



Recommended precautions because of Covid-19 for perceptual, behavioural, quality and user experience experiments with test persons in indoor labs

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## Executive summary

Based on the recommendations from the Public Health Agency of Sweden (Folkhälsomyndigheten; FHM) and a set of internal rules from RISE, the following rules are published for how to conduct experiments involving test persons in the times of the pandemic Covid-19. The recommendations are for non-invasive and non-medical tests, e.g. perceptual, consumer, ergonomic and human-computer interaction tests taking place in an indoor laboratory.

Specifically, in this document we are specifying how experiments with test persons targeting audio and visual presentations should be done considering necessary precautions imposed by the Covid-19 pandemic. Laboratory experiments with test persons, as it involves inviting people to the lab, require particular planning and careful consideration, if they are to be carried out safely because of the risks imposed by the Covid-19 pandemic. The safety aspects are valid for both the invited test persons and are equally important for the health of the test leaders.

Key words: Covid-19, pre-caution, test persons, experiments, perceptual, behavioural, quality of experience, user experience, video quality

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# General guidelines

- Verbal agreement shall be obtained from both the test person and the test leader that he or she is healthy (asymptomatic).
- The test person is instructed to travel during non-rush hour (public transport) or with their own means of transport. Parking space can be booked in the Electrum garage if needed.
- The test person will only meet the test leader. Communication should be done at a safe distance, and preferably through electronic means.
- If both younger and older persons are tested, then they should not be tested close in time, and preferably not on the same day.
- Physical distancing is to be maintained; the test leader should not shake hands with the test persons when they arrive and leave.
- Both test person and test leader should wash and disinfect their hands thoroughly (for 30 s or more).
- The test person is to be instructed to use a face mask or a visor, as is most suitable for the experiment.
- The test leader should use a visor.
- A safe physical distance should be kept as much as is possible when giving the test instructions. Some test equipment may require the test leader to be closer than 1 meter but then preferably in as short a time as possible.
- Products and other equipment as well as the testing room with its furniture should be disinfected and cleaned using appropriate methods between sessions.
- Air purifiers with preferably HEPA-13 or 14 filters could be run in the lab between test sessions.
- Ideally, the test leader should stay in an adjacent lab/room during the tests. If the test leader is in the same room, a plexiglass shield should be used as a partition.
- The equipment that is used shall be adapted as much as is possible to the test conditions and Covid-19 safety., i.e. keyboards, computer mice, etc. When using VR/AR glasses, headsets, etc. for respective tests, they are to be cleaned between test sessions with UV-C light and ozone.
- For toilet visits, the test person shall be instructed to use a designated toilet (marked by the test leader). UV-C light and ozone should be used to clean the toilet between test persons. Other staff are to be instructed not to use this toilet during test sessions.

In addition to these rules and recommendations, the ethical rules for conducting tests and experiments with people should be followed, as specified in the Helsinki convention (first accepted in 1964 and later amended) [1] and regulated by national committees, for Sweden by Swedish Ethical Review Authority (Etikprövningsmyndigheten)[2].

# Content

<b>Executive summary</b> .....	<b>2</b>
<b>General guidelines</b> .....	<b>3</b>
<b>Content</b> .....	<b>4</b>
<b>1 Introduction</b> .....	<b>5</b>
<b>2 Instructions to test leaders</b> .....	<b>6</b>
2.1 Before the test.....	6
2.2 During the test.....	6
2.3 After the test .....	6
2.4 General recommendations.....	6
<b>3 Personal protection gears</b> .....	<b>7</b>
3.1 Visor or/and face mask .....	7
3.2 Gloves or hand disinfection .....	7
3.3 Plastic apron .....	8
<b>4 Before testing</b> .....	<b>9</b>
4.1 Invitations.....	9
4.2 Transportation.....	10
4.3 Reception .....	10
4.4 Instructions .....	11
4.5 Lab preparation.....	11
4.5.1 Ventilation.....	11
4.5.2 Cleaning.....	12
4.5.3 Arrangement of set-up.....	13
<b>5 During testing</b> .....	<b>15</b>
5.1 Pre-screening.....	15
5.1.1 Hearing measurements .....	15
5.1.2 Vision tests .....	15
5.2 Training of test person .....	16
5.3 Instructions when test persons are in the lab .....	16
5.3.1 Communication between test person and test leader .....	16
5.3.2 Running an experiment .....	17
<b>6 Convenience issues</b> .....	<b>18</b>
6.1 Breaks .....	18
6.2 Drinks .....	18
6.3 Toilets .....	18
<b>7 Ending and thanking</b> .....	<b>19</b>
<b>8 References</b> .....	<b>20</b>

# 1 Introduction

The Covid-19 pandemic has affected the world and society severely. Several restrictions are imposed on businesses, private life and social behavior in order to minimize the spread of the disease.

