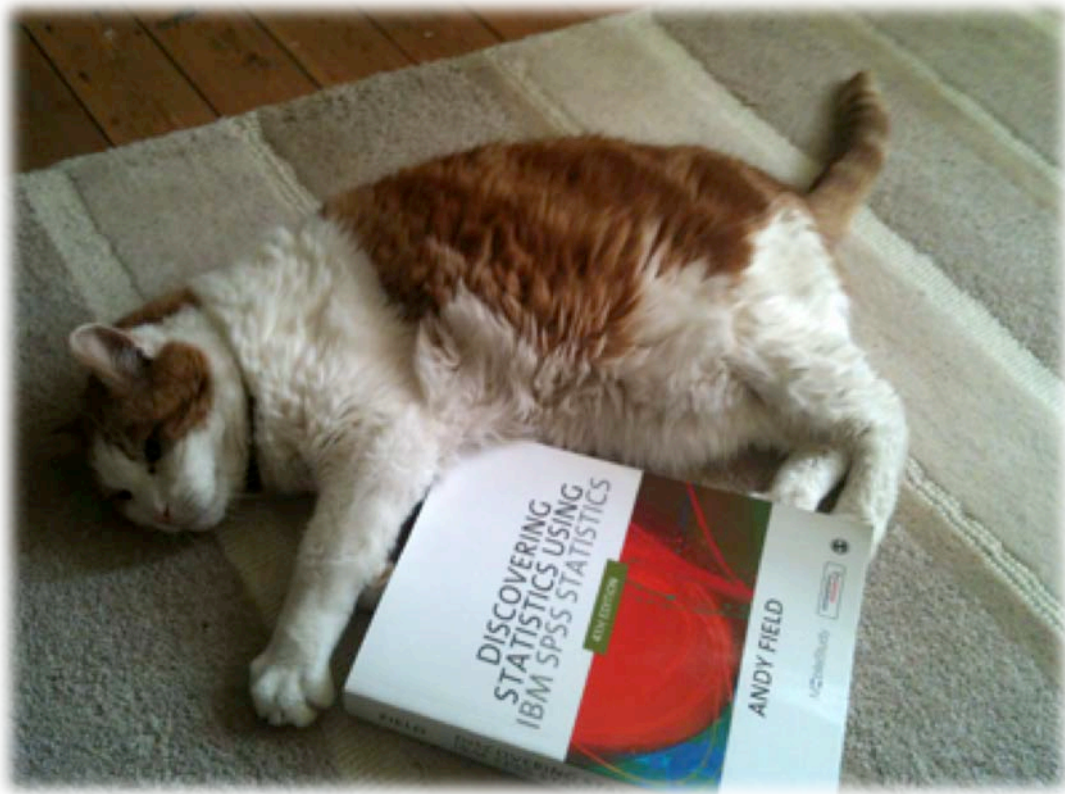


# Discovering Statistics



~~Dr. Matt Easterbrook~~

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](mailto: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 usually the Module organiser. However, for the academic year 2014-15 I will be on unpaid paternity leave during the module. Although I agreed to give the lectures during my unpaid leave, other than that I am not working at Sussex at all during the module. In my absence, the module organiser will be **Dr. Matt Easterbrook**:

<http://www.sussex.ac.uk/psychology/people/peoplelists/person/173988>

### *Lecturers*

I take all of the lectures on this module despite being on paternity leave, but please note above that Matt Easterbrook is overseeing everything other than the lectures.

### *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 woman 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://studysdirect.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 resource 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://studysdirect.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). 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 (well, Matt Easterbrook this year) 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.

Please search the forums for answers to your question before asking it (Figure 2).

