Department of Psychology

NST Part IB: Experimental Psychology

PBST Part IB PBS4: Cognitive Neuroscience and Experimental Psychology

Course Guide and Schedule of Lectures
Academic Year 2019 - 2020

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The information contained in this Course Guide is correct at the time of going to press (03/10/2019), but all matters covered are subject to change from time to time.
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Introduction

Welcome to the Department of Psychology!

This booklet contains useful information about the course, including a description of the lectures we offer together with the related practical classes, and details of the examination. The booklet also includes useful practical information about the Department.

The NST IB Experimental Psychology course may be your first exposure to psychology as a scientific discipline. We will introduce you to Experimental Psychology with a lecture examining its historical roots, its philosophical basis and the methods used in modern Experimental Psychology. You will then learn about topics in perception which are not very far removed from the sciences most of you have studied before (biology and physics most notably) and then gradually introduce you to the mental and brain processes involved in attention, learning and memory, language, action, awareness, thinking and reasoning, cognitive and social development, the psychology of social groups, and atypical psychology.

Although we feel that this is the best way of introducing you to Experimental Psychology, a number of you may well be surprised by the 'openness' of the subject. There are plenty of 'hard facts' in psychology but there are also many theories, some of them, indeed, of a highly speculative nature. This is because, even after more than 100 years of its scientific study, many of the capacities of the mind and the brain remain mysterious. For the new student of psychology this can be both exciting and daunting.

Students from other Triposes take the NST IB Experimental Psychology course, including Philosophers. The course is taught in such a way to allow any student who has never studied Psychology or Biology to follow the material, although it is recommended that students should have at least one A level in a science subject and/or A level maths.

PBST Part IB PBS 4: Psychology and Cognitive Neuroscience

Although we refer to this course as NST IB, a shorter version of the course is also offered as a compulsory paper to students taking PBST Part IB, known as PBS4: Psychology and Cognitive Neuroscience. PBS4 comprises roughly two thirds of the lectures and practical classes. Specific details regarding lectures and practical classes included in this course for students taking PBS4 are provided on page 27. However, all other general information and advice in this guide is relevant.
Aims and Objectives of the Part IB Course

Aims

The academic aims of this course are as follows:

- To introduce students to a broad range of key topics in Experimental Psychology and to provide the opportunity to learn about experimental procedures in Psychology through practical classes.
- To prepare students for the Part II Psychology course.

Learning Outcomes

At the end of the course students should possess:

- Elementary skills of arguing towards theoretical conclusions about cognitive neuroscience processes from empirical evidence, and a knowledge base from which to argue.
- An appreciation of the principles of behavioural experimentation, acquired through participation in practical classes (and from videos and films).
- The ability to write a report of a psychology experiment, developed through writing practical reports.
- An elementary understanding of experimental methodology, design, and statistical analysis.

Professional Outcomes

For students taking NST IB Experimental Psychology, this course provides one step toward obtaining a professionally recognised qualification in Psychology. The combination of NST Part IB Experimental Psychology and NST Part II Psychology has been accredited by the British Psychological Society (BPS). Successful completion of this course AND NST Part II Psychology automatically confers you with Graduate Basis for Chartered Membership of the BPS, which is required for future training in psychology professions such as Clinical Psychology, Educational Psychology, Industrial Psychology etc. For full details of the study requirements for receiving a recognised qualification, see our web page. For further information about opportunities for psychology undergraduates and graduates, see the British Psychological Society website.

Structure of the Course

The course is taught by means of three lectures per week (Tue, Thu, Sat 11am), in combination with up to two practical classes. A detailed summary of each lecture and practical class is given in the final part of this booklet and in the Course Timetable.

Topics covered in the first term include: sensory processes and perception with special emphasis on vision and hearing; attention, consciousness and the control of action; and learning, memory and motivation. The remainder of the course covers language processing; reasoning and decision-making; cognitive and social development; personality (and its measurement); and atypical psychology; and social psychology.

During the practical classes, students will learn research techniques and skills necessary for measuring brain and behaviour, the importance of experimental design including the difficult problem of appropriate control conditions and the relationship between experimental hypotheses,
experimental design and statistical analysis. Students taking NST IB Experimental Psychology are required to write reports on six of these classes; students taking PBST Part IB PBS4 are required to write reports on four (see below).

**Practical Class Registration**

**NST IB Students:** Your College should ask you to register at the Senate House for practical classes at the beginning of the Michaelmas Term.

**PBST students** are assigned practical classes before the start of term.

**Students from other Triposes** (e.g. Philosophy). Please contact the Course Organiser to arrange practical class times.

**Supervisions**

Typically, students receive a weekly supervision on this course. Supervisions are the responsibility of College Directors of Studies (DoS). Your DoS will appoint one or more supervisors who will advise students about the topics for supervisions and preparation for the examinations.

**Advice to Students**

Students are strongly advised to familiarise themselves with the format of the examination papers (see below) and the types of questions by referring to the examination papers from previous years.

