the general linear model using SPSS, advice on designing and executing projects, and conducting experimental research.

Assessed Learning Outcomes

Lectures and practical classes provide a framework in which students will be able to:

1. Explain the conceptual underpinnings of the general linear model: Regression, Multiple Regression, Analysis of Variance (ANOVA), and Analysis of Covariance (ANCOVA).
2. Make informed decisions about how to analyse data sets appropriately and explain these decisions.
3. Conduct and interpret these analyses on SPSS.
4. Design, execute, analyse, and write up (in APA format) experimental research projects.
5. Work independently from a tutor in small groups, as a foundation for their individual research project in the third year.

Method of Student Feedback

Anonymous questionnaires at the end of each term, reported at the next Psychology meeting. You are encouraged to complete these as fully as possible because we do read them and they provide invaluable feedback on further Module improvement.

Assessment

See the section on assessment.
**People**

**Module Organiser**
I (Andy Field) am Module organiser. If you would like a meeting with me to discuss something about the module then I’m happy to chat after (or before) lectures and I try to drop into practical classes too. You can also book an appointment at:

[http://profandyfield.youcanbook.me/](http://profandyfield.youcanbook.me/)

I really do appreciate it when people take the time to check this module document, FAQs and forums for an answer first, and when people with similar problems (project advice and so on) come to see me in groups rather than individually. During term time, I have 2 drop in office hours (see the Sussex website for times) - no appointment is necessary for these. For quick questions, I am usually happy to see people outside of office hours/meeting times: If I don’t want to be disturbed then the sign on my door will say ‘do not disturb’, if it doesn’t then feel free to knock.

During working hours I live in room 2B7 Pevensey 1 Building, ext. 7150 (877150 from outside).

- [www.facebook.com/profandyfield](http://www.facebook.com/profandyfield)
- [@ProfAndyField](http://@ProfAndyField)
- [www.youtube.com/user/ProfAndyField](http://www.youtube.com/user/ProfAndyField)
- [discoveringstatistics.blogspot.co.uk](http://discoveringstatistics.blogspot.co.uk)

**Lecturers**
I take all of the lectures on this module.

**Practical Tutors**
The practical tutors are probably the most important people with whom you have contact. They will tend to be your first port of call for questions, will teach you about SPSS and will guide and support you through your projects and laboratory reports. The practical tutors regularly feedback information to me about how the module is running, so if you have concerns don’t be afraid to tell them (we do communicate with each other and can try to change things if need be). The practical tutors are amazing as both an intellectual and emotional support— so, be nice to them😊

The practical tutors have limited office hours, so please take advantage of practical classes to ask the questions that you need answered.

You will be allocated a practical tutor who marks all of your work. You will be given some indication of who you have been assigned to at the first session. Remember this person: they are the person you should be mainly talking to for advice and so on (because they mark your work).

**Head Tutor**
This year the head tutor is Laura Pearce. She is my right-hand women and helps me with the day to day running of the module. If for any reason you don’t feel able to talk to your practical tutor, or to me, about some problem relating to the module, then you can talk to Laura.
Learning Resources

Books
Please see The Reading List.

Handouts
For all of the projects and SPSS classes there will be handouts provided. Lecture slides and a host of other resources can be found on Study Direct. The handouts are detailed enough to ensure that anyone can get through the Module without buying my book.

Internet
There are downloadable copies of all module material on the Module Study Direct webpage. There are also Module discussion boards:

https://studydirect.sussex.ac.uk

I keep a bunch of other statistics related materials on my website, which might be useful:

http://discoveringstatistics.com

There are self-test questions and materials to accompany my textbook here:

http://www.uk.sagepub.com/field4e/default.htm

I have a lot of video tutorials on statistical things on my YouTube Channel:

http://www.youtube.com/profandyfield

Getting Help

Figure 1 shows the ways in which you can get help/answers to your questions. There are an enormous amount of resources for this module which should empower you to find your own answers. Obviously the best place to start is to review your lecture notes, the textbook chapter or if it’s about module organisation then read this handbook or look at study direct. If you can’t find what you need, then search the study direct forums (see below) – if you can’t find the answer then it’s likely that someone else has had the same problem. If you can’t find an answer then post the question to the forum (if you need an answer then the chances are other people will want to know too). In the unlikely event that you don’t get an answer within 2-3 days then talk to your tutor in a practical class or ask me after the lecture. We’ll look at each resources in turn

