

Chapter 2: Behavioral Analysis of Drug Effects

Chapter Overview

Chapter 2 begins by contextualizing the emergence of behavioral pharmacology as a distinct field of study. Thereafter, students are provided with key concepts in research design and behavioral psychology that are important for understanding how drug effects are measured. Particular attention is paid to experimental control, placebo effects, and designs commonly used in drug research. In addition, the chapter describes how drug effects can be assessed using specific tests of unconditioned as well as classically and operantly conditioned behaviors in research animals. Measures of drug effects on human behaviors, including abuse liability, are also reviewed. These behavioral paradigms will, in later chapters, be frequently revisited in the course of studying the effects of specific classes of drugs.

Chapter Outline/Notes

- ✧ Behavioral pharmacology is the study of the effects of drugs on behavior. The behavioral pharmacologist uses experimental techniques of modern behaviorally oriented psychology and behavioral neuroscience to also examine the mechanisms that underlie drug effects.
- ✧ For millennia, scholars and writers have produced anecdotal accounts of the effects of drugs on humans. Yet, rigorous scientific investigation of drug effects began little more than a century ago, propelled by the advent of chemical techniques and the development of objective and systematic methods for studying behavior.
- ✧ The emergence of behavioral pharmacology as a separate discipline was largely propelled by three events: (1) the therapeutic and commercial success of antipsychotic drugs, particularly chlorpromazine, which sparked a need for laboratory tests useful in examining the therapeutic effects of such drugs; (2) evidence of the usefulness of operant techniques in studying drug effects; (3) the application of physiology to the understanding of behavior and drug effects.
- ✧ Scientific experimentation entails a search for causal relationships between events.
- ✧ Scientific experiments contain an independent variable that is manipulated by a researcher and a dependent variable that is measured. In most experimental research studies conducted by behavioral pharmacologists, the independent variable is the presence or concentration of a drug in the body, and the dependent variable is some aspect of behavior.
- ✧ Behavioral pharmacology studies may use a within-subjects design, in which a participant's behavior is compared across drugged and drug-free states, or a between-subjects design, in which drugged participants' behavior is compared to that of drug-free participants.
- ✧ The treatment of participants in the control group in an experiment should be as similar as possible to the treatment of participants in the experimental group. For this reason, control-group participants are usually administered a placebo: an inactive substance given in exactly the same way as the drug of interest. This procedure controls for changes in behavior that might result due to the placebo effect.
- ✧ The placebo effect refers to the observation that when people expect to experience a drug effect, they often demonstrate that effect even if they are administered only a chemically inert substance.
- ✧ When an investigational drug is being tested for its therapeutic effects, it is standard to use the three-groups design: one group is given the investigational drug, one group is given a placebo, and one group is given an established drug with known therapeutic effect.
- ✧ A double-blind procedure, in which neither the researchers nor the participants are informed as to which group they are in, is used to eliminate the effect of experimenter bias.
- ✧ Nonexperimental drug research can illustrate relationships between events but cannot definitely establish the existence of a cause–effect relationship.

