Why We Created Sniffy

Sniffy Lite is an affordable and humane way to give students hands-on access to the basic phenomena of classical and operant conditioning that introductory psychology courses and courses on the psychology of learning typically discuss. Although psychologists believe that the phenomena that the Sniffy Lite program simulates play a prominent role in both human and animal behavior, courses that discuss these topics are usually taught in a lecture format that gives students no chance to obtain laboratory experience. There are two main reasons for this omission.

The first reason is cost. The most common apparatus that psychologists use to study classical and operant conditioning is the **operant chamber**, a special cage that contains a lever that a rat can be trained to press and devices for dispensing food and water and presenting other stimuli. A computer connected to the chamber automatically records the rat’s responses and controls stimulus presentation. A basic setup consisting of an operant chamber, a computer to control it, and an appropriate interface between the two costs about $3,500 in U.S. money. Few schools can afford to purchase this equipment in the quantity required to offer a laboratory component for a course in the psychology of learning. In addition, modern animal-care regulations specify rigorous standards for maintaining animals used for teaching and research. Typically, these regulations not only require that the animals be housed in clean cages and receive adequate food and water, but also specify that animal rooms must receive more fresh air and have better temperature and humidity control than rooms that people occupy. Facilities that comply with these standards are expensive to build and maintain. To cover these costs, animal facilities usually charge daily
maintenance fees for each animal kept, and these fees would add up to a large sum if each student enrolled in a learning course had his or her own rat to study.

A second reason why students in learning courses rarely have access to animals is that some people think that the use of live animals for teaching purposes, where the outcome of each experiment can be confidently predicted on the basis of previous findings, violates the ethical principles of humane animal treatment. Some people hold this view even when the animals used for teaching are never exposed to any discomfort. Opposition is much more widespread if the animals are subjected to noxious stimuli.

Nevertheless, studying animal learning without being able to see how experiments are set up and data are collected isolates students from an important and fascinating set of behavioral phenomena. The Sniffy Lite program is designed to end that isolation.

How We Created Sniffy, the Animated Creature

We created the animated Sniffy character that you see on your computer screen by videotaping a live laboratory rat as it moved around spontaneously in a glass cage with a blue background. The taping sessions occurred in a comfortable, reasonably quiet room, and we just let the rat perform whatever behaviors it happened to produce. From the several hours of videotape that we accumulated, we selected 40 short behavior sequences that show the rat walking around the cage, rearing up against the walls, grooming itself, and performing other typical rat behaviors. Finally, we removed the blue background from each frame of these video clips and adjusted the brightness and contrast in the resulting images to produce almost 600 animation frames that depict the rat in different postures and orientations. The Sniffy Lite program plays these frames in various sequences and positions to produce the virtual animal that you see.

Sniffy, the Program

The Sniffy Lite program lets you set up and perform a wide variety of classical and operant conditioning experiments and enables you to collect and display data in ways that simulate how psychologists do these
things in their laboratories. In addition, because the program both simulates and displays some of the psychological processes that psychologists believe animals (and people) employ, Sniffy Lite shows you some things about learning that you could not observe if you were working with a live animal.

In a real rat, learning is the result of biochemical interactions among billions of neurons in the brain. As a consequence of these physiological processes, animals acquire information about events in the outside world and about how their behavior affects those events. One aspect of learning involves acquiring information about sequences of events in the world. When one stimulus regularly precedes and thus predicts another, animals modify their behavior in certain ways; psychologists call this kind of learning **classical** (or **respondent**) conditioning. A second aspect of learning involves acquiring associations between behaviors (responses) and external events (stimuli); psychologists call this kind of learning **operant** (or **instrumental**) conditioning.

Although we believe that neurophysiological processes in the brain are ultimately responsible for the learned changes in behavior that we observe, psychologists generally discuss classical and operant conditioning in terms of the acquisition and modification of associations. To some extent, we describe learning in associative terms because we do not understand the physiological processes well enough to explain our findings fully in physiological terms. However, psychological and physiological processes also constitute different levels of explanation (Keller & Schoenfeld, 1950; Skinner, 1938). Thus, we do not need to understand the physiological processes in detail in order to explain learning in psychological terms.

To a degree, the relationship between neurophysiological processes and psychological explanations of learning is analogous to the relationship between the electrical activity in your computer’s electronic circuitry and the simulated psychological processes that form the basis for Sniffy’s behavior. Your computer contains the equivalent of several million transistors that are in some ways analogous to neurons in a rat’s brain. The Sniffy Lite program uses the electronic circuitry of your computer to simulate the psychological mechanisms that many psychologists employ to explain learning in real animals and people. One advantage of computer simulation is that we can program a computer not only to simulate certain psychological processes, but also to display the simulated processes. This fact has enabled us to develop a set of displays that we call **mind windows**. The mind windows show how Sniffy’s behavior interacts with the events in the operant chamber to create, strengthen, or weaken the associations that produce changes
in Sniffy’s behavior. Thus the Sniffy Lite program not only allows you to set up experiments and record and display behavioral data in a fashion similar to how psychologists do these things, but it also lets you observe how Sniffy’s psychological processes operate. We think that being able to observe Sniffy’s psychological processes will make it easier to understand how learning works.

**Sniffy Is a Learning Tool, Not a Research Tool**

The Sniffy Lite program is the result of developments in computer technology that permit the simulation and display of complex processes on relatively inexpensive computers. However, the psychological processes and behavioral phenomena that the program simulates are characteristics of living organisms. Discovering those processes and phenomena required over a century of research with animal and human subjects. Future advances in the scientific understanding of learning will also require research on living organisms. Sniffy Lite and other computer simulations are fascinating tools for demonstrating what we already know, but they cannot substitute for the real thing when it comes to acquiring new scientific insights.

Sniffy is not a real rat. In fact, Sniffy isn’t even the most realistic simulation of a real rat that we could have produced. The Sniffy Lite program employs a rat as a kind of metaphor to help you understand the psychology of learning. In designing Sniffy as a learning aid, we deliberately sacrificed realism whenever we thought that it got in the way of creating a useful tool for students. In addition to immediately obvious things like the mind windows, here are some of the other deliberately unrealistic things about Sniffy:

- You will be using food as a reinforcer (reward) to train Sniffy to press the bar or do other things in the operant chamber. Sniffy is always ready to work for food no matter how much he has recently eaten. In contrast, real rats satiate for food and stop working to obtain it when they have had enough. We could have simulated satiation but decided not to because satiation is mainly a motivational, not a learning, phenomenon. If you ever do research using food reinforcement with real animals, you will have to learn how psychologists control for this motivational factor when they design learning experiments. However, textbooks on the psychology of learning rarely discuss satiation, psy-
Applying What You Learn From Sniffy

The principles of learning that Sniffy illustrates have many real-world applications in such diverse areas as the therapeutic modification of human behavior and animal training for utility, fun, sport, or profit. In addition to a thorough understanding of learning principles, effectively applying the principles of operant and classical conditioning to real-life situations nearly always involves large measures of creative ingenuity and finesse. To become a practitioner of therapeutic human behavior modification, you need to obtain a bachelor’s degree in psychology, attend graduate school, study behavior modification under the direction of a professional, and fulfill the professional licensing requirements of the jurisdiction in which you plan to work. These educational and professional requirements have been established in an effort to ensure the effective and ethical application of the learning principles that Sniffy simulates.