The material taught in practical classes is helpful and relevant for all parts of the examination. The course is divided into five main themes for the purpose of teaching and learning, and is as follows:

- Perception and Cognitive neuroscience – how we perceive, remember, learn, reason, speak and control our actions
- Biological Psychology – how the brain works, how it can be affected by drugs, the effects of hormones, and biological models and treatment of mental disorders
- Developmental Psychology – how humans develop physically, mentally and socially during childhood and adolescence and its underlying neural process.
- Individual Differences – how we try to measure differences in personality or intelligence, and understand atypical cognitive processes associated with mental illness
- Social Psychology – how human behaviour and cognition are affected by social context, including the study of reasoning and decision-making

These themes do not always coincide precisely with the topics areas for the examination sections (which are described in detail below). Lectures will often contain information relevant to more than one section in the examination. The marking criteria used in the School of Biology give particular credit to answers that **integrate** a variety of relevant sources of information.
Assessment

Assessment for the full course is through:

- Two unseen three-hour written papers (40% of the total mark each)
- A written practical of an hour and a half (20% of the total mark)
- Six practical class reports (each failure to pass one of the five required reports will result in the deduction of 1.5 marks from the total examination mark)

**PBS Tripos students offering PBS 4** are assessed by Paper 1, the Written Practical paper and **four** specified practical class reports. PBS4 is **not** assessed by Paper 2. Please see page 27 for specific lectures and practical classes.

**Papers 1 and 2**

The written papers (Paper 1 and Paper 2) consist of three sections, each assessing a certain topic area from the course. In each section, candidates will be required to provide: (1) a short account of two topics from a choice of four, and (2) one essay from a choice of two. The essay carries two thirds of the marks in each section. The sections of these papers address the following topics:

<table>
<thead>
<tr>
<th>Paper 1</th>
<th>Paper 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section A</strong></td>
<td>Perception and Cognition</td>
</tr>
<tr>
<td><strong>Section B</strong></td>
<td>Cognitive Psychology</td>
</tr>
<tr>
<td><strong>Section C</strong></td>
<td>Biological Psychology</td>
</tr>
</tbody>
</table>

How the above topics are divided into Papers 1 and 2 has changed from previous years. Students should bear this in mind when looking at past exam papers.

**Written Practical**

The written practical is divided into two sections, A and B. In Section A, candidates will respond to a compulsory statistics question requiring the understanding of data analysis to the question posed. The compulsory statistics question was modified last year, and the question set in 2018-2019 can be regarded as a representative example. In Section B, candidates will be required to answer one question from a choice of at least three on designing an experiment.

Further information on examinations together with past papers, arrangements for reports of Part IB practicals and guidelines for written reports can be found on the [NST Part IB Experimental Psychology Moodle page](#).
Practical reports

**Students taking NST IB Experimental Psychology:** you are required to submit reports for six of the practical classes, which are listed below.

**PBS Part IB students taking PBS 4 Psychology and Cognitive Neuroscience:** you are required to submit reports only for four of the practical classes listed below (1. Biological Psychology; 2. Cognitive Psychology; 4. Individual Differences; 5. Qualitative Assessment). PBS Part IIB students taking PBS 4 are NOT required to submit reports for classes 3 and 6.

1. Biological Psychology
   - Dr. Tristan Bekinschtein  
     Neural measurements / Data Analysis

2. Cognitive Psychology
   - Dr Simons  
     Behavioural Measurement 1

3. Developmental Psychology
   - Dr Sheila Flanagan  
     Cognitive Developmental Tasks

4. Individual Differences
   - Dr Rentfrow/ Friedrich Götz  
     Psychometric assessment: Personality

5. Qualitative Methods
   - Dr Susan Imrie  
     Qualitative Analysis

6. Social Psychology
   - Dr Schnall / Dr. Tess Langfield  
     Social Psychology

Assessment: Reports are marked as either (a) satisfactory, (b) failed, or (c) revision required (these reports have an indication of how they must be improved to be satisfactory; the student may submit a revised report for re-marking.)

The deadline dates for all reports that may be submitted will be posted outside the Practical Classroom at the beginning of Michaelmas term.

Details of the preparation, submission and evaluation of these reports will be given in each relevant practical class. You may also ask your Supervisors for more guidance about your reports.
Student Input to Teaching and Course Management

Questionnaires

At the middle and end of each term you will receive an email announcing a web-based questionnaire concerning the course. You are strongly invited to give your feedback, as your comments and views are instrumental for evaluating the quality of our lectures and implementing any changes that would improve the quality of the course. You will also be invited to complete a final questionnaire at the end of the year.

Please click on the link in the email and complete the short questionnaire, rating and commenting on various aspects of the course and associated supervisions. Please note that your reply is entirely confidential and no one can identify the author of a particular comment.

Staff/Student Committee

Each year, we need student volunteers taking our NST IB course to join the staff/student committee. The main purpose of this Committee is to raise and discuss any issues about our courses and Departmental arrangements for students. The Committee consists of the Department’s Director of Undergraduate Education, academics responsible for each course the Department contributes to, and student representatives from these courses.

The Committee normally meets towards the end of the Michaelmas Term and at start of the Lent and Easter Terms, when questionnaire feedback on the previous term’s lecture courses is available. Comments from the Committee are discussed at the subsequent Departmental meetings.

The Secretary of the Committee is Dr Jeanne Estabel (je353@cam.ac.uk). Anyone wishing to have an item of business discussed should contact her or the appropriate student representatives.

Other Channels

Students are encouraged to bring suggestions about the teaching or management of the Part IB Course to the Department’s attention via:

- the Head of Department (Prof Mark Johnson, mj492@cam.ac.uk)
- the Teaching Administrator (teaching@psychol.cam.ac.uk)
- the Part IB Course Organiser (Dr Tristan Bekinschttein, tb419@cam.ac.uk)
- the Director of the PBS Tripos (Dr Lee De-Wit, lhd26@cam.ac.uk)
- their Directors of Studies.