- ✧ The effects of a drug on unconditioned behavior can be measured in laboratory animals using a variety of tests. Spontaneous motor activity is often quantified using an open field test. The inclined plane test is used to assess muscle tone, whereas the bar test and ring test measure catalepsy, or muscular rigidity. The elevated plus maze is a commonly used measure of anxiety. A drug's ability to induce analgesia, or a reduction in pain sensitivity, is measured in rats using the paw lick latency test or the tail flick test.
- ✧ Learned behavior may be classically or operantly conditioned. In classical conditioning, involuntary reflexive behavior is brought under the control of a previously neutral stimulus. This form of learning is also known as Pavlovian conditioning. In operant conditioning, voluntarily emitted behavior is shaped by the delivery of response-contingent reinforcement.
- ✧ When reinforcement is not given for every appropriate operant response, but is given according to a specific number of correct responses or the passage of time, the pattern is called a schedule of reinforcement.
- ✧ Animals can be trained to avoid or escape a noxious stimulus, such as an electric shock, and some drugs interfere with these abilities.
- ✧ Dissociation is a phenomenon whereby events experienced or information learned in a drugged state might not have the ability to control behavior or be recalled when the organism is in a non-drugged state, and vice versa.
- ✧ The abuse liability of a drug is determined by the U.S. Drug Enforcement Administration (DEA) based on an eight-factor analysis which is then used to classify the drug into one of five schedules.
- ✧ Drug discrimination studies take advantage of the ability of interoceptive cues to guide an animals' operant responding. The responses of animals trained to discriminate a drug from saline can provide insight into the biochemical mechanisms responsible for the subjective effects of a drug.
- ✧ The reinforcing value of a drug can be assessed in animals using a variety of classical and operant conditioning paradigms. Most commonly, these include conditioned place preference, drug self-administration, progressive ratio schedule of reinforcement, intracranial self-stimulation, and choice studies.
- ✧ The subjective effects of a drug are often measured in humans using rating scales, such as the Profile of Mood States, Addiction Research Center Inventory, or a simple liking or wanting scale.
- ✧ The effects of a drug on human sensory-perception are often determined by measuring changes in thresholds. The degree to which a drug impacts motor performance can be determined by reaction time tests or the pursuit rotor task. The cognitive effects of a drug may be determined by tests of attention, vigilance, or memory.
- ✧ The ability of a drug to interfere with one's capacity to withhold or inhibit actions is called disinhibition, which can be measured in humans using the go-no go task or the go-stop task.

Multiple Choice Questions

2-1. Complete the following quote: "The _____ is not only interested in observing behavioral changes produced by drugs, but analyzing the mechanisms of the drug's effect." (Travis Thompson and Charles Schuster, 1964).	Answer: C Objective: Topic/Section: Behavioral Analysis of Drug Effects Difficulty: Bloom's level:
a. pharmacologist	
b. psychopharmacologist	
c. behavioral pharmacologist	
d. behaviorist	
e. psychoanalyst	

2-2. Who proposed that, to be a science, psychology should study only behavior, rather than thoughts and other subjective experiences that could not be observed?	Answer: E Objective:
a. Aristotle	
b. Hippocrates	

c. Sigmund Freud	Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
d. Anton Mesmer	
e. John B. Watson	

2-3. Which of the following individuals would not be considered a <i>behaviorist</i> ?	Answer: A Objective: Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
a. Sigmund Freud	
b. John B. Watson	
c. Ivan Pavlov	
d. Edward Thorndike	
e. B.F. Skinner	

2-4. <i>Behavioral pharmacology</i> became a distinct discipline in the early 1950s. The impetus to develop the field arose largely due to	Answer: E Objective: Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
a. the tremendous therapeutic and commercial success of chlorpromazine and other antipsychotic drugs.	
b. the need to design tests for laboratory animals that were useful in screening drugs for potential therapeutic effects in humans.	
c. the compelling demonstration by Peter Dews of the usefulness of Skinner's operant techniques to study drug effects.	
d. the application of physiology to the understanding of behavior, largely inspired by Joseph Brady.	
e. all of the above factors contributed to the development of the field of behavioral pharmacology.	

2-5. The development of a pharmaceutical drug, such as chlorpromazine, hinges upon researchers' ability to confirm the drug's therapeutic properties and assess its behavioral effects in experimental animals. One behavioral technique commonly used for this purpose is a test developed by David Macht called	Answer: A Objective: Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
a. the avoidance-escape task.	
b. the ARCI.	
c. the visual analog scale.	
d. the complex reaction time task.	
e. introspection.	

2-6. What pivotal discovery was made by Peter Dews in his analysis of the effects of the drug <i>pentobarbital</i> on the rate of key pecking in pigeons responding for food?	Answer: E Objective: Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
a. Pentobarbital stimulated all forms of behavior in the pigeon, including key pecking.	
b. Pentobarbital depressed all forms of behavior in the pigeon, including key pecking.	
c. Pentobarbital stimulated key pecking in pigeons, but depressed all other forms of behavior.	
d. Pentobarbital depressed key pecking in pigeons, but stimulated all other forms of behavior.	
e. The ability of pentobarbital to stimulate or depress key pecking in pigeons depended upon the schedule of reinforcement in effect at the time the drug was administered.	