Laboratory experiments with test persons, as they involve having people come to a lab, require particular planning and consideration if the experiments are to be carried out safely because of the risks caused by the Covid-19. The safety aspects are not only limited to the test persons invited, but equally important is the safety and health of the test leaders.

The Public Health Agency of Sweden (Folkhälsomyndigheten; FHM) have recommendations that should be adhered to. RISE has also a set of rules, which are in line with FHM but at some points might be stricter.

In this document we are specifying how experiments with test persons when studying visual presentations in different forms, at times combined with audio, should be conducted, when considering necessary precautions imposed by the pandemic. For example, the visual presentation devices could be: TVs, computer displays, mobile phones, Head-Mounted displays for Augmented and Virtual Reality etc.

A laboratory experiment will roughly contain the following different moments when executing them:

- Inviting test persons
- Transporting the test person to the lab
- Meeting the test persons on arrival
- Giving instructions
- Screening, i.e. checking vision and possible hearing
- Making the test persons acquainted with test procedure a.k.a. training
- Performing the actual test
- Breaks between sessions if any
- Debriefing, i.e. ask follow-up question or performing an interview
- Finishing, i.e. thanking and providing remunerations

## 2 Instructions to test leaders

### 2.1 Before the test

- Make sure there are hand sanitizers available which the test person can use.
- Clean thoroughly the equipment that will be used (see Section 4.5.2)
  - This also includes items such as keyboard, mouse, pen and paper.
- Prepare the lab so that it supports distancing between you and test person.
- Just before arrival of test person, put on the visor and keep it on when interacting with the test person.

### 2.2 During the test

- Always keep at least recommended minimum distance to the test person.
- Use electronic communication when possible.
- Use hand sanitizer repeatedly throughout the test.

### 2.3 After the test

- Reset the lab according to your setup.
- Clean all the equipment and surfaces with recommended solutions and materials.

### 2.4 General recommendations

- Have the procedure of the test printed out and close by.
- Make sure that the test person is comfortable with the setup and understands what is expected by him/her. This is accomplished by giving clear instructions and answering any questions he or she might have.
- Keep physical distance of at least 1 m to the test person. If this is not practical use a visor, see also below in Section 3. Personal protection gears.

## 3 Personal protection gears

### 3.1 Visor or/and face mask

Visors are used in a variety of settings, but their efficacy has not been verified (Roberge, 2014)[3]. In addition to health and safety issues, human factor aspects have to be considered, (Hignett, Welsh, Banerjee, 2020)[4], viz. the person has to be able to conduct his/her task. Our advice based on social-psychological considerations, is generally to use a visor in contacts with test persons and especially for those with hearing problems.

A visor is more practical than a face mask when persons with hearing problems are tested, because they may need lip reading to understand other persons. Plexiglass that shields equipment can also be used. However, this protects only the area behind it and is thus not as useful as a visor protection, especially when meeting or interacting with a test person. In addition, most visors are not completely safe because they lack protection from fine mist of tiny water droplets or clouds of droplets entering or leaving through open areas below and beside the visor. A visor can be combined with a face mask in critical medical situations for better protection, but these are not the focus of the present document. A visor is more effective than a face mask for protecting the eyes. Eyes can be an entry point into the body for some viruses. However, a visor can quickly become speckled with moisture, which makes it harder to wear and see through.

### 3.2 Gloves or hand disinfection

We believe that rubber gloves are not needed in perceptual or behavioural experiments. Hand disinfection is in most cases sufficient.

Rubber or plastic gloves can make a suitable protection in medical situations when it is hard to wash hands or use hand sanitiser, but also when serving a lot of people in restaurants, preparing food etc and when you have a wound on your hands. In a laboratory situation with test persons, the use of gloves could make it easier and faster to handle contaminated things before they are cleaned. A test person should be able to handle keyboard and mouse without a fear of contaminating them and him/herself. However, the breath of test persons may still infect the equipment used, so they may need to be cleaned. Furthermore, they should be removed and disposed in a safe way, which can be difficult. Hand disinfection is needed afterwards.

