

LAB MANUAL

Psychology 1410 - Analysis of Behavior

Introduction

Welcome to the Basic Behavior Principles Laboratory. A lab experience much like the one you will have has accompanied this course since 1960. The purpose of this lab is to give you hands-on experience with a live, therefore behaving, organism in a semi-controlled environment. This experience will provide training in the dynamics of teacher-student interaction. You will train/teach your subject/student, utilizing the principles and procedures of **operant conditioning** to which you are exposed in the classroom and from the textbook. Each pair of students will have activities to perform during the conduct of a set of specified exercises. Plan to attend lab every consecutive day for three weeks (excluding weekends). The lab staff will care for the rats on weekends.

Laboratory Subjects

You will be provided a 90-120 day-old albino, male rat. This animal is for use in this lab only. You CANNOT take it out of the lab nor can you keep it at the end of the lab. Male rats, as opposed to female rats, are most commonly used as lab subjects in behavioral research so as to avoid the confounding variable of the 4-day female estrus cycle. These *Sprague-Dawley* albino rats have been selectively bred for being docile (and very smart) and they will have been previously handled but not trained. You will work with your student (your rat), with your lab partner, and with the highly skilled Lab Instructor in performing all exercises and achieving all lab objectives as described in this manual. The rat and the pigeon are the major tools of the basic behavior scientist. A good behavior scientist takes very good care of his tools!

Handling

The proper method of handling your rat will be demonstrated by the course instructor and the Lab TA. (You may use a glove or not, but it really isn't necessary.) DO NOT PICK THE RAT UP BY THE TAIL! It can be painful to the rat and as a consequence, there is a high probability of their twisting about and they may bite you (a case of pain-elicited aggression). To correctly, and appropriately, pick up your rat, place your palm over the animals back and wrap your thumb and fingers gently around the chest. Pick it up slowly and support it from underneath on the palm of your other hand. If the rat struggles, loosen your grip, rather than tighten it. Try not to make any jerky or quick movements that may startle or injure your rat. If the rat appears "restless", or uneasy, allow it to walk back and forth between your hands. As a general rule remember: things will go smoother between the subject/student (rat) and the trainer/experimenter (you) if there is no threat of danger and if neither handler nor rat experience pain.

Note: FINGERS INADVERTENTLY POKED NEAR OR INTO THE CAGES MAY GET BITTEN. Food pellets and fingers sticking into a cage may appear similar to the rat. If, by some odd chance you do receive a rat bite you should: first, replace the rat in its home cage, (try not to drop and do not throw it), then second, rinse the wound with tap water and apply a Band-Aid. You will not catch any disease from the rat, they are disease free, however, a break in the skin will expose you to infection from other sources. So, applying a mild disinfectant and a covering is usually all that is needed.

Care

YOU are personally responsible for the health and well-being of your rat, especially feeding, weighing, and watering it every day! (Staff will care for the animals on the weekends.) Food should be available at all times. Since water is being used as a reinforcer, it is necessary that the rat be thirsty. Thirst is operationally defined in terms of hours of water deprivation, in this case the critical establishing operation. Rats get all the water they need when they are watered for about ten minutes per day or receive 50 or 60 reinforcers in the classroom training chamber. Except for the water provided as reinforcement during lab exercises in the chamber (classroom), this is the only additional water they require or should receive. (There are exceptions and you need always check with the lab instructor if you have questions.) If any questions arise ask your lab instructor or the course instructor.

Note: DEATH OF A SUBJECT DUE TO IMPROPER CARE, NEGLECT, OR MISTREATMENT WILL RESULT IN AN "F", if not worse. If the lab instructions are carefully and completely adhered to there will be no problem with the rats and they will remain healthy and apparently happy (who would actually know?). The lab instructors will check every animal in the lab on a daily basis for the appearance of good health and proper care. Free water is provided each rat after the last lab meeting on each Friday and the water bottle is then removed on Sunday so that the rat is ready to work on Monday.

Weight

Weight must be carefully monitored as it is the best indicator of health. You are responsible for accurately weighing your rat daily (at the beginning of the lab period). The free feeding weights (normal weight established before deprivation) have been recorded for you on the card identifying your rat. Your rat will be given to you already on 24+ hrs water deprivation, so the shaping procedures can be implemented as soon as possible in *session one*. It is your responsibility to calculate the 80% weight of your rat and make sure the rat's weight does not drop below 80% (this is very unlikely). Weight should be monitored and recorded daily on a lab sheet and turned in with the free feeding weight entered as well. Incidentally, when a rat is water-deprived, it eats less food; which is responsible for the weight loss you will observe. You can rest assured, however, that this level of deprivation is not dangerous; on the contrary, it facilitates the learning process, and the animals' longevity as well. Typically the 80% weight of a lab subject is about the same as the free feeding weight of a free ranging animal.