Standards for would-be animal trainers are much less stringent. Anybody can purchase a puppy and attempt to train it. However, if you obtain a puppy and subsequently want to transform the unruly little beast that you actually possess into the obedient, well-behaved member of the household that you had envisioned, you would be well advised to enroll yourself and your puppy in classes at a reputable...
dog-training school. As with human behavior modification, effective, ethical animal training involves combining a thorough understanding of scientific principles with ingenuity and finesse. The best animal trainers understand both the science and the art. Sniffy will help you learn the science, but you must acquire the art elsewhere. Failure to acquire the art before you try to apply the science can produce unexpected and sometimes even dangerous results.
A First Look at Sniffy Lite

The time has come to have a look at the Sniffy Lite program and to begin Sniffy’s training.\(^1\)

- Locate the folder where you installed the Sniffy Lite program and sample files on your computer’s hard disk.
  - In Windows, the installer placed Sniffy Lite and the sample files in a folder called Sniffy Lite for Windows, which is in the Program Files folder on your C drive.
  - On a Macintosh, you should have placed the Sniffy Lite application and sample files in the locations specified in the installation instructions.
- Start the program.
  - In Windows, the most basic way to start the program is to select the Sniffy Lite program from the Programs section of the Start menu. Another way is to double-click the Sniffy file icon inside your Sniffy Lite for Windows folder. The Appendix provides information about how to simplify the process of getting to the Sniffy Lite for Windows folder by placing a shortcut to the folder on your Windows desktop.

\(^1\)In this manual, specific, detailed instructions for performing particular exercises are presented with a gray background.
On a Macintosh, the simplest way to start the program is to open your Applications folder and double-click the program icon. If you’re running Mac OS X, you may want to place an icon for Sniffy Lite and the Sniffy Files folder in the dock. The Appendix provides instructions for placing aliases in the dock.

Depending on whether you’re running Sniffy Lite under Windows XP or Mac OS X, when the program opens, your computer screen should resemble one of the following pictures. (If you are running older versions of Windows or the Mac OS, the appearance of the program and its associated windows will be slightly different.)
When you first start Sniffy Lite, two windows will be visible:

- The Operant Chamber window is the window where you see Sniffy moving about. The title bar at the top of the window contains the name of the Sniffy file that is currently being run. Because you have not yet saved a Sniffy file, the file is called Untitled.

- The Lab Assistant window provides you with useful suggestions about what to do next or about the status of your current Sniffy experiment. In this instance, it is suggesting that to set up a classical conditioning experiment, you should select Design Classical Conditioning Experiment from the Experiment menu; to set up an operant conditioning experiment, you should select the Design Operant Conditioning Experiment command.
Throughout the rest of this manual, sometimes we will show illustrations of the way the program looks in Windows XP and sometimes show how things look in Mac OS X. Because the program operates identically in both operating systems, always showing illustrations from both operating systems would be redundant.

Classical Conditioning Background

Classical conditioning is the form of learning that results when two stimuli reliably occur in a sequence so that the first stimulus predicts the occurrence of the second. Usually, the stimuli have differing degrees of biological importance to the organism, with the less important stimulus coming before the more important stimulus. Many of the phenomena of classical conditioning were first described by the Russian physiologist Ivan Pavlov and his associates, who were the first to explore this form of learning systematically (Pavlov, 1927). Two other terms for the same kind of learning are Pavlovian conditioning and respondent conditioning.

In classical conditioning, the stimulus that comes first in the temporal sequence is called the conditioned stimulus (CS), and the stimulus that comes second is called the unconditioned stimulus (US). The US initially possesses the capacity to elicit an obvious, easy-to-measure response called the unconditioned response (UR). The initial response to the CS is called the orienting response (OR), but the OR is often so inconspicuous that psychologists treat the CS as if it were a neutral stimulus that initially elicits no response at all. In other words, the OR to the CS is rarely measured.

The classical conditioning acquisition procedure consists of repeatedly presenting the CS shortly before the US. As a consequence of this repeated, sequential pairing of the two stimuli, the CS gradually acquires the capacity to elicit a new learned response, which is called the conditioned response (CR). Usually, but not always, the CR resembles the UR in the sense that the CR consists of certain components of the UR.

In their early experiments, Pavlov and his associates used food placed in the mouths of food-deprived dogs as the US. Food in a hungry dog’s mouth elicits chewing, swallowing, and salivation as a UR.
As CSs, Pavlov’s group used various medium-intensity sounds, lights, and tactile stimuli, none of which had any initial tendency to elicit a response resembling the UR to food. When repeatedly paired with food presentation, all these CSs gradually acquired the capacity to elicit salivation. During the century since Pavlov first reported his findings, thousands of classical conditioning experiments have been performed, employing dozens of different species and a wide variety of different stimuli as US and CS.

The Conditioned Emotional Response (CER)

Sniffy Lite simulates a form of classical conditioning called the conditioned emotional response (CER) or conditioned suppression, the experimental paradigm for the measurement of which was first described by Estes and Skinner (1941). Sudden, intense sounds and electric shocks delivered to a rat’s feet are stimuli that intrinsically possess the capacity to interrupt a rat’s ongoing train of behavior. The rat jumps when the loud sound or shock occurs and then freezes; that is, it remains motionless for a period of time. Thus, very loud noises and foot shock can be used as USs to produce freezing as a UR. In contrast, less intense sounds and moderately bright lights initially have little or no effect on a rat’s ongoing behavior. For this reason, these stimuli can be used as CSs. The conditioning procedure consists of turning on the stimulus that is serving as the CS for a period of time before very briefly presenting the US. Usually, the CS and US terminate simultaneously. In different experiments, the period of time during each trial when the CS is presented by itself typically ranges between 30 and 120 seconds (Domjan, 1998, 2003; Mazur, 1998). The duration of the US is usually 1 second or less. As a consequence of pairing the CS with the US, the CS gradually acquires the capacity to interrupt the rat’s chain of behavior and induce freezing.

