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🌐 Before data acquisition -- Start MRI Project Spinoza REC V.16

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We use this protocol and it's working

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Abstract

Dear researcher,

This protocol outlines the steps to start an MRI project at the Spinoza Centre Roeterseiland (REC).
If you haven't had contact with Steven Scholte or Tinka Beemsterboer, make sure to contact them before completing this protocol.

You can reach us by email:
Steven Scholte: h.s.scholte@uva.nl
Tinka Beemsterboer: t.beemsterboer@uva.nl
Lukas Snoek: l.snoek@uva.nl

If you have any suggestions for improving the workflow, don't hesitate to add comments to the steps in the protocol.
Hope to see you soon!

The Spinoza REC team,
Steven Scholte, Tinka Beemsterboer, and Lukas Snoek

Ethical approval

1 **The MRI project should been approved by an ethical committee before running the pilot.**
Approval from the ethical committee (EC) may take some time; therefore, it is the first step in this protocol. Make sure to read the following steps from this section ("Ethical approval") before applying for ethical approval, as it will help you to include all the necessary information in your EC application.

External researchers starting a project at the 3T MRI scanner of the Spinoza Centre UvA REC may also request EC approval using the Ethical Committee of Psychology of the UvA. Send an email to lab-fmg@uva.nl and t.beemsterboer@uva.nl to request an account for the website for requesting EC approval. Mention in your email that you want to request EC approval for a MRI project at the Spinoza Centre UvA REC, your name, university, and department.

Once you have an account, go to the website: https://www.lab.uva.nl/lab.
Click in the upper right corner on 'Onderzoeker'. Log in and follow the instructions.

2 **Rules and regulations for lab research**
The MRI centre is part of the UvA FMG Lab.

The Lab Guide gives you information about for example:
- store research data
- rewarding participants
- buy neccesary material for your research (if not provided by the MRI centre)

Please make sure to read the Lab Guide, but skip the part about booking projects.
You can access the lab guide via de following link and your UvAnetID
https://top.socsci.uva.nl/?page_id=1793

The following link gives you access to the technical support website of the LAB
https://top.socsci.uva.nl/

In case you're not sure who to contact, we are happy to help you out.
Please just send an email to Tinka t.beemsterboer@uva.nl

3 **Screening, information for participants and GP informed consent**
In order to optain ethical approval you need to inform the Ethical Committee or Medical Ethical Committee about the MRI-safety screening procedure and "Incidental findings" procedure. In addition, you need to supply an information brochure about MRI-research that you will give to your participants.

You can find these files attached to this step in both Dutch and English. This also includes an explanation of the **incidental findings procedure** one needs to follow at the Spinoza REC ("description of anomaly procedure"). Include these files to your Ethical Approval.

Information letter for participants and informed consent.

📄 fMRI_InformationLetterAndInforme...

(Note that this document should be adapted according to your specific study.)

Informed Consent General Practitioner

📄 InformedConsentMRI_GP_SpinozaR...

📄 InformedConsentMRI_GP_SpinozaR...

Screening form (both English and Dutch)

📄 ScreeningMRI_SpinozaREC_EN_V10...

📄 ScreeningMRI_SpinozaREC_NL_V10...

Information brochure about MRI research for participants

📄 Spinoza_REC_MRI_info_NL_V7.pdf

📄 Spinoza_REC_MRI_info_EN_V7.pdf

Description of Anomaly Procedure

📄 DescriptionAnomalyProcedure_Spi...

4 **Data sharing**
If you plan on sharing your anonimized data with others, make sure to include this in your EC application. The template "information letter" (see previous step) includes an example paragraph that allows you to do so. When using the centre's preprocessing/QC pipeline, your data will be properly formatted to be uploaded to the **openneuro** data repository.

5 **Screening**
Subjects need to be screened before cooperating in MRI experiments. MRI is a perfectly harmless method for examining the brain, but the static magnetic field attracts metal objects. Therefore, the MR-operator needs to preclude the possibility that participants have any metal objects inside or on their bodies. The screeningform is created with consultation of the radiology department of the AMC. There is also a document provided by the Spinoza Centre REC-L where each question of the screening form is

explained. We advise all researchers to pre-screen their subjects to prevent, as much as possible, to have participants showing up and being rejected for the MRI scan. Keep in mind that the MR-operator has final responsibility for the screening en safety of the participant.

