This Standard Operating Procedure (SOP) was prepared by Brenda Crouthamel, Amy Voltin and Kimberly Grant.
Purpose:
Originally described by Jean Piaget, the phenomenon of object permanence is a cognitive milestone that develops in parallel stages in both human and nonhuman primate infants. Attainment of object permanence requires the understanding that objects are permanent in space and time and continue to exist when removed from the visual field. Performance on this test reflects important aspects of early memory and provides an index of emerging cognitive abilities and maturational status. The development of object permanence is measured by observing the infant’s response to disappearing objects. Over time, this changes from the abandonment of hidden objects to the active and focused retrieval of hidden objects.

Required Readings:


Supplies and Equipment:
The Object Permanence binder, laptop computer, screen apparatus, well apparatus, A not B apparatus, timer, a bowl with small bits of fruit and a mini ice cube tray with yogurt, black pen, diapers, spray bottle with liquid cleaning solution and small brightly colored plastic toys are required.

Schedule:
Testing begins at 14 days of age and takes place four days a week, on Monday, Tuesday, Thursday and Friday. Unless there are special circumstances, there is no testing on Wednesday. In the event that the week is shortened by a holiday or other event, test on all remaining weekdays (including Wednesday). When the infant reaches criterion on Plain Reach, the Screen and Well tasks begin. Well is run on Monday and Thursday.
Screen is run on Tuesday and Friday. Testing for A not B is run, Monday, Tuesday, Thursday and Friday. Animals are tested until they reach criterion on A not B or until they are 150 days old.

**General Instructions:**
Go to the Daily Schedule and determine the subjects for object concept testing for the day. Return to the testing room and begin setting up for the appropriate task.

**Procedure for Plain Reach:**

Step 1. Set up the screen apparatus so that the track for the screen is on the side of the tester. Remove the screen if it is present. Turn to the current test subject’s log sheet in the Object Concept Notebook. Record the date and session number. Turn on the laptop and bring up the Plain Reach electronic test form. Enter the animals’ eartag, tester number, holder number, and session number on the laptop.

Step 2. Ask the holder go get the test subject. The holder should transport the animal in an Igloo carrier to the testing room. To position the infant properly for this test, the holder should grasp the monkey firmly (but not to restrict all movement) around the chest so that the infant is secure but can move its hands and arms freely. The monkey should be wrapped in a diaper or large terry cloth bag. The holder should hold the infant in front of the apparatus, as close to the center as possible, about waist high for each trial.

Step 3. Choose one of the brightly colored plastic toys and dip it in the reward sauce. To begin the trial, present the stimulus to the infant for tactual and visual inspection. This is done to allow the infant to become familiar with the stimuli and to taste the reward sauce. When the infant is ready, begin the orientation period of the trial. Present the stimulus to the infant. The tester can move the stimulus, above the testing surface, both horizontally and vertically to elicit the infant’s attention. If the stimulus is placed on the test surface during orientation, the tester is free to tap with their finger or verbally cluck to the infant. The infant has 15 sec. to orient to the toy. Once the infant is looking at the stimulus, place the stimulus on the apparatus within the monkey's reach. Activate the timer and observe until the monkey picks up the toy or the tone signifies the end of the 15 sec. test trial. Verbalizations and tapping are not allowed during the test trial. Score the response according to the codes on page 9. If the monkey has not oriented to the stimulus within 15 seconds, stop the trial and use the code for no orientation (code 7). Reset the timer for the next trial.
Repeat step 3 for all five trials of Plain Reach for the day.

Step 4. Now test for Relatively Independent Finger Movement (RIFM). RIFM is displayed when the infant uses the forefinger and thumb to pick up the fruit and the forefinger moves independently from the other digits. For RIFM trials, the animal has only 10 seconds to orient and 10 seconds to respond. Take a piece of grape from the bowl and attempt to orient the infant to it as in step 3. Place the grape on the apparatus within the reach of the animal and activate the timer. Encourage the infant with tapping and clucking to pick up the fruit bit closely watching the infant’s method of manual pick-up. Present 5 trials using the timer to control trial length. Record the number of RIFMs observed. Also record the number of times the animal picked up the grape and brought it to its mouth, independent of the method of retrieval. This is called a Pick-Up. Criterion for RIFM is reached when the infant utilizes RIFM as a method of pick-up on 2 out of 5 trials during one test session.

Step 5. The tester should now rate the following 3 behaviors, fussiness, consolability and attentiveness to task according to the codes listed on Page 9 of the SOP.

Step 6. Return to the animal’s log sheet in the Object Permanence binder and fill in total correct responses, number no orientation trials, criterion (yes or no) and number of observed RIFMs.