Over the past 30 years or so, the CER has become the form of classical conditioning that North American psychologists most commonly study. There are probably two main reasons for this popularity. First, the CER provides an experimental preparation for studying the acquisition of a very important and interesting response—fear. Second, because the entire process of presenting stimuli and collecting data can be automated, the CER is a very convenient form of classical conditioning to study.
As originally described (Estes and Skinner, 1941) and in most present-day laboratories, studies involving the CER typically start by employing operant conditioning procedures to train a rat to bar-press for food or water reinforcement on a schedule of reinforcement that produces steady, rapid responses (see Chapter 4). The rat’s steady bar-pressing rate is then used as a baseline against which to measure the effects of presenting stimuli. However, because almost all textbooks on the psychology of learning discuss classical conditioning before operant conditioning, we thought that it was important to provide users of Sniffy Lite with a means of studying the CER before they learned about operant conditioning. Accordingly, Sniffy Lite enables you to measure fear-related freezing in two ways.

To measure freezing behavior in experiments where Sniffy has not been trained to press the bar, we employ a measurement called the movement ratio. This measure is the proportion of time during each presentation of the CS that Sniffy is manifesting freezing and other fear-related behaviors. As the number of times the US has followed occurrences of the CS increases, the proportion of time during the CS when Sniffy will manifest fear behaviors increases. As implemented in Sniffy Lite, the movement ratio provides a robust behavioral measure of classical conditioning whether or not Sniffy has previously been trained to press the bar in the operant chamber.

The other way of measuring Sniffy’s conditioned fear responses requires that Sniffy first be trained to press the bar in his operant chamber to obtain food reinforcement. This second measure, which is called the suppression ratio, is the response measure most commonly used by researchers who study the CER with live rats. The basic idea behind the suppression ratio is to compare the rate of bar pressing (the number of bar presses per minute) during the CS (Rate During CS) to the rate of bar pressing during the period of time immediately preceding presentation of the CS (Rate Pre CS). When the Pre CS and During CS time periods are of equal duration (as in Sniffy Lite), comparing the bar-pressing rates is equivalent to comparing the number of bar presses during the CS (Bar Presses During CS) to the number of bar presses during the period preceding the CS (Bar Presses Pre CS). If the CS elicits no fear response, the number of bar presses during these two time periods should be about the same. However, if the CS suppresses bar pressing, then Bar Presses During CS will be less than Bar Presses Pre CS. To get a quantitative measure of suppression of bar pressing in response to the CS, the suppression ratio is expressed as the ratio be-
tween the Bar Presses During CS and the sum of Bar Presses During CS plus Bar Presses Pre CS. Written as an equation, the suppression ratio is defined as:

$$\text{Suppression ratio} = \frac{\text{Bar Presses During CS}}{\text{Bar Presses During CS} + \text{Bar Presses Pre CS}}$$

Let’s think a bit about how this equation works. If presenting the CS does not affect the animal’s bar pressing (if Bar Presses During CS = Bar Presses Pre CS), then the denominator of the fraction will be twice as large as the numerator; and the suppression ratio will be 0.5. However, if the CS suppresses bar pressing so that the rat presses less during the CS than during the Pre CS period, the suppression ratio will be less than 0.5. If the rat doesn’t press the bar at all during the CS, the suppression ratio will be 0. In a CER experiment where the CS is being paired with an aversive US, Bar Presses During CS should never (except by chance) be greater than Bar Presses Pre CS, so that the suppression ratio should generally be less than or equal to 0.5. On the first training trial (before the animal has experienced the US), the suppression ratio should be about 0.5. As conditioning proceeds, the value of the suppression ratio should decline until it eventually levels off at an average value less than 0.5. To compute the suppression ratio, the Sniffy Lite program compares Sniffy’s response rate during the 30 seconds preceding each CS presentation with the response rate during the CS.

With real rats and with Sniffy, CER conditioning is rather rapid. Maximal (or nearly maximal) conditioning is reached after about 10 CS–US pairings. The US that the Sniffy Lite program simulates is electric foot shock delivered through the parallel metal bars that form the floor of Sniffy’s operant chamber. Shock duration is always 1 second. CS duration is always 30 seconds. When the shock US is being paired with the CS, the shock US occurs during the last second of the CS.\(^2\) Shocking Sniffy immediately interrupts Sniffy’s behavior. He jumps and then freezes. When he begins to move around again, bouts of freezing are interspersed with bouts of grooming and exploratory behavior. After a few minutes, the effect of the shock wears off. If Sniffy has been trained to press the bar, bar pressing will resume. If Sniffy has not been trained to press the bar, he will resume moving around the cage and engaging in his other normal activities.

\(^2\)All stated times are in Sniffy Lite program time. Program time is approximately equivalent to clock time when Sniffy’s animation is set to run at a realistic-looking rate. However, program time and clock time will seldom be exactly equivalent.
To animate Sniffy’s UR to the shock US, we applied some tricks to sequences of animation frames derived from a videotape of a rat that had not been shocked or exposed to any other form of noxious stimulation. We think that the result looks plausible, but we do not know how realistic it is. Psychologists who study the CER virtually never give detailed descriptions of their animals’ UR to the US. To create a realistic simulation of a rat’s response to shock, we would have had to videotape a rat that was actually being shocked, but we did not do that.

The CS that the Sniffy Lite program employs is a light. Duration of the CS is always 30 seconds. On trials when the CS is paired with the US, the US occurs during the last second of the CS. In other words, the onset of the CS always precedes the onset of the US by 29 seconds. The light initially has no effect on Sniffy’s bar-pressing performance. However, when a light is paired with the shock US, the light gradually acquires the capacity to suppress bar pressing as a CR. When he is fully conditioned, Sniffy will begin showing bouts of freezing, grooming, and exploratory behavior soon after the light comes on. As was the case with the UR, although we think that Sniffy’s CR looks plausible, we do not know how realistic it is because we did not videotape a rat that was actually being conditioned to manifest a CER.

