

Week 3 - Doing fMRI experiments

L03-04. How to design an experiment & Pilot studies

Byeol & Hongji

Post-master researcher assistant
and doctoral graduate student
in the Cocoan Lab

12 Mar 2021



L03-04. (1) How to design an experiment

Basic processes of experimental design

1. Starting experimental design

- What is your research question? (=What do you want to know from this experiment?)
- Which/How many conditions do you need?
- How many runs/sessions do you need?
 - **Run:** one continuous period of fMRI scanning (5-15min)
 - **Session:** all of the scans collected from one subject



vs

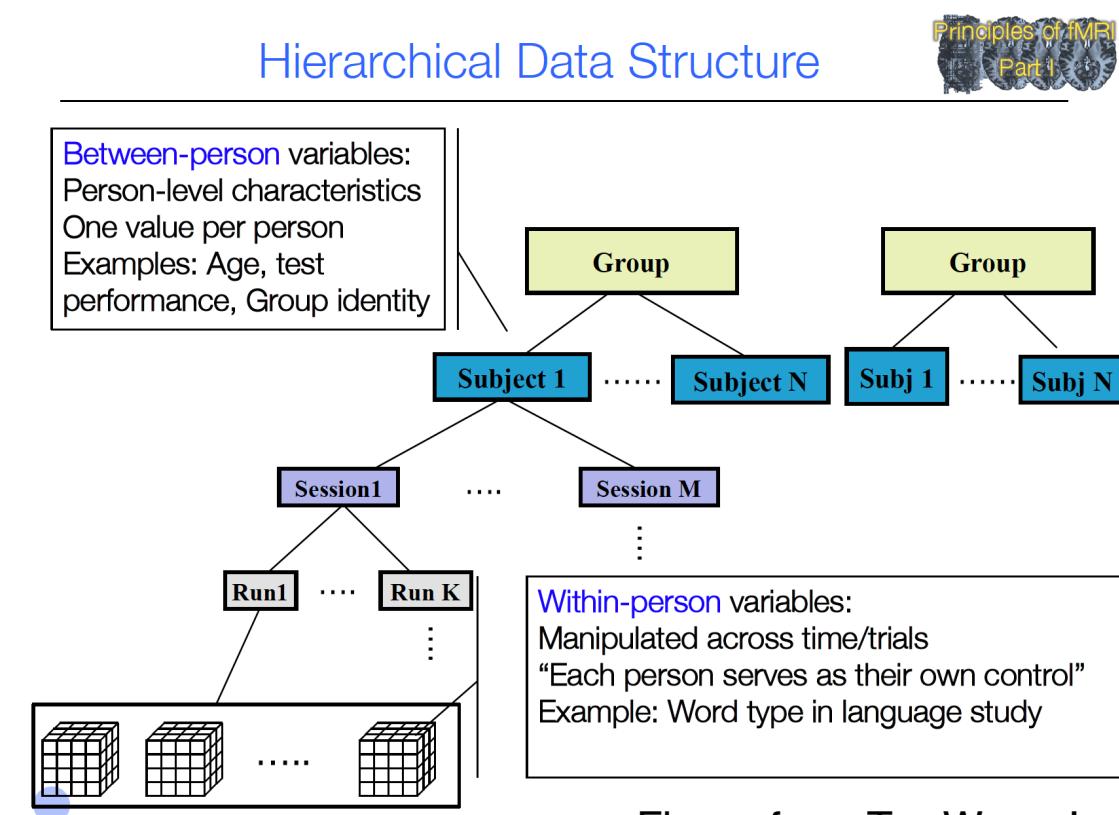
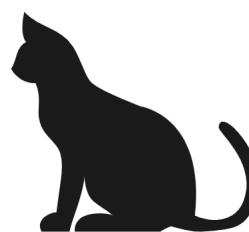


Figure from Tor Wager's coursera lecture



L03-04. (1) How to design an experiment

Basic processes of experimental design

1. Starting experimental design

- What is your research question? (=What do you want to know from this experiment?)
- Which/How many conditions do you need?
- How many runs/sessions do you need?
- What can be possible confounds that need to be controlled?

2. Getting feedbacks

- Have meetings with Wani to modify/ confirm experimental designs
- In the lab meeting, present your experimental design and get feedbacks from lab members (They can be good candidates for pilot tests!)