This provides another route by which your reactions to our courses can influence our future provision.
**Students from outside Natural Sciences**

We are strongly committed to offering our Experimental Psychology Part IB course to students from a variety of disciplines. However, a certain level of mathematical and scientific knowledge is assumed in our teaching.

The majority of the students participating in our course do so after completing Part IA Natural Sciences, which provides sufficient mathematical and scientific background for our course. Students from other Triposes are strongly encouraged to refresh their knowledge on these topics in advance of the course. Practical classes in the first few weeks of the Michaelmas term will review basic neurobiology and mathematics required for the course.

The Department runs a website on Moodle to support students taking this paper:

https://www.vle.cam.ac.uk/course/view.php?id=62652

If you are not already enrolled in this site, please contact our librarian, Daniele Campello (library@psychol.cam.ac.uk) or the Teaching Administrator (teaching@psychol.cam.ac.uk).
The Department of Psychology

General

One of the oldest psychology departments in the country, we celebrated the centenary of our establishment in 1997. We accommodate many Post-Doctoral Research Scientists and Postgraduate Research Students who serve as supervisors for lecture courses.

The Department occupies three adjacent buildings on the Downing Site and a building on the New Museums Site (Department of Psychology, Free School Lane, CB2 3RQ). The main Psychological Laboratory building (CB2 3EB) was built for the Department in the 1950s. Its first two floors house most of the facilities used by students: our lecture theatre, our practical classroom with PCs, a well-stocked library (and helpful Librarian), technical workshops, and two common rooms for Part II Students (containing photocopiers, a snack machine and drinks machines, and computers) in addition to Reception and some staff offices. The remaining floors contain offices and laboratories.

Immediately to the west is the Craik-Marshall building where further laboratories and offices occupy the ground and the top floors. There is also the Kenneth Craik seminar room on the ground floor. Immediately to the south is the William Hardy building, of which we occupy most of the ground, second and third floors. The Centre for Speech and Language is located on the second floor of the William Hardy building.

The Department houses the University of Cambridge Behavioural and Clinical Neuroscience Institute (BCNI) funded by a consortium grant from the Medical Research Council and Wellcome Trust.

The Centre for Family Research and the Cambridge Laboratory for Research into Autism are located in the Old Cavendish Building, Free School Lane (CB2 3RQ).

We are fortunate in having nearby on Chaucer Road (CB2 7EF) the MRC Cognition and Brain Sciences Unit (CBU), which is a major research centre for cognitive psychology and cognitive neuroscience within the University. Some of its members provide lectures and supervisions for our courses. The Department also has links with the Department of Psychiatry at Addenbrooke’s Hospital on Hills Road (CB2 0QQ) and its Autism Research Centre on Trumpington Road (CB2 8AH).

Department Contact Details

Course Organiser: Tristan Bekinschtein (tb419@cam.ac.uk)

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Website: www.psychol.cam.ac.uk
The Library website is an essential source of information about the Department Library and the services it provides (www.library.psychol.cam.ac.uk). There are guides to other useful libraries in Cambridge and the information services offered via the University Library website. Our Librarian (Ms Daniele Campello library@psychol.cam.ac.uk) will be pleased to assist you if needed.

All classified books are available for loan but journals are for use in the library only. However, almost all journal articles are available to students on-line. Please note that a record must be made of all items removed from the library even for a short period.

Photocopying, Scanning and Printing

There is a scanner /printer/ photocopier available for your use. The machine is situated in the Student Computer Room, next door to the Library. The printer charges printing jobs to your Desktop Services Common Balance at a cost of 7p per page. The machine can also be used to scan items and either email them or save them to a USB data stick.

Health and Safety in the Department

The Head of Department is responsible for health and safety provision. You should ensure that you familiarise yourself with the various fire exits and routes to them: all are clearly signed. For areas that you do not visit frequently (e.g. a supervisor's office) the members of the Department that you are visiting will be happy to show you the emergency exits if you ask. In the event of the fire alarms sounding, you should leave the building immediately by the nearest safe exit and assemble outside the Department of Geography. Do not delay to collect your belongings and do not use the lift.

If you are unfortunate enough to have an accident in the Department, a first-aider can be contacted via Reception (telephone 33550). If Reception is closed, contact should be made with the security control room (31818). Any accident must be reported to the Departmental Office (Room 100). In case of serious emergency, telephone 1999 for the Emergency Services.

If you have any general concerns about safety in the Department, please contact the Departmental Safety Officer, Professor Jeff Dalley (jwd20@cam.ac.uk).
Michaelmas Term - Lectures

Lists of suggested readings are provided for each lecture series. Asterisks denote texts suitable for reading before the course begins. Texts marked with + provide useful reference sources for one or more lectures. The handouts published online will provide further readings on particular topics.

Introduction
Dr K Plaisted-Grant

1 Historical background to Experimental Psychology:
Wundt introspection and structuralism, compared to William James, functionalism, behaviourist psychology and reductionism. The rise of cognitive psychology. Modern approaches to the study of consciousness: the relationship between cognitive psychology and cognitive neuroscience.

Visual Perception
Dr. Alex Muhl-Richarson and Dr. Jasper Poort

Recommended Reading:

2 Visual Perception 1: Sensory Coding (Dr. Alex Muhl-Richarson)
Attributes of perception and their relation to the physical characteristics of stimuli. Neural coding of sensory information. Characteristics of neurones - receptor and action potentials.

3 Visual Perception 2: The eye, perception of contrast and adaptation (Dr Alex Muhl-Richarson)
The eye. The structure of the retina. Accommodation and convergence. Visual receptors-
properties of rods and cones. Receptive fields. Contrast detection and lateral inhibition. Light
and dark adaptation.