There are also ecological considerations of rubber or plastic gloves, since their waste contribute to environmental pollution. If there are more than one person or test persons that needs gloves, they are likely to have different hand sizes and it may not be possible to buy a set of gloves with different sizes. Instead sets of different sizes might need to be purchased. So, there is a risk of ending up with plenty of un-used gloves when the test sessions have ended. Much of the waste at hospitals and other medical institutions are plastic- or rubber-based items.



### 3.3 Plastic apron

We believe that plastic aprons are not needed in perceptual or behavioural experiments.

Much of Section 3.2 is also valid for the use of plastic aprons. A plastic apron will protect clothes from solvents of different kinds and drops. It will also protect the chair, so one does not need to clean it. It can be hard to use aprons in a medical safe way without protective gloves and disposal is as difficult as for the gloves.

# 4 Before testing

## 4.1 Invitations

The age of the test persons should be considered. Younger people are more likely to carry the virus, although they may not show symptoms or feel sick. If these people are included in the tests, they should not arrive close in time, preferably not on the same days as older people. Older people could be the relevant test group for some tests, e.g. those in the **Speech-to-Text System using Augmented Reality for People with Hearing Deficits (STAR)** project[5]. When testing is done on older people, special care must be taken in cleaning, correct procedures and handling of apparatus.

FHM has earlier recommended reducing the social contacts for people above 70 years old. Therefore, there should be cautions for these persons to be invited.

If symptoms are present, then the test person must be rescheduled to another time.

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If recruitment is done by RISE, a selection of test persons could be done by sending out invitation mails with a link to a questionnaire, with questions such as age, means of transport (registration number of car), available slots for test and other criteria. From the answers one may screen out suitable test persons.

When scheduling a test person, a confirmation mail needs to be sent with information about their slot time, a reaffirming where the test will be conducted, and how RISE handles Covid-19.

An invitation mail should be sent to each test person on basic principles on how RISE takes Covid-19 into account for his/her safety, see below for an example.

*Example invitation mail:*

\*Information about test\*

The test will be conducted at RISE in Kista, because of the Covid-19 outbreak the reception will not be used, and we **ask you to take elevator C to floor 5 (to the left) where the test leader will meet you**. Please be on time for your appointment, however if you are early to your appointment, please wait outside or in the entrance hall. If you are late, please, inform the test leader about it, preferably by SMS.

RISE RESEARCH INSTITUTES OF SWEDEN

Visiting address: Electrum, Isafjordsgatan 22, 164 25, Kista

Public transportation: you can also use Kistagången 16-18

Car parking is available at Isafjordsgatan 18A, code 2760, use parking spaces marked RISE.

**Use Elevator C, floor 5, left entrance when exiting the elevator.**

Due to the outbreak of Covid-19, we are taking every necessary means of making sure that the testing facilities are safe both for you and all persons involved in the tests.

- All equipment is cleaned before and after a test session

- Hand sanitizer will be available
- The test leader will hold the recommended distance to you.
- You are expected to use a face mask or a visor at all times except when not required by the experiment.
- The test leader will use a visor during the whole test

If you are feeling the slightest symptom of sickness, any increase of body temperature or if anyone in your household shows symptoms of sickness please let us know as soon as possible via email (xxx@ri.se) or telephone (070-yyyxxxxzzz) so we can reschedule the time. Most importantly do not come to RISE.

## 4.2 Transportation

The test leaders should ask, when booking, how the test person intends to travel to RISE. Preferable is to avoid public transportations in general, but especially in rush hours. If public transportation is used, these test persons should be booked only in non-rush hours. At other times private transportation should be used.

A parking space can be booked for the test person in the Electrum garage at a parking space marked RISE by putting out a sign on the parking space informing that it is reserved. The car should also be registered at the reception, which the test leader can assist the test person to do. This is important to remember especially when test persons are not entering through the reception.

## 4.3 Reception

The test leader shall prepare the welcome procedure, put on the visor before meeting the test person and maintain recommended physical distance.

Provide the test person with a face mask or a visor, as is most suitable for the experiment, when he or she enters the entrance door, regardless whether he or she already has one. Clean your hands before providing the face mask.

