

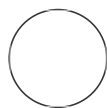


NOV 17, 2023

## 🌐 Set Shifting ASAP Operant Behavior\_LernerLab

jillian.seiler<sup>1</sup>, jacobnadel<sup>1</sup>, talia.lerner<sup>1</sup>

<sup>1</sup>Northwestern University



jillian.seiler

### ABSTRACT

Protocol for set shifting task used by the Lerner Lab for ASAP work

### MATERIALS

Med Associates operant chambers

OPEN  ACCESS



#### DOI:

[dx.doi.org/10.17504/protocols.io.q26g7p3n9gwz/v1](https://dx.doi.org/10.17504/protocols.io.q26g7p3n9gwz/v1)

**Protocol Citation:** jillian.seiler, jacobnadel, talia.lerner 2023. Set Shifting ASAP Operant Behavior\_LernerLab. **protocols.io**

<https://dx.doi.org/10.17504/protocols.io.q26g7p3n9gwz/v1>

**License:** This is an open access protocol distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

**Protocol status:** Working  
We use this protocol and it's working

**Created:** Oct 20, 2023

Last Modified: Nov 17, 2023

PROTOCOL integer ID: 89679

Funders  
Acknowledgement:  
ASAP  
Grant ID: 020529

## Magazine Training

- 1 Food restrict animals overnight prior to beginning magazine training. For the remainder of training animals should be restricted to 85% of their free feeding weight.
- 2 Connect 20 mL syringe with >10 mLs of 1:3 diluted sweetened condensed milk. Add ~15 inches of tubing with tubing adapter to syringe. Load in pump, attach to reward port. Prime pump, ensuring milk is delivered to the reward port on pump activation.
- 3 Place animals in operant box with dummy patch cords (if fiber photometry or optogenetics will be used) attached and allow ~5 minutes to habituate.
- 4 Load JN\_ASAP\_A\_MagTraining\_30min into Med Associates

### Equipment

Mouse Custom Operant Box	NAME
Operant Box	TYPE
Med Associates Inc	BRAND
MED-307W-D2	SKU

and start program. The overview is as follows:

- 4.1 House light, fan, corner lights, and cue lights above the left and right nosepoke ports are turned on.

**4.2** On average, every 60 seconds a noncontigent reward of ~20µl of diluted sweetened condensed milk is delivered via a Med Associates Single Speed Syringe PumpMed Associates Single Speed Syringe Pump.

Equipment	
Single Speed Syringe Pump	NAME
Liquid Pump	TYPE
Med Associates	BRAND
PHM-100	SKU

**4.3** The animal must consume the reward (or make a port entry) in order for the next reward to be delivered.

**4.4** After 30 minutes, the program ends.

**5** After animal has finished, record weight, return to homecage and clean operant chamber tray with 70% ethanol.

**6** Flush reward port and tubing with 70% ethanol and hang to dry.

**7** Store any remaining sweetened condensed milk in therefrigerator (discard after 1 week).

8 This program occurs once, regardless of performance.

## FR1 Both

9 Repeat steps 2+3 ➡ go to step #2

10 Load JN\_ASAP\_B\_FR1\_BOTH and start program. The overview is as follows:

10.1 Fan and Near-Infrared Lights are turned on.


10.2 Animals must initiate trial by holding nose in reward port for 140-300 ms.

10.3 Once the trial is initiated, both left and right cue lights are illuminated. The animal can nosepoke on either side to earn a reward. When a reward is earned, a delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response. After the reward, there is a 3-second timeout period where a new trial cannot be initiated.

10.4 After 90 minutes or 100 rewards, the session ends. Repeat steps 5-7. ➡ go to step #5

11 After 2 consecutive days achieving over 80 rewards, move to FR1 Right and FR1 Left.

## FR1 Right/FR1 Left

- 12** Repeat steps 2+3  go to step #2
- 13** Load either JN\_ASAP\_C\_FR1\_RIGHT or JN\_ASAP\_C\_FR1\_LEFT, beginning with the side on which the animal earned more rewards on FR1\_BOTH and start program. The overview is as follows:
- 13.1** Fan and Near-Infrared Lights are turned on.
- 13.2** Animals must initiate trial by holding nose in reward port for 140-300 ms.
- 13.3** Once the trial is initiated, only one of the cue lights is illuminated (either left or right, depending on which program was selected). Only nosepokes on the illuminated side will earn a reward.
- 13.4** When a nosepoke is made on the correct side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response.
- 13.5** When a nosepoke is made on the incorrect side, the house light illuminates for 7 seconds to signify an incorrect response. No reward is delivered.
- 13.6** After the reward, there is a 3-second timeout period where a new trial cannot be initiated.

