

Syllabus

Behavioral Pharmacology (PG 8540) Fall, 2000

- Course Title:** Behavioral Pharmacology (PG 8540)
- Instructor:** Christopher Newland, Ph.D.
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Room 110, Thach Hall. newlamc@mail.auburn.edu 844-6479
- Meeting Times:** M, W, 3-4:30
- Room:** Thach 105.
- Text:** Julien, R. M. (1995) *A Primer of Drug Action*. New York: W. H. Freeman. (or similar book)

Selected readings to be made available.

Papers from the primary literature are listed at the end of the syllabus.

Behavioral pharmacology is a discipline that straddles experimental psychology (and particularly the experimental analysis of behavior) and pharmacology. Many date it to a paper by Peter B. Dews in the *Journal of Pharmacology and Experimental Therapeutics* in 1955, which showed that the behavioral effects of pentobarbital and amphetamine depended upon the schedule of reinforcement maintaining that behavior but its roots go back much further. The discipline differs from others involving drugs that act upon the nervous system in that behavioral pharmacologists emphasize the study of the behavior of intact organisms (rather than of tissue samples) and the *behavioral* mechanisms of drug action are studied as painstakingly as are the pharmacological mechanisms of action. The abused drug, cocaine, offers an example. This drug may be studied as a catecholamine agonist, a pharmacological mechanism, and its interaction with that class of receptors may be the target of such investigations. Cocaine also acts as a positive reinforcer and its reinforcing properties may be assessed as a function of the availability of alternative reinforcers, the schedule of delivery, response effort, or the degree to which delivery is contingent upon responding. These are all behavioral mechanisms. What is learned about cocaine as a catecholamine agonist applies to other drugs that act on that receptor. What is learned about cocaine as a positive reinforcer applies to other drugs whose response-contingent delivery maintains behavior, regardless of the receptor.

The experimental analysis of behavior has contributed both a new theoretical framework for the study of drug-behavior interactions, and powerful new techniques for understanding drug actions. These techniques and the conceptual framework surrounding them will form the basis for our studies. The characterization of drug classes on the basis of their effects on operant behavior is a widely recognized and well-used technique in both academic and industrial pharmacology. These techniques enable fine-grained characterizations of drug action, the use of drugs to uncover brain-behavior relationships, the early detection of drugs with potential for abuse, basic research

on drug taking, and behavioral mechanisms by which drugs used in clinical settings are effective. We will see many replications of Dews' original discovery that the conditions under which drugs are administered are powerful determinants of their behavioral effects.

Course Structure. The course will be structured as a seminar based upon the primary literature. I have selected papers representing conceptual or methodological approaches to the more fundamental drug-behavior interactions in human and nonhuman species. We cover discriminative and reinforcing effects of drugs, interactions of drugs and the events maintaining behavior (e.g., special properties of behavior under aversive control), behavioral tolerance, drug effects on motor function, discrimination, learning, and memory. As befits a graduate-level seminar, we will spend a lot of time on the interrelationships between our conceptual understanding of phenomena and the methods used to discover them.

Paper presentations. The first portion of the course is divided into sections representing different areas. During the last class of a previous topic, or the first class of a new topic, the instructor will provide an introductory lecture of about 20-60 min. Students will then present papers relevant to the topic under discussion in the remaining class time. We will try to get through about 3-5 papers from the primary literature every week. The papers that we will cover are listed in bold after the schedule and are available in the course packet at Speedy Print. ***These are required readings.*** One student will be assigned to present one of the papers but the other students will be prepared to discuss the paper. We will be able to spend 10-40 min on each paper, depending upon the complexity of the paper. Some may take more time. Presenters should use the board, prepare a handout summarizing the paper, have transparencies of the important figures and your summaries. An overhead projector will be available. To summarize: each student will be responsible for reading and discussing all the papers listed in bold but only one student will present it.

In your discussion be thorough, concise, and clear. Try the "*tell'em*" strategy: "tell 'em what your going to tell 'em, tell 'em, and tell 'em what you told 'em." Be sure to set up each paper by summarizing what question is being addressed, why it is an important question, and what methods might be used to address it. When discussing drugs always use the generic name, state what class they belong to, its half-life, and what neurotransmitter(s) is (are) thought to underlie the drug's action when this is known. Only papers using common drugs were selected, so the information will be available in Julien or some similar book. *It is the presenter's responsibility to provide the background material required to understand the paper*, and this may mean going to the library to read papers referred to prominently. Keep all discussion focused on what was done, what happened, and how this was interpreted. Describe all procedures carefully, and in terms of what was done and what happened. *Always* place all behavior in the context of the environmental contingencies such as three-term contingency of reinforcement or the contingencies of respondent conditioning. This may be difficult at first, but it is worth the effort. **We will not tolerate folksy descriptions of behavior**, but instead, will respect the spirit of Lloyd Morgan's canon:

In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale. (From Morgan, C.L. (1894), *An Introduction to Comparative Psychology*. London: Walter Scott.)