Snowden, Thompson & Troscianko, Chs. 1&2; Barlow & Mollon, Chs. 6, 11.

4 Visual Perception 3: Pattern coding, colour and orientation (Dr Alex Muhl-
Richarson)

Ambiguity in neural signals and the need for groups of neurones to code visual features
cooperatively; principles of univariance and adaptive independence; perception of colour;
perception of orientation.

Snowden, Thompson & Troscianko, Chs. 4&5; Coren, Ward & Enns, Chs. 4, 5 and 11.

5 Visual Perception 4: Spatial frequency, depth and motion (Dr J Poort)

Perceiving edges at different spatial scales; neural channels involved in spatial frequency
perception; cues to an object's depth; mechanisms for perceiving motion.

Snowden, Thompson & Troscianko, Chs. 4, 6, 7; Barlow & Mollon, Ch. 12.

6 Visual Perception 5: Constancy, cortex and conscious vision (Dr J Poort)

Pathways in the visual system. Perceptual constancy. Aspects of high-level vision and
underlying mechanisms. Limitations of conscious vision.

Goldstein, Chs. 3, 4; Coren, Ward & Enns, Ch. 11.

Audition

Dr McClure

Recommended Reading:

Audition:


MIT Press.

10 Audition 1: Introduction to sound (Dr McClure)

Where does sound come from? How does this information reach the ear? How do we
measure and characterize sound? How do physical vibrations get translated into nerve
impulses? Goldstein Chapter 11; Moore Chapter 1.
11 Audition 2 Perceiving sound (Dr McClure)
How does the basilar membrane in the cochlea respond to sound? How do the hair cells of the inner ear encode and relay sound information? How is information encoded by the cochlea used to determine pitch and loudness?
Goldstein Chapter 11; Plack, Chapter 7

12 Audition 3: Where did that sound come from? (Dr McClure)
How does encoded sound information progress from the cochlea to the cortex? How do we use binaural signals (from the two ears) to localize sounds? What is the role of monaural information?
Goldstein Chapter 12; Moore Chapter 7

Attention

Dr J Poort

Recommended Reading:
Snowden, Thompson & Troscianko, Ch. 9.

7 Selective Attention 1 (Dr J Poort)
Historical perspectives and conceptual issues. The need for selection. Inattentional blindness. Spatial orienting. The flanker paradigm and spotlight/zoom Lens metaphors.

8 Selective Attention 2 (Dr J Poort)
Visual Search and Feature-Integration Theory; Attention to auditory stimuli. Attention to objects. Late versus early selection. Single unit recordings from primate visual cortex.

9 Active perception (Dr J Poort)
How do we use vision to explore our environment? How does the eye movement system help with this? How does vision guide our actions? What are the ventral and dorsal streams in the brain?

Learning

Dr A Milton & Dr J Poort
Recommended Reading:


13 Learning 1: Perceptual Learning (Dr J Poort)

What are critical periods of perceptual plasticity? How does experience change the way we perceive? How plastic is perception in the adult brain?


14 Learning 2 (Dr A Milton)

Predictive learning: biological preparedness, neurobiological dissociations; Pavlovian conditioning: dopamine and reinforcement; the Rescorla Wagner rule.

15 Learning 3 (Dr A Milton)

Conditioned inhibition and blocking. Temporal contiguity; Surprise and prediction error; Preventative and superlearning.

16 Learning 4 (Dr A Milton)

Instrumental conditioning, habits and goal directed learning. The role of motivation and incentive learning.

17 Learning 5 (Dr A Milton)


18 Memory 1 (Dr J Simons)

and long-term memories. Criticisms of the multi-store model and Baddeley’s theory of working memory.

**19 Memory 2 (Dr J Simons)**

The evidence for different types of working memory. Verbal and spatial working memory systems: the phonological loop and visuospatial sketchpad. The episodic buffer and central executive.

**20 Memory 3 (Dr J Simons)**

Medial temporal lobe amnesia; Declarative memory; Non-declarative memory; Consolidation and retrograde amnesia.

**21 Memory 4 (Dr J Simons)**

Memory retrieval: semantic memory, episodic memory (remembering and knowing, recall and recognition, encoding specificity); forgetting.

**Higher Cognition**

**Dr T Bekinschtein**

**Recommended Reading:**


**22 Higher Cognition 1: Executive Functions (Dr T Bekinschtein)**

Parsing the central executive into cognitive functions such as control, organisation, planning, sequencing and monitoring. Disorders of executive function (e.g., following frontal lobe damage). The supervisory attentional system.

**23 Higher Cognition 2: Attention and Awareness 1 (Dr T Bekinschtein)**

Attention and awareness, commonalities and differences, neural underpinnings and psychological dissociations.

**24 Higher Cognition 3: Conscious Access 2 (Dr T Bekinschtein)**

Conscious access, binding consciousness techniques, implications of sub and supraliminal cognition, theories of integrated cognition.
Michaelmas Term - Practicals

1  Psychophysics (Dr. W Skylark)

This practical will introduce some key ideas about the relationship between physical magnitudes and internal sensations. We will explore how these relationships can be explored empirically and described mathematically, and examine some of the practical and conceptual challenges associated with this enterprise.