Ask the test person to clean his/her hands with soap or sanitizer. Instruct the test persons to dry their hands with paper towels and opens and closes the door with the paper towel, if cleaning with soap is done in the lavatory.

If a test person has outerwear, then ask them to hang them outside the lab at a designated place for hanging outerwear.

Ask a receptionist to print visitor tags and instruct the test persons to enter the door closest to the test room. Test persons should be instructed to call the test leader if he/she cannot find the way and maybe also when they are at the entrance. When the reception is not used, the test leader has to be more flexible when receiving test persons.

Printed sign/instruction at an alternative door is needed to inform the test persons that they have come to the right place and what they are expected to do e.g. to call the test leader or to wait. The sign will be extra important if test slots are booked so that there is a risk that the next test person will show up before the previous session has ended.

## 4.4 Instructions

The instructions are important so that the test persons can read in their own pace and have a chance to ask questions so that the task will be clear to them. There are a few options in conducting this, so that safety is upheld.

- **Electronic instructions:** The instructions are sent electronically to the test person beforehand so that he/she can read them before arriving to the lab and to have them ready in their smartphones when arriving. For those test persons who have not done this, there will be a person on site who will give the instructions. The instructions can also be sent once again to their smartphone and time be given to read them. For those for whom electronic reading is not possible paper or large screen/projector instructions can be conducted, see below.
- **Paper instructions:** A plastic covered paper can be produced to protect the instructions, which needs to be cleaned after each use. The instructions may also be printed just before the test person arrives and the test person can take these from the printer and without anyone else touching them. Paper and electronic instructions can be combined.
- **Large screen/projector instructions:** The instructions are presented on a large screen for the test persons to read. This can be combined with electronic instructions.

Handling of the question needs to be performed using either physical distance or a shield.

- There should be **markings on the floor** to show the FHM recommended distance.
- **A large meeting room:** A meeting room could be booked at the same time as the test person is present or have been scheduled where questions can be safely handled due to the size of the room. The instructions can be shown on the screen.
- **A small meeting room:** The test leader can either stand outside the room or behind a plexiglass shield if it has been installed.
- **A large experimental lab:** the same can be done as in a large meeting room above to keep distance.
- **A small experimental lab:** the same can be done as in a small meeting room.

## 4.5 Lab preparation

### 4.5.1 Ventilation

Normally there is little that can be done to increase the ventilation inside an office building. You can consult the caretaker of the building, but it is seldom that this person can fix the problem since the ventilation usually is tuned to serve several rooms at the same time and cannot easily be adjusted for a specific room.

The easiest way to ventilate the room is to open the window (if there is any) and the door to the corridor simultaneously. A short strong ventilation is often better than a long soft one.

If the room is a laboratory without windows, a mobile air-condition device can be placed in the door opening. This device does not really evacuate the air from the room, it just mixes the air in the room with the air in the corridor outside the room. The evacuation air from an air-condition device is generally designed to transport heat and moisture out from the room, not the air itself.

A third way is to clean the room with UVC-light. The drawback with this method is that nobody should be inside the room during cleaning and that care has to be made so that shadows and obstacles do not detract the effectiveness of the procedure.

#### 4.5.1.1 Air purification with High Efficiency Particulate Absorbing filters

High Efficiency Particulate Absorbing (HEPA) 14 filters, or H14-filters, is the most commonly used filter to filter out bacteria and viruses in hospitals and health centers. All H14-classed filters are tested, and they shall filter out at least 99,9995% of particles of size 0,1 – 0,2  $\mu\text{m}$ . A common flue- virus is of size 0,12  $\mu\text{m}$ , and the Covid-19 virus is of the same size.

No tests have been done so far specifically on Covid-19, so there is no data for the present pandemic. However, H14-filters have been tested against other airborne viruses[6] and been shown to be effective. To note, there is no guarantee that a person will not be infected with Covid-19 just because air purifiers equipped with H14-filters have been used, but it has been proven that air purifiers equipped with H14-filters reduces the number of other airborne viruses in the space where they are used[6, 7]. H14-filters shall therefore be used as a complement to other disinfection methods but not as a solitary method. However, H14-filters based air purifiers may be hard to obtain, especially portable one. Some improvements of the air quality can still be accomplished with H13 filters-based air purifiers, but the amount of filtered virus may be low, and the regular cleaning is then very important.

### 4.5.2 Cleaning

#### 4.5.2.1 Personal Cleaning procedures

Always follow the recommendation from FHM. For more clear and important procedures, consult the list below.