2-7. The field of <i>behavioral neuroscience</i> was originally referred to as	Answer: D Objective:
a. physiology.	

b. brain research.	Topic/Section: History of Behavioral Pharmacology Difficulty: Bloom's level:
c. pharmacology	
d. physiological psychology.	
e. neuropsychiatry.	

2-8. All scientific experimentation, including that conducted in the field of behavioral pharmacology, can be thought of as a search for _____ relationships between events.	Answer: B Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. correlational	
b. causal	
c. strong	
d. predictive	
e. meaningful	

2-9. In behavioral pharmacology research, the <i>independent variable</i> is often the	Answer: A Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. presence or dose of a drug in an organism.	
b. change in an organism's behavior following drug administration.	
c. duration of intoxication following drug administration.	
d. safety profile of a pharmaceutical drug.	
e. abuse potential of a pharmaceutical drug.	

2-10. In behavioral pharmacology research, the <i>dependent variable</i> is often the	Answer: B Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. presence or dose of a drug in an organism.	
b. change in the organism's behavior following drug administration.	
c. duration of intoxication following drug administration.	
d. safety profile of a pharmaceutical drug.	
e. abuse potential of a pharmaceutical drug.	

2-11. To be certain that any measured behavioral change that follows drug administration is directly caused by the substance's effects on the individual, rather than some other uncontrolled variable, a behavioral pharmacologist should	Answer: E Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. compare the behavior of the drugged participant with the drugged behavior of other participants under similar circumstances.	
b. compare the behavior of the drug-free participant with the drug-free behavior of other participants under similar circumstances.	
c. compare the behavior of the drugged participant with the drug-free behavior of that same participant under similar circumstances.	
d. compare the behavior of the drugged participant with the behavior of other drug-free participants under similar circumstances.	
e. make either of the comparisons outlined in c. and d., above.	

2-12. Which of the following statements is <u>false</u> , regarding <i>within-subjects</i> and <i>between-subjects</i> designs?	Answer: D Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. A within-subjects design involves comparing an individual's behavior across drugged and drug-free states.	
b. In a between-subjects design, the behavior of individuals is seldom reported.	
c. A within-subjects design helps to minimize the effects of random behavioral variation between individuals.	
d. A between-subjects design requires fewer individuals but the study takes longer to run.	

e. None of the above statements are false.	
2-13. In behavioral pharmacology research, a <i>placebo</i> is used	Answer: C Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. to calm anxious participants.	
b. to determine the toxicity of a drug combination.	
c. as a control.	
d. only in within-subjects designs.	
e. in order to plot the lower end of a dose–response curve.	
2-14. It's final exam time. You and your friend decide to pull an all-night cramming session to study for your <i>Drugs and Behavior</i> test. At 3:00 a.m., your friend needs a boost of energy and asks you to put on a fresh pot of coffee. Much to your dismay, you realize that the only coffee left in the cupboard is decaffeinated. You make the coffee anyway, keep its caffeine content (or, lack thereof) a secret, and hand a fresh cup to your friend. What is likely to happen, thereafter?	Answer: E Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. After drinking the decaffeinated coffee, your friend will fall asleep.	
b. After drinking the decaffeinated coffee, your friend will not retain any of the information (s)he reads during the remainder of the study session.	
c. After drinking the decaffeinated coffee, your friend will feel more energetic and alert, and the study session will continue.	
d. After drinking the decaffeinated coffee, your friend will feel more energetic and alert, until your confess that the coffee contains no caffeine at which point its beneficial effects will likely be diminished.	
e. Both c. and d. are likely possibilities.	
2-15. How many groups are required in drug research using the <i>balanced placebo design</i> ?	Answer: D Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. 1	
b. 2	
c. 3	
d. 4	
e. 5	
2-16. When an investigational drug is being assessed in clinical trials for its potential use in medical treatment, the <i>three groups design</i> offers the advantage of	Answer: E Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. allowing researchers to determine which of three diseases is most successfully treated using the investigational drug.	
b. allowing researchers to determine whether the investigational drug provides any advantage over a placebo.	
c. allowing researchers to determine whether the investigational drug provides any advantage over an already established pharmaceutical.	
d. both a. and b. are correct.	
e. both b. and c. are correct.	
2-17. The <i>double-blind procedure</i> is an experimental approach in which	Answer: D Objective: Topic/Section: Research Design Difficulty: Bloom's level:
a. participants who ingest psychedelic substances and close both eyes commonly report experiencing visual hallucinations.	
b. researchers do not divulge to the study participants whether they are in the experimental or control group.	
c. study participants do not inform other study participants as to whether they are in the experimental or control group.	

