

PSY 1201 PSYCHOPHARMACOLOGY—YOUR BRAIN ON DRUGS

Tuesdays/Thursdays • 12:00 – 1:15

All Lectures are in person—WJH Basement Lecture Hall

Mandatory One 1-hour Section/week

Instructor:

Scott E. Lukas, Ph.D.

Director, McLean Imaging Center

Director, Behavioral Psychopharmacology Research Laboratory

Research Director, McLean Sleep Diagnostic and Treatment Center

McLean Hospital

Professor of Psychiatry (Pharmacology)

Harvard Medical School

e-mail: Lukas@mcLean.harvard.edu**Office Address:**

BPRL/McLean Imaging Center, Room 111

McLean Hospital

115 Mill Street

Belmont, MA 02478

617 855-2767 (office)

Teaching Fellows:Diana Keith, Ph.D. dkeith@mclean.harvard.eduCole Korponay, Ph.D. ckorponay@mclean.harvard.eduAlaina Baker, Ph.D. abaker@bostonchildstudycenter.com**Textbooks****RECOMMENDED FOR ALL STUDENTS***Julien's Primer of Drug Action*, 15th edition

Authors: Robert M. Julien with Claire D. Advokat and Joseph E. Comaty,

ISBN-13: 978-1-319-24486-6

ISBN-10: 1-319-24489-6

Publisher: Worth Publishers, 2023

OPTIONAL FOR NEUROSCIENTIST CONCENTRATESBasic Neurochemistry: Principles of Molecular, Cellular, and Medical Neurobiology 8th Edition

Editors: Scott Brady (Editor), George Siegel, R. Wayne Albers, Donald Price

ISBN: 978 0123749475

OPTIONAL FOR CLINICAL-RELATED CONCENTRATES

Clinical Psychopharmacology: Principles and Practice

Author: Nassir S. Ghaemi

ISBN: 978 0199995486

or

Handbook of Clinical Psychopharmacology for Therapists, 8th edition, 2017

Authors: John D. Preston. John O'Neal and Mary Talaga

ISBN: 978 1626259256

PSY 1201-OVERVIEW

Primary Goals: To gain a working understanding and practical application of how drugs affect mood, sensation, consciousness, and other psychological and behavioral functions in both healthy and disease states. During this journey, the student will be exposed to basic issues in neuroscience and pharmacology to understand how drugs are used to treat psychiatric disorders and why individuals use drugs to alter their mood state for recreational purposes. Lectures will be punctuated with scientific data from the literature as well as based on my personal experience. Mandatory Section meetings are used to complement the course and offer additional skills in reading and interpreting scientific literature as well as preparing for the end of the semester class debates. Prerequisite: introductory psychology will be a major help as will any neuroscience experience.

Prerequisites: While this is fundamentally a basic course in psychopharmacology, a rudimentary background in psychology and/or biology is recommended to help with many of the terms and basic concepts that we will discuss (see the FAQ for more). The Psychology Department requires completion of PSY 1 (or equivalent) and at least one foundational course from PSY 14, PSY 18, MCB/NEURO 80, MCB 81 or Psyc S-1240 before enrolling.

Lecture 1 Sept 3 Tue
Controversies in Psychopharmacology

Overview of the scope of psychopharmacology, drug classes, subject populations, definition of terms, course goals, role of research in the field. The benefits of a drug are weighed against its side effect and potential toxic profile. Some of the more common controversies in the field will be discussed.

Julien's—Chapter 4

Lecture 2 Sept 5 Thur
Neuroanatomy/Neurophysiology

The basic structure and function of the neuron, receptors and how chemical messengers communicate within the central nervous system. The concept of how brain cells work together to create “behavior” will be discussed as will the impact of this on cognitive and motor performance and memory. Students will learn how brain cells are affected by psychoactive drugs of different pharmacologic classes. Both normal and abnormal activity are defined and set the stage for studying drugs that alter brain activity.