**Procedure for the Screen hiding task:**

Step 1. Set up the screen apparatus so that the track for the screen is closest to the monkey and slide the screen into the track. Record the date, task code, session number and randomization on the log sheet for the animal to be tested. Bring up the Screen/Well electronic data sheet on the laptop. Enter the animals’ eartag, tester number, holder number, task code, session number, and randomization on the laptop.

Step 2. Have the holder get the proper infant and swaddle the infant as necessary for restraint during testing.
Step 3. Begin the trial by eliciting orientation from the monkey with one of the brightly colored toys. Allow the infant to touch the stimulus and taste the sauce reward if you are having difficulty getting the infant to orient. Tapping and clucking are allowed during the 15 sec. orientation period. If the infant does not orient during the 15 sec. orientation period, enter in code 7 for no orientation and do not present the hiding portion of the test trial. Once the infant has oriented, place the toy on the apparatus in the hiding condition indicated on the data sheet. Trials can be no hide, partial hide, or full hide. On the no hide trials the object is placed in front of the track and the screen is moved behind the toy so that the toy is fully visible. On partial hide trials, the stimulus is placed behind the track and the screen is moved to cover ½ the object (from the infant’s perspective). On full hide trials, the stimulus is placed behind the track and the screen is moved to fully hide the object from the infant’s view. These trial conditions are listed on Page 9 of this SOP. It is ideal, but not necessary, for the animal to be visually orienting to the stimulus as the screen is being moved into place. Slide the screen from the monkey's left to the right until it completely hides, partially hides, or does not hide the stimulus from the monkey's vantage point.

Step 4. Activate the timer and allow 15 seconds for the infant to respond. Code the response according to the response codes on page 9.

**Note:** The holder should hold the infant just out of reach while the screen is being moved into the appropriate hiding condition. Once the screen is in place and the trial begins, the monkey should be moved forward slightly so that the toy is within reach.

Step 5. Repeat Steps 3-4 for each of the 15 trials for that day.

Step 6. Test for RIFM and Pick Ups if criterion has not been reached (Criterion for RIFM is 2/5 during one test session). Make sure that the apparatus is turned around and that the screen has been removed before beginning to test for RIFM.

Step 7. Rate the following 3 behaviors, fussiness, consolability and attentiveness to task according to the codes listed on Page 9 of the SOP.
Step 8. Return to the animal’s log sheet in the Object Permanence binder and fill in number no orientation trials, number no hide trials correct, number half hide trials correct, number full hide trials correct, criterion on no hide (yes or no), criterion on half hide (yes or no), criterion on full hide (yes or no) and number of observed RIFMs.

**Note:** If the monkey bumps the toy out of sight on a no hide or partial hide trial, the tester should replace the toy to the original hiding condition. If the infant bumps or throws the toy on the floor, quickly replace the toy in the original hiding condition. The timer does not stop during the repositioning of the stimulus or screen.

**Procedure for the Well hiding task:**

Step 1. Set up the Well apparatus so that the well is on the side of the monkey. The cover for the well should be placed on the apparatus, behind the well, so that the well is completely exposed to the infant. Record the date, task code, session number and randomization on the log sheet for the animal to be tested. Bring up the Screen/Well electronic data sheet on the laptop. Enter the animals’ eartag, tester number, holder number, task code, session number, and randomization on the laptop.

Step 2. Have the holder get the proper infant and swaddle the infant as necessary for restraint during testing.

Step 3. Try to orient the monkey to one of the toy stimulus within the 15 sec. orientation period as described above. When the infant is orienting to the object, place the stimulus in the well so that no part of the toy extends above the upper surface of the apparatus. Use the condition codes to determine whether the cover for the well should be slid forward to completely cover the toy (full hide), partially cover the toy (partial hide), or, if it is a no hide condition, not be moved at all. For the partial hide condition, the toy should be placed near the back of the well. When the lid is moved into position, only half of the toy should be visible to the monkey. It is ideal but not necessary for the animal to be visually orienting to the stimulus as the screen is being moved into place. If the infant does not orient during the 15 sec. orientation period, code 7 for discontinue trial and end the trial.
Step 4. Once the object has been placed in the well under the appropriate hiding condition, activate the trial timer and allow 15 seconds for the infant to respond. Code the response according to the codes on page 9.

Step 5. Repeat Steps 3-4 for each of the 15 trials for that day.

Step 6. Test for RIFM and Pick Ups if criterion has not been reached (Criterion for RIFM is 2/5 during one test session). Make sure that the well apparatus is turned around before beginning to test for RIFM.

