DOCUMENTATION

of

RESTRICTED ACCESS DATA

in

MIDUS 3
Neuroscience Project (P5)

University of Wisconsin ♦ Institute on Aging
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INTRODUCTION

This document is intended to provide an overview of the Neuroscience Project's (P5) MIDUS 3 data available through restricted access procedures. Please see https://midus.wisc.edu/midus-neuroscience-repository/ for instructions on how to access.

Restricted data described here are categorized as behavioral, psychophysiology, or imaging data. More details including subject counts, explanations for missing data, and confidentiality procedures are provided in the data access request's accompanying README.

Data type	Number of participants with data
Out-of-scanner psychophysiology Emotional Response Task	229
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*added part way through the MIDUS 3 data collection

These data are arranged and organized according to the Brain Imaging Data Structure specification, available at: http://bids.neuroimaging.io/
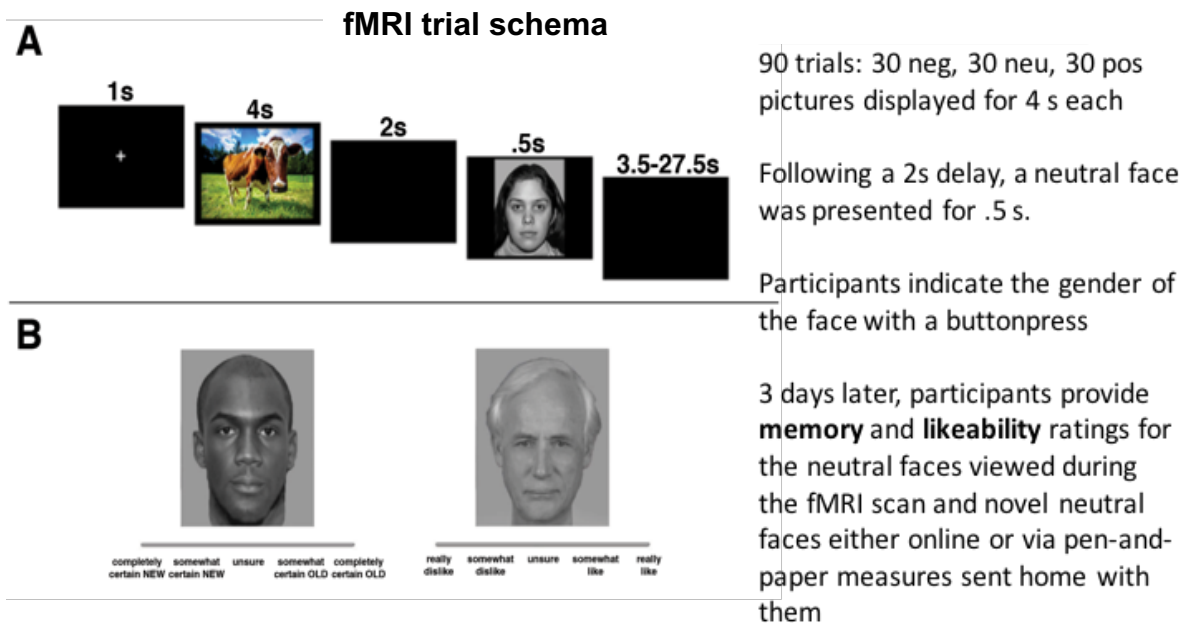
BEHAVIORAL

Out-of-scanner psychophysiology Emotional Response Task

Participants completed the psychophysiology session's Emotional Response Task out-of-scanner as described in Colectica Documentation: *M3_P5_DOCUMENTATION_OF_BEHAVIORAL_COGNITIVE_*

Summary variables are available via ICPSR and/or the Colectica portal, while the raw behavioral data from this task are on Globus and can be requested following restricted access instructions.

fMRI Emotional Response Task

Participants completed the fMRI Emotional Response Task, as described below and in Grupe et al. 2018. Raw behavioral data from this task are on Globus and can be requested following restricted access instructions.

fMRI trial schema

90 trials: 30 neg, 30 neu, 30 pos pictures displayed for 4 s each

Following a 2s delay, a neutral face was presented for .5 s.

Participants indicate the gender of the face with a buttonpress

3 days later, participants provide **memory** and **likeability** ratings for the neutral faces viewed during the fMRI scan and novel neutral faces either online or via pen-and-paper measures sent home with them

During fMRI scanning, participants passively viewed pictures from the International Affective Picture System (IAPS; Lang, Bradley, and Cuthbert, 2005, 2008), each one presented for 4s. Every task run contained 10 pictures each from negative, neutral, and positive valence categories, for a total of 30 picture presentations per task run, or 90 pictures total. Pictures were presented using a pseudorandom trial order with the requirement that no more than two pictures from the same valence category be presented sequentially. Within each valence category, stimuli were randomly ordered for each participant. Each picture was followed by a 2s inter-stimulus interval and a .5s neutral face presentation.