Study Direct

If you’ve missed a lecture, lost a handout, or just plain and simply don’t know what on earth is going on, then consult the module study direct page; all of the handouts, lecture slides, data sets and so on for the module are kept there.

https://studydirect.sussex.ac.uk

Perhaps the most useful features of the study direct website are the module forums (or ‘fora’, if you want to get all properly Latin about it). One of the problems with teaching 250 students is it is difficult to give you all individual attention. However, I spend quite a lot of time on the forums:
they are the best way for me to interact with you and give you a bit of one-to-one help. It also has the great benefit that by helping you I am probably helping other people because students often get stuck on the same things. The forums are a good way for us to discuss things and for you to get feedback as you work through the module. They are also there to encourage you to help each other, so in many cases you can answer each other’s questions. The best way to learn is to explain things to someone else. Obviously if I notice any bad advice I dip in and correct it. The forums are typically quite busy so I have set them up so that they are dedicated to particular topics – please try to post your question to the most relevant forum.

Figure 1: The process of getting help
The study direct site has an archive of everything people have asked and the responses given. So please use the search box (Figure 2) to see whether someone has posted a similar question.

I also welcome you to use the forums to communicate things that you like or dislike about the module. However, do remember that I read what you write so don’t accidently start discussing with your mate what a twat you think I am, because that would be upsetting.

During the module I tend to check the forums twice per week (once at the beginning of the week, and once towards the end), so you can expect answers within 2-3 days. Please search previous year’s forums for answers to your question before asking it (Figure 2)!

**Face-to-Face**

Although I have office hours, I prefer to talk to people after lectures: It saves you having to come to my office. So, I will always be happy to hang around after lectures and talk about the module or answer questions. I also drop into some of the practical classes from time to time. This is also a good opportunity to ask me questions.
Email

The fastest way to get a response is to use one of the forums or talk to me after a lecture because my PA filters my email, so I don't always see things very quickly. However, you are of course very welcome to email me.

Student Mentors

This Module is part of the student-mentoring scheme. For details of this scheme please see: http://www.sussex.ac.uk/psychology/internal/students/studentmentors

Student mentors can be contacted by email also: psychology_mentors@sussex.ac.uk

Teaching Arrangements

Timetable

- Each week you will have one or more lectures and practical classes.
- Table 1 shows the weekly structure of the module.
- Please consult Sussex Direct for the times and locations of lectures and practical classes.

Practical classes

You will be allocated to one practical class. These allocations are not random and are done centrally by the magic elves that work in university timetable office based on your other timetabling commitments. It is a complete nightmare to switch people into different groups because the groups are organised centrally by the elves. I am not able to change practical groups, but requests can be made to the psychology office who will attempt to change anyone who has work or childcare commitments: requests made on any other basis will be refused.

Practical tutors do record attendance and anyone turning up to the wrong practical will be politely refused entry to the class. The classes are full to capacity so if extra people turn up it causes havoc. Please co-operate with the tutors by turning up to the correct practical group, being quiet when asked and listening to what they have to say.

Also, tempting as it may be to spend the sessions checking your email/Facebook during computer-based practical classes this won’t help you pass your exams!

Project Partners

Each laboratory project is done in a small group. Tutors will ask you to form groups during one of the practical classes early in the term—you can work with anyone within your practical class. You can work with the same people for every project, or work with different people on different projects; the only constraint being that you must work with people within your practical group. The reason for this constraint is that your reports will be marked by the same tutor each time and it makes sense to have your report marked by someone who has been involved with the development and execution of your projects.