MRI screening forms are stored safely at the Spinoza REC. After a scan session, the researcher or MRoperator, has to deposit the MRScreening in the mailbox. The mailbox is located in the MR operator room.

6   **Rewarding participants**
Monetary rewards should be arranged by the research group.

First year UvA Psychology students have to earn a number of RC's during their first year. Projects from UvA Psychology can give these credits to subjects for participating in MRI studies.
In case you want to reward participants with RC's, contact Tinka Beemsterboer about this matter.

7   **Insurance**
The liability insurance of the UvA offers, within the framework of the policy conditions of the insurance, coverage for (non invasive) research provided the Medical Research Act (WMO) set no specific requirements regarding insurance for participants. This coverage includes damage to the equipment and damage to / from the subject and the experimenters. This coverage applies to researchers of the University of Amsterdam and visiting researchers at the University of Amsterdam (employees of other universities and employees of scientific institutes like the NIN). In addition, this insurance also applies for external (possibly commercial) research as long as this is conducted by employees of the UvA. For every claim there is a deductible for the institution of the researcher of 25,000 euros. If however there is an indication of WMO, the responsible investigator must get a separate insurance.

Liability
The Spinoza Centre REC-L advises all users to have a personal liability insurance.

8   **The PI of the MRI project completes the User Agreement.**
 If we did not have contact yet about pricing etc., please contact Tinka Beemsterboer or Steven Scholte.

The budget holder of the project completes and signes the contract.
Before signing a contract, make sure to read the **UserPolicy**

Send the contract to t.beemsterboer@uva.nl.

📄 scanovereenkomstrecl_eng_v2.4.pdf

Quality control of scanner

9   **Weekly and monthly quality control**

The Spinoza Centre REC-L does a weekly and monthly quality control of the MR scanner to maintain good quality of the scans. If any irregularities are noticed they are solved by the Spinoza Centre REC-L, and if necessary by Philips Healthcare. If we find that it may have influenced previous scans sessions, the Spinoza Centre REC-L contacts the researcher about this. During the weekly check we perform the Philips system wide quick check, make a recording of the basic sequences with a phantom (and perform subsequent data-analysis to determine the behavior of the sequences) and run through a checklist to ensure that the stimulus material and the rest of the center are in working order. During the monthly check we recalibrate the system to ensure that the operation specs are always close to the optimal. We further perform more complete diagnostics, for instance on each of the 32 channels of the headcoil.

10   **Apply for a calpendo User Account.**

The *PI and all other researchers, research assistants and interns* of the project should apply for a user account in Calpendo.

Go to the link **https://spinozarec.calpendo.com**.

Calpendo is the Calendar and user registration system used by Spinoza REC. Apart from booking registrations, Spinoza REC uses Calpendo to register Scan, Safety, Eyelink, EEG, GSR, EMG, fear conditioning and TMS certification, badges and BHV.

11   **Sign up for the mailing list**

The Pi and all other researchers, research assistants and interns of the project should sign up for the mailing list by sending an email to t.beemsterboer@uva.nl

The mailing list is later accesable via this link
https://groups.google.com/forum/#!forum/uva3tmri

12   **The PI of the project applies for a project in Calpendo.**

After the user accounts have been approved, the PI of the project can apply for a project in Calpendo.

