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Safety Guidelines
2021-12-16

Stockholm University Brain Imaging Centre (SUBIC)

Department of Linguistics

SUBIC SAFETY GUIDELINES

This document contains a summary of the current safety guidelines at Stockholm University Brain Imaging Centre (SUBIC). This summary is not a definite collection and there will be additional safety instructions communicated in safety classes for each instrument. This is further a dynamic document that will be continuously updated as needed. It is therefore advisable to revisit this document on occasion to keep up to date with all safety requirements. These guidelines have been put in place to keep all individuals safe as well as to assure that our equipment is able to operate at its full capacity.

1. General access

Users will be provided with an access card that will give them general access to SUBICs facilities around the clock. Access will automatically be given to Zones 1 and 2 (defined below). No guests can be brought to SUBIC unless they are participants in your ongoing experiment, assisting with an experiment, or are at SUBIC for a meeting or otherwise professional purpose. When entering the premises, it is important to assure that no one that should not have access to SUBIC is allowed in. If an unauthorized individual is found in SUBICs facilities, SUBIC staff or campus security should be notified as soon as possible.

2. MR safety routines

Data handling

MR data is not stored long-term at SUBIC. Researcher should export their data from the scanner soon after each collection to avoid accidental deletion or overwriting. The necessary information entered into the MR system when a new research person is registered should not contain data that can be used for identifying the individual. The researcher enters a Subject-ID instead of the name of the research person and they do not register the personnummer (social security number). The key that can link a Subject-ID to an individual is kept by the researcher and should not be stored within SUBICs premises.

MRI safety zones

The areas of SUBIC that are relevant for MR researchers are divided into four safety zones following the recommendations and guidelines of the American College of Radiology (ACR)

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[1,2]. Zones 1 through 4 correspond to levels of increasing potential safety concern and are therefore under different access and safety rules.

Zone 1: These areas can be accessed freely by anyone, e.g., the waiting room.
Zone 2: These are the parts within SUBIC that are outside of the areas demanding specific MR access. Zone 2 can be seen as an interface between the freely accessible areas (Zone 1) and the strictly controlled MR areas (Zones 3 and 4).
Zone 3: To enter this zone you need to either have Level 1 or 2 access or be brought in under the supervision of someone with Level 1 or 2 access. In terms of magnetic field strength, this part of the MR area is safe for unscreened people. The magnetic field here never exceeds 5 Gauss, an upper limit considered safe for medical electronic implants such as cardiac pacemakers.
Zone 4: Zone 4 consists of the scanner room and the system equipment room and is the area with the highest risk. Because of the strong magnetic field, no unscreened person may ever enter Zone 4. All ferromagnetic objects must be excluded before entering the scanner room. Before any new equipment is allowed to be brought into the scanner room, it must be tested and approved by the staff MR physicist.

Access levels

Before a person is allowed to work in the MR environment (Zones 3 and 4) they need to participate in safety training where they learn about the potential dangers involved and how to prevent and handle a variety of safety related issues. Following the recommendations of the ACR [1,2], we divide people into three different access level groups with different permissions.
Non-MR persons: This group refers to anyone without Level 1 or 2 access, for example a research subject. A Non-MR person is never allowed to be in Zone 3 or 4 unaccompanied and their safety is the responsibility of the person with access that brought him/her in.
Level 1 access: After successfully finishing a first and more basic MR safety training Level 1 access will be provided. This level allows unaccompanied access throughout Zones 3 and 4. The Level 1 authorized individual can bring in Non-MR persons into Zone 3. Non-MR persons need to be accompanied by an individual with Level 2 access if entering Zone 4.
Level 2 access: To get Level 2 access, a more extensive safety and operating training (on top of the Level 1 course) course is needed; followed by a few assistant scanning sessions where the individual operates the scanner under supervision. Individuals with Level 2 access are allowed to independently handle the MR scanner and perform scanning. A Level 2 person must always be present when bringing a Non-MR person into Zone 4 and they are also responsible for that person's safety.
After the training, you sign a document where you acknowledge that you received the training, that you understood the material, and that you agree to follow the safety regulations and instructions. If you do not start working actively in the MR laboratory within two months after training, you will need to retake the course. Both Level 1 and 2