2  Visual Thresholds and Adaptation I (Prof J Mollon)

Using an optical system, we measure the thresholds for brief flashes on steady background fields of increasing luminance. In our first experiment, the test and background are of the same wavelength and we investigate how well Weber’s Law holds over a range of luminances. Also shown in this practical is a demonstration of the change of visual time constants with adaptation (the Pulfrich effect) (Note: The instruction sheet for this practical, and the next one, will be available the previous week. Please read over it in advance. Students from PBS or Philosophy or Linguistics are invited to go through it with their supervisors)

3  Visual Thresholds and Adaptation II (Prof J Mollon)

In our second experiment, we ask to what extent Weber's Law holds independently for the different classes of retinal cone. Important concepts for interpreting your data are: Trichromacy; the Principle of Univarience; and the Principle of Adaptive Independence. Also shown in this practical is the Mollon-Polden effect, which illustrates the difference in time constants between cone classes, as well as the Principle of Adaptive Independence. For the theoretical background to this practical, see Barlow and Mollon (1989) The Senses, pp 165-172. A more advanced treatment (which may recommend itself to NST students) is that by Marriott (1962) in H. Davson The Eye, vol 2, ch 17.

4  Attention (Dr. Mc Clure)

Through a computer-based experiment we will assess different aspects of attention furthering the concepts development in the Lectures and integrating with executive functions.

5  Prediction Error Learning (Dr Aude Belin-Rauscent)

This practical provides students with the opportunity to explore the predictions of a simple associative model of learning, based upon the concept of prediction error. Students will simulate simple experiments on a computer implementation of the model.

6  Neural Measurement/ principles of Data analysis (Dr. Tristan Bekinschtein )

This practical must be written up and submitted for assessment (INCLUDING students taking PBS 4)

This practical discusses human brain imaging and its contributions to the understanding of cognitive processes. Magnetic resonance imaging (MRI) and positron emission tomography (PET), MEG and EEG are considered in the inferential process of functional brain activity in humans. The basic principles of MRI, fMRI, PET and EEG/MEG will be described using examples from recent imaging studies, all of which will be relevant to your lectures and
course work. A hands-on discussion and interpretation will illustrate the difficulties of interpreting neural results to cognitive processes. The primary aim of this practical is to gain an appreciation of contemporary brain imaging techniques and to understand how they can be applied to investigate cognitive neuroscience.

7 Data Analysis 1: Soft stats at the Plot Spot (Dr Edwin Dalmaijer)

Introducing the idea of sampling, normal distributions, and detecting signal among noise. Focus is on concepts rather than statistical tests, with a complete omission of the latter for now. The concept of z-scores is introduced. Heavy reliance on plotting groups and playing around with distribution parameters and effect sizes to build intuition that later statistics will build on.

Also: Learning how to appropriately visualise data in the era of New Science. Bar graphs are not enough, and students should get acquainted with better methods, but also with the reasoning behind why certain plots are better than others.

8 Behavioural Measurement 1 (Dr J Simons)

This practical must be written up and submitted for assessment (INCLUDING students taking PBS 4)

This practical illustrates some of the classic methods for measuring mental processes, including measuring reaction times and errors in responses. It explores how reaction time and error data may be used to infer the nature of mental processes. In a formal, randomized experiment, using the classroom computer system, undergraduates judge the identity of a form that is rotated by varying amounts from its standard orientation.

9 Assessing Memory (Dr Aude Belin-Rauscent)

This practical class demonstrates important principles in assessing human learning and memory. As some students will be acting as participants, details of the procedures will not be announced before the practical sessions.

10 Data Analysis 1: T-Test Fest (Dr Edwin Dalmaijer)

Naturally following from Data Analysis 1 is how we quantify differences between two distributions. One way of formally doing this is with a one-sample t-test (is signal difference from noise?) and an independent samples t-test (are samples in group 1 from a different underlying distribution than samples in group 2?). In addition, the session will cover a 2x2 ANOVA in disguise (sets of t-tests) to introduce the concept of interactions. One crucial concept for understanding t-tests is the "standard error". This session will introduce this (and by extension variance) in a more intuitive way, allowing the next session to build on concepts in a more formal way. Furthermore, this session will introduce the concept of statistical power.
Lent Term – Lectures

Language and the Brain

Dr M Bozic

Recommended Reading:


1 Language and the Brain 1: Introduction

Major themes and issues in language research. Methods used to study language processing. Language building blocks (phonemes, syllables, morphemes, words). Serial vs interactive models of language processing. Preliminaries about language in the brain.

2 Language and the Brain 2: Reading


3 Language and the Brain 3: Spoken word recognition

Properties of the spoken signal. Word segmentation: the problem of detecting when spoken words begin and end; strategies for speech segmentation. Lexical selection and the cohort model. Access to meaning; the role of context in spoken word recognition. Speech processing in the brain.

4 Language and the Brain 4: Sentence processing


5 Language and the Brain 5: Second language acquisition and bilingualism

6 Language and the Brain 6: Language and Communication

Language in the wider context of multimodal communication. The role of gesturing. Use of pauses, intonation, and prosody for communicative purposes. Conversation convergence. Speech-vision integration. The neural correlates of communication; the hypothesis about neural coupling.

Reasoning and Decision Making

Dr W Skylark

Recommended Reading:


7 Reasoning and Decision Making 1: Judging Probabilities

We often try to estimate how likely it is that some outcome will occur, or how frequently it has occurred in the past. Such probability judgments are fundamental to decision-making, but they often deviate from the dictates of formal probability theory. This lecture explores some of the “errors” in our estimates of probability, and discusses what these results tell us about the underlying mental processes.

8 Reasoning and Decision Making 2: Reasoning

Reasoning is one of the most sophisticated and challenging cognitive operations, and has been studied since antiquity. This lecture examines the psychology of syllogistic and propositional reasoning, and shows how careful experimentation can illuminate complex thought processes.