d. neither the researchers nor the participants know whether any given individual is in the experimental or control group.	
e. only participants given a placebo are told that they are in the control group.	

2-18. <i>Nonexperimental</i> research	Answer: B
a. is of no benefit in understanding the effects of drugs in humans.	Objective:
b. cannot demonstrate that one event causes another.	Topic/Section:
c. is the primary research method used in understanding the effects of drugs in humans.	Research Design
d. helps to determine whether there is a relationship between two manipulated events.	Difficulty:
e. can demonstrate that a relationship does not exist between two events.	Bloom's level:

2-19. <i>Spontaneous motor activity (SMA)</i>	Answer: E
a. is a simple measure of behavior in nonhumans.	Objective:
b. may be quantified in a variety of ways.	Topic/Section:
c. is often measured in rodents using an <i>open field</i> .	Measuring
d. may involve <i>stereotyped behavior</i> .	Unconditioned
e. is all of the above.	Animal Behavior
	Difficulty:
	Bloom's level:

2-20. Which of the following is a measure of muscle tone in rats?	Answer: A
a. The inclined plane test	Objective:
b. The pursuit rotor task	Topic/Section:
c. The elevated plus maze	Measuring
d. The paw lick latency test	Unconditioned
e. The tail flick test	Animal Behavior
	Difficulty:
	Bloom's level:

2-21. <i>Catalepsy</i> can be assessed in rats using the	Answer: B
a. elevated plus maze and shock-probe burying test.	Objective:
b. bar test and ring test.	Topic/Section:
c. hot plate test and paw lick latency test.	Measuring
d. pursuit rotor task and tail flick test.	Unconditioned
e. None of the above can be used to assess catalepsy in rats.	Animal Behavior
	Difficulty:
	Bloom's level:

2-22. Which of the following can be used to assess <i>anxiety</i> in rats?	Answer: D
a. The inclined plane test	Objective:
b. The bar test	Topic/Section:
c. The ring test	Measuring
d. The elevated plus maze	Unconditioned
e. The hot plate test	Animal Behavior
	Difficulty:
	Bloom's level:

2-23. Which of the following can be used to assess <i>analgesia</i> in rats?	Answer: C
a. The elevated plus maze and shock-probe burying test	Objective:
b. The bar test and ring test	

c. The tail flick test and paw lick latency test	Topic/Section: Measuring Unconditioned Animal Behavior Difficulty: Bloom's level:
d. The pursuit rotor task and reaction time test	
e. None of the above can be used to assess analgesia in rats.	

2-24. Researchers are investigating the effect of an investigational drug called <i>applaws</i> on rats' paw lick latency. Compared to the effects of a placebo, applaws increases paw lick latency. Applaws must therefore be	Answer: D Objective: Topic/Section: Measuring Unconditioned Animal Behavior Difficulty: Bloom's level:
a. an anxiolytic drug.	
b. a psychomotor stimulant drug.	
c. a depressant drug.	
d. an analgesic drug.	
e. a pain-producing drug.	