Step 7. Rate the following 3 behaviors, fussiness, consolability and attentiveness to task according to the codes listed on Page 9 of the SOP.

Step 8. Return to the animal’s log sheet in the Object Permanence binder and fill in number no orientation trials, number no hide trials correct, number half hide trials correct, number full hide trials correct, criterion on no hide (yes or no), criterion on half hide (yes or no), criterion on full hide (yes or no) and number of observed RIFMs.

**Note:** If the monkey fully covers the toy with the lid from the well due to flailing or fussing, the tester should replace the lid to the original hiding condition. However, if the infant purposefully pulls the lid towards themselves, do not interfere. Let the infant discover the physical dynamics of the lid and allow them to learn how to move the lid to retrieve the stimulus.

**Procedure for A not B:**

Step 1. Set up the A not B apparatus so that the wells are in front of the monkey and the lids are positioned directly behind the wells. Record the date, session number and randomization on the log sheet for the animal to be tested. Bring up the A not B electronic data sheet on the laptop. Enter animal number, eartag, tester and holder number and session number on the laptop.

Step 2. Orient the monkey to one of the toy stimuli as described above. Once oriented to the toy place it in the well indicated on the data sheet (left or right) and quickly cover both wells at the same time (these trials are always full-hide). It is ideal,
but not necessary, for the animal to be visually orienting to the stimulus as the wells are being moved into place. If the infant does not orient during the 15 sec. orientation period, code 7 for discontinue trial and end the trial.

Step 3. Allow the infant 15 seconds to respond.

Step 4. Code the response according to the response codes on page 9.

Step 5. Once the infant has two correct well trials, you do not have to complete the full five trials available for that problem. Move immediately to the A not B trial.

Step 6. If the monkey has not responded correctly on two of the five trials, move on to the next A not B problem on the data sheet.

Step 7. To test for A not B, begin with orientation. If the infant does not orient during the 15 sec. orientation period, code 7 for discontinue trial and end the trial. After the infant has oriented to the stimulus, put the toy in the well that is opposite from the one used in the preceding full-hide trials. Cover both wells simultaneously and audibly tap three times on the well that does not contain the stimulus. For e.g., if the left well was used for the full-hide well trials, the stimulus would be placed in the right well on the A not B trail but the tester would tap on the left well.

Step 8. Allow 15 seconds for the infant to respond.

Step 9. Code the response according to the response codes on page 9.

Step 10. Complete the remaining trials in the same manner as described above.

Step 11. Test for RIFMs if criterion has not been reached.

Step 12. Return to the animal’s log sheet in the Object Permanence binder and fill in total correct responses, number no orientation trials, criterion (yes or no) and number of observed RIFMs.

**Criterion:**
The criterion for completing the Plain Reach task and moving on to the Screen/Well hiding tasks is 3 out of 5 trials with a correct response (response code "2") during one test session.

Criterion for Screen and Well is calculated separately for each hiding condition. The infant must score 8 out of 10 correct responses (response codes “1” or “2”) on a particular test condition across two consecutive days. At the end of each test session, the computer will prompt you to indicate whether criterion was reached on any of the hiding conditions. Code a “0” on the data form if the animal did not reach criterion on that day and a “1” if the infant attained criterion. A “1” code indicating that criterion was reached should only be entered on the day the infant reached criterion.

Once the infant has reached criterion on a particular hiding condition, only 3 of the 5 trials are run on subsequent testing days. For e.g., if an infant scores 9 out of 10 correct over 2 test days on no-hide screen trials, all subsequent screen test sessions would only present 3 of the 5 trials that are indicated for the no-hide condition. The two remaining no-hide trials that are not presented are given -8 codes to indicate that the trials were not presented. A -8 code should also be scored in the criterion boxes for hiding conditions that have already been passed. The screen and well task are fully passed when the infant reaches criterion on all 3 hiding conditions. Infants often reach criterion faster on one task than the other (e.g. the screen task is frequently passed before the well). In this case, continue to test the monkey on the well-screen-well-screen schedule but only present three of the five trials for each hiding condition per day on the task that has already been completed until the infant reaches criterion on the other task.

Criterion for A not B is 8 out of 10 correct responses (response codes “1” or “2) on the A not B reversal trials across two consecutive days of testing.

Criterion for RIFM is 2/5 RIFMs during one test session.

Once an animal has reached 150 days and has not passed one or any combination of well, screen or RIFM’s they are dropped from testing.