When presenting and evaluating the papers, consider the following points:

- Are dose-effect data presented?
- Are the data relevant to the performance of individual organisms?
- What is the pharmacological relevance of the paper? What does it tell us about the action of the drugs used?
- What is the behavioral significance? What does it tell us about behavior?
- What is the behavioral mechanism of the drug's action?
- Where does the drug's action fit into the three-term contingency of reinforcement? Is it a stimulus? a consequence?
- Is the discussion well-grounded in data?
- Are adequate behavioral controls applied? Is there an alternative behavioral interpretation?
- Are adequate pharmacological controls applied? Vehicle injections? Drugs from different categories?
- Draw from the behavioral mechanisms and describe how the results might apply to human behavior.
- Does this paper attempt heterogeneous or homogeneous reduction?

Evaluation. Evaluation will be based upon your presentations, class participation (quality and quantity), and two take-home exams. By 9:00 a.m. on the morning of each class, I want you to e-mail me at least one question about the readings for that day. The question should reflect a careful reading of the materials. I use these questions to guide how material is covered, and what is said about it. The distribution will be as follows: Each presentation will count as a single unit, the exams as three units each, participation (including the questions) counts as one unit. Your course grade will be a simple average of these.

Following are some of the criteria used to evaluate the presentations:

- Clear description of the research question and coverage of the points listed above.
- Clear description of the methods. (*important* details, not all details).
- Graphical presentation of the results. This can be a transparency, or on the blackboard.
- Presentation of the author's conclusions.

- The extent to which you go beyond the paper and incorporate what you know, or what you are learning in this course. This can be in the form of critical comment on weaknesses, unanswered questions raised, further research prompted by this experiment, or extensions to understanding human behavior.

Following are some of the criteria for evaluating participation of those not presenting:

- Clear evidence that you have read the paper.
- Questions asked and points of discussion raised.
- Insights about how two or more of the papers tie together (especially relevant for those with no responsibilities to present during a class).
- Participation in discussion.

Schedule of Activities				
Wk	Class	Date	Topic	Readings
General Issues.				
1	1	23 Aug	Course Introduction. Review of basic behavior and pharmacology.	Julien
2	2	28 Aug	History, mechanisms, and reductionism.	[1-3]
Reinforcing Effects of Drugs: Theory and Application.				
	3	30 Aug	Drugs as reinforcers: General issues	[4, 5]
3	4	4 Sep	Drugs as reinforcers: Primary readings.	[6-9]
	5	6 Sep	Pharmacological approaches to treatment.	[10, 11]
	6	11 Sep	Behavioral Economics General Issues.	[12]
	7	13 Sep	Behavioral Economics: Primary readings.	[13-15]
4	8	18 Sep	Behavioral Approaches to treatment.	[16-18]
Drugs as Discriminative Stimuli				
	9	20 Sep	Drug discrimination: A pharmacological tool and behavioral process.	[19]
	10	25 Sep	Drug discrimination as a pharmacological tool.	[20, 21]
	11	27 Sep	Human drug discrimination, primary readings.	[22, 23]
Respondent Conditioning of Drug Effects				
	12	2 Oct	Drugs as conditional and unconditional stimuli: general issues.	[24]
6	13	4 Oct	Drugs as conditional and unconditional stimuli: primary readings.	[25, 26]
Drug Effects on Schedule-Controlled Behavior				
	14	9 Oct	Behavior maintained by positive reinforcers: general issues.	[27]
7	15	11 Oct	Behavior maintained by positive reinforcers: Primary readings.	[28, 29]

Schedule of Activities				
	16	16 Oct	Behavioral history: Primary readings	[30-32]
8	17	18 Oct	Behavior under aversive control: General readings	[33]
	18	23 Oct	Primary readings.	[34, 35]
9	19	25 Oct	Primary readings.	[36, 37]
Motor Function				
	20	30 Oct	Motor function: general issues.	[38]
	21	1 Nov		[39, 40]
	22	6 Nov	Motor function: primary readings.	[41-43]
Contextual Control over Behavior				
	23	8 Nov	Drug effects and contextual control over behavior: general issues	[44]
	24	13 Nov	Drug effects on contextual control: primary readings.	[45, 46]
	25	15 Nov	Drug effects on contextual control: primary readings.	[47, 48]
Tolerance.				
	26	20 Nov	Behavioral mechanisms of tolerance: General Issues.	[49, 50]
	27	27 Nov		[51, 52 Siegel, 1976 #27, 53]
	28	29 Nov	Student projects	
	29	4 Dec	Student Projects	
FINAL EXAM DAY				

References

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