Julien's—Chapter 2 Ghaemi—Chapter 2 Preston—Chapter 3

Lecture 3 Sept 10 Tue
Basic Pharmacology, Pharmacokinetics & Bioavailability I

Basic drug/receptor interactions, routes of administration, dose response relationships, absorption, distribution, metabolism, and elimination of a variety of drugs from different pharmacologic classes. The concept of compartments and how drugs move from one to another will be studied. The importance of liver function enzymes and how acute and chronic dosing regimens differ.

Julien's—Chapter 1 Preston—Chapter 4; Appendix A

Lecture 4 Sept 12 Thur**Principles of Tolerance and Physical Dependence/Withdrawal**

The concepts of neuroadaptation and the maintenance of homeostasis as it applies to both healthy and unhealthy states will be discussed. Abnormal states such as sensitization and neurotransmitter depletion will be presented as they apply to the development of psychiatric disorders and the desire for mood altering substances. The concept of sex-related differences in these measures will also be discussed.

Lecture 5 Sept 17 Tue**Cannabis/Marihuana I**

Students will learn about marihuana abuse and why marihuana is often called a "Gateway Drug". Understand why many people believed that marihuana causes no harm, but how that belief has changed in recent years. Learn about the recent discovery of a marihuana receptor in the brain and how this explains the mechanism of marihuana's effects on the brain and behavior. The effects on cognitive performance, motor performance, and memory as well as medical marihuana and legalization will be discussed.

Julien's—Chapter 9

Lecture 6 Sept 19 Thur**Cannabis/Marihuana II**

A continuation of the material on cannabis including medical marihuana and treatment options.

Lecture 7 Sept 24 Tue**Alcohol I**

The natural history of alcoholism, its identification and consequences will be reviewed. How pre-existing psychological states can alter the development of alcoholism will be studied. Basic pharmacology, absorption, mechanism of action, metabolism, kinetics of ethanol in the body. The medical and social consequences of alcoholism and the arguments for whether alcoholism is inherited will be reviewed. The impact of drunk driving laws will be discussed as will better methods of measuring performance.

Julien's—Chapter 5

Lecture 8 Sept 26 Thur**Alcohol II**

Continuation of alcohol including medications used to treat alcohol use disorders.

Lecture 9 Oct 1 Tue**Tobacco and Nicotine**

The basic pharmacology of nicotine and how it acts on the brain. Medical complications including second-hand smoke and the effects on the fetus. The various tobacco preparations (e.g., smoking, and snuff) will be discussed with reference to their abuse liability. A detailed look at smoking behavior, why so many people abuse tobacco and why it is so difficult to treat. Cue-induced craving and current treatment strategies including behavioral modification, nicotine gum and patches will be examined.

Julien's—Chapter 6

Lecture 10 Oct 3 Thur**Caffeine and OTC Stimulants**

The pharmacology, mechanism of action and impact of caffeine use and abuse. The culture of

using caffeine will be presented in context of common beliefs (both accurate and inaccurate). The distinctions between over the counter (OTC) and prescription medications will be discussed. The student will also learn how the patterns of licit drug use differ from illicit drug use.

Julien's—Chapter 6 Preston—Chapter 20

Lecture 11 Oct 8 Tue
Cocaine and Amphetamines

The basic pharmacology and mechanism of action of cocaine. Patterns of use and the route of administration to understand why CRACK cocaine became so popular. The mechanism of action will be explained in the context of how new medications (including vaccines) are being developed to treat cocaine abuse. The effects will be contrasted with those of amphetamine including the smoked form of methamphetamine (ICE).

Julien's—Chapter 7

Lecture 12 Oct 10 Thur
Depressants, Anxiolytics, and Inhalants

Drugs that dampen the activity of the brain with primary focus on inhalants, gaseous anesthetics. The practice of sniffing solvents like gasoline and glue will be studied and the mechanism of their toxic effects on brain cells will be explained. The social context of inhalant abuse will be presented. Students will learn how the barbiturates or sleeping pills are used and how they affect brain cells and behavior. The proper use of diazepam-like drugs will be reviewed and the development of abuse and dependence on them will be explained. The differences between reducing anxiety and producing sedation will be discussed using real world examples.