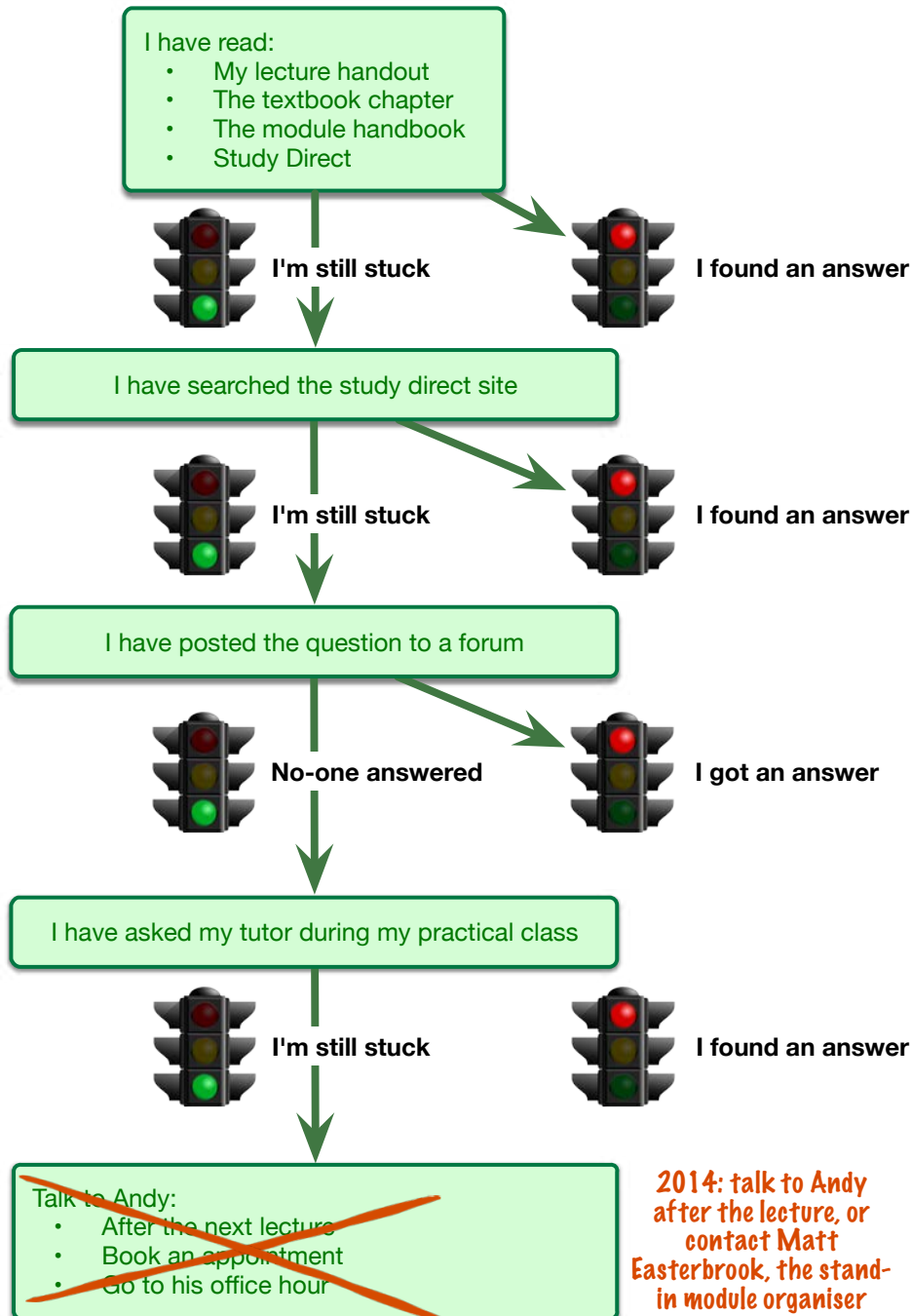


Figure 1: The process of getting help

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 accidentally start discussing with your mate what a twat you think I am, because that would be upsetting.

