


PSY4320 1 Research methods in cognitive neuroscience Part II

Oppgaver	Oppgavetype	Vurdering
 Task description	Dokument	Ikke vurdert

PSY4320 1 Research methods in cognitive neuroscience Part II

Starttidspunkt:	12.05.2017 09:00	PDF opprettet	04.07.2017 09:25
Sluttidspunkt:	26.05.2017 14:00	Opprettet av	Elin Arntzen
		Antall sider	6

Seksjon 1



Task Description for Written Examination Module PSY4320

General task description:

Your task is to analyze a set of EEG data of a stop signal task, and to program your own toolbox for EEG processing to do so. The parameterized event-related potential data will then be statistically assessed using SPSS. All necessary files can be downloaded from Fronter.

File description:

The files (*.mat) contain data from a study using a stop signal task. EEG from a total of 13 participants was recorded. The data are stored in simple mat-files with most structure names being self-explanatory. However, the native file-format was built somewhat sloppy so additional information is needed:

- The sampling interval is given in microseconds (μs). Hence, EEG data were sampled every 4000 microseconds. What is the corresponding sampling frequency in hertz (Hz)? The measurement unit of the signal is microvolt (μV).
- As online reference served Cz, which was not included as physical channel in the data.
- Besides the common EEG channels, all datasets also contain information from two horizontal ocular electrodes placed lateral to the outer canthi (HEOG_li \approx left, HEOG_re \approx right) and two vertical ocular electrode (VEOG_re_u: below right eye; VEOG_re_o: above the right eye). These channels can be used for artifact rejection.

The data recorded stem from a stop signal task: subjects are asked to respond via button press to a frequently occurring stimulus (go signal) but to withhold the response when this stimulus is followed by a second one (stop signal; inter-stimulus interval < 150 ms). These are the corresponding trigger/marker codes:

- S 8: go signal
- S 4: stop signal
- R 2: response

Hence, valid stop trials (go signal followed by stop signal but no response), go trials (go signal followed by response; no stop signal) as well as erroneous stop trials (stop trials with a response) can be differentiated.

Task specifications:

1) Write functions implementing the basic processing steps to extract event-related potentials (ERPs). Those processing steps include the recoding of triggers, data filtering, re-referencing, epoching, artifact rejection, baseline correction and averaging. Please also provide a flexible routine to visualize the data of specific channels and/or conditions.

The functions should be flexible to use. Hence, settings should be able to vary and differ from those needed for the datasets at hand.

Do not forget to provide a decent documentation for these functions.

Please follow these instructions for the analysis of the EEG data:

- No high-pass filtering is needed, but you should program a function for low-pass filtering based on a moving average procedure (see Luck, chapter 5, filtering as time-domain procedure). You are free to choose a window width for the analysis of the given data.
- Re-reference the data to mathematically linked (average) ears (channels A1 and A2). Channel Cz (the online reference) needs to be interpolated/recomputed during re-referencing (see Luck, chapter 3 for details).
- Extract epochs from -200 to 800 ms with respect to the trigger/marker of interest (valid stop trials: stop signal; go trials: go signal).
- Trials with artifacts should be rejected. Relevant artifacts in this context include eye blinks and muscle activity. More than one criterion for rejection should be implemented and used (see Luck, chapter 4).
- Extract mean amplitudes for the N200 and P300 for the go and stop condition. To do so, the function should locate each individual's peak amplitude for a given ERP at a specified electrode (or set of electrodes), and then compute the mean of the peak and its surrounding 4 data points (peak +/- 2).

Stick to the code conventions accompanying the datasets.

2) Write a well-commented MATLAB-script to process the given datasets using your functions and the settings specified above and extract valid go- and stop-related ERPs. Visualize the outcome of your analysis (plot the ERPs).

3) Having computed the ERPs and extracted their amplitudes (N200, P300) from all subjects and conditions, compute statistics using SPSS comparing go and valid stop trials at several electrodes. Specifically, set up a three-factorial ANOVA with one factor for the experimental conditions, one for electrodes along the front-to-back axis and one for the left-to-right axis (a simple example for such analyses can be found in Luck, chapter 6). The latter two factors should have three levels each. Provide a description of your procedure, and the SPSS-syntax. Shortly describe the results and provide a concise interpretation.

Files to hand in:

1) A pdf-document containing a short documentation of the functionality of the MATLAB-functions, a description of the actual EEG processing, statistical analysis, results and interpretation. Append the SPSS output.

2) The m-files for all functions as well as the EEG processing script.

SUBMIT HOME EXAM IN FRONTER:

Arkiv --> Resources --> Home exam

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Module PSY4320

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