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access are only kept as long as you work in the MR laboratory on a regular basis. Once an access is lost or a year has passed since the training, a refresher course is mandatory.
[1] Kanal E, Bell C, Borgstede JP, Bradley WG, Froelich JW, Gimbel JR, et al. ACR guidance document on MR safe practices: 2013. J Magn Reson Imaging 2013;37:501–30. doi:10.1002/jmri.24011.
[2] ACR Manual on MR Safety 2020, https://www.acr.org/-/media/ACR/Files/Radiology-Safety/MR-Safety/Manual-on-MR-Safety.pdf

Mandatory persons during experiments

As recommended by the ACR [2], it is mandatory to be two people during scanning; one scanner operator and one assistant. The scanner operator has Level 2 access and is the person that controls the scanner and that is responsible for any Non-MR person inside Zone 4. The assistant has Level 1 or 2 access and is always present and available to directly assist when needed.

The person bringing a non-MR person into the MR area (Zone 3 and 4) is then responsible for them unless responsibility is formally transferred to someone else with level access. Inside the scanner room, there is always a Level 2 person responsible.

Screening procedures

To assure safety, every person that is going to be scanned in the MRI must go through SUBIC's MR screening procedure. If the same person is being scanned again at a later time, the screening must be redone to make sure that nothing has changed. Important, individuals that are merely entering Zone 4, e.g., parents joining their child, must also be screened.
The screening consists of two parts: filling in a screening form and scanning the person with a metal detector.
Screening form: The screening form consists of 12 questions designed to identify aspects of concerns for exposing the non-MR person to the magnetic fields. The scanner operator should go through the answers together with the participant to make sure the person does not have a contraindicator to be inside the MR camera. The Level 2 safety training contains information on how to deal with various screening form results and when there is any doubt, the staff MR physicist should be consulted.
Metal detector: Just before bringing the non-MR person into the scanner room, they must be checked with a metal-detector to assure that no metal objects, e.g., hairband, mobile phone or pen, has been left on the person.

Incidental findings

Incidental findings are rare but not exceptional, even when scanning healthy individuals. MR scans at SUBIC are not routinely clinically evaluated, but standardized procedures are in place at SUBIC to aid the principal investigator (forskningshuvudman) fulfilling their responsibilities according to Swedish law in respect of handling potential incidental

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findings. In other words, it is the principal investigator of a study that is responsible to either inform their own medical expert about the suspicious finding or contact SUBIC. SUBIC will then contact our medical experts who will advise the principal investigator of the project whether further clinical assessments might be needed. **It is further the responsibility of the project's principal investigator, when deemed necessary, to contact the research participant to inform them about potential findings and the recommended steps for further investigation.**
Note that the research participant should not be informed that an image is being flagged as a potential incidental finding. Only if a medically trained expert has evaluated the scan and judged that further clinical investigation is necessary should the research participant be informed. This procedure is in place to prevent undy stress because in most cases, flagged incidental findings are innate or benign.

3. EEG safety routines

Data handling

EEG data is not stored long-term at SUBIC. Researcher should export their data from the EEG computer after collection to assure that the data is not deleted or overwritten. The necessary information entered into the EEG recording system when a new EEG session is started should not contain data that can be used for identifying the individual. The key that can link a Subject-ID to an individual is kept by the researcher and should not be stored within SUBICs premises.

Electrode cleaning and EEG system handling

It is important that the EEG electrodes and cap are cleaned according to the cleaning instructions directly after each session to avoid transfer of any pathogens or diseases between participants. Only authorized electrodes is allowed to be attached to the EEG system.

Safety training

Before use of the system, all users must have gone through the mandatory safety and handling course.

4. X-ray microscope safety routines

Data handling

Data from the x-ray microscope is not stored long-term at SUBIC. Researcher should export their data from the microscope computer soon after collection to assure that the data is not deleted or overwritten.

Sample handling

Safety measures need to be implemented for samples with potential hazard, including, but

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not limited to, toxic chemicals, biohazards, and radioactive materials.

All sample materials should be removed from SUBIC after the experiment unless alternative arrangements are agreed with SUBIC staff.

Safety training

Before initiating use of the system, all users must have gone through the mandatory safety and handling course.