It is your responsibility to turn up to the practical classes and to find a project group in which you are happy.
### Lecture Outline
Table 1: Lecture outline for Discovering Statistics

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Practical</th>
</tr>
</thead>
</table>
| 1       | • Lecture 1: De-mystifying statistics  
          • Lecture 2: The PENIS of statistics I  
          • Lecture 3: The PENIS of statistics II | • Practical 1: Revision of SPSS |
| 2       | • Lecture 4: Experimental Laboratory Project Overview | • Practical 2: Experimental Project (Getting Ideas) |
| 3       | • Lecture 5: The beast of bias | • Practical 3: The beast of bias (SPSS) |
| 4       | • Lecture 6: Introducing Linear Models | • Practical 4: Linear models using SPSS |
| 5       | • Lecture 7: Bias in Linear Models | • Practical 5: More Linear Models Using SPSS |
| 6       | • Lecture 8: Categorical predictors and moderation  
          • Lecture 9: One-Way Independent ANOVA | • Practical 6: In class exercise 1 |
| 7       | • Lecture 10: Follow-Up Tests in ANOVA | • Practical 7: One-Way Independent ANOVA Using SPSS |
| 8       | • Lecture 11: Analysis of Covariance, ANCOVA | • Practical 8: ANCOVA using SPSS. |
| 9       | • Lecture 12: Two-Way Independent ANOVA | • Practical 9: Two-Way Independent ANOVA Using SPSS |
| 10      | • No Lecture | • Practical 10: In class exercise 2 |
| 11      | • Lecture 13: Repeated Measures ANOVA | • Practical 11: Repeated Measures ANOVA |
| 12      | • Lecture 14: Three-Way Mixed ANOVA | • Practical 12: Mixed ANOVA using SPSS |
Assessment

**Undergraduates (C8552)**

For this module undergraduates will be assessed in the following way:

Table 2: Breakdown of assessments for Discovering Statistics

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Assignment</th>
<th>Length</th>
<th>% of Total Mark</th>
<th>% of Coursework Mark</th>
<th>Learning Outcomes Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework</td>
<td>In class exercise 1</td>
<td>60 Minutes</td>
<td>15%</td>
<td>23.07%</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td></td>
<td>In class exercise 2</td>
<td>60 Minutes</td>
<td>20%</td>
<td>30.77%</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td></td>
<td>Laboratory Report</td>
<td>3000 words</td>
<td>25%</td>
<td>38.46%</td>
<td>4, 5</td>
</tr>
<tr>
<td></td>
<td>Research Participation</td>
<td>2 hours</td>
<td>5%</td>
<td>7.69%</td>
<td>4</td>
</tr>
<tr>
<td>Unseen Exam</td>
<td></td>
<td>2 hours</td>
<td>35%</td>
<td>N/A</td>
<td>1, 2, 3</td>
</tr>
</tbody>
</table>

**Postgraduates (500C8)**

Students on the M.Sc. in Experimental Psychology will be assessed in the following way:

Table 3: Breakdown of assessments for Discovering Statistics

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Assignment</th>
<th>Length</th>
<th>% of Total Mark</th>
<th>% of Coursework Mark</th>
<th>Learning Outcomes Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework</td>
<td>In class exercise 1</td>
<td>60 Minutes</td>
<td>15%</td>
<td>25%</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td></td>
<td>In class exercise 2</td>
<td>60 Minutes</td>
<td>20%</td>
<td>33.33%</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td></td>
<td>Laboratory Report</td>
<td>3000 words</td>
<td>25%</td>
<td>41.67%</td>
<td>4, 5</td>
</tr>
<tr>
<td>Unseen Exam</td>
<td></td>
<td>2 hours</td>
<td>40%</td>
<td>N/A</td>
<td>1, 2, 3</td>
</tr>
</tbody>
</table>

**Submission information**

Two copies of the lab report must be submitted to the Psychology School Office in Pevensey 1 before the deadline. **Deadline information can be found on Sussex direct.**

**Late Submissions and Mitigating Evidence**

The usual university-wide procedures apply to this module. Information on penalties for late submissions, how to submit mitigating evidence, and general examination procedures please see:

- [http://www.sussex.ac.uk/academicoffice/documentsandpolicies/examinationandassessmenthandbooks](http://www.sussex.ac.uk/academicoffice/documentsandpolicies/examinationandassessmenthandbooks)
Very Important Note: Appropriately completing and submitting formally assessed work is your responsibility. Definitive guidelines on this are provided in the examinations and assessment handbook for undergraduate/postgraduate students (link above) or via the school office. If you are in any doubt about the rules concerning submissions check with the school office. **I cannot grant extensions and neither can your practical class tutors.**

Visiting and Exchange Students

Students visiting Sussex on the visiting and exchange during Autumn term only (i.e. who are not here for the spring examination period) your mark for this module will be based solely on the grade received for the in-class exercises. Those here for the spring examination period will be assessed as a home student (see the table above).

Plagiarism and Collusion

Full details of plagiarism and collusion appear in the examinations and assessment handbook (link above). You are reminded of these notes on plagiarism:

Plagiarism is the use, without acknowledgement, of the intellectual work of other people and the act of representing the ideas or discoveries of another as one’s own written work submitted for assessment. To copy sentences, phrases or even striking expressions without acknowledgement of the source (either by inadequate citation or failure to indicate verbatim quotations) is plagiarism; to paraphrase without acknowledgement is likewise plagiarism. Where such copying or paraphrase has occurred, the mere mention of the source in a bibliography shall not be deemed sufficient acknowledgement; each such instance must be referred specifically to its source. Verbatim quotations must either be in inverted commas, or indented, and directly acknowledged.

You are particularly reminded of the definition of collusion:

Collusion is the preparation or production of work for assessment jointly with another person or persons unless explicitly permitted by the examiners. An act of collusion is understood to encompass those who actively assist others as well as those who derive benefit from others. Where joint preparation is permitted by the examiners but joint production is not, the submitted work must be produced solely by the student making the submission. Where joint production or joint preparation and production of work for assessment is specifically permitted, this must be published in the appropriate module documentation.

Even though you work on laboratory reports in groups this is a situation in which ‘joint preparation is permitted by the examiners but joint production is not’. In other words, your submitted work must be unique to you. Obviously we expect some similarities in the method sections, and in the type of material you might cover in the introduction and results, direct similarities between students work will be noticed and will be submitted to the academic misconduct officer as a case of collusion. The outcome of this process is unpleasant for everyone, so please don’t do it, and don’t lend people your work.
Coursework

Assessment Criteria for in class exercises

In class exercises are made up of multiple choice, numeric, and short answer style online questions. It should be self-evident how these are assessed: if you give the correct answer you get a mark. 

Assessment Criteria for Laboratory Reports

The assessment criteria for laboratory reports can be found on the school website: http://www.sussex.ac.uk/psychology/internal/students/examinationsandassessment

These criteria describe work that would fall into different mark boundaries. The descriptions represent what we would typically expect from a project within a particular boundary. At the higher end (70+) these guidelines should be interpreted as the marker expecting most or all of the attributes listed. At the lower end (below 70) these guidelines should be interpreted as the marker giving a mark in that boundary if the project contains some (but not necessarily all) of the attributes listed. For example, a project that has most of the attributes listed in the 70-79% range but has one important flaw (such as inadequate or incorrect statistical analysis) may be bought down to a mark within the 60-69% bracket. In other words, these are guidelines only.

A note about analysis: It is certainly not true that the more analysis you do the better your mark. The best research often uses simple designs and simple analysis. So, less can sometimes be more. We are mainly looking for a good correspondence between design and analysis (i.e., that your analysis maps onto your design and you haven’t run 70,000 ANOVAs just to prove that you can). So, it’s important to think about what analysis you’ll use while you design your research.

The Marking Scale

In line with marking of third year contributory coursework, we mark lab reports on a categorical scale. This means that within a certain class boundary, there are only certain marks permitted. For example, within the range of 60-69%, marks of 62%, 65% and 68% are permissible but all other marks are not. Permissible marks are described at: http://www.sussex.ac.uk/psychology/internal/students/examinationsandassessment

The Marking Process

Practical tutors mark the laboratory reports. The fact that different people have different markers always brings up the urban myth that certain markers are ‘light’ or ‘harsh’. It’s worth mentioning how marking is done as this will hopefully reassure you that provisions are in place to make sure that marks are equitable.