- Before handling any equipment that the test person shall use, you shall clean your hands or use a hand sanitizer if hand washing is not possible or not practical. At least 30 s is a recommended cleaning time.
- When cleaning the visor use soap and water. Hold the visor with paper towels while you are drying the visor. Put the visor back on your head holding it with the paper towels. Do not put the clean visor on uncleaned surfaces.
- If a face mask needs to be disposed, , the person that has used it should then put it in the waste basket prepared for such waste and afterwards wash his or her hands.

#### 4.5.2.2 Equipment Cleaning procedures

You can take the possible infected equipment with a paper towel and put it in the UV-C box or disinfect it with other cleaning devices. See also Sections 4.5.2.3 and 4.5.3

### 4.5.2.3 Cleaning Products

It is important to distinguish between hand disinfection, e.g. Dax Clinical Handdesinfektion, and surface disinfection, e.g. DAX Ytdesinfektion 75. Elbow rests on chairs, handles at doors, and surfaces on tables shall be cleaned with surface disinfection, but see the safety data sheet for the disinfection product before use. Use only hand disinfection on people, and also here see the safety data sheet before use.

Electronics and VR-headsets might require special treatment, check with vendor how these products shall be disinfected. A VR-headset can be cleaned by UV-C-light in an especially prepared casing.

You can, for example, use hand sanitizer 85%, soap or detergent, see e.g. Witre.se [8].

Ethanol-free disinfection wipes or solution may be used instead for cleaning and especially for sensitive skin.

### 4.5.2.4 Ultra-violet radiation lamps

UV-radiation can be used to disinfect. They may to be used in conjunction with liquids

One could use the UV-C lamps in a box(es) suitable for the instruments and equipment with a cover or a cap and by putting e.g. the smart glasses there for 15 minutes to get sterilized. This is enough time between test persons. By using mirrors or similar items inside the box, one can design a box that gives UV-C radiation to almost any part of the objects inside.

UV-C light can kill up to 99% of all bacteria without the use of chemicals. Such a UV lamp cleans the air by killing bacteria, viruses, mites and molds by using ultraviolet light and ozone. It is equipped with an intelligent on/off mechanism. The UV sterilization lamp starts working after the power has been on for 10 seconds (giving time for the operator to leave the location). It automatically switches off after 15 minutes.

**IMPORTANT:** Ultraviolet radiation can cause skin and eye burns. When using UV disinfection - keep yourself, other persons, children and pets away from the lamp and do not look directly at the light!

## 4.5.3 Arrangement of set-up

### 4.5.3.1 Physical distancing measures

Plexiglass can be bought at any construction market, e.g. in Sweden Bauhaus, Byggmax, etc. The plexiglass shield should then be fitted to the test place. It can be positioned to the right and left of the test person so that the test leader can be on the opposite side of the shield. It can easily be cleaned between each test person. It is also possible to buy factory designed plexiglass shields.

Floor markers for physical distancing should be put on the floor.

#### 4.5.3.2 Video communication

Video communication can be arranged as a video-meeting session between two computers. If the test person is wearing a VR-headset, one might consider a walkie-talkie with hands-free (VOX) mode for audio communication. Use a water-proof walkie-talkie to facilitate cleaning.

#### 4.5.3.3 Keyboard, mouse and other interaction equipment

Use USB-keyboards with a mouse pad that can be cleaned with liquids, since common keyboards are notorious for spreading diseases. Preferably use a medical keyboard with IP68-classification, e.g. Medical Keyboard X10-MED-OEM that is easy to clean

#### 4.5.3.4 Chairs

The chairs that are used should be possible to clean. Use preferably a chair with a seat and arm rests that can be cleaned with surface disinfection liquids.

# 5 During testing

## 5.1 Pre-screening

When doing screening test for hearing and vision, the following has to be observed.

### 5.1.1 Hearing measurements

Instructions on the hearing test have to be made before the test person is tested. The equipment to be used can be shown to the test person at the same time, so he or she will be familiar with it.

When conducting a hearing test with an audiometer, the distance between the test person and the test leader has to be kept at the required minimum distance. It is advised to put a screen between these two persons. Such a screen has also the advantage of making it more difficult for the test person to observe the test leader.