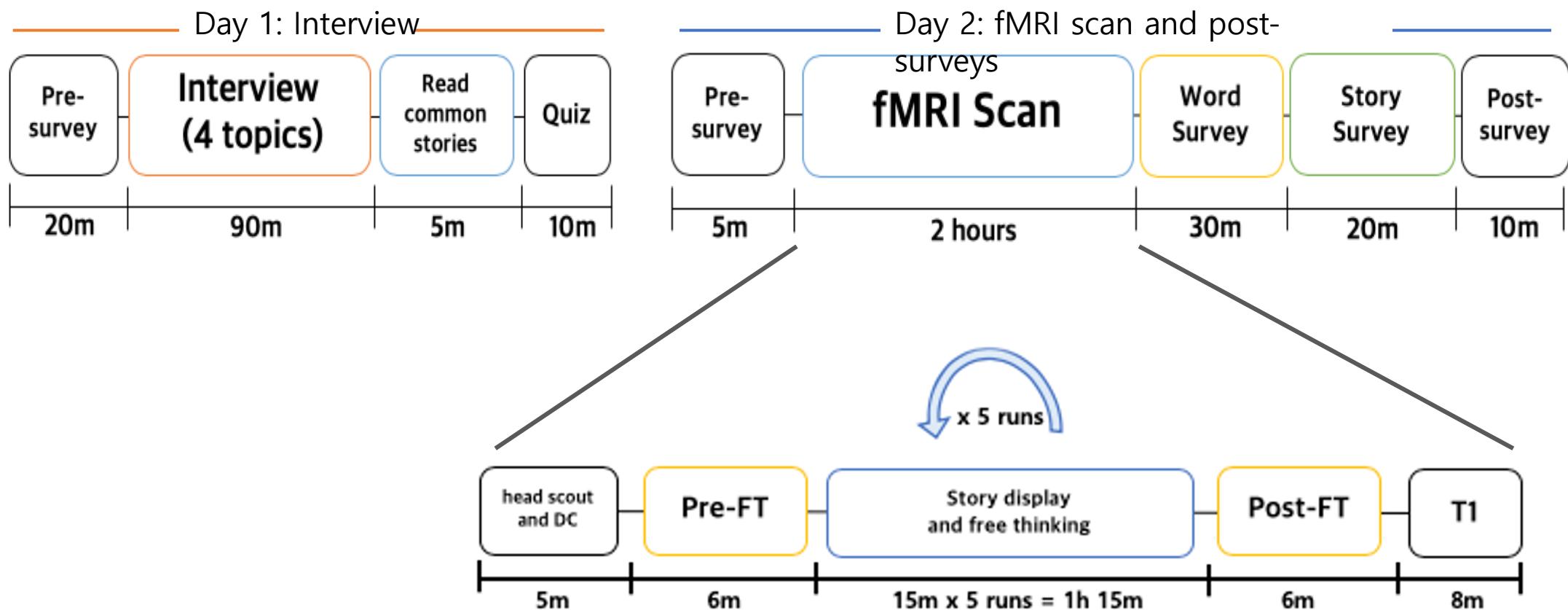
3. Cautions

- Triple-check randomization and counterbalancing (through pilot tests)
- If possible, through simulations, predict power and possible problems (cf. scn_spm_design_check.m)
- Get enough time for disdaq and baseline at the start of each run
- Note that: If you discover serious design flaws after data collection, all data can become useless.



L03-04. (1) How to design an experiment

Example of experimental designs



L03-04. (2) Doing a Pilot Study

1. Why do we need a pilot study?

- Doing fMRI experiment is a time/money-consuming process. We don't want to waste our time/money for incomplete experiments.
- Actual experience and feedback from participants are essential (very important: e.g., "The stimuli are too fast", "I cannot concentrate for 20 minutes for this same task", "The fonts are too small", ...etc)

