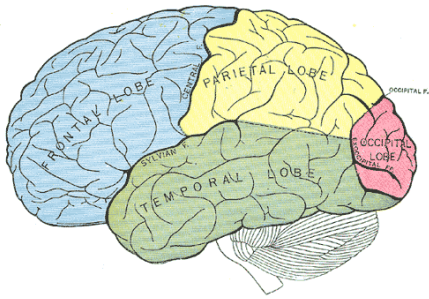


PSU Psychology 410: Psychopharmacology



Bill Griesar, Ph.D., **Instructor**, griesar@pdx.edu
Sean Reilly, **TA**, reilly3@pdx.edu
James DeLaney, **Graduate TA**, delaneyj@pdx.edu

D2L course login: <https://d2l.pdx.edu/>
WINTER TERM January 5 – March 20, 2015
MWF, 9:00 – 10:05am; Room TBA

GOAL OF THE COURSE: For generations, people across the globe have used mind-altering chemicals, many derived from plants, for medicine, culturally significant ceremonies, and to influence cognition and mood. *Neuropsychopharmacology* is the study of how drugs affect the nervous system, and how drug effects underlie resulting alterations in both physiology and behavior. The goal of this class is to introduce you to the structure and function of the nervous system, techniques used to study drug effects, and the specific molecular and behavioral influence of alcohol and other drugs (including opiates, cocaine, methamphetamine, nicotine, caffeine, marijuana, and LSD).

TEXTBOOK: *Psychopharmacology*, by Meyer & Quenzer, First edition (ISBN-13: 978-0878935345); or Second edition (978-1-60535-179-7). *Required for the course.*

GRADES: Grades are assigned on a 90+ (A), 80-89 (B), 70-79 (C) and 60-69 (D) point scale. Points are awarded on the basis of your understanding of the material as assessed by a midterm and a final exam. Additional points can be earned by answering questions on four in-class quizzes. Students taking this course with the pass-fail option must maintain a C- average (70%) to receive a passing grade.

QUIZZES (20 points; 5 points each): Four quizzes will test your ability to recall and think critically about material presented during the previous few lectures. ***It is extremely difficult, in a large class, to reschedule a quiz or exam for personal reasons. So instead, your lowest quiz grade will be dropped, and replaced with full credit (5 points!).***

MIDTERM EXAM (40 points): The midterm will cover all the material presented in the class up to and including the lectures on behavioral pharmacology techniques. Questions may also be drawn from the reading assignments in the *Psychopharmacology* textbook.

FINAL EXAM (45 points): *The final exam will be comprehensive, but will draw more from lectures and textbook reading assignments presented after the midterm exam. **The final is offered during finals week, and will not be re-scheduled for any reason.***

ACADEMIC HONESTY: Any evidence of cheating or plagiarism will lead to serious academic consequences, including possible failure of the course and/or dismissal from school. Plagiarism is also a violation of the PSU Student Conduct Code. For more information please visit: http://www.ess.pdx.edu/OSA/osa_b.htm.

STUDENTS WITH DISABILITIES: If you are a student with a documented disability and registered with the Disability Resource Center (DRC), please contact the instructor immediately to facilitate arranging academic accommodations. If you have a disability and have not registered with the DRC, please contact the DRC immediately. **Further instructions related to DRC accommodations are found on our course d2l website.**

NOTE: Incompletes are rarely given, and are based on criteria described in the university catalog. Incompletes are not appropriate when less than ¾'s of the course work has been scored. No incomplete will be assigned without a written formal agreement and timeline related to course completion.

EXCUSES: Life has ups and downs, and everyone struggles sometimes with family, work, and other personal concerns and commitments. However, unless there is a serious, unexpected, sudden, documented, and significant emergency, *please do not petition for special treatment regarding deadlines for quizzes or exams.* **I am required to treat all students fairly**, and that means that each of you must think ahead and plan for when assignments are due. Everyone is subject to the same course expectations ...