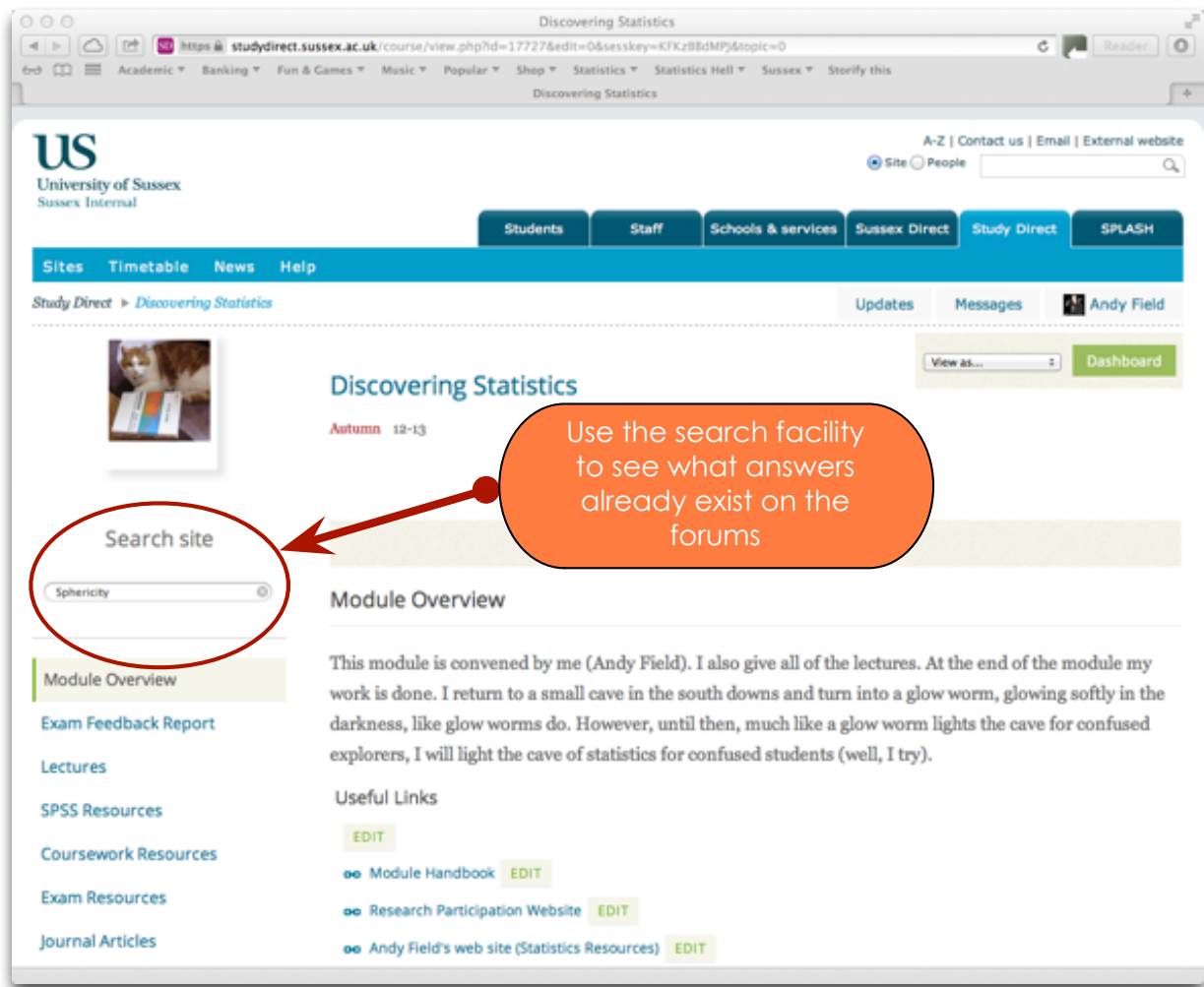


Figure 2: Remember to search the forum for an answer

### *Face-to-Face*

I am on unpaid paternity leave during the module. The only opportunity to talk to me face-to-face is after the lecture. You can talk to **Dr. Matt Easterbrook**, the stand in module organiser, please see his University webpage for his student consultation times.

### *Email*

I am on unpaid paternity leave during the module and not checking email at all. If you have concerns about the module, please email **Dr. Matt Easterbrook**, the stand in module organiser, please see his University webpage for his contact details.

### *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](mailto: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.

Tempting as it may be to spend the sessions checking your favourite social networking website 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

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

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

### *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

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

### *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.**

### *What Happens if I Miss an Assessment Deadline?*

Where applicable you may still submit the assessment within 7 days of the published deadline. This will incur a penalty, as follows:

- Work submitted up to 24 hours late shall incur a penalty deduction of 5 percentage points (not 5% of the actual mark).
- Work submitted after 24 hours and up to 7 days late shall incur a penalty deduction of 10 percentage points (not 10% of the actual mark)

- No work shall be accepted after the 7 day penalty period has elapsed

Please consult your assessment deadlines timetable on Sussex Direct:

- <https://direct.sussex.ac.uk>

For any piece of late work where the student wishes to claim mitigating circumstances or impairment a MEC claim needs to be completed and submitted to the Student Life Centre. Please access the links for further information.

- <http://www.sussex.ac.uk/studentlifecentre/mitigation>
- <http://www.sussex.ac.uk/academicoffice/documentsandpolicies/examinationandassessmenthandbooks>

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 and lab report. Those here for the spring examination period will be assessed as a home student (see the table above).

### *Plagiarism and Collusion*

Information on plagiarism and collusion can be found here:

- <http://www.sussex.ac.uk/s3/?id=33>
- <http://www.sussex.ac.uk/academicoffice/documentsandpolicies/examinationandassessmenthandbooks>

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 brought 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 be more. We are 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 (when I say 'I' I mean Matt Easterbrook this year) 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 at a different university). He or she looks at distributions of marks, look at any decisions I've made to lower or raise marks, and read a sample of lab reports. They have the power to change any decisions if they don't think I've acted in line with what happens at other universities.

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 section 16.2 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 January Exam*

- The end of module exam is sat during the spring exam period (usually in January).
- The end of module exam is 120 minutes long and consists of several long questions. Please see the sample exam paper, which mimics the format of the spring exam.
- The end of module exam is an Unseen exam (**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 and SIT 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 mode for this module is an unseen exam. Whether you're doing a RESIT or SIT you will take the same exam paper, the only difference is that a RESIT has a capped mark and the SIT does not. *The resit opportunity needs to assess all of the learning outcomes - it is not a replacement for the January exam it is a replacement for all assessments on this module (i.e., the two online tests, the laboratory report, and the January Exam)*. Because it needs to replace all assessments on the module, the resit exam differs in format to the January exam. It is a 120 minute exam that is a mix between the format of the main January exam and a laboratory report. The resit opportunity has three compulsory questions:

#### *Questions 1 and 2*

There will be two 'January Exam' style questions: SPSS output with questions testing both your statistical knowledge and your ability to interpret the output Therefore, look at the sample paper.

