Purpose:

The purpose of the Hamilton Search task, also called the Hamilton perseverance test, is to measure early learning skills in infant monkeys. Originally developed with cats, the Hamilton Search task was adapted for monkeys in the 1950s. On this test, a monkey sits and faces 4 identical boxes with lids that close after being opened. One of the boxes contains a food reward and the subject’s task is to locate the food with the least number of box openings. Across trials, the location of the food reward is changed. Errors are defined as repeated responses to a box that does not contain a food reward. On the basic search task, the optimal solution would be one in which the last box that contained food is avoided and all other boxes are responded to in sequence. Another strategy would be to consistently respond in a particular order, thereby reducing the number of perseverative responses to boxes that do not contain a reward. This task has been used to study learning in normal rhesus monkeys as well as to determine the effects of early chemical and drug exposure on the development of learning.

Essential Readings:


Warren, JM; Warren, Helen B. Performance of immature and adult cats on the Hamilton search test. *Psychonomic Science. 6(1) 1966, 5-6.*

Supplies and Equipment:

The daily schedule, testing apparatus, testing cage, small pieces of food reward, laptop computer, timer, Hamilton search apparatus, log sheets, extra exam gloves, black pen, diapers, disinfectant and a carrier.

Schedule:

Testing begins with Hamilton Search Adaptation after the completion of the Discrimination series. All tests take place five days a week, on Monday, Tuesday, Wednesday, Thursday and Friday. When the infant reaches criterion on Hamilton Search Adaptation, the Hamilton Search test begins.

General Instructions:

Go to the Daily Schedule and determine the subjects for WGTA testing for the day. Return to the testing room and begin setting up for the appropriate test ensuring that both the WGTA apparatus and the Hamilton Search apparatus are functioning properly.
Procedure for Hamilton Search Adaptation:

Step 1. Turn to the current test subject’s log sheet in the WGTA Notebook. Record the date and your tester number. Turn on the laptop and bring up the Hamilton Search Adaptation electronic test form. Enter the subject’s ear tag, your tester number, and time code on the laptop. Get the Hamilton Search apparatus from the shelf in the testing room and place it on the WGTA apparatus presentation board ensuring that the hinged side of the box faces the tester.

Step 2. Go get the appropriate test subject. Transport the animal in an Igloo carrier, with the lid closed, to the testing room. Remove the monkey from the carrier and immediately put her/him into the testing cage.

Step 3. Testing is to begin with Stage 1. To begin the trial, place the reward in the box and using one hand hold the box’s door open. When you are ready to begin the test open the testing door with the opposite hand. Start the timer when the stimulus or reward is visible from the monkeys’ perspective. Stop the timer when the monkey retrieves the reward and then close the testing door. Record the stage and latency on the electronic testing form. If the monkey has not responded within 60 seconds, stop the trial by lowering the testing door and use the code for a balk (code –2) and enter that into the latency column. Reset the timer for the next trial.

Step 4. Repeat step 1 for the next five trials of Hamilton Search Adaptation. Criterion for all testing stages is reached when the test subject successfully completes five trials in a row, each having a latency of 60 seconds or less. Once criterion is reached on a given stage, move the monkey to the next stage. If the animal balks for five consecutive trials, stop testing for that day. The next testing day start the animal on the previous testing stage. If a given stage is not completed within 25 trials, stop testing for that day and start on the same stage the next day. After the animal responds five times in a row on stage 1 with a latency under 60 seconds move her/him onto stage 2.

Step 5. During stage 2 the grape is placed in the box with the lid closed half way. Test the monkey using the same rules as in stage 1. After the animal responds five times in a row on stage 2 with a latency under 60 seconds move her/him onto stage 3.