After each test with a test person, the earphones/headset of the audiometer have to be cleaned in a proper way. One proposal is to use an aerosol or suitable cleaning wipes. In both cases, they should not contain alcohol of any kind. If rubber cushions are attached to the earphones, they should preferably be detached when cleaning. Care has to be taken that the acoustic characteristics of the headphones are not damaged.

One should avoid getting moisture in the speaker portion of the headset as moisture will cause damage to the transducer. One should also make sure that an eventual rubber cushion is dried before placing it back on the transducer. UV-C could also be used for disinfection.

In addition to eventual earphone cushions, also the test person's hand switch should be cleaned after each test person. The same mild cleaning substance as for the earphones could be used.

If noise measurements are to be made of the testing facilities, it is recommended they are performed when no test persons are present.

### 5.1.2 Vision tests

For acuity tests using Snellen charts, the minimum distance between test person and test leader shall be observed. The instructions should be given before the tests are done.

For other visual tests, e.g. Ishihara colour cards, or the similar pseudo isochromatic cards of Boström and Kugelberg. the distance between the two persons should be kept at the recommended minimum distance. Other colour blindness test could be suitable and may sometimes be sufficient, for example: Colblindor Ishihara test [9].

For Randot test of stereo vision, the glasses used should be cleaned between each test person.

For testing the dominant eye, left or right, there is a number of simple tests one could instruct the test person to do, while the test leader is standing the minimum distance away.



## 5.2 Training of test person

Before the actual tests, a short training of the test person should be made.

In the training for the first time, the test person should become familiar with the test procedure and the use of the equipment. In this phase and especially if wearable devices are used, e.g. head-mounted displays, how the procedures to perform this in a safe way will be critical. The training consists of different phases and here the different points are considered in order of their appearance:

- **Positioning the test person:** The positioning of the test person either standing or sitting can be prepared with markings on the floor and adjusted using verbal instructions.
- **Adjusting the height of the chair:** In case the test person should be sitting the chair should be adjusted in height. In most cases, this could be done by the test person with the help of verbal instructions. The test leader should familiarize him- or herself with the adjustments beforehand. If the chair is difficult to handle or broken it should be exchanged. It is also advisable to have identified an alternative chair, if for some reason it does not fulfil demands. The height and back support adjustment levers should be clearly marked.
- **Adjusting and fitting of wearables:** For experiments involving wearables such as Head-mounted displays (VR or AR-goggles) it is often important that the devices are sitting properly for correct performance during the test. Before the arrival of the test person, the wearable should be adjusted to the same starting position. It will then be easier to instruct the test person what to do. For the preparations, a step-by-step procedure could be established, which the test leader can ask the test person to follow. A short instruction video can be recorded showing these steps to test person.
- **Communication between test person and test leader:** see Section 5.3.1.
- **Running training:** this is no different than running the actual experiment see Section 5.3.2.
- **Q/A:** see Section 5.3.1.

## 5.3 Instructions when test persons are in the lab

The number of people should be maximum 2 (test person and test leader) at the same time at the immediate test location.

### 5.3.1 Communication between test person and test leader

The communication should be done at a safe distance and in most instances at the recommended safety distance. The time spent in the same room should be minimized. Therefore, the communication should be done through a video system whenever possible, see Section 4.5.3.2.

## 5.3.2 Running an experiment

The test person should perform his/her task and may preferably be left to do so. The progress, monitoring and helping of the test person could be done through video communication, see Section 4.5.3.2.

## 6 Convenience issues

### 6.1 Breaks

The test persons should be informed in advance that breaks will be held.

### 6.2 Drinks

Arrangement for drinks, e.g. coffee or tea, should be arranged in such a way that it shall be easy for the test person to serve him/herself. If the test leader serves the test person, physical distance and hygiene should be ascertained.

### 6.3 Toilets

A designated toilet is preferable. One should inform other persons other persons not to use this toilet at the time of tests. UV-C radiation may be used to disinfect when toilet is unoccupied see also Section 4.5.2.

## 7 Ending and thanking

A debriefing session shall be given after the test in a safe environment. At this time, questions that the test person may have can be answered. The session ends with thanking the test person, without shaking hands and with a recommended physical distance.

In addition to the rules and recommendations stated in this document, the ethical rules for conducting tests and experiments with people should be followed, as specified in the Helsinki convention (first accepted in 1964 and later amended) [1] and regulated by national committees, for Sweden by Etikprövningsmyndigheten[2].

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