The Design Classical Conditioning Experiment Dialog Box

As noted earlier, one of the reasons for the CER’s popularity among North American researchers is the fact that all aspects of CER experiments can be automated. A computer controls the presentation of stimuli, records the rat’s behavior, and computes the movement ratio and/or suppression ratio. The Sniffy Lite program provides you with a simplified interface that enables you to set up and run three basic classical conditioning experiments. Like a psychologist in a research lab, you will set up the experiment and then let your computer present the stimuli and record the data. When you choose the Design Classical Conditioning Experiment command from the Experiment menu, the following dialog box appears:

3All these times refer to Sniffy Lite program time.
4The dialog box is shown as it appears in Mac OS X 10.3. In earlier versions of the Mac OS and in Windows, the appearance of the dialog box is slightly different. All the program controls work in the same way in all versions of the Windows and Mac operating systems that the program supports.
Classical conditioning experiments can contain one or more stages. A stage is a group of trials. All the trials in one stage are run before any of the trials in the next stage. In the Stage section of the dialog box, the number after View/Edit Experiment Stage indicates which stage of the experiment you are currently viewing. When you first open the dialog box by selecting the Design Classical Conditioning Experiment command from the Experiment menu, the numeral to the right of View/Edit Experiment Stage will always be 1, indicating that Stage 1 of the experiment is being displayed.

You can edit (create or change) any stage that has not already been run, and you can add more stages to an experiment in which one or more early stages have already been run. You can also view the settings for stages that have been run. However, you cannot change the settings for any stage that has already been run or for a stage that is in the process of being run. When you view the settings for a stage that has already been run or for a stage currently being run, all command buttons are dimmed, and you cannot enter any information into the text boxes.

The Stage section of the dialog box contains four command buttons and two boxes into which you can type numerals:

- If you are viewing or editing Stage 1 of an experiment, the Previous Stage command button is dimmed. However, if you are working on Stage 2 or higher, the Previous Stage command is available. Clicking your (left) mouse button when your cursor is on the command button will move you to the previous stage. For example, if you were working on Stage 3, clicking on the Previous Stage button would move you back to Stage 2, and clicking it a second time would move you back to Stage 1.
The Next Stage button moves you from stage to stage in the opposite direction. For example, if you have created three stages and are currently working on Stage 2, clicking the Next Stage button moves you to Stage 3. The Next Stage button is dimmed when you are viewing or working on the last stage that you have defined.

Clicking on the New Stage button creates a new stage, inserts it immediately after the stage that you were viewing when you clicked the button, and automatically moves you to the new stage. If necessary, other stages of the experiment are automatically renumbered. For example, if you have already created three stages and are currently working on Stage 2, clicking on New Stage will create a new Stage 3 and insert it between Stage 2 and the stage that was previously called Stage 3. The former Stage 3 automatically becomes Stage 4.

The Delete Stage button deletes the current stage and, if necessary, automatically renumbers the other stages. Suppose that you have already defined four stages in an experiment and are currently working on Stage 3. Clicking the Delete Stage button will eliminate the old Stage 3 and cause the stage that had previously been called Stage 4 to be renumbered as Stage 3.

You specify the average time interval between trials for the current stage by typing a number into the Interval Between Trials text box. Intervals between trials are measured in minutes. The number you type must be an integer (a whole number without a decimal point). The shortest allowable average interval is 2 minutes; the longest is 20 minutes. Remember that you are specifying the average interval between trials. The actual intervals vary from trial to trial so that Sniffy cannot learn to anticipate when the next CS is going to occur.

The number you type into the box labeled Number of Trials determines the number of trials in the stage you are currently editing.

Below the Stage section of the dialog box are sections for defining the first stimulus (CS) and second stimulus (the stimulus, if any, that comes after the CS).

In Sniffy Lite, the first stimulus is always the light CS, and the duration of the light is always 30 seconds of Sniffy Lite program time.

There are two possible Second Stimulus settings: Shock US and None.

- Selecting the Shock US alternative causes the shock to follow each occurrence of the light during the stage you are currently editing.
- Selecting the None second stimulus alternative causes the light CS to occur without the shock on each trial of the stage you are currently editing.
Two buttons labeled Cancel and Save appear at the bottom of the dialog box.

- Choosing **Cancel** closes the Classical Conditioning Experimental Design dialog box without saving any of the experimental design settings or changes that you have made.
- Choosing **Save** saves the experimental design you have created (or any changes that you have made to the design) as a part of the current Sniffy file.

To run (execute) a classical-conditioning experiment that you have designed, select the **Run Classical Conditioning Experiment** command from the Experiment menu. Once the Run Classical Conditioning Experiment command has been executed, the Sniffy Lite program will run the experiment. *Be sure that the experiment is designed the way you want it before you execute the Run Classical Conditioning Experiment command!*

If you quit (exit) the program or open another Sniffy file after executing the Run Classical Conditioning Experiment command, you will be asked whether you want to save the file. If you save it, the program will begin running the classical conditioning experiment exactly where it left off when you open the file the next time.

If you realize you have made a mistake in setting up a stage of the experiment that has not already started to execute, you can choose the Design Classical Conditioning Experiment command and change the unexecuted stage(s).

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**The Sensitivity & Fear Mind Window**

Below is a picture of the Sensitivity & Fear mind window:
Mind windows display some of the parameters of the Sniffy Lite program that affect Sniffy's behavior. You should view them as representing Sniffy's psychological states. They are not measures of Sniffy's behavior. All mind windows have a blue background.

- The column labeled **Pain Sensitivity** depicts Sniffy's sensitivity to the shock US and predicts the strength of his UR the next time the US occurs. This column will always be at its midpoint throughout the experiments in Sniffy Lite.
- The column labeled **Fear** shows the current intensity of Sniffy's fear. Remember that this is not a measure of Sniffy's behavior; it is a measure of an internal psychological process. The more intense Sniffy's internal fear, the more likely he is to display fear behaviors, such as freezing. If Sniffy has been trained to press the bar (or perform any other operantly conditioned response), he will be less likely to display that behavior when he is afraid. If Sniffy has not been trained to perform an operantly conditioned behavior, a high level of fear will reduce his exploratory and other movements that are not related to fear.

### The CS Response Strength Mind Window

The CS Response Strength mind window displays the strength of the light CS's capacity to elicit a bar-press suppressing CR as a function of trials. Below is the CS Response Strength mind window as it would be displayed at the end of a one-stage experiment in which the light CS was paired with the shock US 10 times.

Note the following features of this CS Response Strength mind window:
The blue background color denotes that the CS Response Strength window is a mind window, not a measure of Sniffy’s behavior. The psychological state depicted is the strength of the light CS’s capacity to elicit a CR at the end of each trial. CS Response Strength predicts how strongly Sniffy will respond to a light the next time it is presented.

- The vertical axis of the graph indicates whether the CS Response Strength is excitatory or inhibitory. If a CS has an excitatory, positive tendency to elicit a bar-press-suppressing CR, its response strength will be greater than 0. In Sniffy Lite, the light’s CS Response Strength will always be greater than or equal to 0.