2-25. <i>Classical conditioning</i> involves which of the following components?	Answer: E Objective: Topic/Section: Measuring Conditioned Animal Behavior Difficulty: Bloom's level:
a. Unlearned reflexive responses	
b. Learned reflexive responses	
c. Neutral stimuli	
d. Learned stimuli	
e. All of the above	

2-26. Unlike most people, Jenny loves the smell of mothballs because they remind her of her grandmother's house and the happy childhood she spent there. For Jenny, mothballs are	Answer: B Objective: Topic/Section: Measuring Conditioned Animal Behavior Difficulty: Bloom's level:
a. unconditioned stimuli.	
b. conditioned stimuli.	
c. primary reinforcers.	
d. addictive.	
e. conditioned reflexes.	

2-27. Brittany has been smoking tobacco cigarettes for a number of years. She no longer finds smoking pleasurable, and would like to quit, but finds the withdrawal symptoms too overwhelming. She smokes because a cigarette takes her cravings away. For Brittany, the act of smoking a cigarette is best thought of as	Answer: D Objective: Topic/Section: Measuring Conditioned Animal Behavior Difficulty: Bloom's level:
a. positive punishment.	
b. negative punishment.	
c. positive reinforcement.	
d. negative reinforcement.	
e. conditioned stimulus.	

2-28. The administration of a drug of abuse acts as a _____ reinforcer, whereas the stimuli associated with the drug's administration act as _____ reinforcers.	Answer: C Objective: Topic/Section: Measuring Conditioned Animal Behavior
a. conditioned; unconditioned	
b. neutral; negative	
c. primary; secondary	
d. secondary; primary	

e. scheduled; unscheduled	Difficulty: Bloom's level:
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2-29. Which of the following <i>schedules of reinforcement</i> involves providing a reinforcer based on an average number of appropriate responses?	Answer: B Objective: Topic/Section:
a. Fixed ratio schedule	Measuring
b. Variable ratio schedule	Conditioned Animal
c. Fixed interval schedule	Behavior
d. Variable interval schedule	Difficulty:
e. Continuous reinforcement	Bloom's level:

2-30. Which of the following <i>schedules of reinforcement</i> involves providing a reinforcer based on the passage of a specific and constant amount of time?	Answer: C Objective: Topic/Section:
a. Fixed ratio schedule	Measuring
b. Variable ratio schedule	Conditioned Animal
c. Fixed interval schedule	Behavior
d. Variable interval schedule	Difficulty:
e. Continuous reinforcement	Bloom's level:

2-31. The situation in which an operant response terminates a stimulus that precedes a shock is called	Answer: C Objective: Topic/Section:
a. punishment.	Measuring
b. escape.	Conditioned Animal
c. avoidance.	Behavior
d. habituation.	Difficulty:
e. inhibition.	Bloom's level:

2-32. The inability to remember, while sober, events that took place or information that was learned while intoxicated is known as	Answer: D Objective: Topic/Section:
a. dissociative fugue.	Stimulus Properties
b. drug discrimination.	of Drugs
c. amnesia.	Difficulty:
d. dissociation.	Bloom's level:
e. reverse conditioning.	

2-33. According to the U.S. <i>Controlled Substances Act</i> (1970), drugs are classified into one of five schedules, depending on an eight-factor analysis of their	Answer: E Objective: Topic/Section:
a. potency.	Box 2-
b. efficacy.	1 Classifying
c. cost-benefit analysis.	Controlled
d. active ingredients.	Substances
e. abuse liability.	Difficulty:
	Bloom's level:

2-34. In the United States, drugs are classified by the Drug Enforcement Administration (DEA) into one of five categories (schedules I-V), depending on an 'eight-factor analysis' of their abuse liability. Which of the following is <u>not</u> considered, in determining a drug's classification schedule?	Answer: D Objective: Topic/Section:
	Box 2-
	1 Classifying

a. Scientific evidence of the drug's pharmacological effects	Controlled Substances Difficulty: Bloom's level:
b. What, if any, risk there is to the public health	
c. Whether the drug is an immediate precursor of a substance already controlled under the Controlled Substances Act (1970)	
d. The ease with which the drug may be acquired for illicit use	
e. The drug's history and current pattern of abuse	