#### *Question 3*

One question assesses the 'doing research' component of the module. 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.*
  - (a) *Use the SPSS output to write a results section in APA style like you would find in a published research paper. You may include sketches of graphs and/or tables to summarise the data if you think it appropriate. [10 Marks]*
  - (b) *Write a discussion section like you would find in a published research paper. This discussion should relate the findings back to the material in the introduction, discuss limitations of the study design, and suggest some areas for improvement. You are not expected to have any additional knowledge about the topic of the research than that provided in the question. [10 Marks].*

### *Research Participation (Undergraduates Only)*

All undergraduate students on this module have to complete 2 hours of *research participation* to gain 5% of the credits<sup>1</sup>: you will receive no marks at all for doing anything less than the full 2 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/technicalservices/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

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<sup>1</sup> Students on the M.Sc. in Experimental Psychology are not required to do research participation.



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 of 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 ....

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.

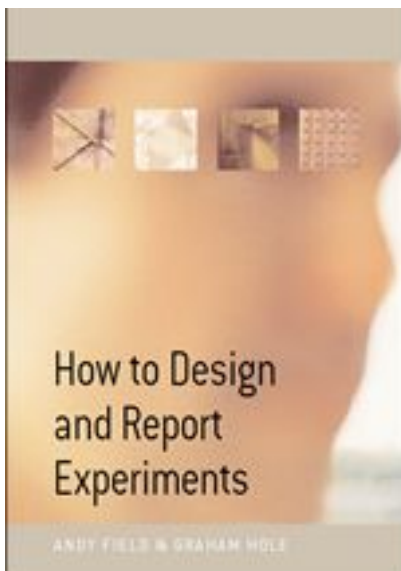
### *Recommended Text*

The University bookshop and Library should be plentifully stocked with my textbooks (below). They can also be ordered from Sage Publication's web page ([www.uk.sagepub.com](http://www.uk.sagepub.com)), 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:

**Field, A. P. (2013). Discovering statistics using IBM SPSS Statistics: and sex and drugs and rock n' roll (4th Edition). London: Sage.** [Library: Short/Reserve QE 1927 Sps (Fie), (ISBN: 1446249182)].



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.

**Field, A. P., & Hole, G. J. (2002). How to design and report experiments. London: Sage** (ISBN: 0-7619-7382-6).

## *Reading by Topic*

### *Topic 1: De-mystifying statistics*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapters 1 and 2**).

### *Topic 2: The PENIS of Statistics*

Cohen, J. (1990). Things I have learned (so far). *American Psychologist*, 45(12), 1304-1312.

Cohen, J. (1994). The earth is round ( $p < .05$ ). *American Psychologist*, 49(12), 997-1003.

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 2**).

Miles, J. N. V., & Field, A. P. (2007). Perspectives on significance testing. *The Irish Journal of Psychology*, 28(1-2), 13-26.

### *Topic 3: Experimental Methods and writing up research*

American Psychological Association (1992). *Ethical Principles of Psychologists and Code of Conduct*. Washington, DC: APA. [Available online from <http://www.apa.org/ethics/>]

British psychological Society (2000). *Code of conduct, ethical principles, and guidelines*. Leicester: BPS. [Available online from [http://www.bps.org.uk/system/files/documents/code\\_of\\_ethics\\_and\\_conduct.pdf](http://www.bps.org.uk/system/files/documents/code_of_ethics_and_conduct.pdf)].

Field, A. P., & Hole, G. J. (2003). How to design and report experiments. London: Sage. (**Chapters 1 to 3**)

A lovely handout I wrote on APA style: <http://www.discoveringstatistics.com/docs/writinglabreports.pdf>

### *Topic 4: The beast of bias*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapters 4 and 5**).

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

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 8**).

### *Topic 6: Categorical predictors and moderation*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 10**).

### *Topic 7: One-Way Independent ANOVA*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 11**).

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

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 12**).

### *Topic 9: Two-Way Independent ANOVA (AF)*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 13**).

*Topic 10: Repeated Measures ANOVA (AF)*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 14**).

*Topic 11: Mixed ANOVA (AF)*

Field, A. P. (2013). *Discovering statistics using IBM SPSS Statistics: And sex and drugs and rock 'n' roll* (4th ed.). London: Sage. (**Chapter 15**).

**Andy Field, August 2014**

## 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!).

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