Simulations conducted using optseq2 (https://surfer.nmr.mgh.harvard.edu/fswiki/optseq2) to generate different timing profiles compared different static intervals, as well as jittered timings between the picture and face. These simulations suggested that this fixed 2s interval provided the greatest power to detect effects of interest during the face period.

Participants were instructed to press one of two buttons to indicate the gender of the face, a categorization task chosen to confirm task engagement without interfering with natural processing of the faces or preceding IAPS pictures. Participants pressed a blue button (recorded either as "1" or "b") to indicate seeing a male face, and a yellow button (recorded as a "2" or "y") to indicate seeing a female face. Faces were followed by an inter-trial interval between 3.5-27.5s (mean duration=7.5s). A 1s crosshair appeared before the start of each trial to orient participants' attention.

Average normative arousal ratings were equivalent for negative (5.46 ± 0.66) and positive (5.47 ± 0.53) IAPS pictures, with neutral pictures arousal ratings normed slightly lower (3.16 ± 0.42; ts > 16.1, ps < 0.001). Valence sets of images were matched on luminosity, visual complexity, as number of images rated to be social in content. Faces were drawn from the XM2VTSDB multi-modal face database (Messer et al. 1999), the NimStim database (Tottenham et al. 2009), and the Montreal Set of Facial Displays of Emotion (Beaupre, Cheung, and Hess 2000). To reflect our diverse subject population, these faces included equal proportions of male and females with a broad range of ages and ethnicities. Faces were cropped just above the hair and below the chin, converted to black and white, and edited (e.g., to remove distinctive facial hair and eyeglasses). A total of 45 neutral faces were presented, and each face was presented following 2 randomly selected pictures from the same valence category.

Picture Ratings Task

Following the scans, participants rated the pictures they viewed during the fMRI Emotional Response Task, following the same instructions as described in Colectica documentation for the psychophysiology session's out-of-scanner Emotional Response Task. See the most recent *M3_P5_DOCUMENTATION_OF_BEHAVIORAL_COGNITIVE_**. Raw behavioral data from this task as well as the out-of-scanner Emotional Response Task are on Globus and can be requested following restricted access instructions.

Face Ratings Task

Three days after the fMRI, participants were asked to complete memory and likeability ratings for the neutral faces presented during the scan. They completed this task on paper or online, rating each of the 45 faces viewed during the fMRI task interspersed with 45 novel faces. The novel faces are indicated with an 'A' next to the image number.

Each of these 90 faces was presented with two continuous rating scales. First, participants rated their memory of each face selecting any place on the continuum between equidistant anchor points labeled "*completely certain new*", "*somewhat certain new*", "*unsure*", "*somewhat certain old*", and "*completely certain old*". Second, each of the 90 faces was presented again with a continuous rating scale for likeability of each face. The likeability scale had equidistant anchor points labeled "*really dislike*", "*somewhat dislike*", "*unsure*", "*somewhat like*", and "*really like.*" Memory ratings were always completed prior to liking ratings.

Ratings were converted to values ranging between -1 and 1, with higher values indicating either greater liking of a face, or greater confidence in having previously seen each face. Raw behavioral data from this task are on the restricted access data repository and can be requested following restricted access instructions.

PSYCHOPHYSIOLOGICAL MEASURES

During the fMRI

Psychophysiological measures (electrodermal activity, respiration, pulse oximetry) were collected during the fMRI Emotional Response Task and resting state scans using a BIOPAC MP150 system at 1000Hz with the EDA 100C (EDA), OXY 100C (Pulse Ox), and RSP 100C (Resp) amplifiers. Mid-study, in August 2021, the MP150 was upgraded to the BIOPAC MP160 system. Summary variables of the pulse oximetry data for heart rate variability are available via ICPSR and/or the Colectica portal (see most recent Colectica documentation *M3_P5_DOCUMENTATION_OF_PSYCHOPHYSIOLOGY_*)*, while the raw data for all psychophysiological measures recorded during fMRI are on Globus and can be requested following restricted access instructions.

Out-of-scanner psychophysiology

Psychophysiological measures (facial electromyography, electrodermal activity, respiration, electrocardiography) were collected during the psychophysiology session's Emotional Response Task. Summary variables for facial electromyography (corrugator supercilii, zygomaticus major and eyeblink startle reflex) and heart rate variability (via electrocardiography data) are available via ICPSR and/or the Colectica portal (see most recent Colectica documentation *M3_P5_DOCUMENTATION_OF_PSYCHOPHYSIOLOGY_*)*, while the raw data for all psychophysiological measures recorded during the psychophysiology visit are on the restricted access data repository and can be requested following restricted access instructions.