Please follow the following workflow to request the project:
- In Calpendo press Projects, **Create Project;**
- Choose for **Project Code** the unique short name for your experiment as specified in the contract;
- **Upload the protocol** as known by the Ethics Committee, at Protocol
- In **Project Resource settings** choose the Resources needed for the project. Include the number of hours per resource and the costs per hour for use of the MRI

scanner as specified in the contract.
- **Users:** add all users of the project who have permission to manage MRI bookings for the project.
- **Safety:** set true at the stimulus equipment that will be used for the project.
  Note that the researcher of the project needs a certificate for using the Eyetracker, TMS, EGI and electrical stimulator.
  For more information about certification on stimulus equipment, contact Tinka Beemsterboer.

| Calendar | Templates | Bookings | Projects | Search | Admin | Help |

Cancel Save

	Short project Title
Project Code	Short project Title
User Agreement	Completed and send an user agreement ▼
Ethics Committee Code	2001-EXT-45
Type	MRI Project ▼
Status	Requested ▼
Owner	TinkaUser (T Beemsterboer) ▼
Description	Describe your project here
Start	6 Sep 2017
Finish	20 Sep 2017
Department	FMG ▼
Protocol	Choose File No file chosen

Project Resource Settings
Users
Proposed Sequences
Comments
Approvals (for administrator use only)
Safety
Project Groups

Resource	Cost Per Hour
3T MRI	250
Cancelled MRI Bookings	
MOCK/NPO DS.04	

Choose resources...

13 **Send an email** to Tinka Beemsterboer (t.beemsterboer@uva.nl) once you have requested a project in Calpendo and mention which stimulus equipment (as described in the Safety tab) you intend to use.

MRI Data export

14 **Apply for a storage folder.**
In order to export MRI data from the scan computer, you need access to an 'fMRI Projects' (for researchers affiliated with the UvA FMG) or 'Dropbox' (external researchers) folder on our data-server.

Instructions:

- UvA FMG researchers (**link**)
- External researchers (**link**)

How to access the dropbox FTP-server is explained **here**.

Introduction Meeting

15 **Schedule an introduction meeting.**
Spinoza REC offers the possibility to have a meeting with Tinka Beemsterboer, Lukas Snoek and Steven Scholte to discuss the project. To set up a meeting, email Tinka Beemsterboer (t.beemsterboer@uva.nl).

Examples of what to discuss during the intro meeting
- Choice of scan sequences
- Set-up of the experiment
- Information about our automated preprocessing and quality control pipelines (see also step 18)
- MR-course for the MR-operator
- Safety certification of assisting researchers
- Planning of the project
- Access to the Spinoza Centre *(all researchers and research assistants get access to the Spinoza Centre, either on your UvA card or a badge provided by the Spinoza Centre REC)*.
- Use of Spinoza REC lockers
- Expectations and questions from both parties

We strongly advice to make use of this oppurtunity and prepare accordingly, because it is our experience that small details, which are easily overlooked, often result in failed pilots and the loss of valuable scanning time. The rest of this protocol gives you more information about this matters.

Scan sequences

16   Below, you can download an overview of our standard set of scan sequences. While the document is 'work in progress', we recommend to take a look at it before the introduction meeting.

📄 SpinozaREC_scan_sequences.pdf
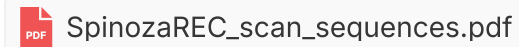
Experimental paradigm/stimulus programming

17   **Make sure to have a working paradigm that waits for the first start pulse of the scanner**
With each BOLD-MRI volume (excluding dummy scans), a trigger is sent to the stimulus computer. These enter the system as the letter **t** (a keyboard response). Make sure your paradigm doesn't start until it registers the first keyboard **t** response.

The following stimulus programs are installed on our stimulus-computer:

- Presentation (for which we offer technical support)
- E-Prime
- Matlab (Psychtoolbox)
- PsychoPy
- (For other programs, contact Tinka Beemsterboer for the possibilities)

18   **Make sure your experiment interfaces properly with the response buttons of our button boxes.**
Check the image below for the mapping of the buttons to the registered reponses on the stimulus-computer (e.g., a reponse with the left index finger of the left hand will be registered as a keyboard **e** response).

