**Stimuli descriptions can be found in the next section**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Typical Order** | **Name** | **# of TRs** | **# of Acq.** | **Total Time** | **Stimuli** |
| 1 | Localizer |  | 1 | 0" | none |
| 2 | MPRage |  | 1 | 5'51" | none |
| 3 | Ep2d\_pace |  | 1 | 3" | none |
| 4 | Resting BOLD | 150 | 1 | 7'30" | none |
| 5 | BOLD sentences | 150 | 1 | 7'30" | [CMP .wav files](http://www.cfn.upenn.edu/aguirre/private/CMP_Stimuli/) |
| 6 | BOLD sentences | 150 | 1 | 7'30" | [CMP .wav files](http://www.cfn.upenn.edu/aguirre/private/CMP_Stimuli/) |
| 7 | BOLD response to light | 120 | 1 | 6'00" | 30s blocks of flashing light |
| 8 | Perfusion (Fairest) |  | 1 | 5'28" | none |
| 9 & 10 | DTI 30dir |  | 2 | 9'36" | none |

**Total: 53 mins**

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**MPRAGE**

**Check technical specifics when I am at the scanner** High-resolution MPRAGE (magnetization prepared rapid gradient echo) data were acquired as a single image during a 5:51 T1-weighted anatomical scan (160 axial slices with 1.0 mm isotropic voxels; TR = 1620 msec, TE=3.87 msec; TI = 950 msec; flip angle 15°).

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**Resting BOLD**

3mm isotropic voxels. **Get technical specifics when I am at the scanner**

The room lights remain off during this portion of the scan.

The researcher gives these standardized instructions to the subject: "There will now be a 7 minute scan. During this time please rest quietly with your eyes closed but do not fall asleep. Try and remain still."

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**BOLD responses to auditory sentence comprehension**

**check that these parameters are correct** Echoplanar data were acquired in 45 axial slices with 3 mm isotropic voxels in an interleaved fashion with 64 × 64 in-plane resolution, field of view=192mm, repetition time [TR]=3000 ms, echo time [TE]=30 ms, flip angle 90°, and 64 base resolution. The first 6 seconds of each scan consisted of “dummy” gradient and radio frequency pulses to allow for steady state magnetization during which no stimuli were presented and no fMRI data collected. Two scans, each with 150 TRs, were collected.

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**Launching the Eprime experiment**

1. Use the Dell Lab laptop (logged in as iron) to run the experiment from /MyDocuments/CMP2\_v2\_fMRI
2. Determine the sequence of blocks for the experiment (These are saved as .txt files under CMP2\_v2\_fMRI/Seqs)
   * Sequence 1 = White Noise - Reverse Sentences - Sentences
   * Sequence 2 = Reverse Sentences - Sentences - White Noise
   * Sequence 3 = Sentences - White Noise - Reverse Sentences
3. In the folder "Shortcut to Shared Experiments/CMP2\_v2\_fMRI", open the CMP\_v2\_fMRI Eprime script.
4. Under "List 1", go to "Property Pages" and select the proper "Seq" file for the experiment.
5. Start the experiment in order to check the volume is set appropriately. (Adjust volume settings on the laptop and on the audio output to the scanner headphones)
6. Remind the subject of the following instructions: Push any button on the response pad when you hear white noise, when you hear the first reverse sentence in the block, or when you hear a forward sentence that is not plausible.
7. When the subject is ready, run the experiment and enter the subject and session number (1). Press the space bar to begin running the experiment, and inform the tech to begin the scan.
8. The scan consists of total of 15 30sec blocks; in the Sentences and Reverse Sentences conditions, the 30sec block contains 10 3sec stimuli
9. When the experiment has finished, ask the subject if it went well and they heard the stimuli and knew what to do. Then proceed with the 2nd scan by pressing the space bar. The 2nd run is also 15 30sec blocks in the same sequence, but the order of presentation of individual stimuli is randomly set.
10. The data is recorded in a .txt file in the CMP2\_v2\_fMRI folder, called "CMP\_v2\_fMRI-[subject #]-[session #]" and contains the subject's response for each trial, to be imported into Excel.