9 Reasoning and Decision Making 3: Decision Making

Would you rather have a 90% chance of £20 or a 50% chance of £50? Why? This lecture shows how people’s social and economic decision-making deviates from “rational” behaviour, and critically evaluates one of the most influential accounts of these data.

10 Reasoning and Decision Making 4: Emotions and Decision-Making

This lecture will examine the role of emotions on decision-making. We will examine the interplay between emotion, physiology, and cognition, and will critically evaluate some ideas about how this interplay shapes our decisions.

Developmental Psychology

Prof U Goswami
Recommended Reading:


11 Developmental Psychology 1

Theories of Development. I describe different theoretical approaches to understanding child development and assess them in the light of recent advances in understanding the brain.

12 Developmental Psychology 2

Perception and Cognition in Infancy. I describe sensory development and attention; cross-modal perception; enumeration of objects; early memory; and whether infants know that the external world continues to exist when not being perceived, as assessed by reactions to anomalous events and by searching.

13 Developmental Psychology 3

Social Cognitive Development in Infancy. I discuss infant imitation; imitation and the ‘like me’ hypothesis; reading emotional states; joint visual attention; perceiving the goal-directedness of others’ actions; the development of attachment of child to mother and assessing the quality of attachment; and individual differences in relation to quality of attachment.

14 Developmental Psychology 4

Language Acquisition. I give a brief overview of language acquisition, a core cognitive system that makes us uniquely human – or does it? Traditionally, language acquisition was studied separately from cognitive development. It seemed such a remarkable feat for the infant brain that a special human capacity must be at work (a “language acquisition device”). However, more recent research shows that this distinction is probably false.

15 Developmental Psychology 5

Social and Cognitive Development in Childhood 1. Research on learning, memory and social behaviour in young children will be sampled. It will be demonstrated that the processes of learning and memory in children, and of social processes such as ingroup versus outgroup behaviour, are very similar to these processes in adults. What differs is the knowledge base.

16 Developmental Psychology 6

Social and Cognitive Development in Childhood 2. This lecture will consider the development of inductive and deductive reasoning, and the development of the kinds of logical reasoning studied by Piaget. It will also touch briefly on moral development.
Personality

Dr D Stillwell

Individual differences in personality are perhaps one of the most fascinating yet frustrating topics studied in psychology. Fascinating because of its richness and complexity, frustrating because there’s little consensus about what personality is exactly. These lectures review some of the dominant theoretical perspectives about personality and the ways in which it is typically assessed.

Recommended Reading:


17 A brief history of personality trait theory

18 Assessing personality and evaluating its impact on life outcomes

Atypical Psychology

Prof S Baron-Cohen

Recommended Reading:


In most of the lectures, videos of real patients are shown to illustrate diagnosis.

19 Atypical Psychology 1: Autism Spectrum Conditions

This lecture describes the diagnosis of autism, sometimes considered to be the most severe of the childhood psychiatric conditions because it can leave the individual unable to socialize. Since humans are essentially a social primate species, such a deficit affects a central characteristic of typical human behaviour. The subgroup of Asperger Syndrome (AS) is also introduced. Autism and AS also involve areas of strength, not just areas of disability, and cognitive theories are examined for their power to explain both the strengths and deficits in autism spectrum conditions (ASC). The neurobiology of ASC, from genes to neural structure and function, is also reviewed.

20 Atypical Psychology 2: Schizophrenia

This lecture describes the key symptoms of this condition, including hallucinations and delusions, in order to clarify how it is identified. Schizophrenia is one of the psychoses, and contrasts with the neuroses (phobias, obsessive compulsive disorder, and depression) covered in later lectures. Major aetiological factors of schizophrenia, both genetic and environmental, are reviewed, in the context of earlier psychogenic theories. Research into schizophrenia forces us to consider the notion of rationality, of how we form accurate beliefs about the world, and what can lead an individual to become ‘out of touch with reality’.
21  Atypical Psychology 3: Phobias

This lecture covers the classification of anxiety disorders and then focuses on specific phobias. The contrast between this kind of atypical reaction, in which an individual has insight into the irrationality of their excessive behaviour (fearing an object or event that poses no danger) and schizophrenia, in which the individual has no insight into their own irrationality, is considered. Learning theories and cognitive theories are considered, along with the data relevant to each, along with their implications for treatment.

22  Atypical Psychology 4: Obsessive Compulsive Disorder

This is another anxiety disorder. Whereas in phobias the individual simply avoids a class of stimuli because of anxiety these trigger, in OCD the individual experiences anxiety as a result of intrusive and unwanted thoughts or images, and feels compelled to carry out actions to rid themselves of the unwanted thoughts. OCD forces us to question where thoughts normally come from and why most people can dismiss unwanted thoughts whilst patients with OCD cannot. As with phobias, learning and cognitive theories are considered, together with their implications for treatment. The neurobiology of OCD is also reviewed.

23  Atypical Psychology 5: Depression

Anxiety disorders are one of the major affective conditions, and depression is the other, causing extreme low mood. It is of major importance not only because it affects 1 in 5 adult women and 1 in 10 adult men, but also because it carries with it the risk of suicide. This lecture reviews learning and cognitive theories, and the neurobiology of depression. Both psychological and pharmacological treatments are also outlined in the context of aetiological theories. The role of ‘life events’ (such as bereavement) and particularly disruptions to early attachment (including neglect and abuse) are covered at Part 2.