- Beneath the horizontal axis of the graph to the right of the word “Stage” is a row of numerals. The numerals denote the stage of the experiment in which each trial occurs. In this example, the row of numerals consists of ten 1’s because Stage 1 consisted of 10 trials and was the only stage in the experiment.

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**The Movement Ratio Window**

Below is the Movement Ratio window for this same experiment:

The white background of this window indicates that it contains a measure of Sniffy’s behavior. The Movement Ratio is the proportion of time during each CS presentation that Sniffy is frozen or manifesting other fear-related behaviors.

At the bottom of the graph, the row of numbers that appears to the right of the word “Stage” denotes the stage of the experiment.

The movement ratio is 0 on the first trial. After Trial 1, the movement ratio increases rapidly and then levels out at around 0.7.
We believe that most users will be using a file in which Sniffy has not previously been trained to bar-press for their classical conditioning experiments. However, for the benefit of those using files where Sniffy has previously been trained to bar-press, we depict a cumulative record showing how the Sniffy Lite program records events during classical conditioning experiments. Prior to the classical conditioning experiment described earlier, Sniffy had been trained to press the bar in his operant chamber, and his bar-pressing behavior was being maintained on a VR-25 schedule of reinforcement, which means that he had to press the bar an average of 25 times to obtain a pellet of food.

- The characteristics of the cumulative record as a measure of bar pressing and other operantly conditioned behaviors is described in detail in Chapter 5.
- The cumulative record will not contain any useful information unless Sniffy has been trained to bar-press or perform another operant behavior. Users who are not using an operantly conditioned animal for their classical conditioning experiments should ignore this response measure.
- We strongly recommend that users who plan to use an operantly conditioned rat for studies of classical conditioning use an animal that is being maintained on a VR-25 schedule.
- At the left side of the record, near the middle, and on the right side, are the numeral 1 with a short horizontal bar under it, and lettering below the bar that reads “Light: US”. The numeral 1 indicates that these three trials occurred in Stage 1 of the experiment. The horizontal bar under the 1 marks the duration of the CS. The lettering below the horizontal bar indicates that the light CS was presented and that it was followed by the shock US.
The Suppression Ratio Window

For the benefit of users who are using an operantly conditioned animal for their classical conditioning experiments, here is the Suppression Ratio window for the same experiment. This response measure produces useful information only for animals that have previously been operantly conditioned.

- The white background of this window indicates that it contains a measure of Sniffy's behavior.
- At the bottom of the graph, the row of numbers that appears to the right of the word “Stage” denotes the stage of the experiment.
- The suppression ratio is about 0.5 on the first trial. After Trial 1, the suppression ratio decreases and then levels out at or just above 0 for the remainder of the experiment. Thus, the light CS acquires the capacity to elicit almost complete suppression of bar pressing.

How to Get Reliable, Comparable Results

The movement ratio is a very robust measure of Sniffy’s classically conditioned fear behavior—so robust that it provides a useful response measure whether or not Sniffy has been operantly conditioned to press the bar in the operant chamber or to perform any of the other operantly conditioned behaviors that Sniffy is capable of learning.

However, the suppression ratio depends on measured changes in Sniffy’s bar-pressing performance. The Sniffy Lite program computes the suppression ratio by comparing the number of responses that Sniffy makes during the 30-second CS with the number of responses that he makes during the 30-second period just before the CS was presented. To make this measurement reliable, it is critically important that Sniffy be pressing the bar at a rapid, steady rate unless his response rate is...
being reduced because he is showing either a CR or a UR. If Sniffy is not pressing the bar at a steady rate, you will obtain erratic results because the value of the suppression ratio is affected by the number of bar presses that Sniffy makes during the 30 seconds prior to each CS presentation.

Variable-ratio (VR) schedules produce rapid, steady bar-press performances that make ideal baselines against which to measure suppression ratios. Thus we strongly recommend that you use a VR-trained Sniffy as the starting point for all your classical conditioning experiments that employ the suppression ratio as a response measure. Demonstrating many of the more advanced classical conditioning phenomena that the Sniffy Lite program simulates requires comparing the suppression ratios that Sniffy manifests under different experimental conditions. Whenever such a comparison is necessary, your results will be meaningful only if you use a Sniffy file with the same baseline performance characteristics (a Sniffy trained on the same reinforcement schedule) in each of the different experimental conditions.

The surest way to get predictable, comparable results both within and between experiments using the suppression ratio as a response measure is to use the same baseline Sniffy file as the starting point for all your classical conditioning experiments in which you want to use the suppression ratio as your response measure. The baseline that we used for calibrating the Sniffy Lite program is the VR-25 file located in the Sample Files folder. We recommend that you use it as your classical conditioning baseline in all experiments where the suppression ratio is being used as your classical conditioning response measure. For experiments employing the movement ratio as the response measure, we recommend that you start all your classical conditioning experiment with a new (that is, untrained) Sniffy file.

### Putting Everything Together to Understand Classical Conditioning

During a classical conditioning experiment, you can observe four things:

- **Occurrences of the CS and US.**
- **Changes in Sniffy’s psychological states.** These changes are visible in the Sensitivity & Fear and CS Response Strength mind windows.
- **Sniffy’s responses to the CS and US,** and especially how his response to the CS changes as a function of experience. You can observe
Sniffy’s responses to these stimuli simply by watching Sniffy’s behavior during and after their presentation.

- **Response measures.** If Sniffy has been trained to bar-press or to perform any of several other automatically recordable operant behaviors, the Cumulative Record contains raw data about occurrences of the chosen operantly conditioned behavior throughout the experiment, shows when the different classical conditioning stimuli occur, and enables you to view the ways in which the stimuli affect Sniffy’s operantly conditioned behavior. The Movement Ratio window shows the proportion of time during each conditioned stimulus that Sniffy is manifesting fear behaviors. The Suppression Ratio window contains the classical conditioning response measure that psychologists typically employ in CER experiments.

Being able to see how stimulus events produce psychological changes, which in turn produce behavior changes, which in turn are reflected in behavioral measurements, should enable you to develop a thorough understanding of the way in which psychologists believe classical conditioning works.

### Exporting Your Results to Other Programs

During a classical conditioning experiment, the Sniffy Lite program enters data into the Movement Ratio, Suppression Ratio, and CS Response Strength windows. These graphs are saved as part of the Sniffy Lite file so that you can go back and examine your results after an experiment has been completed.