• Before a set of reports is marked I meet with all markers to discuss generally what they should be looking for, what they should give credit for and so on. In short, I give them general guidelines about what I expect. This includes summarizing the advice that I have given on the forums.
• When they begin marking a particular assignment, each marker submits to me the first few assignments that they have marked. I independently and blindly mark these and then compare my marks with those of the marker. Based on this sample, I make some general decision about whether the person is marking too lightly/too harshly and discuss this with them so they can change accordingly for the remaining reports.

- *This process happens on each assignment.*

• During the entire marking process I also look at any assignment about which the marker is unsure or is having problems with (for whatever reason).

• When all assignments have been marked I look at the distribution of marks from each marker to check that these are comparable and in line with the sorts of distributions we might expect. If a marker is being ‘harsh’ (or lenient for that matter) this is blindingly obvious from their distributions of marks (trust me, I teach statistics!). If this does happen I adjust marks accordingly before they’re released to students. This is why your cover sheets say ‘marks are provisional’. I usually write a report on the marking process and post it on study direct for you all to see.

• At the end of the year all of this information is given to an external examiner (an academic from a psychology department in a different university). They look at distributions of marks, look at any decisions I’ve made to lower or raise marks. They have the power to change any decisions if they don’t think I’ve acted in line with what happens at other universities.

So, in short, there are lots of security measures in place to ensure that the marker you have does not affect your marks.

**What if I don’t agree with my mark?**

The examinations and assessment handbook provides details of all things to do with your assessment and examination. In section 16.2 it says:

**There is no right of appeal against the academic judgement of the examiners.**

Basically, the moderation process described above ensures consistent and fair marking. In short, I can’t do anything in response to people believing that their marks are wrong. **Your practical tutor has no power to change your mark** so please don’t put yourself or them in the embarrassing situation of asking them to change your mark.

If you don’t feel that you have had sufficient feedback to help you improve, then you should discuss this with your marker (but don’t ask them to change your mark). If you believe that a marker is not providing adequate feedback on a consistent basis (i.e., you and others in your group feel that they have been slack in their duties) then I’m very happy to discuss this with you and to do whatever I can to rectify the situation.

**The Exam**

• The end of module exam is sat during the spring exam period.

• The exam is 120 minutes long and consists of several long questions. Please see the mock exam, which mimics the format of the real exam.
• The exam is a **closed book exam**. You cannot take anything into the exam (other than a University-regulation calculator and your brain).

• Many people do very well on the exam, and those that do typically are those who attend all of the lectures and (probably more importantly) practical classes and get lots of practice interpreting the various procedures that we cover.

**RESIT opportunities**

Those who get less than 40% overall (50% for M.Sc. EP students) on the module will fail. If this happens (which I sincerely hope it doesn’t) you’ll likely be offered a ‘resit’. The rules for resits can be found in the Examination and Assessment Handbook.

If you have mitigating evidence for any of the assessments on this module it’s possible you might be offered to take the resit opportunity but in ‘sit’ mode (which means that your mark is not capped like it normally is for resits). Check the [Academic Office Website](#) for the current rules on resits and mitigating evidence.

The resit opportunity needs to assess all of the learning outcomes, therefore it is a 120 minute exam that is a mix between the format of the main January exam and a laboratory report. The resit has two parts, both of which are compulsory:

**Part A**

Part A of the resit exam will be two ‘January Exam’ style questions. Therefore, look at the sample paper. You’ll get two questions in that style: SPSS output with questions testing both your statistical knowledge and your ability to interpret the output.