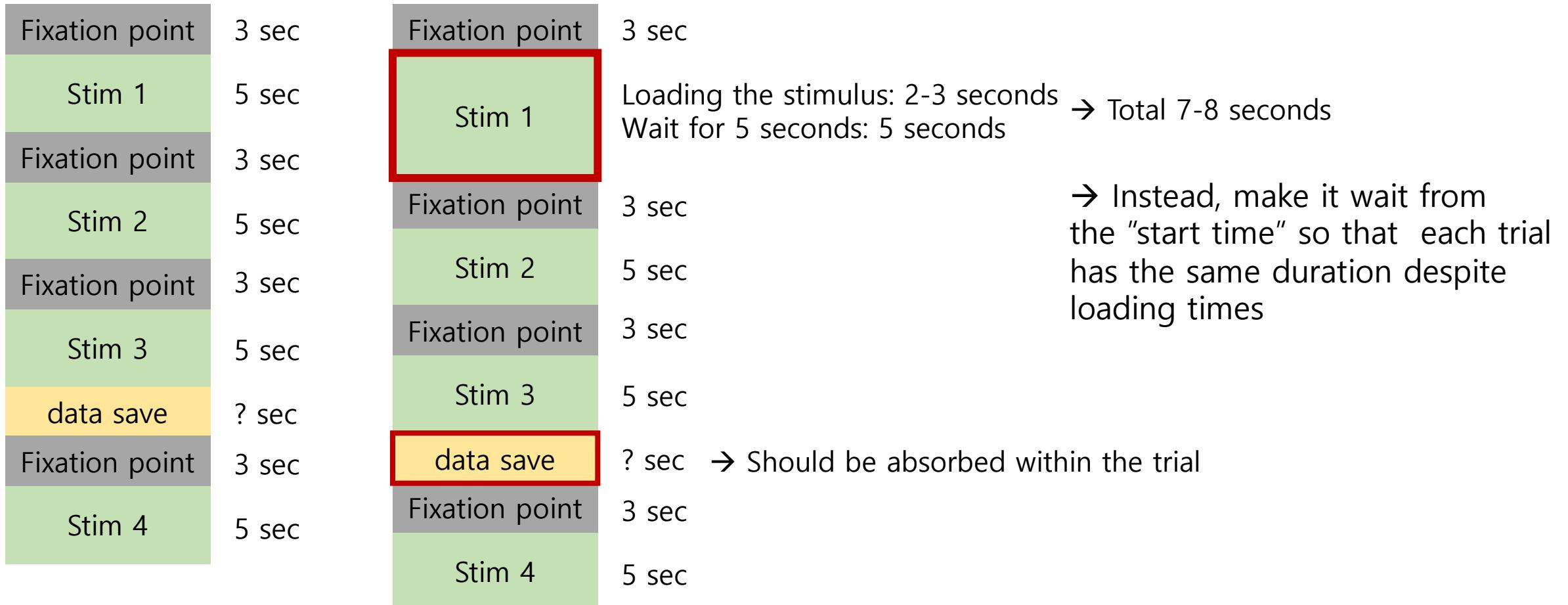
2. What do we need to check through pilot studies?

- Randomization, counterbalancing (never trust your codes.. 😊)
 - In MATLAB, `rng('shuffle')`
 - Always check the actual behavioral data
- Whether all data are saved properly (e.g., fMRI data, BIOPAC data, Matlab data, EYELINK data)
- Whether every necessary information is recorded (e.g., onset, trigger, ratings, timestamps, etc)
- IMPORTANT: check time syncing (e.g., syncing of actual ending time of MATLAB and scanner, timestamps)
 - sync among multiple datasets
 - use `waitsec_fromstarttime.m` to absorb possible delays
- If the experiment is aborted in the middle, is the data still safe? (e.g., saving data in run-level or trial-levels)
 - If you save the data too often, the computer can have a bit of load and this can make the time delay. Make sure this time for saving data is calculated and absorbed.



L03-04. (2) Doing a Pilot Study

- use waitsec_fromstarttime.m to absorb possible delays



L03-04. (2) Doing a Pilot Study

3. After pilot study..

- Analyze 1-2 behavioral data
 - Did participants follow the instruction?
 - Are the behavioral results consistent with expectations?
- Analyze 1-2 fMRI data
 - Are fMRI signal and image quality okay?
- Are the names of datafiles and variables okay?
- NOTE THAT: (Wani) in the past, the data was not saved properly and the whole experiment became useless. You need to be careful.



Cocoan 101

<https://cocoanlab.github.io>



Computational Cognitive Affective Neuroscience Lab (Cocoan Lab) <https://cocoanlab.github.io>