Julien's—Chapters 5 & 13 Ghaemi—Chapter 12

MIDTERM EXAMINATION—Closed Book Oct 15 Tue

• The exam will cover all material up to and including Lecture 12 •

Lecture 13 Oct 17 Thur
Physical & Mental Performance Enhancing Drugs

How concerns about and perceptions of physical appearance have influenced the desire to use a variety of drugs will be contrasted with those who use drugs to enhance athletic performance. The controversy over whether these drugs improve performance will be debated. Similar approaches will be taken as we explore the role that mild psychostimulants play in the belief that they can enhance academic performance.

Julien's—Chapter 10

Lecture 14 Oct 22 Tue
Opiates and Prescription Pain Killers

Discussions on how opiates affect the brain and behavior and how heroin mimics some naturally occurring chemicals in the brain will lead to the understanding of the basic pharmacology and receptor profile of opiates and the naturally occurring endorphins. The profile of opiate withdrawal and how it affects relapse to use heroin will be discussed. The use of prescription opiate analgesics will be studied from both pharmacological and social context. Current practices for treating pain will be discussed and new techniques such as patient controlled analgesia (PCA) will be presented. Current methods of treating opiate abuse will be reviewed including psychotherapy and medications such as methadone, buprenorphine and LAAM.

NOTE: Week of October 21 to October 25

The answers and commentary will be published over the weekend and Dr. Lukas will review the Midterm Examination during Section meetings (likely via zoom)

Lecture 15 Oct 24 Thur**Club Drugs, Hallucinogens and Current “Fads”**

Students will learn about “club” drug production, use, and why such drugs are so popular. The importance of anecdotal reports, “lore” and hearsay in the development of a fad is discussed. The relationship between multiple drug use with the environment of “raves” will be demonstrated. Specific drugs to be discussed include bath salts, ecstasy (MDMA), ketamine, GHB, Rohypnol and LSD. Phencyclidine (PCP) and ketamine abuse will be studied and how psychosis can develop with continued use of these drugs. Learn about how hallucinations are produced and how these drug-induced experiences differ from the hallucinations of someone with schizophrenia.

Julien’s—Chapter 8

Lecture 16 Oct 29 Tue**Diagnosing Psychiatric Disorders—Guest Lecturer (Psychiatric nurse on an inpatient unit)**

The fundamental principles of how psychiatric and substance use disorders are managed both behaviorally and via psychopharmacological management on an inpatient unit will be presented by a registered psychiatric nurse. Special attention will be paid to co-morbidity and thus the need for dual diagnosis and how one disorder may mask or express another. Actual case reports will be used to highlight the challenges that are experienced in the modern care of psychiatric patient populations.

Ghaemi —Chapter 38 Preston—Chapter 6

Lecture 17 Oct 31 Thur**Hallucinogen Treatments for Psychiatric Disorders**

The evolution of psychedelic drugs and their effects on mood and subjective states are discussed in the context of their recent role as adjunct therapies. The classical psychedelics like LSD will be contrasted with how MDMA, psilocybin and ketamine are currently used in clinical settings.

Lecture 18 Nov 5 Tue**Child & Adolescent Psychopharmacology—Part 1**

The diagnosis of attention deficit and hyperactivity disorder (ADHD), autism and related developmental disorders and their treatment with conventional and experimental medications. Controversies associated with the over diagnosis of ADHD will be discussed as will the risks of developing substance abuse disorder after being treated with stimulants.

Julien’s—Chapter 16 Ghaemi —Chapter 28 Preston—Chapter 23

Lecture 19 Nov 7 Thur**Child & Adolescent Psychopharmacology—Part 2**

A continuation of the issues related to adolescent psychopharmacology

Lecture 20 Nov 12 Tue**Antipsychotics**

The development of psychotic behavior and its treatment including both typical and atypical antipsychotic medications. Special attention will be paid to weight gain associated with some of the newer medications and how this impacts their selection as a treatment.