THE CLASSES: ATTENDANCE IS HIGHLY RECOMMENDED*Introduction to the nervous system:*

1. **Introduction to the course** (1/5): course information, syllabus; what is neuropsychopharmacology?, what is a drug?, the nervous system (brain, spinal cord, peripheral nerves, CNS vs. PNS, autonomic vs. somatic), drug action vs. drug effect, therapeutic vs. side effects, specific vs. non-specific effects, placebo effect.
 - READ TEXTBOOK: 2nd ed. Ch. 1 (3 – 24); Ch. 2 (41 – 52); 1st ed. Ch. 1 (3 – 20); Ch. 2 (33 – 40)
2. **Pharmacokinetics** (1/7): “central dogma” of biology, drug administration methods, drugs act on cells, what is a cell?, the cell membrane, neuroactive drugs act on cells in the nervous system; what are glial cells?, glial cell structure and function
 - READ 2nd ed. Ch. 2 (52 – 53); 1st ed. Ch. 2 (40 – 47)
3. **Electrical properties of neurons** (1/9): neurons - structure and function, dendrites, soma, axons; excitable membranes and the resting potential; forces that act on moving ions (currents): electric, concentration gradient, ATP-driven “pumps;” voltage gated Na⁺, K⁺ channels and the action potential; importance of myelin; *How do neurons carry information?*
 - READ 2nd ed. Ch. 2 (53 – 57), Ch. 3 (77 – 87); 1st ed. Ch. 3 (63 – 72)
4. **The action potential, and the synapse** (1/12): voltage gated Na⁺, K⁺ channels and the action potential (AP), drug effects on the AP, synapse types (electrical, chemical, various connections), synapse components, presynaptic release of neurotransmitter; *What is a language? What two forms of “language” does the nervous system use?*
 - READ 2nd ed. Ch. 3 (87 – 95); 1st ed. Ch. 3 (72 – 80)

QUIZ



5. **More on the chemical synapse** (1/14): autoreceptors, postsynaptic receptors (ionotropic versus metabotropic), postsynaptic responses (EPSP's, IPSP's, spatial and temporal summation), second messenger systems and biochemical cascades.
- READ 2nd ed. Ch. 2 (58 – 74); 1st ed. Ch. 2 (47 – 61)
6. **Basic brain organization** (1/16): cortex, lobes, sulci and gyri, white matter vs. gray matter, basal ganglia, cerebellum, brainstem, hypothalamus, thalamus, **brain networks**; *How are complex cognitive abilities organized in the brain?*

NO CLASS ON MONDAY, JANUARY 19th (MLK JR. DAY)

QUIZ

- READ 2nd ed. Ch. 2 (25 – 38), Review Ch. 3 (77 – 87); 1st ed. Ch. 2 (Read 21 – 26; Review 63 – 72), Ch. 3 (72 - 87)
7. **Neuropharmacology** (1/21): neurotransmitters, classical and non-classical; neurotransmitter synthesis, release and inactivation; agonists and antagonists, dose-response curves, ED-50 and TD-50, drug efficacy versus drug potency. *How does the chemical synapse offer primary sites for drug action?*
- READ 2nd ed. Ch. 5 (143 – 164); 1st ed. Ch. 5 (119 - 137)
8. **Catecholamines** (1/23): dopamine (DA) and norepinephrine (NE); synthesis, release, inactivation; DA pathways (nigrostriatal, mesolimbic, mesocortical), link to Parkinson's disease, DA receptors; NE pathway, receptors
- READ 2nd ed. Ch. 6 (167 – 183), Ch. 7 (185 – 199); 1st ed. Ch. 6 (140 - 160)
9. **Acetylcholine and Serotonin** (1/26): ACh synthesis, release, inactivation; peripheral cholinergic systems (neuromuscular junction and autonomic nervous system), central cholinergic pathways (pons and basal forebrain), ACh receptors (nicotinic, muscarinic); 5-HT synthesis, release, inactivation; 5-HT pathways and receptors, importance for mood & psychological health; *How are the catecholamine, acetylcholine and serotonin systems similar? How do they differ?*
- READ 2nd ed. Ch. 8 (200 – 224); 1st ed. Ch. 7 (163 - 182)

10. **Amino Acid Neurotransmitters** (1/28): glutamate is the primary excitatory brain neurotransmitter; GLU synthesis, release, inactivation; receptors (including the ionotropic AMPA, kainate, NMDA), excitotoxicity; GABA is the primary inhibitory neurotransmitter in the brain, synthesis, release, inactivation, receptors

- READ 2nd ed. Ch. 9 (226 – 263); 1st ed. Ch. 8 (185 - 213)

11. **Drug Abuse, Dependence & Addiction** (1/30): drug addiction, dependence and abuse, tolerance (and “resistance”), withdrawal, abuse potential of different drugs, traditional models of drug abuse and dependence (physical dependence, positive reinforcement, the medical model (genetics versus exposure)), new ideas



Happy Groundhog Day!