(80% wt. = FFW x .80).

However, IT IS YOUR RESPONSIBILITY TO MONITOR AND MAINTAIN YOUR RAT'S WEIGHT EVERY DAY. ALERT YOUR INSTRUCTOR IF THE WEIGHT DROPS NEAR OR BELOW 80%!! Any rats which are not weighed for two consecutive days (the lab instructor will care for the animals over weekends) will be removed from the lab and their tutors will be unable to continue and will therefore not receive credit for attendance. After the final session on each Friday a full water bottle is placed on the home cage and will remain there until Sunday morning.

The Apparatus

Before starting any experiment, familiarize yourself with the operant chamber and the features you will be using during the experiment. It is helpful, and often necessary, to have a partner to help run the controls of the chamber during some of the experiments. Note the following:

1. "AC Power" on the yellow (or blue) box turns the unit ON. This box must be plugged into a wall outlet.
2. Water dipper hand control switch: this switch operates the dipper. This is a momentary switch on a long cord. Depress the switch briefly but long enough for the dipper to complete a down/up cycle. Try this out several times before placing your rat in the chamber. **Be sure there is adequate water in the dipper pan.**
3. Light switch: this light is used in various stages of the lab experiments. You operate the light with the small 2-way red switch as appropriate to the instructions in the exercise.
4. Water Pan: Make sure that your dipper pan has sufficient water. If the water level is low, alert the lab assistant. Please only allow the lab assistant to provide new or additional water.
5. Bottom waste tray: simply slide out from the bottom. This needs to be wiped out (rinsed if necessary) and perhaps covered with a fresh paper towel at the end of your lab. Wipe off the floor bars with a wet paper towel after each session. You should expect a fresh cage at the beginning of each lab day; please pass this courtesy on to the person who will use your chamber next.

Daily Lab Sheet

It is imperative that you and your partner fill out and hand in the lab sheet every day. Credit for attending cannot be given without it. If data appropriate to that day is not ready at the end of the lab, hand in the sheet anyway and note that the appropriate graph, for example, will be handed in the following day.

CHECK-LIST FOR EACH DAILY LAB

Make sure you do each of the following every day in order to avoid laboratory catastrophes!!

1. **Read, and re-read**, the appropriate procedures from this lab manual. Start filling in the daily worksheet.
2. Be sure YOUR HANDS are clean BEFORE TOUCHING ANYTHING.
3. **Conduct apparatus check**: Make sure the equipment functions properly. Behave as though you are the rat; press the lever, check water delivery, note the conditions of the light, etc. Note: Let your lab assistant make any adjustments regarding water delivery or other equipment operations.
4. Weigh and record your rat's weight on the daily lab sheet.
5. Place rat in the chamber and conduct correct exercise(s) (be sure you know what the next two exercises are every day). When your TA approves, remove your rat from the chamber and return it to the correct home cage. Fill out daily lab sheet.
6. Hand in daily lab sheet in appropriately-marked place. Lab sheets that are not submitted in the designated area cannot be accounted for.
7. **Clean around your station**. Wipe out the chamber pan and change the paper in the bottom of the chamber.

8. It is a good idea to WASH YOUR HANDS BEFORE LEAVING.
9. Make sure the rat has food pellets in its home cage and that the lid is on correctly.
10. Make sure your rat has appropriate food and water each Friday, check with the instructor. Rats are placed on "free" water over Friday night.

Signing out of Lab

At the end of the complete lab (three weeks or when your TA agrees you are completed) and in order to get any grade in this course, you must do the following and have them checked off by your lab instructor:

1. Complete all lab exercises satisfactorily. Again, make sure each is checked off, otherwise no credit can be given. This is your responsibility!
2. Place half-full water bottle on the animal's cage at the appropriate time.
3. Remove the DO NOT WATER label from the cage. Lab rats cannot be taken home. They are considered University property and removal is considered theft.

Criteria for Lab Completion

Experiment completion: You must complete each of the prescribed exercises.

Attendance: Points are not given for the lab as it is a pass-fail experience. One missed day can have serious ramifications. You need to pass the lab and to do that you have to be present. Having said that, if you are going to be absent (and only one such day is acceptable), contact your lab instructor and your partner, or, as a last resort, the course Teaching Assistant or instructor. Note: Regardless of the excuse (in jail, in hospital, out of state) you MUST be here for the specified days in order to receive lab credit. If there is an emergency and you cannot attend for an extended portion of the lab, it may be possible to make arrangements to make up the lab the following semester.