**Part B**

In the second part of the exam, you will be given a research scenario (i.e., an introduction and some methodological details) and some SPSS output and you will be expected to complete the report (that is, write the results and discussion in the appropriate format). The question will be phrased more or less as follows:

- **Below and over the subsequent 3 pages there is an introduction and method section from a laboratory report of an experiment. The SPSS output of the data is also included. Using the introduction, method and SPSS output, complete the laboratory report by writing the corresponding results section and discussion. For the results section use APA format for presenting the results: you may include sketches of graphs and/or tables to summarise the data if you think it appropriate. For the discussion section you are expected to relate the results back to the material in the introduction, but you are not expected to have any additional knowledge about the topic of the research.**

**Research Participation (Undergraduates Only)**

All undergraduate students on this module have to complete 2 hours of research participation to gain 5% of the credits\(^1\): you will receive no marks at all for doing anything less than the full 2

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\(^1\) Students on the M.Sc. in Experimental Psychology are not required to do research participation.
hours. This participation can include both taking part in studies (such as filling in someone’s questionnaire) and assistance in studies (such as handing out someone’s questionnaires to others). Each study in which you participate or assist with is worth some multiple of 15 minutes.

The main way that you will be notified about studies is through a computerised research participation management system called SONA. You can find details about this at http://www.sussex.ac.uk/psychology/internal/students/technicalsservices/sonasystems

You will receive your username and password by email at the start of your Module. The password will be a temporary one, and you should change it as soon as you can to something secure that does not match your Sussex password.

SONA will send you emails from authorised researchers once a fortnight during term time, telling you about studies for which they want participants and assistants. You can browse through the available studies, click on those you wish to sign up for, and book yourself in for a time and day for participation or assistance.

You can view your accumulated credits in the profile section of the site, which will allow you to see how much more you need.

Some studies involve children as participants. If you are a parent, you will be able to get module credits for taking your child to participate in research.

If you sign up for a study, PLEASE make sure you turn up (or let the researcher know in good time that you won’t be able to). Not only is it very rude not to show up, but no-shows waste a lot of a researcher’s time. If you fail to show up for three separate appointments, your name will automatically be forwarded to the Head of School and your Academic Advisor. You may lose your 5% credit in the relevant module unless you are able to demonstrate significant extenuating circumstances preventing you from attending your appointments.

Only researchers who are authorised to use the scheme can advertise on SONA and award you credits: third-year students and M.Sc. Students doing their projects are NOT allowed to give you credit. Obviously if you want to, you can take part in one of their studies out of the kindness of your heart, but you should be aware that this will not count towards your 5%.

Psychologists must adhere to a strict code of ethics in their research (for details see the British Psychological Society’s website). Participants in research studies must give informed consent to take part, must not be coerced into participating, and are free to withdraw from a study at any time. If you do not wish to be a research participant at all, you can still obtain your module credits through research assistance.

Taking part in research is one of the best ways to learn how real research is done. Therefore your participation and/or assistance should be educational to you as well beneficial to the research taking place in the School. There is a sufficient range or research going on that you should be able to find something to volunteer for that you’re happy to do.

Whether participating or assisting, at the end of the study the researcher will explain to you the aims of the study (‘debrief’) and give you the chance to ask any questions (whether to with design/method or the topic itself).

Note: it is your responsibility to log in to Sona regularly and sign up to take part in research.
Reading List

Let’s face facts — students hate statistics. The only thing they hate more than listening to me droning on about stats, is having to read about me droning on about stats. That’s unfortunate because the module is based on my textbook. The good news is that this means that the lectures will very closely match the content of the book. Although as you read it you might find this hard to believe, the book has won awards and is widely used and regarded as a classic by students around the world. I guess the bar is set pretty low for stats books though ....

The style of this book is fairly laid-back and I’ve tried to make it as enjoyable to read as possible (given the subject matter). If you’re not that confident about statistics then I recommend that you read the recommended book chapter before each lecture (that way, the lecture should be easier to understand). If you find a lecture confusing, then you can refer to the appropriate chapter afterwards to clarify things.

Statistics can be understood at a number of different levels and that there is substantial variation in students’ interest and ability in the subject. At the end of each chapter in my book there are suggestions for further reading on a given topic. If you require additional reading I recommend you follow the suggestions in my book. You should also feel free to see me or email me if you want to discuss additional reading material on any topic.