You can also export Suppression Ratio and CS Response Strength results to a spreadsheet or statistical analysis program where you can perform additional data analyses or produce more sophisticated graphs. To export the numeric data on which both the CS Response Strength and Suppression Ratio graphs are based:

- Click your left mouse button once while pointing the cursor at the Movement Ratio, Suppression Ratio, or CS Response Strength window.
- Choose the Export Data command from the File menu. Executing the Export Data command will bring up the standard dialog box for creating and saving a new file.
Choose an appropriate name and location on your hard drive for your data export file and click OK.

Printing All the Contents of a Data Window

You can print the contents of any response measure or mind window that the Sniffy Lite program produces. To print the contents of a window:

- Select the window by placing the cursor over it and clicking your left mouse button once.
- Execute the Print Window command in the File menu.
- Make the necessary selections in the printing dialog box that appears.

Copying and Pasting the Visible Portion of a Window

With the exception of the Operant Chamber and the Lab Assistant, the visible portion of all the windows that the Sniffy Lite program produces can be copied and then pasted into a word-processing or graphics program that accepts pasted images. To copy and paste the visible portion of a Sniffy window:

- Open your word-processing or graphics program and determine where you want to paste the image that you are going to copy from Sniffy Lite. In a word processor, it’s a good idea to go to the place in your document where you want to insert the image and to create a blank line there.
- Open the Sniffy Lite data file containing the window whose image you want to copy.
- If necessary, make the window that you want to copy visible by selecting it from the Windows menu.
- Make sure that the window that you want to copy is selected by clicking on it once.

The only window whose contents cannot be printed is the operant chamber, the window in which you see Sniffy moving around.
Execute the Copy Window command in the Sniffy Lite program’s Edit menu.
Move back to your word processor or graphics program.
Execute the word processor’s or graphics program’s Paste command, which will probably be under that program’s Edit menu. (Some programs have a special paste command for pasting images.)
The graphic contents from the Sniffy Lite window will appear in the other program’s document.
Important Technical Information

- In the following exercises, the instructions for saving Sniffy Lite files direct you to select an appropriate destination on your computer's hard disk. It is extremely important that you get into the habit of saving your Sniffy Lite files on the hard disk of the computer that you are using. Never save a file on a floppy disk. Sniffy files can grow to be quite large. If you try to save a large Sniffy file on a floppy disk that does not have enough room to accommodate it, the program will not be able to save the file successfully. As a consequence, the time and effort that you have invested in doing an exercise may be lost. This potential problem results from the limited storage capacity of floppy disks. It is not a problem with the Sniffy Lite program. Similar problems arise with any program that produces large files.
- If your instructor wants you to hand in your Sniffy Lite files on floppy disks, you should initially save the files on your computer's hard disk and then copy the saved files from the hard disk onto one or more floppy disks.
- If you do not have your own computer and must therefore store your Sniffy Lite files on floppy disks, you should initially save the file on the hard disk of the computer that you’re using, then copy the files onto one or more floppy disks. You should then copy the files from the floppy disks back onto the hard disk of the computer that you’re using before you try to work with the files again.
- You need to keep track of where you save your Sniffy Lite files on your computer’s hard disk so that you can find them easily when you need to. A very good place to keep them is in the Sniffy Files
folder that was installed on your hard drive when you installed the program.
❖ If you require additional information about saving files, see the Appendix at the back of this manual.

Accelerating Time

Some of the Sniffy Lite experiments that you will be performing require an hour or two of both clock time and program time to complete when your computer is displaying all Sniffy’s movements. To enable you to run long experiments faster, we have made it possible for you to make Sniffy invisible so that your computer can run the experiments as fast as possible. Selecting the Isolate Sniffy (Accelerate Time) command from the Experiment menu simulates enclosing Sniffy’s operant chamber in a sound-proof, air-conditioned container of the type used in many laboratories to isolate an easily distractible live animal from extraneous stimuli that might divert the animal’s attention from the experiment itself. When he is hidden, the window in which Sniffy is normally visible will look like this.

The amount of time acceleration that isolating Sniffy will achieve depends on the speed of your computer. With a relatively slow computer,
5 minutes of program time may pass in 90 seconds. With a fast computer, 5 minutes of program time may be compressed into 5 seconds or less. To make Sniffy visible again, click on the handle in the isolation window or choose the **Show Sniffy** command from the Experiment menu. The Isolate Sniffy (Accelerate Time) and Show Sniffy commands replace each other in the Experiment menu: The Isolate Sniffy (Accelerate Time) command is available whenever Sniffy is visible; the Show Sniffy command is available whenever Sniffy is isolated.

**Warning:** Don’t let accelerated time get away from you. *If you are running an experiment using time acceleration and want to be able to add new stages to the experiment later, you need to keep an eye on things and stop the experiment when the exercise you are currently performing is complete. There is a time limit of 20 hours of program time for each Sniffy experiment, at which point no more data can be collected. If your computer can run an experiment 20 times faster than clock time when Sniffy is isolated, an hour of program time will elapse in 3 minutes. Unless you watch what’s going on, it’s easy to run an experiment for several “hours” longer than you intended.*

The Sniffy Lite program includes two useful features to help you avoid running a time-accelerated experiment longer than you intended:

- The program signals the end of a classical conditioning experiment by beeping at the end of the last currently programmed classical conditioning trial. When you hear that sound, save the file and either quit (exit) the program or set up the next exercise that you want to perform.
- The Lab Assistant informs you about the status of your experiment. When a classical conditioning experiment is in progress, the Lab Assistant window provides several kinds of self-explanatory information about what is going on. When the classical conditioning experiment is complete, the Lab Assistant’s message will change.

**Another Time-Saving Hint**

If your computer has enough random access memory (RAM), you can set up a Sniffy exercise and let the program run the experiment in the background while you do something else on your computer. The program will run more slowly in the background than in the foreground.
but that speed difference may be offset by the convenience of being able to do something else while the program is performing an experiment.

**Background to the Classical Conditioning Exercises**

**Acquisition** (learning) of a classically conditioned response is produced by repeatedly presenting the CS followed by the US. As a result of this acquisition procedure, the CS gradually acquires the capacity to elicit a new response (CR) that in most forms of classical conditioning resembles the UR. Once a classically conditioned response has been acquired, it can be eliminated by repeatedly presenting the CS alone, without the US. Elimination of CR by repeatedly presenting the CS without the US is called **extinction**. If the animal is removed from the experimental situation for a day or so after a CR has been extinguished and then returned to the experimental setting and given a second extinction session, it is likely that CR will occur again during the first few trials of the second extinction session. This reappearance of a previously extinguished CR is called **spontaneous recovery**. Early in the second extinction session, the CR is stronger than it was at the end of the first extinction session but weaker than it was at the end of acquisition.

