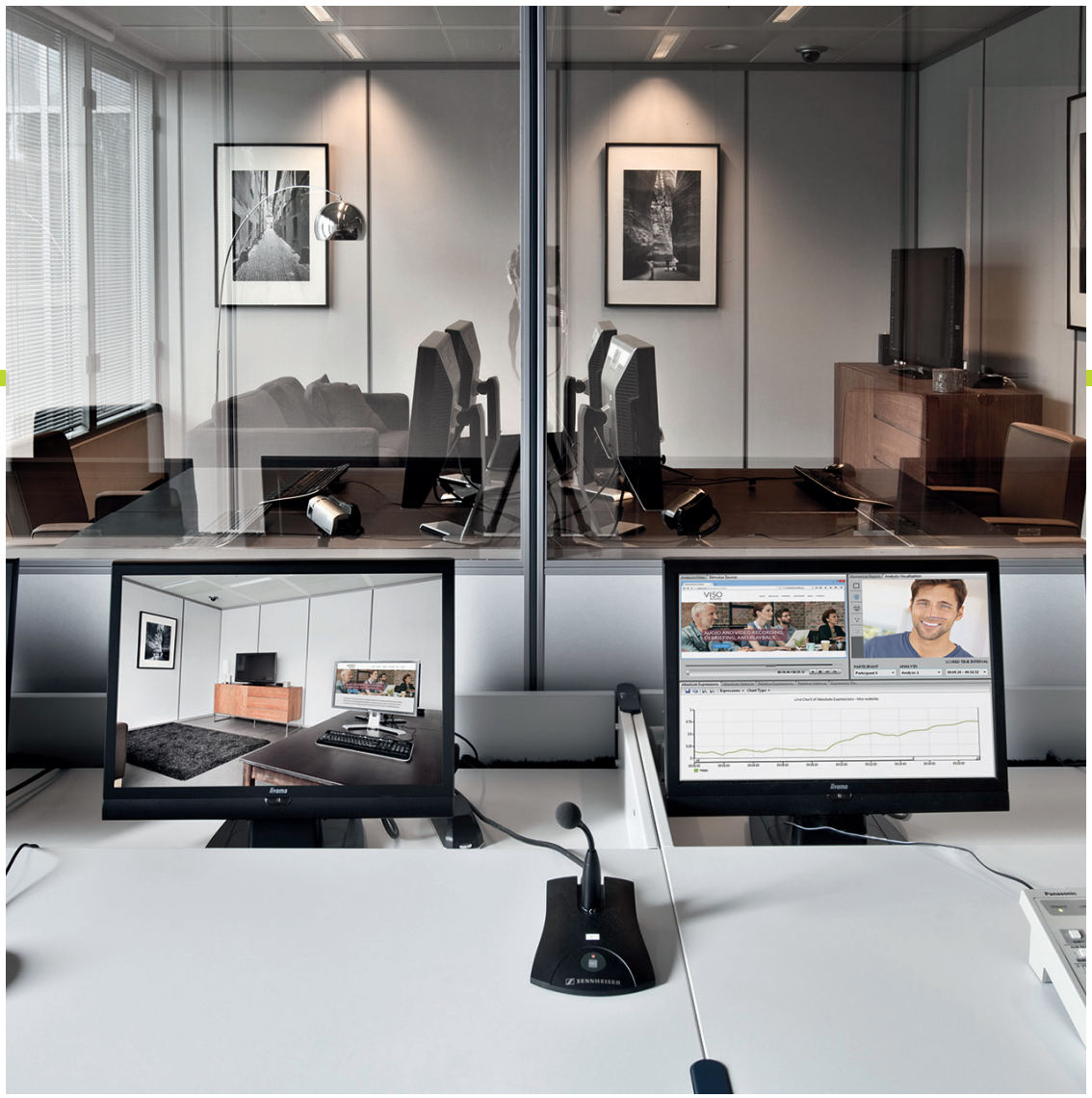


Unobtrusive observations

How to build an AudioVisual Lab (AV Lab)