**Describe the headphone hardware used.**

**Stimuli**

Each stimulus sentence is constructed as: "The [noun] is [adjective]."

The stimulus sentences were recorded using Microsoft Sound Recorder v 5.1 (PCM 22.06KHz, 16 bit, mono). All sentences were spoken by the same female voice. We used WavePad v.3.05 (NCH Swift Sound) to normalize each stimulus to the maximum auditory level and apply auto-spectral subtraction to voice. Fifty control stimuli were created by recording sentences played in reverse. In addition, the white noise stimulus was created with this software.

The sentences were initially assigned to one of three modal categories (auditory, tactile, visual) but they are collapsed into a single "Sentences" group for this study.

**Example stimuli**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Auditory** | | | **Tactile** | | | **Visual** | | |
| **Noun** | **Adjective** | **True/False** | **Noun** | **Adjective** | **True/False** | **Noun** | **Adjective** | **True/False** |
| baby | crying | T | coffee | hot | T | chain | locked | T |
| alarm | blaring | T | elephant | leathery | T | door | cracked | T |
| bush | rustling | T | frog | bumpy | T | hall | dim | T |
| phone | storming | F | bat | misty | F | tree | cloudy | F |
| piano | drilling | F | pig | stringy | F | broom | dreary | F |

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**BOLD response to light**

Scanning conducted on and before December 2009 used the Epson 8100 3-LCD projector for light stimulation, with a screen luminance of XX. Scanning conducted on and after March 2010 used the [Sanyo plc-xt35](http://us.sanyo.com/Projectors-Products-by-Category-Portable/PLC-XT35-L).

1. The scanning room should already be prepared as detailed above, and the cover to the projector is removed
2. Instruct the subject to now stay awake with eyes open and watch the screen for the duration of the scan.
3. Launching the Flashing Light Stimuli in Eprime
   1. In the "MyDocuments/CMP2\_v2\_fMRI/Contrast Flash" folder, open the "Contrast" Eprime script.
   2. When the subject is ready, run the experiment and enter Subject and Session number. Press the space bar to begin running the experiment, and inform the tech to begin the scan.

- The scan consists of 12 30sec blocks (starting with flashing light and alternating with darkness).

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**ASL Perfusion imaging**

**Check with JJ that the correct perfusion scan protocol is uploaded**

1. Before the perfusion scan, enter the scanning room and turn off the projector to maintain darkness. Instruct the subject to rest with his eyes closed.
2. Arterial spin-labeling was carried out using a variation of the flow-sensitive alternating inversion recovery (FAIR) technique with saturation pulses to define the tagging bolus duration (Wong EC, Magn Reson Med 39: 702-708). A single 8:08 scan was obtained (TR = 4000 msec, TE = 17 msec, TI1/TI2 = 700/1900 msec, FOV = 220 mm, in-plane matrix size = 64 ×64, 20 slices, 4mm thickness, 1mm gap, 120 repetitions, flip angle 90°). ASL signals were generated by surround subtraction of the label and control images, followed by conversion to absolute cerebral blood flow images (ml/100g/min) based on a single compartment PASL perfusion model assuming a blood T1 of 1.5s at 3T (Wang J, Magn Reson Med 48: 242-254).

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**DTI**

1. Inform the subject that the last set of mages will be obtained. This scan has long periods of quietness which is normal.
2. **Definitely check this since we have switched to a new 30direction protocol** Two, 4:31 diffusion-weighted image scans were obtained (FoV = 220 mm, matrix = 128 × 128, TR = 6300 msec, TE = 85 msec, 53 slices with thickness 2.1 mm, interleaved; a single b=0 volume followed by 30 b=1000 s/mm2 volumes at different gradient directions).