Variables and analysis pipelines

General Notes: Analysis scripts will require modification to work in your unique setup. For example, directories will need to be set up for loading and saving data. I may be able to answer general inquiries by email as time allows, but code support is not guaranteed. Code was developed on Windows and has not been tested on any other operating system.

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Top-level analysis code

These scripts make plots and conduct statistical analyses used in the manuscript. They can be found in the *analysis_scripts* folder.

Figure generation

- VAST_manuscript_figures_v3.R
  - Collect data and generate figures used in the manuscript.
  - Figures are generated in the same order as they appear in the manuscript.
  - In several cases, multi-panel figures were arranged in Adobe Illustrator. The outputs of this script are generally rudimentary figure components used in these Illustrator files.
- VAST_wholeTrialPupilAnalysis.R
  - Pupillometry sub-panels found in Figure 4.
- plot_all_ERPs.R
  - Separate script to generate the event-related potential panels in Figure 5A. Each panel is saved as a separate image file.

Statistical modeling

- VAST_LMER2.R
  - Conduct LME modeling on the error rate data.
  - Includes analysis of both the Intervening task and working memory task errors.
- ERP_LME.R
  - Conduct LME modeling on ERP P2 amplitudes.
  - Located in the *EEG_Analysis* subfolder.

Data processing pipelines

Behavioral data (error rates)

- Raw behavioral data are provided in .mat format. Files are named according to the following convention: [participant_ID]_[session_modality]_[alphanumeric code].
    - Example, the file **p2670_v_190628.mat** is data from the visual working memory session (auditory and visual working memory were conducted on separate days) for participant 2670.
- Error rate data are compiled and analyzed in the MATLAB analysis script **VAST_behavior.m**. This outputs the file **errorRates.mat** into *RESULTS\VAST\DATAforR*. This file is used by the top-level R scripts described above.

Pupillometry data

- Raw pupil size data (.edf format) are provided in .edf format. They are named following a similar format to the behavioral data, just without the alphanumeric code at the end.
- Pupil data were preprocessed using a custom GUI as described in the manuscript. Cleaned pupil data are available as .mat files in the following location: *PREPROCESSED_DATA\VAST\Cleaned_Pupil_Data_wholeTrial*.
    - The GUI code is available upon request via GitHub. Note that these functions should be primarily for reference and replication; the code is unlikely to work for other datasets without significant adaptation.
- The analysis script **pupil_avg_WT.m** averages across trials within each participant, conducts permutation testing to find time stretches of significant difference between conditions, then computes grand averages across participants. The "_WT" refers to "whole trial", as these analyses include the WM encoding and retention windows.
    - This script relies on the helper function stored in **pupil_permutation.m**.
    - Analyzed data are stored in *RESULTS\VAST\DATAforR\WholeTrial*. The key .mat files are **avgPupil_wholeT.mat** and **pupilStats_wholeT.mat**. The former contains grand average data, the latter contains results of the permutation testing.

Event-Related Potentials (ERPs)

- The figure below illustrates the processing pipeline for the ERP data. Analysis scripts are shown in blue, data files are shown in green.
- ERP analysis scripts are stored in *analysis_scripts\EEG_Analysis*, except for the final scripts (at the bottom of the figure below), which are stored in the root *analysis_scripts* directory.
- Preprocessed ERP data are stored in *PREPROCESSED_DATA\VAST\ERP*.
- Note that analysis scripts may output additional files (especially preprocessing scripts), but only those used by the main downstream analyses are included.