24  Atypical Psychology 6: Anorexia Nervosa

This is the major eating disorder, and is almost exclusively a female condition. Defined largely in terms of body weight, it raises social questions about whether we should medicalize a person’s body shape and weight, or whether our body weight is a matter of personal choice and individual civil liberty. The risk of death from anorexia leads to the conclusion that this condition is appropriately viewed as a medical condition. Anorexia is contrasted with the other major eating disorder, Bulimia Nervosa. Social, psychological and biological factors associated with anorexia are reviewed. The fact that this is a condition of the industrialized world, and is more prevalent in certain social groups, might lead one to suspect that this has a strongly environmental and social determinant, yet neurobiology is proving to be just as important.
Lent Term - Practicals

1  **Behavioural Measurement 2: language Processing (Dr M Bozic)**

The practical is aimed at demonstrating priming, a classical method for investigating the mechanisms of language processing. It focuses on the effects of prior exposure on the recognition of written words. Students will take part a short experiment, followed by a basic data analysis and a discussion of experimental design in psycholinguistics, including control of word variables, participants’ strategic approaches to the task, and sources of response variability. The results will be discussed in the context of relevant theories, aiming to demonstrate how priming data can inform language processing models, in both behavioural and neural domain.

2  **Data Analysis 3: Variance at the Correlation Station (Dr Edwin Dalmaijer)**

Session on sources of variance, e.g. within and between subjects, following the introduction of within-subject t-tests, repeated-measures ANOVA, and the basic principles of correlation using hands-on data. The idea is to explore Pearson correlation at first, but also to touch upon non-parametric alternatives like Spearman's rho and Kendall's tau. This session will be built upon the previous two sessions, and thus will rely heavily on visual examples and illustrations.

3  **Behavioural Measurements 3: Arousal modulates performance (Dr T Bekinschttein)**

How does wakefulness and arousal modulate cognition? By changing emotional and physical states this practical aims to understand the relationship between the physiological state and the cognitive capacities in humans. With short experiments and analyses online we will build a series of models incorporating neuroanatomical and functional information.

4  **Data Analysis 4: Regression Session (Dr. Dalmaijer)**

Basic principles of curve fitting. We will use the dataset of Dalmaijer et al. (2015) and (2016) to explore the fairness of the Winter Olympics. Using this real dataset we will explore what it means to fit a linear curve. What we will cover includes computing the error between prediction and reality (sum of squares), and understanding that minimisation of this sum means getting closer to the data. In addition, we will have real-life outliers (i.e. due to observable events like falls and near-falls in races), which do not necessarily show up as very clear outliers in the data, but still need to be addressed.

5  **Data Analysis 5: Model Doddle (Dr Edwin Dalmaijer and Frank Hezemans)**

This session will focus on how theories can be compared to each other. Modelling entails writing theories down as equations, and then compare how well they fit the data. The session requires students to take a step back and think about how qualitative theory can be quantified. We will cover curve fitting (using the same minimisation tools as for regression), and formal model comparison using adjusted R square and Bayesian Information Criterion (BIC).

6  **Data Analysis 6: Evidence and Bayes (Frank Hezemans)**
Introduction to thinking in Bayesian ways. Specific focus will be on what constitutes "evidence", and looking beyond the yes/no thinking in frequentist null-hypothesis significance testing. Bayes Factors will be introduced with examples that relate to all the tests introduced in previous settings, allowing students to directly compare frequentist and Bayesian approaches in JASP. This will also increase technical competence.

7 Data Analysis 7: 2nd Bayes: Priors and Learning (Dr Edwin Dalmaijer and Frank Hezemans)

Furthering the Bayesian framework by focussing on priors and their role in testing theory. Ties in nicely with lectures on learning theory, where temperature and learning rate parameters govern how individuals weigh evidence. Similar concepts apply in science, specifically with regards to the role of priors in Bayesian statistical testing.

8 Cognitive Developmental Tasks (Dr S Flanagan)

This practical must be written up and submitted for assessment (EXCLUDING students taking PBS 4)

This practical will study videos of children in key paradigms used to measure cognitive development. The focus will be on measures of security of attachment.

9 Psychometric assessment: Personality (Friedrich Götz)

This practical must be written up and submitted for assessment (INCLUDING students taking PBS 4)

In this practical, students will gain experience collecting and analysing survey data using Internet-based methods. During the practical session, students will learn basic techniques for scoring surveys and computing variables using Excel and SPSS. For the practical report, students must formulate a set of research questions, conduct an independent analysis of the data to address the questions, and provide an interpretation of the results.

10 Measurement schmeasurement: Issues in contemporary Psychology (Dr. Bekinschtein and Frank Hezemans)

This will be a session with a little lower intensity than the previous sessions. It will focus on what the current issues are with null-hypothesis significance testing, under-sampling, failures to correct for multiple comparisons, double-dipping, etc. Basically everything that is wrong with current-day Psychology, and the different initiatives that are currently happening to solve the "crisis". The session will cover pre-registration, the importance of replication, Many Labs and similar efforts, focus on effect size rather than p-value (especially important in the context of Big Data), and problems in scientific reward structures. Important tools to mention here are open science tools like data and code repositories.