We also offer the use of the MRI compatible mouse and joystick. Let us know when you want to use these.
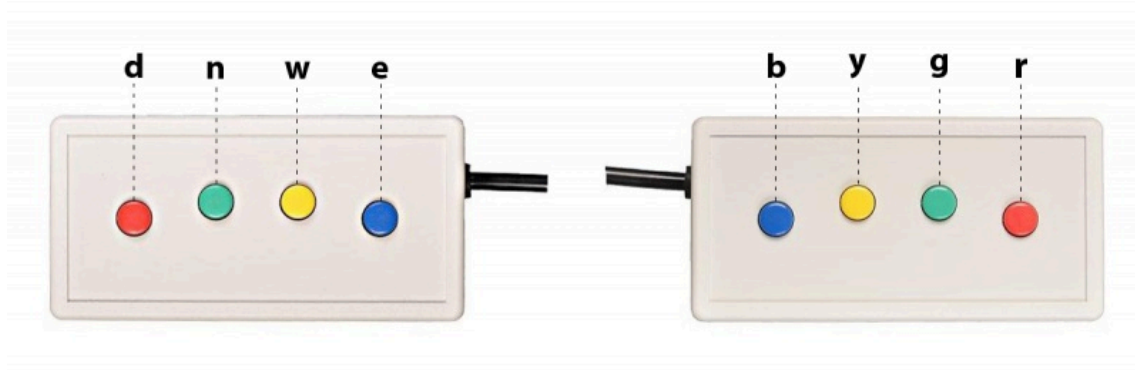
19   **Decide on whether to use additional stimulus equipment.**

Note: users are not allowed to change the stimulus set-up of the Spinoza Centre REC without approval from Spinoza staff.

If you think additional stimulus equipment or other programs are necessary for your experiment, please let us know.

For example:
- Auditory stimuli;
- PPU (cardiac signal) and respiratory belt. This is free of charge and it is not necessary to book extra time for this;
- Eye tracker;
- EEG;
- Skin conductance;
- EMG;
- Electro-stimulator device (pain stimulation)
- TMS

 Ideally, mention if you plan on using extra stimulus equipment during the introduction meeting.

For the use of additional equipment additional training is required. This is mostly done in short courses, depending on the experience of the user. The user may very well be an experienced user already, in this case we only verify correct handling of the equipment and some MRI specifics. This "exam" can be done within an hour and there are no additional costs. To get experience using the equipment you may consider consulting an experienced fellow researcher.

There are no additional costs for using GSR, EMG, EyeTracker, Electrical stimulation, ECG, PPU, Resperatory belt and auditory system. Electrodes and other accessories are provided and also without additional costs.

The additional costs for the use of EEG are 50/hr if you need to use a cap from the Spinoza Center.

For TMS this still needs to be determined, contact Steven Scholte for more information.

We are happy to give you advice and/or more information about the additional equipment.

Preprocessing/QC service

20 **Decide on whether to use our Preprocessing Pipeline and QC pipeline offered by Spinoza REC**
We offer automatic BIDS-conversion, preprocessing, and quality control of your data.

*Info about **BIDS**-format and the Spinoza BIDS converter tool*
In order to run the QC and/or preprocessing pipelines (**MRIQC** and **FMRIPREP**, respectively), we need to convert the raw data from the scanner to the **BIDS**-format. The BIDS-format is a specification of the format and naming of files associated with neuroimaging experiments. We have developed a tool (**bidsify**) that is able to automatically convert MRI data and associated files from our scanner to the BIDS-format, such that we can use the aforementioned pipelines.

Our BIDS-conversion tool works, in principle, with all standard scans in our repository (i.e., it doesn't work with custom sequences) *given that you've given the correct names to your scans*. Also, unfortunately, our BIDS-conversion tool *does not work with scans that are manually stopped by the MR-operator* (which is sometimes done in experimenting with variable stimulus/task timing). So, if your scans need to be stopped manually, you cannot use the preprocessing/QC services.

During the pilot, the MR-operator will help you with the correct naming, but the responsiblity for correct naming lies, ultimately, with the researcher.

21 **Decide on the specific scan sequences that you want to run.**
We advise you decide on which and how many sequences you want to run, including structural scans (T1-weighted, T2-weighted), functional scans (EPI-based), diffusion-based (DWI) scans, and fieldmap scans (e.g., B0-based phase-difference fieldmaps or 'top-up' fieldmaps). Also, calculate the duration of the scans with regard to the duration of your paradigm/tasks.

If you intend to use other sequences than the basic sequences, let us know in time so we can set this up before the pilot (ideally, in the introduction meeting).

