**Buddy role:**

Pre-Entrance (15 minutes before):

*In auxiliary testing room*

* Setup experiment computer (Linux laptop)
  + Power on
  + Plug in joystick
  + Open Matlab by typing ptb3-matlab in a terminal
  + Navigate to /home/ntblab/Documents/MATLAB/vma\_recall\_BIC
  + Read the participant the instructions, and show them the symbol mappings.
  + Run main\_practice.m
  + Give them the symbol-target association memory test.

**Operator role:**

Entrance (15 minutes before participant arrival):

*In console room*

* Setup experiment computer (Linux rack-mount)
  + Power on (if not already)
  + Webcam (Epiphan) USB – wait to see LED turn Blue
  + Switch Window’s rack-mount Display Port to the linux rack-mount
  + Set Linux and Windows displays to screens on wall using Crestron
  + Pair Mouse and Keyboard 1 to Linux computer (Keyboard 1 receives scanner triggers so it MUST be Keyboard 1 that is paired to Linux)
* Setup display profile
  + Open Matlab by typing ptb3-matlab in a terminal
  + In Matlab: enter command: XOrgSelector; select option 1 (for dual screen).
  + Exit Matlab
  + Log out of NTBlab; log back in.
  + Using Crestron, set the Windows computer screen to display on the projector.
  + Check that the projector is on and showing a black screen that displays the cursor
* Start camera display
  + Open Matlab again (ptb3-matlab) & navigate to: Desktop/NTBLab/huberdeau/vma\_recall\_BIC
  + Enter: scanner\_cam\_test1
  + Using Crestron, set the scanner bore camera to display on the large screen in the scanner room.

*In scanner room*

* Setup Camera
  + Move camera to front of scanner and place on counter for easy access later.
  + Rudimentary focus adjust
  + Retrieve the tracker hardware from the cabinets in the back of the scanner and bring them to the front for easy access later.
  + Install 64-channel head coil base. Have top-part ready

*In console room*

* Prep subject and enter info
  + Consent (if not done)
  + De-metal and screening
  + Scanner console info (height, weight, etc.)
  + Instructions reiterated.
  + Shoes off
* Camera testing
  + In Matlab, enter scanner\_cam\_test\_3 (this will allow you to test tracking once the subject is in the scanner)

*In scanner room*

* Subject setup
  + Earplugs
  + Give subject the tracker glove.
  + Lie subject down
  + Provide subject emergency squeeze ball
  + Give subject earphones and head padding.
  + Place tracker surface over subject and adjust for comfort
  + Iso-center subject
  + Install head coil top.
  + Enter subject into bore
  + Place tracker and camera in position.
    - Adjust focus by watching large-mount display of camera feed.
* Camera testing
  + Have subject test tracker
  + Watch on scanner room display for if the camera has the tracker in it’s field of view

*In console room*

* Camera setup
  + In Matlab, run calibrate\_rotation.m to calibration the camera:
  + Re-Run camera tracking (scanner\_cam\_test\_3.m)
  + Ask subject if tracking “feels natural & looks as expected”
    - If not, adjust camera or re-calibrate as necessary
    - Possibly adjust lighting in room to fix any tracker problems.
  + In Matlab, run retention\_TR\_experiment\_v5\_tracker.m
    - Have subject test that the tracker is working, that the image in centered, and that they have adequate range of motion to reach possible target locations.

*In console room*

* Initiation runs
  + Run Auto align scout
  + Run T1 mprage structural scan
* Functional runs
  + On the experiment computer (linus laptop), in matlab, run:
    - [s, a, b, c] = retention\_TR\_experiment\_v5\_tracker;
  + Start Functional scan (324 TRs @ 1.5sec)
  + \*\*Repeat the above two steps 5x, but change block number sequentially\*\*
* T2 scan – align so that motor cortical areas and cerebellum, if possible, are captured
* Spin echo 1
* Spin echo 2

**Instructions for participants:**

In this experiment, you will make reaching movements to targets presented on a computer screen while you lie in an MRI scanner. During the study, we will use the MRI scanner to take images of your brain. We will use these images to infer the neural activity occurring in your brain while you plan each movement. It is important that you remain completely still throughout the study, except for the small reaching movements that you will be making with your arm.

The task will require you to make reaching movements from a target located in the center of a screen to one of four possible target locations in the periphery of the screen. The experiment is divided into trials, and each trial will begin when your index finger is placed in the center of the screen. A small white circle marks the center of the screen, and every trial will begin when your index finger is on this start position.

After you move to the start position, there will be a wait period of 6 to 8-seconds. Please remain motionless during the wait period. You will then make a reaching movement at a very specific time to a target that has appeared on the screen. The time that you should begin moving will be signified by a visual cue. A ring that encircles the start position will begin closing-in on the center of the screen; this is your cue that you will soon need to make a movement. As soon as the ring vanishes in the center of the screen, a second, identical ring will appear at the center of the screen and expand outward. You must begin your reach at the moment the first ring vanishes and the second ring begins expanding. At that precise moment, reach to the target that has appeared on the screen. If you are unsure where the target has appeared, reach in whichever direction you think it might have or will be likely to appear.

If you begin moving before the first ring has vanishes, you will receive feedback saying that you “moved too soon”. If you begin moving after the second ring has begun expanding, or if you move too slowly to stay ahead of the expanding ring, your cursor will turn red. Try to begin your reach precisely on time, avoiding moving too soon and moving too late. It is, however, a very difficult task to master, and mistakes in timing are very common, so please do not become discouraged if you feel that you are not moving on time.

On some trials, the location that the target is going to appear will be indicated to you well in advance of the time that you have to begin your reach. On trials when a cue is presented indicating the location that the target is going to appear, the cue will either take the form of a symbol that has been paired with a target location, or will be the target itself. Do not move to the target when these cues are presented; they should only be used to plan the movement that you ultimately will make at the appropriate time later in the trial. You will have a chance to memorize which symbol is paired with each target before beginning the experiment. Any cue indicating the target that will appear will be presented very briefly and at a variable time during the wait period, so please pay close attention throughout the wait period for the possible appearance of one of these cues. Furthermore, cues will occasionally indicate the wrong target location, i.e. a different target may ultimately appear than was indicated by the cue. In these rare cases, reach to target that ultimately appears.