Important:

Read through all of the experiments prior to beginning them. Remember that success with Experiments 1, 2, and 3 are critical for completing subsequent experiments so take your time and be thorough, there is no rush.

Good luck in your work!

Experiment Instructions

Experiment 1 - Magazine Training

I. Preview

A. The purpose of this lab exercise is to magazine train your subject. The point here is to establish the sound of the dipper as a conditioned reinforcer. You do this by pairing the sound of the dipper operation with the water in the dipper. You will activate the dipper when the student is near the dipper. Repeat presentations as the rat is standing with his head in the dipper magazine. The goal is to have the rat approach the water delivery area and drink whenever water delivery is made. Since water delivery has an auditory cue, the click,

you must be quiet and attend to the rat's behaviors to be effective in magazine training/shaping.

II. Procedures

- A. Complete the daily lab checklist as far as possible.
- B. Light over the bar should be **ON**. You are to establish the sound of water delivery as a conditioned reinforcer. You will pair the sound and water as your rat drinks from the dipper by delivering water frequently as he stands there. Gradually begin delivering water later as the rat moves further away from the water dipper. "Shape" the rat to move away from the dipper by activating the dipper when he moves a bit further away after each delivery. This may take 30 to 40 deliveries.
- C. Have lab instructor observe your rat and sign off lab Experiment #1. This may take all of session one. Don't rush, this is critical behavior. Fill in lab sheet and turn it in.

D. Data

- D. Number of reinforcers delivered.
 - E. Time in the chamber.
- C. Rat weight.

III. Completion Criteria

- A. The rat must be on the far side of the chamber and respond by moving quickly to the water dipper immediately after water delivery has been made. After it consumes the reinforcer the rat must move back to the far side of the chamber and wait for the next reinforcer to be delivered. You must demonstrate that the rat can do this 8-10 times successively with the lab assistant observing before you will be given permission to move onto Experiment 2.

Experiment 2 - The Bar Press

Preview: You will shape the rat to press the bar (the lever on the wall).

Procedures:

1. Daily lab checklist
2. S+ light is ON
3. Shape the bar press:

Shape (reinforce with dipper activation) rat movement toward the bar (lever) side of the chamber, then Shape movement towards the lever, then Shape touching the bar (with any part of body), Shape pressing the lever such that you can see/hear a switch closure.

When bar pressing is established allow the rat to bar press on a CRF schedule for 6-8 minutes (20-30 reinforcers).

Ask lab instructor to sign off lab Experiment #2. During this time record data and fill in lab sheet completely. Turn in lab sheet.

DATA:

1. Number of Reinforcers delivered.
2. Total time spent training the bar press.
3. Shaping Criterion at each step.

Completion Criteria :

The subject presses the bar (and you press your switch to activate the dipper) in a rapid and efficient manner for at least 20 consecutive responses.

Experiment 3 - Establish a Discriminative Stimulus for Bar Pressing

Preview : In this lab exercise you will establish the light over the bar as an S+ (SD discriminative stimulus) for bar pressing. Final performance - When the light is ON (SD present) the rat should press the lever promptly and frequently. When the light is OFF (S-), the rat should not press the lever.

You will need to collect baseline data as well as final data. This is to show that the rat learned to discriminate through training. During baseline it is important to remember the rat must have been reinforced for bar pressing in both conditions (i.e. Light ON and OFF). During the experiment only leave the light ON each time for 2-3 successive responses and reinforcers, so as to slow satiation. While in training use extinction in S- and CRF in S+. (Then switch to turning ON the light when the rat is away from (not pressing) the bar.) Since the light ON is an S+ it will reinforce the rat for being away from the bar when the light is OFF. (With the light OFF going away produces the light ON.)

Procedure:

Daily lab checklist

Collect Baseline data for 4 minutes:

S+ light is ON for 1 min then OFF for 1 min - alternate but continue to reinforce CRF **regardless** of light condition.

Record bar presses per minute, 4 minutes total.

Minute 1: light ON, minute 2: light OFF, minute 3: light ON, minute 4: light OFF. This provides baseline pressing rate with light on and off.

Discrimination Procedure:

S+ light is ON to begin with.

With the light ON, allow rat 3-4 reinforcers for bar pressing. Turn S+ light OFF and DO NOT deliver any reinforcers. Leave light off until rat has not pressed or attended (touched, played with, investigated) the bar for at least 5 seconds (this can take awhile so be patient).