22 **Folder structure in BIDS (in case you want to use the automated preprocessing or Quality Control Pipeline).**
Not using the preprocessing of qc pipeline? Skip this step!

Every day at 11pm, we will check the export folders (fMRI Projects or Dropbox) corresponding to the currently active experiments at our centre. If we find 'new' data, we will copy it to our server and start BIDS-conversion and QC (and, if desired, preprocessing). In order for our tools to 'find' your data, we expect it to be organized in a particular way. In all cases, we expect that you export the data to a subfolder in your export folder called 'raw'. Then, we expect each subject to get its own subdirectory in the 'raw' directory, with the subject name as folder-name (e.g., *sub-01CON*). Optionally, if you have multiple sessions, each session will get its own subdirectory in the subject-directory, with the session name as folder-name (e.g., *ses-01*). For example, suppose you plan to scan 20 subjects, each two sessions, and your export folder is called 'fMRI Project ExampleExp'. You should export the data from subject *sub-01_ses_01* to the following location:

```
fMRI Project ExampleExp
└── raw/
        └── sub-01
                └── ses-01
                        ├── sub-01_ses-01_T1w.PAR
                        ├── sub-01_ses-01_T1w.REC
                        ├── sub-01_ses-01_task-Nback_acq-SeqMm3_bold.PAR
                        └── sub-01_ses-01_task-Nback_acq-SeqMm3_bold.REC
```

If you don't have multiple sessions, you may export all files directly to the subject-directory, e.g.:

```
fMRI Project ExampleExp
└── raw/
        └── sub-01
                        ├── sub-01_ses-01_T1w.PAR
                        ├── sub-01_ses-01_T1w.REC
                        ├── sub-01_ses-01_task-Nback_acq-SeqMm3_bold.PAR
                        └── sub-01_ses-01_task-Nback_acq-SeqMm3_bold.REC
```

Note that you cannot create directories within your export folder from the scan-computer; you can use the 'scan-assistant' computer (right of the scan-computer) for that. Then, after 24 hours or so (depending on the desired parameters used in the