Julien's—Chapter 11 Ghaemi—Chapters 10 & 22 Preston—Chapters 11 & 19

Lecture 21 Nov 14 Thur

Mood Stabilizers/Antidepressants/Adult ADHD

The unique aspect of bipolar disorder is presented and the need for specialized medications to treat both the depression and the mania that ensues. The issue of rapid versus slow cycling between mood states is presented. The newer neuromodulating anticonvulsants and their role in treating bipolar disorder will be explored. In addition, the development and natural progression of clinical depression is presented. Early onset versus late onset depression and the implications will be presented. Drugs used to treat clinical depression including the newer SSRI agents. Short-term and long-term management will be discussed.

Julien's—Chapters 12 & 14 Ghaemi—Chapters 11 & 26 Preston—Chapters 7, 8, 16 & 17

Lecture 22 Nov 19 Tue

The role of Sleep and Sleep Disorders in Psychiatry

Sleep, or the lack of, plays an important role in mental and physical health. Sleep disorders can lead to the use of drugs and chronic use of drugs can impact sleep. Sleep is also disrupted by a variety of psychiatric disorders. The neurobiology of sleep, how it is measured and the pharmacology of managing sleep will be presented.

Lectures 23 Nov 21 Thur

Class Debates

During Section, students will have been assigned to a team with a controversial topic in psychiatry or drug abuse and will debate another team that has been assigned the other side of the controversy. Preparation for the debates will take place during Section meetings. The debates will be moderated by Dr. Lukas. Students *must* attend both sessions of debates as you will be required to provide written critiques of the debates presented by your peers.

Lectures 24 Nov 26 Tue

Class Debates

Continuation of class debates

Nov 28 Thur

No Class—Thanksgiving Recess

NO Section meetings the week of November 25 - 29

Lecture 25 Dec 3 Tue

Course Review

A review of the entire course will highlight the key elements of the material that was covered in class. Students are encouraged to ask questions about the material presented in class and Section.

Dec 5 - 10 Fall Reading Period

Dec 11 - 20 Final Examination Period

Final Exam TBD

• COURSE ADMINISTRATION •

Class materials-- I use slides and videos to accent my lectures. There is a [highly] recommended textbook that was written by Dr. Robert Julien and colleagues and students should plan to read the chapters before class. This book not only provides an excellent discussion of how drugs work in general, but he also has chapters on specific drug classes and offers more details on the molecular bases of how drugs work.

Much of the material presented in class is derived from my personal experience as a researcher and so is designed to complement the textbook and to add an additional dimension to the topics. The optional books on neuropharmacology and clinical practice are focused on two different domains that many students have asked for in the past to expand their exposure to additional topics.

Sections—Sections are mandatory, and they are not for reviewing lecture material presented that week. You are expected to attend all sections as specific assignments will be given and opportunities to develop arguments for the class debates will be offered.

The weekly sections are conducted by the TFs and grading is based on attendance, participation in discussion as well as your preparation for the class debates. If you have a conflict, it is possible to switch a section and attend a different one during a specific week. This is for one-off situations (medical, interviews, etc.) and you must let your TF know if you are attending a section to which you have not been assigned. However, because the debate preparation sections are focused on group interactions, you cannot switch those sections.

Class Debates—You will NOT be graded on your public speaking ability. You are expected to participate in the preparation and delivery of the debate materials with your team. You will be asked to fill out a brief survey on the debates that you witness and if you do this for both debate days you will receive credit for one quiz.

Class Debate Paper—In addition, each student will prepare a brief report of his/her debate topic, which will be graded on an individual basis. The paper must be no longer than 3 pages; one extra page is allowed for the reference list. Additional details of the paper will be provided as you prepare for your debates. The introduction of the topic is expected to be similar among each student and his/her team members. However, the interpretation of the topic and an integration of what your opposing team presented needs to be your own work and not a group effort. Your paper is due by 5:00 pm, EST on December 3rd. One full letter grade is reduced (so the maximum grade attainable is a “B”) starting at 5:01 December 3rd and is reduced by ½ letter grade for every 24 hours the paper is late.