Recommended Text

The University bookshop and Library should be plentifully stocked with my textbooks (below). They can also be ordered from Sage Publication’s web page (http://www.sagepub.co.uk), and more cheaply from places like Amazon. You are also given ample handouts to get through the module without buying my book.

This is the most important book for this Module:

For your laboratory report you might also find the following book useful because it covers aspects of designing, reporting and writing up experiments. It’s a bit out of date now though.


Reading by Topic

Topic 1: De-mystifying statistics


Topic 2: The PENIS of Statistics


Topic 3: Experimental Methods and writing up research

A lovely handout I wrote on APA style: http://www.discoveringstatistics.com/docs/writinglabreports.pdf
Topic 4: The beast of bias


Topic 5: Linear Models (Including Bias in Linear Models)


Topic 6: Categorical predictors and moderation


Topic 7: One-Way Independent ANOVA


Topic 8: Analysis of Covariance (ANCOVA) (AF)


Topic 9: Two-Way Independent ANOVA (AF)


Topic 10: Repeated Measures ANOVA (AF)


Topic 11: Mixed ANOVA (AF)


Andy Field, July 2013
## Appendix: A Guide to Symbols for this Module

Throughout this Module you will come across various mathematical symbols (usually Greek letters) that denote certain statistical functions. For reference, I’ve included a list of the common symbols and what they represent (hopefully this will make lecture notes less confusing!).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>Probability of a Type I Error (accepting a hypothesis that, in reality, is false)</td>
</tr>
<tr>
<td>$b$</td>
<td>Unstandardized regression coefficient</td>
</tr>
<tr>
<td>$\beta$</td>
<td>Standardized coefficient in a regression equation</td>
</tr>
<tr>
<td>$d$</td>
<td>Cohen’s measure of effect size</td>
</tr>
<tr>
<td>$df$</td>
<td>Abbreviation of ‘Degrees of Freedom’</td>
</tr>
<tr>
<td>$\varepsilon$</td>
<td>Sphericity</td>
</tr>
<tr>
<td>$F$</td>
<td>$F$-ratio</td>
</tr>
<tr>
<td>$k$</td>
<td>Number of groups</td>
</tr>
<tr>
<td>$MS$</td>
<td>Abbreviation of ‘Mean Squared Errors’</td>
</tr>
<tr>
<td>$MS_{M}$</td>
<td>Model mean squared error</td>
</tr>
<tr>
<td>$MS_{R}$</td>
<td>Residual mean squared error</td>
</tr>
<tr>
<td>$N$</td>
<td>Total number of observations</td>
</tr>
<tr>
<td>$n_{i}$</td>
<td>Number of observations in the $i$th group</td>
</tr>
<tr>
<td>$R, r$</td>
<td>Pearson’s correlation coefficient, effect size measure</td>
</tr>
<tr>
<td>$\Sigma$</td>
<td>Summation (i.e., add everything that follows this symbol)</td>
</tr>
<tr>
<td>$s$</td>
<td>Standard deviation of the sample</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Standard deviation in the population</td>
</tr>
<tr>
<td>$s^{2}$</td>
<td>Variance of the sample</td>
</tr>
<tr>
<td>$\sigma^{2}$</td>
<td>Variance in the population</td>
</tr>
<tr>
<td>$SS$</td>
<td>Abbreviation of ‘Sum of Squared Errors’</td>
</tr>
<tr>
<td>$SS_{T}$</td>
<td>Total sum of squares</td>
</tr>
<tr>
<td>$SS_{M}$</td>
<td>Model sums of squares</td>
</tr>
<tr>
<td>$SS_{R}$</td>
<td>Residual sums of squares</td>
</tr>
<tr>
<td>$\mu$</td>
<td>Mean of the population</td>
</tr>
<tr>
<td>$t$</td>
<td>$t$-statistic</td>
</tr>
<tr>
<td>$\bar{x}$ or $M$</td>
<td>Mean of the sample</td>
</tr>
<tr>
<td>$X$</td>
<td>Predictor variable</td>
</tr>
<tr>
<td>$Y$</td>
<td>Outcome variable</td>
</tr>
</tbody>
</table>