**Exercise 1: Basic Acquisition of a CR**

Acquisition is produced by setting up a series of trials in which a CS regularly precedes occurrences of the US. The following steps describe how to set up and run an experiment in which Sniffy receives 10 pairings of the light CS with the shock US.

- If you plan to use the movement ratio as your measure of classical conditioning, simply start the Sniffy Lite program or, if the program is already running, choose the New command from the File menu.
- If you want to employ the suppression ratio as a response measure, open a file in which Sniffy has been fully trained to bar press on a VR schedule. We recommend that you copy the file.
Exercise 1: Basic Acquisition of a CR

Exercise 1: Basic Acquisition of a CR
	named VR-25 that is located in the Sample Files folder, and use it as the baseline file for this and all your classical conditioning experiments that employ the suppression ratio as a response measure.

- Use the Save As command in the File menu to save the file under an appropriate new name (for example, Ex1-ClassAcq) on your computer’s hard drive. We strongly recommend you save it in the Sniffy Files folder that the installation instructions directed you to create in an appropriate place on your hard drive. If you are running the Macintosh version of the program, the Sniffy Files folder that we asked you to create on your hard drive when you installed the program is the best place to keep all your Sniffy files. If you are running the Windows version of the program, we suggest that you save this exercise and all future exercises in the Sniffy Lite for Windows folder that the installer program created. That folder is inside the Program Files folder at the root level of your hard drive.¹

- Choose the Design Classical Conditioning Experiment command from the Experiment menu. In the Classical Conditioning Experiment Design dialog box, do the following:
  - Note that the numeral 1 appears after View/Edit Experiment Stage. This indicates that you are setting conditions for the first stage of the experiment.
  - Make sure the numeral 5 appears in the text box located to the right of Interval Between Trials, indicating that the average interval between trials will be 5 minutes.
  - In the text box located to the right of Number of Trials, type 10.
  - In the Second Stimulus panel of the dialog box, make sure that the shock US is selected.
  - Carefully check to see that all the settings are correct.
  - Click the Save command button.

- After the Experimental Design dialog box has closed, choose the Run Classical Conditioning Experiment command from the Experiment menu.

- If you want to speed up execution of the experiment, select the Isolate Sniffy (Accelerate Time) command from the Experiment menu.

¹If you need additional information about how to save files, see the Appendix at the back of this manual.
menu. If you use this feature, be careful not to let the program run very long after the experiment is completed. You will need the file that this exercise creates in the next exercise.

- After the last acquisition trial, save your results by selecting the Save command from the File menu.

During the next 50 minutes of program time, the program will automatically run the experiment. While the program is running, the Movement Ratio window will draw a bar graph that shows Sniffy’s movement ratio as a function of trials. At the same time, the CS Response Strength mind window will produce a line graph depicting changes in the CS’s capacity to elicit a CR.

At the end of the experiment, your Movement Ratio and CS Response Strength windows should resemble the following.  

2The CS Response Strength mind window shown here is from Windows XP. If you are running another version of Windows or the Mac OS, the contents of the mind window should look exactly like that shown, except for the format of the window borders.

The contents of mind windows depict processes that are parts of Sniffy’s learning algorithm, and these parameters are completely determined by the settings that you make in the Classical Conditioning Experiment Design dialog box. However, the resemblance between the Movement Ratio window shown and the one you get will be less exact. The movement ratio is a measure of Sniffy’s actual behavior. As Sniffy learns, the learning algorithm changes the probability that Sniffy will behave in certain ways, but does not completely determine what Sniffy does. Because the learning algorithm only changes the probabilities with which behaviors occur, the details of the movement ratio result will be different each time the experiment is performed.
During acquisition, the movement ratio starts at 0 on the first trial, then rises and levels off at about 0.7. This increase in the movement ratio means that the light CS is acquiring the capacity to induce freezing and other fear-related behaviors. At the same time the movement ratio is increasing, the CS Response Strength mind window shows that the light’s capacity to elicit fear as a psychological process is also increasing. Remember that the Movement Ratio window depicts a change in Sniffy’s behavior, while the CS Response Strength mind window depicts the change in Sniffy’s psychological state that influences the behavioral change.

If you performed the experiment with a file in which Sniffy had previously been trained to bar-press, the Suppression Ratio window should resemble that shown here:

During acquisition, the suppression ratio starts out at around 0.5 on the first trial, then declines and levels off at an average value a little above 0. This decrease in the suppression ratio means that the light CS is acquiring the capacity to suppress Sniffy’s bar pressing. You could verify this fact by examining the cumulative record. During the last several trials, you would note that Sniffy stops pressing the bar very quickly after the light comes on.

With a real rat, the animal's changing response to the CS would be the only thing that a psychologist could observe. Many psychologists explain this behavior change by postulating that it results from a change in an unobservable psychological process. With the conditioned emotional response, the acquired capacity of a CS to elicit freezing and to suppress bar pressing or other operantly conditioned behaviors is thought to be the result of an increasingly intense fear response. During CS presentations, Sniffy’s Sensitivity & Fear mind window displays the strength of Sniffy’s current fear, and the CS Response Strength mind window shows how strong the fear response will be when the CS is presented the next time. With Sniffy Lite, you can observe both the behavior change and the change in the Sniffy Lite
program’s classical conditioning algorithm, Sniffy’s psychological state, that causes Sniffy’s behavior to change. We have designed Sniffy’s classical conditioning algorithm to resemble theoretical processes that psychologists (for example, Guthrie, 1960; Hull, 1943, 1952; Rescorla & Wagner, 1972) have postulated in an effort to explain classical conditioning. However, nobody has ever seen anything closely analogous to CS Response Strength in a rat’s brain, and many psychologists assert that it’s impossible, even in principle, to observe the psychological (mental) processes of real animals. We believe that the Sniffy Lite program’s mind windows will help you understand psychological explanations of classical conditioning, but it’s important to remember that they do not provide any deep insights into the workings of the “animal mind.”

An interesting point to note is that the movement ratio and suppression ratio measures of Sniffy’s response to the CS are not a perfect reflection of Sniffy’s internal fear response. As the CS Response Strength and the Sensitivity & Fear mind windows show, Sniffy’s fear response is at an almost constant high level during the last several acquisition trials. Yet the value of Sniffy’s movement ratios and suppression ratios fluctuate somewhat from trial to trial. These behavioral measures vary because Sniffy’s behavior is determined by a complex set of probabilities. Changes in Sniffy’s learning algorithm (Sniffy’s psychological state) change the probabilities with which fear-related behaviors occur, but Sniffy’s behavior is always probabilistic and somewhat variable.