preprocessing pipeline), we will copy the BIDS-converted data, quality control results, and preprocessing results to your export folder, using the following structure:

```
fMRI Project ExampleExp
    └── raw
    └── bids
            ├── sub-01
            │         ├── anat
            │         ├── dwi
            │         ├── fmap
            │         └── func
            └── derivatives
                    ├── fmriprep
                    │         ├── sub-01
                    │         │         ├── anat
                    │         │         ├── dwi
                    │         │         ├── fmap
                    │         │         └── func
                    │         └── sub-01.html
                    ├── freesurfer
                    │         └── sub-01
                    └── mriqc
                            ├── sub-01
                            ├── sub-01_ses-01_task-Nback_acq-SeqMm3_bold.html
                            ├── sub-01_ses-01_T1w.html
                            ├── group_bold.html
                            └── group_T1w.html
```
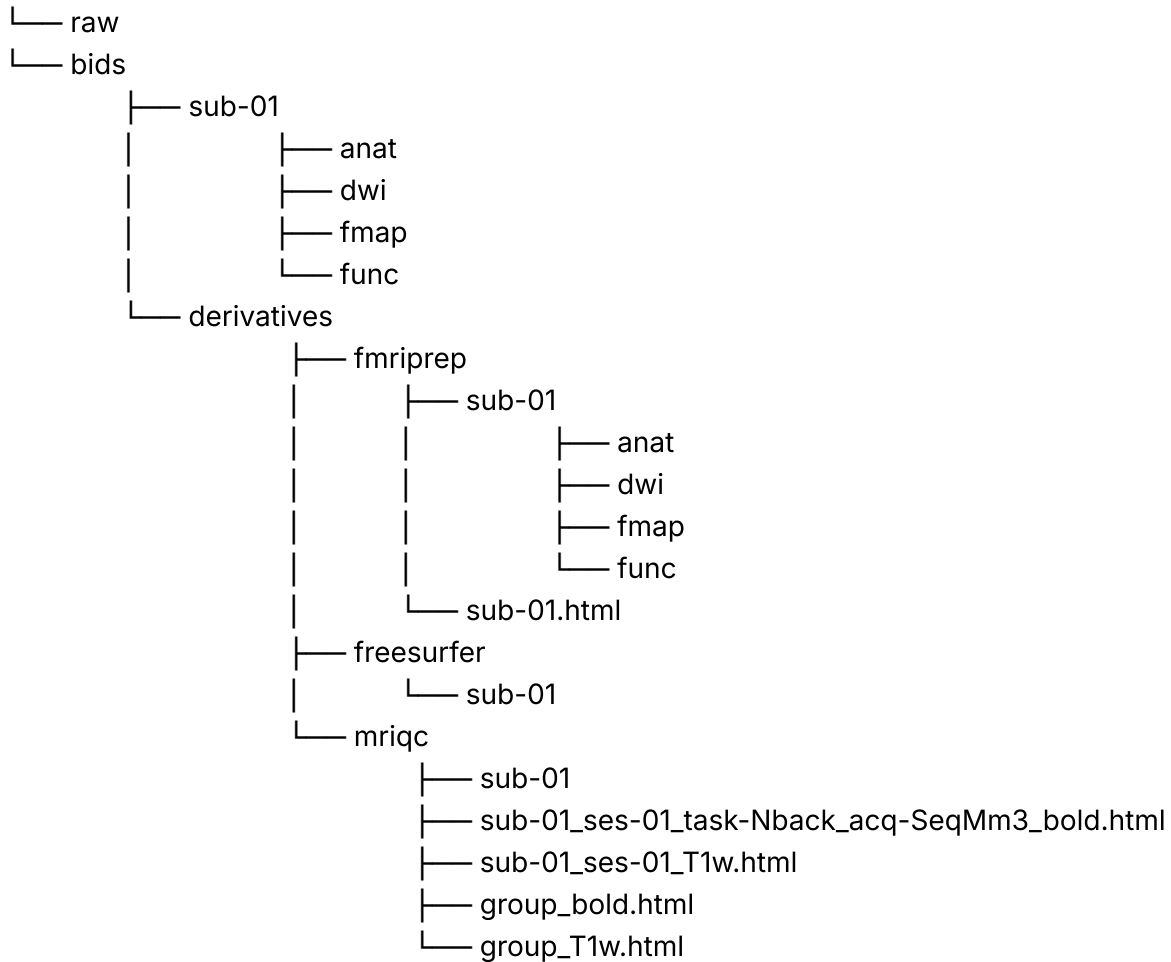
All "BIDSified" data will be stores in a directory called "bids". Moreover, this directory contains a subdirectory called "derivatives", that contains all "derived" results from the BIDS-data, including the output from the preprocessing pipeline ("fmriprep", and optionally "freesurfer") and QC-pipeline ("mriqc"). The html-files contain information and visualizations of the intermediate steps and results from the preprocessing and QC pipelines. You can simply double-click these files to open them in your default browser. The *group_*.html* files contain useful plots with different QC-metrics of all your participants so far, which is a great way to easily spot outliers (e.g., participants with a lot of motion).

Estimate scanning time

23   **Estimate the time needed for one participant.**

Below you find an approximation of the scan time needed per participant depending on the stimulus setup; note that the duration of the scans should include communication to the participant, set up of the scans, shimming and survey scan. Furthermore the time needed per participant is dependent on the type of participants and the experience of the researcher.

- Simple protocol, possibly including PPU and Resp: duration of the scans + 10 minutes;
- With GSR or EMG measurements: duration of the scans + 20 minutes;
- With eye tracker measurements: duration of the scans + 20 minutes.

Of course, this estimation may be adjusted after the pilot or during your experiment.

Schedule and prepare a pilot

24   We strongly recommend running a pilot session with an experienced subject. Please email Tinka to schedule
In the protocol referenced at the very last step of this document, we'll outline a checklist with things to think about before running a pilot session.
Read the Protocol on running an MRI pilot at Spinoza REC so that you will be even more prepared for the pilot.

Let us know if you have any questions before coming to the pilot!