Quizzes—There will be weekly, timed, online, closed book quizzes. Quizzes will be accessed via CANVAS and the start and end times will be posted; do not wait until the last minute to log on and take the quiz—if you start the quiz 2 minutes before the close time, the system will cut you off where you were and you will receive a grade based only on the answers provided. During some weeks there may be 2 quizzes, but the covered material will always be made clear. The quizzes will always cover material that was presented in the previous 1-2 lectures. There will be 13 – 15 quizzes offered during the semester, but only 10 of your best scores will count towards your grade. Because you can drop some quizzes, **there is no opportunity to make up a missed quiz**. There will be an opportunity at the end of the course to make up one quiz that you may

have missed during the semester.

Mid-Term Exam— Mid-term Exam is an online, timed closed book exam and focuses on applying the information learned in the first “half” of the course. Questions often include small vignettes that you read, and are answered via T/F, multiple choice, and short answer format.

Final Exam— Like the Midterm, the Final Exam is a closed book exam and will focus on integrating what you have learned during the entire semester into real life situations. But the Final Exam must be taken in person as per university policy. Questions are often vignettes that will require that you use much of what you have learned throughout the course to answer them. Some of the questions involve reviewing data or figures depicting situations that you might encounter. As with the Midterm, the format includes T/F, multiple choice, short answers and in addition will have a few essay questions.

Evaluations of Performance/Grading—Your final grade will be determined based on performance in several areas.

The distribution of grades will be determined as follows:

10%	Section attendance, participation, and discussion (including the debates)
25%	Quizzes
30%	Mid-term exam
30%	Final Exam
5%	Debate Paper

A 100-point system is used, and letter grades are based on the following: **A** (90-100%), **B** (80-89%), **C** (70-79%), **D** (60-69%) and **F** or fail (<60%). A + and – grade is applied to the upper and lower extremes of each letter grade. For example, final grade points of 80% and 81% would receive a B- final grade and final grade points of 88% and 89% would receive a B+ final grade. Final grade points of 82% – 87% will receive a final grade of B.

Other Information

Academic Dishonesty. While many instances of plagiarism are unintentional and mostly due to ignorance of the guidelines and definitions of plagiarism, some are not and so it is important to be mindful of these elements when writing your final paper. In addition, the University has a very strict policy on ethical code of conduct when taking quizzes or exams. The following is a direct quote from the Harvard College Handbook for Students:

It is expected that all homework assignments, projects, lab reports, papers, theses, and examinations and any other work submitted for academic credit will be the student's own. Students should always take great care to distinguish their own ideas and knowledge from information derived from sources. The term “sources” includes not only primary and secondary material published in print or online, but also information and opinions gained directly from other people. Quotations must be placed properly within quotation marks and must be cited fully. In addition, all paraphrased material must be acknowledged completely. Whenever ideas or facts are derived from a student's reading and research or from a student's own writings, the sources must be indicated.

The Academic Dishonesty policy is printed in the Harvard College Handbook for Students.

Office hours—My office is in Room 111 of the McLean Imaging Center at McLean Hospital, located at 115 Mill Street in Belmont MA. I can easily arrange a Zoom appointment, but I also have an office in 837 WJH for in person meetings that can be arranged by appointment.

When: Starting the first week of classes

Times: Whenever we can find a mutually free time

Contacting me—E-mail is the most efficient method of communicating with me. Lukas@mcLean.harvard.edu. I usually return morning e-mails between 1:00 and 2:00 and afternoon e-mails after 5:00 or the next morning. I will respond to your e-mail messages as quickly as possible. I also highly recommend that you request a return receipt with your e-mail so that you know when I read it.

Also, please insert the text **PSY1201** as the first entry in the subject field of every e-mail—this helps me locate your messages as I use that as a key word to search my inbox.

See the FAQ sheet for more detailed information about the course as well as petitioning for enrollment.