These variations in Sniffy’s movement ratio and suppression ratio are somewhat analogous to the results that you obtain if you repeatedly perform an experiment in which you toss a coin 10 times. On any given coin toss, the probability that the coin will come up heads is equal to the probability that it will come up tails. For this reason, if you perform a great many 10-toss experiments, the average number of heads will be 5; however, the exact number of heads will vary from experiment to experiment. Sometimes you will get 5 heads, sometimes 7 heads, and sometimes 4 heads. The operation of similar processes accounts for the variation that you see in Sniffy’s response measures. The response measures vary because Sniffy’s behavior is probabilistic. After every movement Sniffy makes, there are several things that he could do next. His experiences in the operant chamber change the probabilities of his behaviors, but the program is designed in a way that ensures that we can never know in advance exactly what Sniffy will do next. Even under very similar conditions, Sniffy doesn’t always do the same thing. This variability in Sniffy’s behavior is what ac-
counts for the variability that we see in the classical conditioning response measures. The behavioral measures that psychologists obtain with real animals vary in a similar fashion and possibly do so for somewhat similar reasons.

**Exercise 2: Extinction**

These instructions assume that you have already run the acquisition experiment described in Exercise 1. To set up a series of 30 extinction trials, you should follow the steps listed below. You need to conduct more extinction trials than acquisition trials because the CER extinguishes much more slowly than it is acquired.

- Start the Sniffy Lite program and open the file that we suggested you name Ex1-ClassAcq, in which Sniffy acquired a CR to the light CS.
- Use the Save As command to save the file under a new name (e.g., Ex2-ClassExt) in the Sniffy Files folder on your computer’s hard drive.
- Choose the Design Classical Conditioning Experiment command from the Experiment menu. The Classical Conditioning Experiment Design dialog box opens to Stage 1. All the options for defining conditions are dimmed because Stage 1 has already been run.
- In the Classical Conditioning Experiment Design dialog box, make the following settings to define Stage 2, which will contain your extinction trials:
  - Click on the command button labeled New Stage. The number after View/Edit Experimental Stage changes from 1 to 2 to indicate that you are now working on Stage 2 of the experiment. Because this is a new stage that has not yet been run, all the options are available.
  - In the Stage section, be sure that the numeral 5 appears in the text box after Interval Between Trials, and type 30 in the text box located to the right of Number of Trials. These settings indicate, respectively, that the average interval between trials will be 5 minutes and that there will be 30 trials.
  - In the Second Stimulus panel, choose None.
  - Carefully check your settings.
Click on the Save button at the bottom of the dialog box to save the experimental design.

- After the Classical Conditioning Experiment Design dialog box closes, choose the Run Classical Conditioning Experiment command from the Experiment menu.

- If you want to speed up the experiment, select the Isolate Sniffy (Accelerate Time) command from the Experiment menu. Because you will need to use the file from this exercise as the starting point for the next exercise, you want to avoid inadvertently letting the program run for very long after this exercise is complete.

- When the program has finished running the experiment, choose the Save command from the File menu to save your results.

During the next 150 minutes of program time (less if you choose Isolate Sniffy), the Sniffy Lite program will automatically give Sniffy 30 extinction trials—that is, 30 trials during which the CS occurs without the US. As the program executes, the Sniffy Lite program will draw a graph showing Sniffy’s movement ratio on each trial in the Movement Ratio window and the strength of the light’s capacity to elicit fear at the end of each trial in the CS Response Strength window. At the end of extinction, your Movement Ratio and CS Response Strength windows should resemble the following:

![Graphs showing Movement Ratio and CS Response Strength](image)

The Movement Ratio window shows that repeatedly presenting the CS without the US causes the CS to gradually stop eliciting freezing and other fear-related behaviors. The CS Response Strength window...
Exercise 3: Spontaneous Recovery

Here are the steps that you need to follow to observe spontaneous recovery:

- Open the file that we suggested you call Ex2-ClassExt from Exercise 2, in which Sniffy was first conditioned in Stage 1 and then extinguished in Stage 2.
- Use the Save As command to save the file under an appropriate new name (e.g., Ex3-ClassSponRec) in the Sniffy Files folder on your computer’s hard drive.
- Under the Experiment menu, choose Remove Sniffy for Time Out. This operation simulates removing Sniffy from the operant chamber, leaving him in his home cage for 24 hours, and then returning him to the experimental situation.
- Choose Design Classical Conditioning Experiment from the Experiment menu and make the following settings in the Classical Conditioning Experiment Design dialog box to give Sniffy a second 15-trial extinction session:
  - The dialog box opens (as always) to Stage 1. All alternatives for defining trials and stimuli are dimmed because Stage 1 has already been run.
  - To define a new Stage 3, you must first move to Stage 2 because new stages are always inserted immediately after the...
stage currently being displayed. Click on Next Stage to move to Stage 2, which has also already been run.

- When you reach Stage 2, click on New Stage to create the new Stage 3 after Stage 2. Note that the numeral 3 is now present after View/Edit Experiment Stage.
- Ensure that the Interval Between Trials is set at 5 minutes.
- Set Number of Trials to 15.
- In the Second Stimulus panel, choose None.
- Carefully check your settings.
- Click on the Save command button at the bottom of the dialog box to save the experimental design.
- After the dialog box closes, choose the Run Classical Conditioning Experiment command from the Experiment menu.
- If you want to speed up the experiment, select the Isolate Sniffy (Accelerate Time) command from the Experiment menu.
- When the experiment has finished running, save the file.

As Stage 3 executes, the movement ratio will be graphed as a function of trials in the Movement Ratio window, and the strength of the light’s capacity to elicit a fear response will be graphed in the CS Response Strength mind window. At the end of the experiment, these two windows should resemble those shown next:

![Graphs showing Movement Ratio and CS Response Strength](image)

If your Sniffy was trained to bar-press on a VR schedule, your Suppression Ratio window should resemble the following:

![Suppression Ratio Graph](image)
Some Questions and Things To Do

- Compare and contrast the movement ratio and the suppression ratio as response measures in classical conditioning.
- As the strength of an animal’s fear response increases, the value of the movement ratio increases, but the value of the suppression ratio decreases. Why? How can two measures of the same thing move in opposite directions as the strength of the thing measured increases?
- Why do you think that most psychologists studying live rats use the suppression ratio and not the movement ratio as their response measure?