**13.7** After 90 minutes or 100 rewards, the session ends. Repeat steps 5-7. [➡ go to step #5](#)

**14** The animal receives one day of FR1\_RIGHT and one day of FR1\_LEFT, regardless of performance.

**100/0**

**15** Repeat steps 2+3 [➡ go to step #2](#)

**16** Load JN\_ASAP\_D\_100\_0\_40RewardsSwitch. The overview is as follows:

**16.1** Fan and Near-Infrared Lights are turned on.

**16.2** Animals must initiate trial by holding nose in reward port for 140-300 ms.

**16.3** Once the trial is initiated, both cue lights are illuminated. Left or right is randomly selected to begin as the high probability side. Only nosepokes on the high probability (100%) side will earn a reward.

**16.4** When a nosepoke is made on the high probability side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response.

- 16.5** When a nosepoke is made on the low probability side (0%), the house light illuminates for 7 seconds to signify an incorrect response. No reward is delivered.
- 16.6** After the reward, there is a 3-second timeout period where a new trial cannot be initiated.
- 16.7** If the animal earns 40 rewards, a new block begins where the high probability (100%) and low probability (0%) sides are switched. If the animal earns 40 rewards on the new high probability side, a new block begins where the high and low probability sides switch once again.
- 16.8** This continues until 90 minutes have elapsed. There is no maximum number of rewards or block switches.
- 16.9** After 90 minutes, the session ends. Repeat steps 5-7. [⇒ go to step #5](#)
- 17** After 3 consecutive days of >80% accuracy ( $\text{Left Rewards} + \text{Right Rewards} / \text{Total Trials} \times 100$ ) or 14 days, animals can move on to the next program.

**90/10**

- 18** Repeat steps 2+3 [⇒ go to step #2](#)
- 19** Load JN\_ASAP\_F\_90\_10\_50RewardsSwitch. The overview is as follows:

- 19.1** Fan and Near-Infrared Lights are turned on.
- 19.2** Animals must initiate trial by holding nose in reward port for 140-300 ms.
- 19.3** Once the trial is initiated, both cue lights are illuminated. Left or right is randomly selected to begin as the high probability side.
- 19.4** 90% of the time, when a nosepoke is made on the high probability (90%) side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response. 10% of the time, when a nosepoke is made on the high probability side, the house light illuminates for 7 seconds to signify an incorrect response and no reward is delivered.
- 19.5** 90% of the time, when a nosepoke is made on the low probability (10%) side, the house light illuminates for 7 seconds to signify an incorrect response and no reward is delivered. 10% of the time, when a nosepoke is made on the low probability side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response.
- 19.6** After the reward, there is a 3-second timeout period where a new trial cannot be initiated.
- 19.7** If the animals complete 50 trials on the high probability side, a new block where the high probability (90%) and low probability (10%) sides are switched. If the animal complete 50 trials on the new high probability side, a new block begins where the high and low probability sides switch once again.
- 19.8** This continues until 90 minutes have elapsed. There is no maximum number of rewards or block switches.



19.9 After 90 minutes, the session ends. Repeat steps 5-7. [⇒ go to step #5](#)

20 After 3 consecutive days of >70% accuracy (Left Rewards+Right Rewards/Total Trials x 100) or 10 days, animals can move on to the next program.

75/25

21 Repeat steps 2+3 [⇒ go to step #2](#)

22 ***Load JN\_ASAP\_E\_90\_10\_50\_Trials.*** The script for the program is attached as a comment. The overview is as follows:

22.1 Fan and Near-Infrared Lights are turned on.

22.2 Animals must initiate trial by holding nose in reward port for 140-300 ms.

22.3 Once the trial is initiated, both cue lights are illuminated. Left or right is randomly selected to begin as the high probability side.

22.4 75% of the time, when a nosepoke is made on the high probability (75%) side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response. 25% of the time, when a nosepoke is made on the high probability side, the house light illuminates for 7 seconds to signify an incorrect response and no reward is delivered.

- 22.5** 75% of the time, when a nosepoke is made on the low probability (25%) side, the house light illuminates for 7 seconds to signify an incorrect response and no reward is delivered. 25% of the time, when a nosepoke is made on the low probability side, a Med Associates Single Speed Syringe Pump delivers ~20µl of the sweetened condensed milk and a tone plays for 0.5s to signify a correct response.
- 22.6** After the reward, there is a 3-second timeout period where a new trial cannot be initiated.
- 22.7** If the animals complete 50 trials on the high probability side, a new block where the high probability (75%) and low probability (25%) sides are switched. If the animal complete 50 trials on the new high probability side, a new block begins where the high and low probability sides switch once again.
- 22.8** This continues until 90 minutes have elapsed. There is no maximum number of rewards or block switches.
- 22.9** After 90 minutes, the session ends. Repeat steps 5-7. [⇒ go to step #5](#)
- 23** After 6 days, the animals are finished.