**Balk Procedure:** If an animal receives five 7 codes in a row, stop testing for the day. The 7 codes are the only codes that count as balk trials.
**Condition Codes:**

A. Plain Reach
   Plain Reach has no condition codes

B. Screen hiding task
   ( 1 ) No hide. Place the stimulus on the animal's side of the track for the screen and slide the screen behind it.
   ( 2 ) Partial hide. Place the stimulus on the tester's side of the track and slide the screen in front of it so that approximately one-half the stimulus is behind it (from the monkey's vantage point).
   ( 3 ) Full hide. Place the stimulus as if testing condition 2, but slide the screen so that it completely hides the object from the monkey's view.

C. Well hiding task
   ( 1 ) No hide. Place the stimulus in the well in plain view of the monkey and do not move the lid.
   ( 2 ) Partial hide. Place the stimulus towards the back of the well and slide the cover forward until it blocks one-half of the stimulus from the monkey’s sight.
   ( 3 ) Full hide. Place the stimulus in the middle of the well and slide the lid forward until it completely covers the well opening on all sides.

D. A not B
   ( L ) Place the stimulus in the left well and cover both wells completely.
   ( R ) Place the stimulus in the right well and cover both wells completely.

E. RIFMs
   RIFM testing does not have condition codes

**Response Codes:**

A. Plain Reach, Screen, and Well
   ( 0 ) Animal orients to stimulus but does not respond
   ( 1 ) Animal purposefully reaches for and/or touches stimulus, but does not definitively pick-up stimulus
   ( 2 ) Animal reaches for, grasps, and definitively picks up stimulus
(7) Animal does not orient to stimulus within 15 seconds (Discontinue trial)

(-8) Trial not run because subject has reached criterion

(-9) Animal scheduled but not tested due to illness or extraneous circumstances

B. A not B

(0) Animal orients but does not respond to stimulus.

(1) Animal chooses correct well but does not definitively pick up stimulus. The animal does however, see the object in the well.

(2) Animal chooses correct well and picks up stimulus

(3) Animal chooses incorrect well

(7) Animal does not orient to stimulus within 15 seconds (Discontinue trial)

(-8) Trial not run. Animal does not respond correctly on two of the five full-hide well trials (record the -8 code in the A not B test column)

(-9) Animal scheduled but not tested due to illness or extraneous circumstances

Minus Codes

The following codes are recorded on the data sheet when the standard testing codes do not apply to particular testing situations:

(-1) No data due to tester error

C. Behavioral Ratings

Fussiness

(0) Not fussy (was never fussy throughout test)

(1) Somewhat fussy (showed intermittent fussiness)

(2) Extremely fussy (fussy throughout the entire session, unmanageable)

Consolability

(0) Not necessary to console (did not need to be consoled at any time)

(1) Easy to console (was able to be quickly calmed down by holder)

(2) Difficult to console (required extensive soothing to calm down, not easy to comfort, quickly becomes fussy again)
Attentiveness

(0) Fully attentive (focused and alert throughout the test)
(1) Somewhat attentive (showed moderate interest in test but had some difficulty remaining focused)
(2) Not attentive (showed little interest in test and was distracted throughout most of the test)

Training and Reliability:

New Tester Training and Reliability
Prior to testing, both testers should closely review the SOP. The SOP should be available during all training sessions so differences in the codes can be discussed and reconciled. Training should take place across several weeks of testing on all tasks with a representative sample of age ranges. For reliability sessions, testers no longer review the SOP or discuss scores. For plain reach, 3 animals must be tested over 4 days. For the screen task, 5 animals must be tested on 6 sessions. For the well task, 5 animals must be tested over 6 sessions. For A not B, 3 animals must be tested over 4 sessions. The new tester should perform the test while the old tester observes.

To pass reliability testing, there must be an 85% agreement between the scores of the new tester and the scores of the old tester. Reliability is calculated separately for each hiding condition in both the screen task and the well task.

Nine Month Reliability Sessions.
Testers who are routinely taking data partake in reliability sessions every 9 months. Testers should not review the SOP or discuss their coding with other testers prior to reliability sessions. Sessions should be conducted with a minimum of five animals representing an age range for the entire test. This group of animals should be tested over 4 consecutive days. Testers record data independently and do not discuss responses or scores, do not repeat trials.

If testers become concerned about how they (or others) are coding a particular behavior after they have passed reliability, they should discuss their concerns with Kimberly Grant or Noelle Liberato prior to attempting to reconcile the situation. Testers should not discuss or implement changes in scoring without a thorough discussion with one of the above. This is being done to keep testers from changing the procedures which negates reliability. Any changes in testing that come out of these discussions have to be listed in the log of changes section of this document, even if they pertain to only one tester.
Log of Changes