11 Qualitative Research 1: Interview overview (Dr S Imrie)

Where previous sessions have focussed on quantitative methods, Psychology and related fields have a rich history of qualitative research too. This session introduces qualitative research, and allows students to design and carry out semi-structured interviews on each other.
12  Qualitative Research 2: Getting creative with qualitative (Dr S Imrie)

This practical must be written up and submitted for assessment (INCLUDING students taking PBS 4)

This session builds on the previous one by allowing students to use the interview data collected in the previous session and try out several different types of qualitative analysis, including content analysis and thematic analysis.
Recommended Reading:

People think and act with respect to other people. We will survey a range of classic topics in social psychology, including how people process social information, how they relate to others either as individuals or in groups. In particular, we will consider biases in social contexts, including stereotyping, obedience and social influence, prosocial behaviour on the one hand and aggression on the other. Finally, we will discuss the extent to which findings obtained in Western samples can be generalised to populations from other cultures. Overall the goal is to explore how the nature of human cognition and behaviour is constrained by social contexts.


1 Social Psychology 1 (Dr S Schnall)
Social Cognition

2 Social Psychology 2 (Dr S Schnall)
Stereotyping and Prejudice

3 Social Psychology 3 (Dr S Schnall)
Group Processes

4 Social Psychology 4 (Dr S Schnall)
Prosocial Behaviour

5 Social Psychology 5 (Dr S Schnall)
Aggression

6 Social Psychology 6 (Dr S Schnall)
Culture
Easter Term - Practicals

1  Statistics Revision Class (Dr Bekinschtein, Dr Dalmaijer, F Hezemans)

A practice exam will be broken down question-by-question, and students are allowed to ask any additional questions they might have on any of the topics covered in the above sessions.

2  Social Psychology (Dr S Schnall and Dr. Tess Langfield)

This practical must be written up and submitted for assessment (EXCLUDING students taking PBS 4)

We shall be using some classic paradigms in Social Psychology to assess the extent to which psychological processing of the individual can be affected by group processes.

3  Ethical Issues in Experimental Psychology (Dr Henry Shevlin)

In this practical class we will examine fundamental ethic issues relevant for conducting experiments in psychology. We will discuss the right of experiment participants and the ethical code that experimenters are required to follow. Several examples will be analysed in class. Students will also learn about the ethical requirements they are expected to follow when they carry out experiments.
For PBS 4 students only
Lecture and practical class list

PBS Part IB PBS 4 Paper:

Psychology and Cognitive Neuroscience

As specified in the course guide above, students taking PBS 4 are expected to attend a subset of the lectures and practical classes in the NST IB course. The following provides a clear list of each of these lectures and practical classes. A copy of the timetable can be found on PBS Part IB moodle site or on the online timetable. Please note that four practical classes must be written up and submitted for assessment. These are in bold type in the list below.

1) Lecture list

**Michaelmas Term**
- Dr Plaisted-Grant  Introduction to the study of Experimental Psychology
- Dr Muhl-Richarson  Visual Perception 1
- Dr Muhl-Richarson  Visual perception 2
- Dr Muhl-Richarson  Visual perception 3
- Dr Poort  Visual perception 4
- Dr Poort  Visual perception 5
- Dr Dr McClure  Audition 2
- Dr Dr McClure  Audition 3
- Dr Dr McClure  Audition 4
- Dr Poort  Attention 1
- Dr Poort  Attention 2
- Dr Poort  Active Perception
- Dr Poort  Perceptual Learning
- Dr Milton  Learning 1
- Dr Milton  Learning 2
- Dr Milton  Learning 3
- Dr Milton  Learning 4
- Dr Simons  Memory 1
- Dr Simons  Memory 2
- Dr Simons  Memory 3
- Dr Simons  Memory 4
- Dr Bekinschtein  Higher Cognition 1
- Dr Bekinschtein  Higher Cognition 2
- Dr Bekinschtein  Higher Cognition 3

**Lent Term**
- Dr Bozic  Language and the Brain 1
- Dr Bozic  Language and the Brain 2
- Dr Bozic  Language and the Brain 3
- Dr Bozic  Language and the Brain 4
- Dr Bozic  Language and the Brain 5
- Dr Bozic  Language and the Brain 6
- Dr Skylark  Reasoning and Decision Making 1
- Dr Skylark  Reasoning and Decision Making 2
| Dr Skylark | Reasoning and Decision Making 3 |
| Dr Skylark | Reasoning and Decision Making 4 |

### 2) Practical classes

#### Michaelmas Term
- **Dr Skylark** | Psychophysics
- **Prof Mollon** | Visual Thresholds and Adaptation 1
- **Prof Mollon** | Visual Thresholds and Adaptation 2
- **Dr McClure** | Attention
- **Dr Belin-Rauscent** | Prediction error learning
- **Dr Bekinschtein** | **Neural Measurement (write up and submit)**
- **Dr Dalmaijer** | Data analysis 1
- **Dr Simons** | **Behavioural Measurement 1 (write up and submit)**
- **Dr Belin-Rauscent** | Assessing memory
- **Dr Dalmaijer** | Data analysis 2

#### Lent Term
- **Dr Bozic** | Behavioural Measurement 2
- **Dr Dalmaijer** | Data analysis 3
- **Dr Bekinschtein** | Behavioural Measurements 3: Arousal modulates performance
- **Dr Dalmaijer** | Data analysis 4
- **Dr Dalmaijer/Hezemans** | Data analysis 5
- **Dr Hezemans** | Data analysis 6
- **Dr Dalmaijer** | Data analysis 7
- **Dr Götz** | **Psychometric Assessment: Personality (write up and submit)**
- **Dr Imrie** | **Qualitative Analysis (write up and submit)**
- **Dr Bekinschtein/Hezemans** | Data analysis/problems in research

#### Easter term
- **Dr Bekinschtein et al** | Statistics revision class
- **Dr Henry Shevlin** | Ethical Issues in Experimental Psychology