2-35. A substance deemed by the U.S. Drug Enforcement Administration (DEA) to have a high potential for abuse, no currently accepted medical use in treatment, and a lack of accepted safety for use under medical supervision would be classified under which Schedule?	Answer: A Objective: Topic/Section: Box 2-1 Classifying Controlled Substances Difficulty: Bloom's level:
a. Schedule I	
b. Schedule II	
c. Schedule III	
d. Schedule IV	
e. Schedule V	

2-36. <i>Drug discrimination</i> studies take advantage of the ability of _____ cues to guide an animal's _____ responding.	Answer: B Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. motivational; conditioned	
b. interoceptive; operant	
c. visual; conditioned	
d. olfactory; operant	
e. auditory; conditioned	

2-37. In the context of the drug discrimination paradigm, a <i>substitution test</i> can determine whether	Answer: C Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. a saline injection will substitute for the reference drug.	
b. a saline injection will substitute for the training drug.	
c. injection of a substitute drug will elicit responding similar to that of the training drug.	
d. various doses of the reference drug will substitute for saline.	
e. different individual animals will respond similarly during drug discrimination training.	

2-38. The development of a <i>conditioned place preference</i> for a context paired with drug administration depends upon	Answer: E Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. classical conditioning.	
b. the reinforcing value of the drug.	
c. distinctive contextual cues.	
d. stimulus-stimulus and/or stimulus-response associations.	
e. all of the above.	

2-39. Which of the following behavioral tests is <u>not</u> one commonly used to assess the reinforcing value or abuse liability of a drug?	Answer: E Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty:
a. The conditioned place preference test	
b. The drug self-administration paradigm	
c. Intracranial self-stimulation (ICSS)	
d. Choice studies	
e. The avoidance-escape task	

	Bloom's level:
2-40. In a <i>progressive ratio schedule</i> of reinforcement,	Answer: A Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. the breaking point acts as an indicator of an animal's level of motivation.	
b. the animal receives a reinforcer according to a fixed and unchanging number of required responses.	
c. the animal receives a reinforcer according to the passage of a fixed and unchanging amount of time.	
d. the animal is restrained so that emitting a response becomes progressively more difficult throughout the session.	
e. the ratio schedule makes obtaining reinforcement progressively easier throughout the session.	
2-41. A researcher using <i>intracranial self-stimulation</i> (ICSS) to assess the abuse liability of an investigational drug should be most concerned when the investigational drug	Answer: A Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. has a strong capacity to lower the threshold of responding and facilitate the rate of operant responding in rats.	
b. has a strong capacity to raise the threshold of responding and facilitate the rate of operant responding in rats.	
c. has a strong capacity to lower the threshold of responding and impede the rate of operant responding in rats.	
d. has a strong capacity to raise the threshold of responding and impede the rate of operant responding in rats.	
e. None of the above—the ICSS paradigm cannot be used to assess the abuse liability of a drug.	
2-42. Researchers employing the <i>intracranial self-stimulation</i> (ICSS) paradigm to assess a drug's abuse liability surgically implant a tiny electrode into the major reward pathway of the brain, called the	Answer: A Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. medial forebrain bundle.	
b. ascending serotonergic pathway.	
c. lateral striatal projection.	
d. descending hindbrain bundle.	
e. hemispheric callosal projection.	
2-43. Rate of drug self-administration is	Answer: B Objective: Topic/Section: Reinforcing Properties of Drugs—Abuse Liability Difficulty: Bloom's level:
a. a perfectly reliable and accurate measure of a drug's abuse liability.	
b. an imperfect measure of the abuse liability of a drug because the motor effects of some readily abused drugs may interfere with an animal's ability to produce an operant response.	
c. an inaccurate measure of a drug's abuse liability because all readily abused drugs are highly reinforcing, thereby producing a ceiling effect on operant responding.	
d. inversely related to the abuse liability of a drug.	
e. tremendously difficult to interpret, as a measure of the abuse liability of a drug, and is therefore rarely assessed in animal research.	
2-44. In early examinations of drug effects, individuals were administered a drug and asked to report their subjective experiences. This method of investigation is called	Answer: B Objective:
a. introversion.	
b. introspection.	

c. extroversion.	Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
d. extrospection.	
e. interoceptive reporting.	