When rat is not near the bar turn light ON and allow the rat to press the lever and be reinforced 2-3 times, turn light off. Gradually increase the interval of no light and no lever pressing. When rat does not respond for a one minute light off period do a 6 minute test (alternate light on/off one min each) as in baseline data collection, (but do not make water available when light is off.) with the LA present. Graph this data minute by minute. Fill out lab sheet completely with data included and turn in to the lab assistant.

Data

Baseline data (responses per minute during 4 min test)

Final 6 minute test data (responses per minute on same graph as baseline data)

Total number of reinforcers delivered

Completion Criteria:

When the light is ON, the rat presses with gusto (>2 sec latency and more than one press per S+ light ON period) and when the light is S- (OFF), the rat does not press bar (fewer than 2 presses per opportunity).

Experiment 4 - Increasing the Fixed Ratio Requirement

Preview: Now that you have established a light on/off discrimination, (be sure that it is well established) you can increase the number of bar presses your rat must perform before a reinforcer is delivered (always in S+, of course). Your goal is FR10 (10 responses to 1 reinforcer in the presence of the light).

Procedures:

Daily lab checklist

S+ light is ON

One partner must count and record responses

Initially require your rat to press the bar two or three times and reinforce.

Then begin to gradually vary the number of responses required throughout the process, do not require the same ratio more than twice in a row. Use a variable ratio (VR) 2 or thereabouts (1-4) is best. This type of ratio building is a dynamic process and requires careful attention. Pay close attention to your rat since what you want is for him to be persistent and fast.

Gradually increase the response requirements. Ratio strain (he quits) may occur if you increase the ratio too rapidly so don't do it.

Don't try to establish FR10 itself directly but establish a variable ratio (VR) of around 8 (range from 1 to 16) first.

Gradually raise the lower number so as to approximate FR10.

When FR10 is stable check with the lab assistant to observe.

Complete and turn in lab sheet.

Take your time with this exercise, it is not unusual to take at least two lab sessions to meet this criteria.

Data:

Total number of reinforcers delivered

Completion Criteria: The acceptable FR performance will be a high rate of pressing within the FR range and very little pausing. There will also be only modest pausing following reinforcement between ratio completions. Short PRPs.

Experiment 5 - Establishing a Chain

Preview: The objective is to teach your subject to push the vertical lever (trapeze) suspended from the top of the chamber when the over-the-bar light is OFF. The consequence of this action (trapeze touch) will be that the light goes ON (you turn it ON) over the bar, this is the S+ light. This bar light ON "sets the occasion" (is the SD), wherein if the lever is pressed, will ultimately lead to water reinforcement. (You instantly recognize this as a two component heterogeneous chain. SD- R2 -> Sr+ / SD - R1 -> SR+). In the light OFF condition the rat pushes the trapeze, usually by standing up and placing their front paws on the rod, which "causes" the bar light to go ON, which then sets the occasion upon which bar presses are reinforced on a small VR and the light goes OFF, and the cycle repeats.

Procedures

Daily lab checklist

Light is ON, reinforce 2-3 bar presses; turn light OFF.

Use your knowledge and skill of Shaping to establish trapeze pushing by using the light ON as the reinforcer for approximations to trapeze contact.

Light is OFF. Rat performs trapeze push or approximation thereof and light turns ON (you turn light on, remember contingency and contiguity!) When light is ON rat lever presses and is reinforced with water (use CFR or VR2 during the trapeze shaping).

Water is delivered and light goes OFF (you turn light OFF). Continue this cycle until trapeze pushing with light OFF and bar pressing with light ON is firmly established into a frequent and effortless heterogeneous chain.

Reestablish FR10 for lever pressing once the trapeze push is established (reestablish this as part of the chain including trapeze pushing).

Demonstrate chain behavior cycle thoroughly at least 10 times to Lab Assistant

Turn in completed lab sheet.

Data:

Total number of water reinforcements delivered, which will equal the number of chains completed.

Completion Criteria

When the rat runs through the chain successively at least 10 times with all the conditions established. (The light is OFF, the rat pushes trapeze, light comes ON, rat lever presses on FR10 schedule, water is delivered, light goes OFF, rat pushes trapeze, etc.)

This exercise may take more than one lab session. **Not to worry, you have plenty of time.**

Experiment 6 - Extinction of the Chain

Preview: You will no longer be reinforcing any response with water, but you will be turning the light ON and OFF at appropriate times. That is, you will reinforce the first component of the chain (the trapeze push by turning ON the light), but lever pressing will only result in the light going OFF after several (2-3) presses. The point is to see what happens to chain performance when the terminating water reinforcer is no longer delivered. (Hint: What will probably happen is that the subject will be slower and slower to start the chain (trap push) but once that is started (and the light goes ON, which is a reinforcer) the chain performance will be rapidly completed. And this should continue several cycles.)