IMAGING

Image acquisition

MRI data were collected on a 3T scanner (MR750 GE Healthcare, Waukesha, WI) using a 32-channel NOVA head coil. The entire sequence normally took just under 1.5 hours with routine checks in between scans to ensure participant comfort and motivation levels remained high.

The T2-weighted imaging was added to the protocol midway through data collection. Moreover, time and comfort constraints resulted in not all participants contributing all modalities of data.

The imaging protocol followed this sequence of scans (for more acquisition details see below):

[1] 3-plane localizer (<1 min)
[2] Asset Calibration (< 1 min)
[3] T1-weighted BRAVO image (7.5 min)
[4] higher order shimming sequence
[5-7] three EPI functional task runs (7.5 min x 3)
[8] one resting state EPI run (8 min)
[9] Diffusion Weighted Images (10 min)
[10] sagittal field map (1.3 min)
[11] 3D ASL (4 min 38 sec)
[12] Cube T2 Flair (4.25 min)
[13] Cube T2 (4.4 min)

T1 structural MRI

T1-weighted BRAVO anatomical image (repetition time (TR) = 8.2, echo time (TE) = 3.2, flip angle = 12°, field of view (FOV) = 256 mm, 256 × 256 matrix, 156 axial slices, slice thickness = 1 mm, inversion time = 450 ms).

Task functional MRI

Three sets of echo planar images were acquired during the fMRI task (231 volumes, TR = 2000, TE = 20, flip angle = 60°, FOV = 220 mm, 96 × 64 acquisition matrix (128 × 128 reconstructed matrix), 3-mm slice thickness with 1-mm gap, 40 interleaved sagittal slices, and ASSET parallel imaging with an acceleration factor of 2).

Resting state functional MRI

One set of echo planar images was acquired during resting (240 volumes, TR = 2000, TE = 20, flip angle = 60°, FOV = 220 mm, 96 × 64 acquisition matrix (128 × 128 reconstructed matrix), 3-mm slice thickness with 1-mm gap, 40 interleaved sagittal slices, and ASSET parallel imaging with an acceleration factor of 2).

Resting perfusion (arterial spin labeling; ASL) MRI

3D ASL images (stack of spirals) with and without labeling were acquired axially with the following acquisition parameters: FOV = 240 mm, acquisition matrix = 512 × 8 (reconstructed matrix = 128 × 128), TR = 4888 ms, slice thickness = 4 mm, TE = 10.5 ms, flip angle = 111°, 80 images in acquisition. Quantitative perfusion images were normalized to MNI space using an affine transformation (FLIRT).

Diffusion weighted imaging (DWI)

The diffusion acquisition protocol was set as follows. 74-75 × 2 mm sagittal slices with 0 mm spacing, within plane FOV = 256 mm × 256 mm, and voxel size =2 mm × 2 mm. Acquisition matrix 128 × 128 (readout R/L), partial Fourier encoding 62.5% and ASSET (SENSE) x 2. TR = 8575 ms and TE =76.6 ms. Six non-diffusion weighted (b = 0 s/mm^2) images were acquired. A total of 63 diffusion weighted images in 63 non-collinear directions were also acquired. Of these 9 were acquired at b = 500 s/mm^2, 18 b = 800 s/mm^2 and 36 at b = 2000 s/mm^2. The two different diffusion weightings enable estimation of multi-compartment multi-tissue neurite orientation dispersion and density (NODDI) model as well as diffusion kurtosis image (DKI) and white matter tract integrity (WMTI) parameters that provide complementary tissue specificity compared to the classical diffusion tensor images (DTI).

Cube T2 FLAIR structural MRI*

Sagittal orientation, TR = 6002ms, TE = 106-110 ms, Preparation Time (TI) = 1696-1726 ms, Echo Train Length = 170, FOV = 250 mm, 248 slices, acquisition matrix (256 × 256) reconstructed matrix = 512 × 512, voxel size = 0.8 mm × 0.488 mm × 0.488 mm, Bandwidth = ± 35.71 kHz.

Cube T2 structural MRI*

Sagittal orientation, TR = 2502ms, TE = 100-107 ms, Echo Train Length = 100, FOV = 256 mm, 384 slices, acquisition matrix (256 × 256) reconstructed matrix = 512 × 512, voxel size = 0.5 mm × 0.5 mm × 0.5 mm, Bandwidth = ± 31.25 kHz.

*T2 weighted scans added part way through the MIDUS 3 data collection

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