2-45. The <i>POMS</i> and <i>ARCI</i> are examples of	Answer: D Objective: Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
a. sleep stages.	
b. animal research paradigms.	
c. indices of drug effectiveness.	
d. paper-and-pencil tests of subjective drug effects.	
e. measures of motor performance.	

2-46. <i>Critical flicker fusion frequency</i> is a measure of human	Answer: A Objective: Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
a. sensory acuity.	
b. reaction time.	
c. cognitive arousal.	
d. physical arousal.	
e. psychomotor reactivity.	

2-47. The <i>Mackworth Clock Test</i> is a measure of	Answer: C Objective: Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
a. perception.	
b. motor performance.	
c. attention and vigilance.	
d. memory.	
e. response inhibition.	

2-48. A researcher is investigating the cognitive effects of a new investigational drug called <i>forgetmenot</i> . She discovers that the study participants have no trouble describing the route they took to get from their home to the laboratory, but perform poorly on the <i>N-back test</i> . The researcher concludes that <i>forgetmenot</i> appears to be	Answer: B Objective: Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
a. interfering with long-term memory, but not with short-term memory.	
b. interfering with working memory, but not with long-term memory.	
c. interfering with implicit memory, but not with explicit memory.	
d. interfering with explicit memory, but not with working memory.	
e. interfering with episodic memory, but not with short-term memory.	

2-49. Which of the following does not belong with the others?	Answer: E Objective: Topic/Section: Measuring Human Behavior Difficulty: Bloom's level:
a. Long-term memory	
b. Procedural memory	
c. Episodic memory	
d. Explicit memory	
e. Working memory	

2-50. Drugs, like alcohol, that interfere with inhibitory control are likely to cause	Answer: A Objective:
a. an increase in responding on the "no go" signal in the <i>go-no go task</i> .	

b. a decrease in responding on the “no go” signal <i>go—no go task</i> .	Topic/Section: Measuring Human Behavior Difficulty: Bloom’s level:
c. an increase in responding on the “go” signal <i>go—no go task</i> .	
d. a decrease in responding on the “go” signal <i>go—no go task</i> .	
e. no change in responding <i>go—no go task</i> .	