Step 6. During stage 3 the grape is placed in the box with the lid fully closed. Test the monkey using the same rules as before. Criterion to graduate from Hamilton Search Adaptation is 23 or more correct responses out of 25 Stage 3 trials. Trails can not be added across separate testing days.
**Procedure for Hamilton Search:**

Step 1. Turn to the current test subject’s log sheet in the WGTA Notebook. Record the date, your tester number, and the box order. Create a new randomization order for the Hamilton Search boxes. This is done by randomly selecting a new order for the boxes that is different from the order used on the previous day. Turn on the laptop and bring up the Hamilton Search electronic test form. Enter subject’s eartag, problem code, your tester number, time code, box order, and randomization on the laptop. Get the Hamilton Search apparatus from the shelf in the testing room and place it on the WGTA apparatus presentation board ensuring that the hinged side of the boxes face the tester. Rearrange the boxes so that they are in the chosen order for that testing day.

Step 2. Go get the appropriate test subject. Transport the animal in an Igloo carrier, with the lid closed, to the testing room. Remove the monkey from the carrier and immediately put him/her into the testing cage.

Step 3. To begin the trial, place the reward in the correct box. To avoid giving auditory cues, lift the lid on multiple boxes when placing the reward. When you are ready to begin the test open the testing door. Start the timer when the stimulus or reward is visible from the monkeys’ perspective. The monkey is allowed to make as many choices as possible for the 60 seconds or until the correct choice is made. Record the boxes as they are opened in the series column. Stop the timer when the monkey retrieves the reward from the correct box and then close the testing door. Record the latency on the electronic testing form. If the monkey has not responded within 60 seconds, stop the trial by lowering the testing door and use the code for a balk (code –2) and enter that into the latency column. If the animal makes choices but doesn’t make the correct response record a ( -1 ) in the latency column. This does not count as a balk. Reset the timer for the next trial.

Step 4. Repeat step 3 for all trials of Hamilton Search. If the animal balks for five consecutive trials then stop testing for that day. Run the Hamilton Search Problem for fifteen days. Balks during a test session are acceptable; however, if five balks in a row occur (resulting in termination of testing), that day cannot count as one of the 15 days.

**Criterion:**

The criterion for moving on to the next stage in Hamilton Search Adaptation is 5 responses in a row all under 60 seconds. The criterion to advance past Hamilton Search Adaptation is 23 or more correct responses out of 25 Stage 3 trials. The criterion for Hamilton Search is fifteen full testing days.
Problem Codes:
06 Hamilton Search Adaptation
07 Hamilton Search

Hamilton Search Adaptation codes:
Stage 1. Using the randomization order, place reward in the box and the hold lid fully open.
Stage 2. Using the randomization order, place reward in the box and hold the lid half open.
Stage 3. Using the randomization order, place reward in the box with the lid fully closed.

Response codes:
( 0 ) Incorrect
( 1 ) Correct
(-1) Subject makes choices but does not make the correct choice in 60 seconds. This does not count as a balk
(-2) Subject makes no choice within 60 seconds; after 5 consecutive balks, end testing.
(-3) Subject balks due to external noise.
(-4) Missing data due to timer/experimental error

Reliability:
1) The testing supervisor and each of the other testers simultaneously test one infant selected for the reliability session (by the testing supervisor).

2) For all reliability tests, the testers review the SOP prior to testing. Testers then score the infant simultaneously and do not discuss the results during the test. The SOP should be available during all reliability sessions. Once all test trials have been given (n=25), the results should be scored and tabulated for reliability.

3) All testers must have a reliability score of 85% for the latencies and 100% for the response code. For a latency to be considered correct, the value must be within 1 second of the testing supervisor's recorded value. If an individual does not pass reliability testing, retraining must take place. Retraining requires that the testers
meet to discuss the basis for the differences in scoring. After the testers decide retraining is complete, reliability must be retested.

4) The testing supervisor is responsible for maintaining a consistent coding pattern (through regular meetings with the P.I. and all testers). A training period of at least one day is used for each new tester prior to the initial reliability testing.

Log of Changes in SOP

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