Completion will be assumed when the trapeze is not touched for **two minutes** in the dark.

Procedures:

Daily lab checklist

Run through the chain three times with water reinforcement with the LA watching

Begin extinction procedure, and time the segments.

When completion criteria is reached have LA observe performance.

Answer the following questions on the lab sheet:

Which response dropped off first?

Why did that response stop first?

Record all data on the lab sheet and turn it in.

Data

Record responses each minute of trapeze pushing and lever pressing

Graph the data (responses over time with two lines, one for lever and one for trapeze, keep a copy of your data and graph as you will need it for the next experiment.)

Completion Criteria

When latency to operate the trapeze reaches two minutes, extinction may be said to have occurred. That is, when the light goes OFF following a bar press and the rat does not touch the trapeze for at least 2 minutes.

Experiment 7 - Spontaneous Recovery and Part Two

Preview: The day after you have completed Experiment 6, reinstate the previous (Experiment 6) conditions to determine whether your animal demonstrates "spontaneous recovery". Will he?

Procedures

Daily lab checklist

The procedures are identical to those in Experiment 6:

Place the rat in the chamber with light OFF and record latency to trapeze operation and to lever pressing. Turn light ON when trap is pressed but do not deliver water! Turn light OFF after VR2 lever presses.

Have LA check rat performance.

Discontinue this aspect of Exercise 7 after 10 minutes regardless of outcome.

This part of Exercise 7 can be continued into **Part 2** by reestablishing the bar press performance in the light. Leave the light ON and get the rat onto a FR10 steady bar press performance. At least ten cycles of FR10 with water reinforcement will satisfy the criteria.

Complete lab sheet and turn it in.

Data:

Trapeze pushes and lever presses per minute for the 10 min trial.

Graph this data onto the end of the Experiment 6 data

Record how the rat performed in the "Problems/Comments" section of the lab sheet.

Completion Criteria

When you have observed for spontaneous recovery move on to Part 2 and complete as indicated (ten cycles of FR10). Complete the graph, show the information to the LA, and have him/her sign off the lab.

Experiment 8 - Broken Contingency

Preview: In this experiment you will start by reestablishing, or maintaining, the FR10 performance on the lever with the light ON. After 10 reinforcers, **pass the reinforcer hand switch to your neighbor and have them press the switch (deliver dipper operation to your rat) whenever they do so for their own rat.** This random (actually yoked control) procedure will break the response - consequence contingency for your rat and demonstrate what such a procedure does to the bar pressing performance. (If your neighbor cannot assist simply reinforce on some random schedule independent of the behavior.) You will begin to reinforce behavior other than bar pressing (and not reinforcing bar pressing) and you should therefore begin to see other behaviors being strengthened. The point is to eliminate the bar pressing - dipper operation contingency (dependency) and to observe what happens to the bar press performance.

Procedure:

Establish FR 10 by shaping if necessary.

Demonstrate the cycle and high rate pressing for 10 cycles to the LA.

Deliver water independent of the rats activity. (Count to 5 then to 8 then to 2 then to 10 etc.)

Use your knowledge of operant conditioning to account for the emergence of an alternative response with the light ON. Does trapeze pushing occur?

Data:

total number of reinforcers delivered in all conditions.

Description of behavior drift.

Completion Criteria:

When at least 25 response-independent reinforcers have been delivered you may discontinue the random reinforcement and return to the dependency for 5 cycles.

Experiment 9 - FREE-FORM SHAPING

In this exercise turn off the bar light and reinforce going to the opposite corner of the chamber and touching a spot you or the LA have placed on the outside of the clear plexiglas wall. The objective is to teach some other behavior using the dipper operation as the response consequence. This can serve as a preliminary demonstration to the next exercise.

Experiment 10 - Shaping Novelty - Teachers (YOUR)Choice

Preview: In this lab session (or how many you have) you can decide what novel behavior you want to establish.

Do it (that is shape it up) and then ask your instructor to observe and describe what it is. You may use some clean foreign objects (marbles; Ping-Pong ball; tuna can; etc) as props.

Be creative and thoughtful, this is your opportunity to practice the skills you have learned in a controlled situation.

The Procedures etc are yours to determine.

LABORATORY COMPLETION and TERMINATION

See page 4 above.

Complete Lab Assistant Evaluation form and return in class on Monday.

We hope you have had a valuable experience and any comments or suggestions you might provide will be taken under consideration for future improvement.

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