Short Answer Questions

2-1. Briefly describe the major events that helped shape the field of behavioral pharmacology as a separate discipline in the early 1950s.	Topic/Section Containing Answer: History of Behavioral Pharmacology
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2-2. Explain the difference between an <i>independent variable</i> and a <i>dependent variable</i> in a scientific experiment. Give a specific example of what would constitute a plausible independent variable and a plausible dependent variable in a behavioral pharmacology research study.	Topic/Section Containing Answer: Research Design
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2-3. Compare and contrast <i>within-subjects design</i> with <i>between-subjects design</i> . In so doing, be sure to point out the advantages and disadvantages of each research design.	Topic/Section Containing Answer: Research Design— Experimental Research
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2-4. Explain why it is important to include a placebo control group in behavioral pharmacology research.	Topic/Section Containing Answer: Research Design— Experimental Research
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2-5. When an investigational drug is undergoing clinical trials, it is standard procedure to use a <i>three-groups design</i> . What groups are included in this design? Describe the comparisons that researchers would be interested in making using this design.	Topic/Section Containing Answer: Research Design— Experimental Research
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2-6. Describe two tests used in animal research to assess the analgesic properties of a drug. How would you expect a drug like morphine to alter behavior measured in these tests?	Topic/Section Containing Answer: Measuring Unconditioned Animal Behavior
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2-7. On the last day of classes for the semester, Rachel and her friends decide to celebrate by trying out the new sushi restaurant near campus. Rachel discovers that the sushi is delicious and she plans to return with her boyfriend. Later that night, Rachel begins to feel ill and subsequently develops a bad case of influenza with symptoms of fever, muscle ache, and severe stomach upset. Two weeks later, Rachel feels much better and she and her boyfriend go for dinner at the sushi restaurant. Upon entering the restaurant, Rachel begins to feel nauseous. She suddenly loses her appetite and the thought of eating sushi is revolting to her. Explain why Rachel feels this way, being sure to use appropriate terminology.	Topic/Section Containing Answer: Measuring Conditioned Animal Behavior—Classical Conditioning
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<p>2-8. In operant conditioning, a <i>reinforcer</i> may be <i>positive, negative, primary, or secondary</i>. Define each of these terms, and provide an example of each type of reinforcer.</p>	<p>Topic/Section Containing Answer: Measuring Conditioned Animal Behavior— Reinforcement</p>
<p>2-9. Describe the four most common <i>schedules of reinforcement</i> and provide a methodological example of how each may be used in behavioral pharmacology research.</p>	<p>Topic/Section Containing Answer: Measuring Conditioned Animal Behavior—Schedules of Reinforcement</p>
<p>2-10. Describe the <i>avoidance–escape task</i>. How would administration of an antipsychotic drug affect an animal’s behavior on this task?</p>	<p>Topic/Section Containing Answer: Measuring Conditioned Animal Behavior— Avoidance–Escape Task</p>
<p>2-11. List 5 of the 8 factors the U.S. Drug Enforcement Administration (DEA) takes into consideration when classifying a drug under a particular schedule.</p>	<p>Topic/Section Containing Answer: Box 2-1 Classifying Controlled Substances</p>
<p>2-12. Describe the method involved in the <i>conditioned place preference</i> (CPP) paradigm, and the learning process that takes place to establish a CPP.</p>	<p>Topic/Section Containing Answer: Reinforcing Properties of Drugs – Abuse Liability— Conditioned Place Preference</p>
<p>2-13. List and briefly describe some of the rating scales used to gather quantitative data to assess individuals’ subjective drug experience.</p>	<p>Topic/Section Containing Answer: Measuring Human Behavior—Rating Scales</p>
<p>2-14. Describe the different types of memory, and provide details of two different tests that can be used to assess the effects of a drug on human memory.</p>	<p>Topic/Section Containing Answer: Measuring Human Behavior—Memory</p>
<p>2-15. Under the influence of alcohol, people have been known to do or say things that they normally wouldn’t. That is, they are <i>disinhibited</i> by alcohol. Describe two behavioral tests used to measure response inhibition in humans and indicate how alcohol intoxication would alter performance on these tasks.</p>	<p>Topic/Section Containing Answer: Measuring Human</p>

	Behavior—Tests of Response Inhibition
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Essay Questions

2-1. Imagine that you are part of a research team tasked with determining whether a new investigational drug developed to curb craving in addiction is therapeutically superior to one already on the market. Design an experiment that will inform your decision about the new drug's effectiveness.	Topic/Section Containing Answer: Research Design
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2-2. What specific unconditioned animal behaviors are behavioral pharmacologists often interested in assessing, when determining a drug's effects? For each behavior of interest, name and describe at least one behavioral test used in laboratory research. How might a specific class of drug influence performance on these behavioral tests?	Topic/Section Containing Answer: Measuring Unconditioned Animal Behavior
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2-3. Describe <i>drug discrimination</i> and the various ways in which this task can be used as a tool in behavioral pharmacology research.	Topic/Section Containing Answer: Reinforcing Properties of Drugs—Abuse Liability—Drug Discrimination
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2-4. An animal's rate of operant responding is often assessed by behavioral pharmacologists investigating a particular drug's abuse liability. Describe the specific paradigms or tests employed by researchers in which rate of responding is measured. How do these tests inform scientists about the abuse potential of a drug?	Topic/Section Containing Answer: Reinforcing Properties of Drugs—Abuse Liability—Rate of Responding
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2-5. A new pharmaceutical drug has been developed that claims to reverse the cognitive, sensory-perceptual, and psycho-motor effects of aging. The manufacturers state that they employed relevant measures that allow them to make these claims. Specifically, which tests of human behavior would you deem relevant, in this case, and what evidence would you like to see before you determine the truth of these claims?	Topic/Section Containing Answer: Measuring Human Behavior
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