12. **VIDEO** (2/2): “Secret Life of the Brain” - adolescence, schizophrenia and drugs

Neuropsychopharmacology Methodology

- READ 2nd ed. Ch. 4 (121 – 140); 1st ed. Ch. 4 (90 - 105)

13. **Neuropharmacology techniques** (2/4): stereotaxic surgery, lesioning, microinjection of drugs/chemicals, microdialysis, electrophysiological stimulation and recording, radioligand binding, receptor autoradiography, genetic engineering (“knockout” animals, gene replacement and transgenic animals, antisense)

QUIZ

- READ 2nd ed. Ch. 4 (106 – 121); 1st ed. Ch. 4 (105 - 116)

14. **Behavioral pharmacology techniques** (2/6): animal testing, locomotor activity, analgesia (tail flick), learning/memory (T-maze, radial arm maze, Morris water maze, delayed recall), anxiety (elevated plus maze, light/dark crossing), fear (conditioned emotional response, fear-potentiated startle), reward (conditioned place preference, drug

and electrical self-administration); *How do the techniques available to study drug effects on the nervous system limit the scientific questions we can ask?*

15. **REVIEW CLASS WITH COURSE TAs (2/9):** Bring questions

16. **MIDTERM REVIEW CLASS (2/11):** BRING QUESTIONS!!!!

17. ***** MIDTERM EXAM (2/13)**

Drugs

- READ 2nd ed. Ch. 10 (264 – 302); 1st ed. Ch. 9 (215 - 243)

18. **Alcohol (2/16):** psychopharmacology, mechanisms of action, behavioral and physiological effects, alcoholism; *How does alcohol use vary among different cultural groups? Between different families? Among people at different ages? What do these differences suggest about societal/legal approaches to alcohol use/abuse?*

NO CLASS ON WEDNESDAY, FEBRUARY 18th (Power outage)

- READ 2nd ed. Ch. 11 (304 – 337); 1st ed. Ch. 10 (245 - 272)

19. **Opiates (2/20):** narcotic analgesics; receptors and endogenous neuropeptides; opioids and pain; Oxycontin, Vicodin, opiate addiction; *How can we balance the need to reduce suffering and pain with the abuse potential of these drugs?*

- READ 2nd ed. Ch. 12 (339 – 371); 1st ed. Ch. 11 (275 - 300)

- **WATCH VIDEO (on d21):** “Frontline: The Meth Epidemic”

20. **Cocaine and Amphetamine (2/23):** psychopharmacology, mechanisms of action, behavioral and physiological effects; amphetamine psychosis; *What is lost with the hijacking of the mesolimbic dopamine network by drugs such as meth?*

- READ 2nd ed. Ch. 13 (372 – 399); Ch. 12 (303 - 324)

21. **Nicotine and caffeine (2/25):** nicotine psychopharmacology and smoking; caffeine psychopharmacology, mechanisms of action, behavioral & physiological effects; *How*

are nicotine and caffeine similar? How do they differ? How would you discuss effects and actions of these two drugs with adolescents exposed to both?

- READ 2nd ed. Ch. 14 (400 – 426); 1st ed. Ch. 13 (327 - 345)

22. **Marijuana** (2/27): cannabinoid pharmacology, mechanisms of action, endogenous cannabinoids, behavioral and physiological effects, acute vs. chronic exposure; *How do you feel about “medical marijuana” laws? How does knowledge of cannabinoid psychopharmacology influence your views?*

- READ 2nd ed. Ch. 15 (428 – 449); 1st ed. Ch. 14 (347 - 363)

23. **Hallucinogens** (3/2): hallucinogens (mescaline, psilocybin, DMT, LSD), pharmacology of hallucinogenic drugs, mechanisms, physiological and behavioral effects; *Why is use of hallucinogens often associated with religious/spiritual ceremonies?*

QUIZ



24. **GUEST LECTURE** (3/4): **BRET KING**, Deputy, Multnomah County Sheriff’s Office, “From Drugs to Mugs.” Visit to be confirmed..

25. **COURSE REVIEW DAY!** (3/6): Bring your questions, comments, concerns, panic attacks, etc. relating to the course material.

26. **TA REVIEW** (3/9): Bring questions!! **Our TAs will be here to go over it all!**

27. **** FINAL EXAM**

Scheduled for TUESDAY, MARCH 17th from 8:00 – 9:50am

QUIZ DATES AND TOPICS

- Quiz 1 (1/12): Pharmacokinetics, neurons, resting potential difference
- Quiz 2 (1/21): Action potential, synaptic transmission, brain organization
- Quiz 3 (2/6): Neuropharmacology (DA, NE, ACh, 5-HT, GLU, GABA)
- Quiz 4 (3/4): DRUGS (alcohol, opiates, cocaine, meth, nicotine, caffeine..)