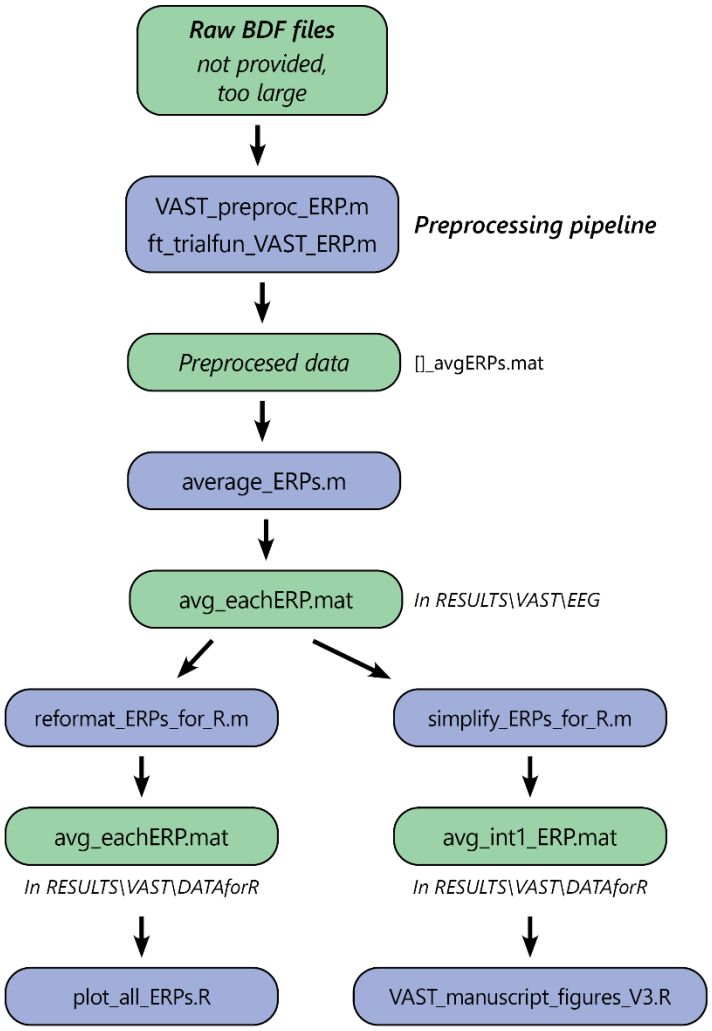
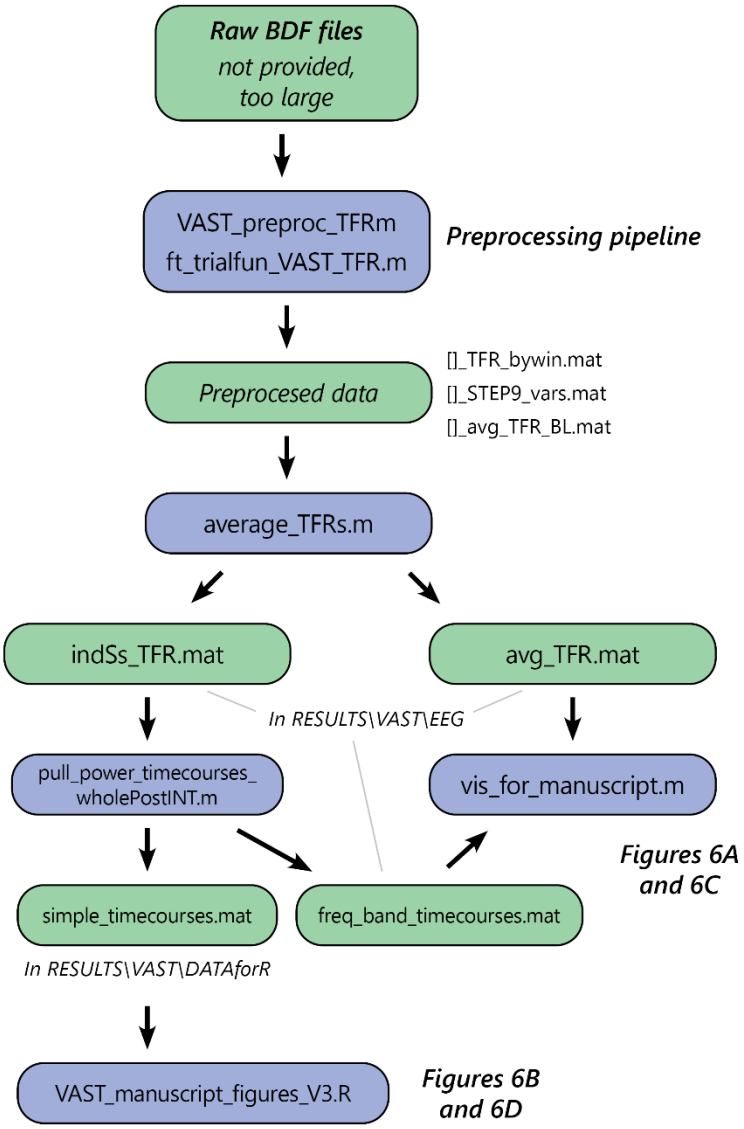


Figure 5A ***Figures 5B and 5C***

Time-Frequency Responses (TFRs)

- The figure below illustrates the processing pipeline for the TFR data. Analysis scripts are shown in blue, data files are shown in green.
- Preprocessed TFR data are stored in *PREPROCESSED_DATA\VAST\TFR*.
- Note that analysis scripts may output additional files (especially preprocessing scripts), but only those used by the main downstream analyses are included.