A white paper by Noldus Information Technology

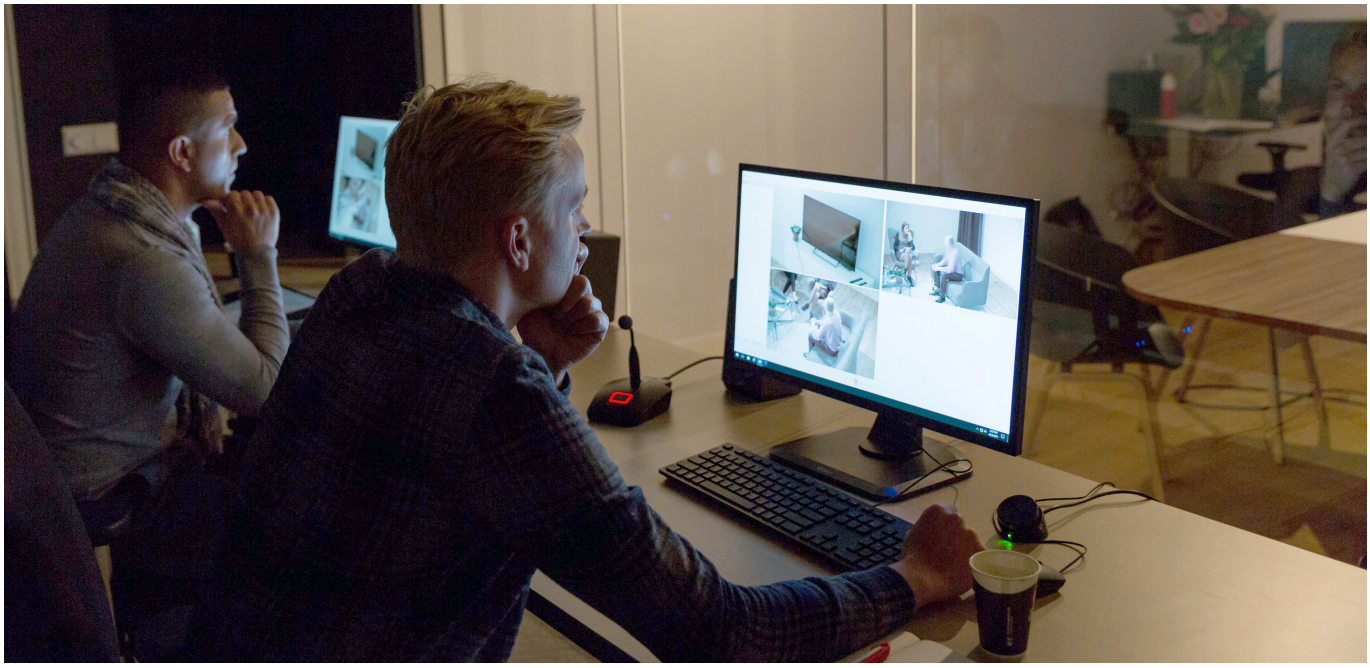
HOW TO BUILD AN AUDIOVISUAL LAB

When you intend to perform observations for your study or research, or if you need to capture a participant's behavior while navigating on a website, you must be able to perform these actions in a certain room or space. You might wonder which room is most suitable and what equipment you actually need? And how do you keep an overview of everything that comes with it?

> Stable images, high quality video recordings, and clear recordings of speech make all the difference in your research results.

An AudioVisual lab allows you to observe test participants unobtrusively, in an environment similar to test participant's natural surroundings. Stable images, high quality video recordings, and clear recordings of speech and other sounds make all the difference in your results. Simply put, you need to hear and see how your participants are behaving.

Would you like to learn more about how to build an AV lab? Check out this *how to* guide! You can rely on our many years of experience with building labs all over the world to provide you with the perfect tips & tricks!



After reading this White paper, you know:

- What important questions need to be answered before starting to build a lab.
- Which possibilities are available for determining size, location, and equipment of the actual room where the lab will be.
- What equipment is available (software and hardware) and how it benefits your work.
- What an observation, experiment, or UX sessions entails and what to check before the start.

STEP 1

STUDY DESCRIPTION

To get to a good start, it is best to describe the study or observations that are going to be performed in great detail. With this description it becomes clear what kind of equipment will be needed, and which physical environment would best suit this observation or research. In general, the description should answer the following questions:

PARTICIPANTS

- How many participants need to be recorded at the same time?
- What kind of participants are observed (age, health, degree of mobility, etc.)?
- Are children involved in the observation? Realize that children require different camera positions than adults to have good view of their faces, posture, and expressions.
- How many people are present in the experiment room during an observation, besides the participant(s)?
- Do participants need to walk around in the lab? Do they need to be mobile?

How many observations are expected to be performed and are observations carried out simultaneously

EQUIPMENT

- Is audio and video of all participants needed? What is the best location of cameras and speakers in the room?
- Does the observation involve working at a computer? If so, should the PC screen of the participant(s) be captured and recorded?
- Are specific devices or tools present, such as mobile phones, tablets, teaching devices, mannequins, or medical devices, such as a patient monitor? Should their screens or data be recorded?

LOCATION

- Are participants being invited to visit the lab? Is on-site research going to be performed? Or both?
- Is there a reception to welcome the participants?
- Should there be a separate room for participants to wait before an observation?

Depending on your research, it could be advisable to have more rooms available.

- How many observations are expected to be performed and are observations carried out simultaneously (in different rooms)?
- How many rooms are required? A single room observation lab can be used, but it is more common to build a two-room observation lab with a one-way mirror. Depending on your research, multiple participant cubicles are an option, or it could even be advisable to have more rooms available. Multiple rooms can be managed from a single control room with our software tool Viso®.

TECHNICAL SPECIFICATIONS

- What quality of video is needed? Most observation labs use hard discs or NAS (Network Attached Storage, also for backup) in combination with MPEG4 media files. Noldus solutions provide recording in HD which guarantees excellent video quality. The videos are stored in a compatible format.
- How many video streams need to be recorded simultaneously? Many AV labs use multiple video streams that are recorded in sync, and there are labs that use one video stream that consists of a mixed image.
- How is security of video material guaranteed? Storing the videos on an external hard drive is insecure (possibility of theft). Storing the videos on a server is more secure. Also in this case, special attention should be paid to protecting the video material.
- Is keeping track of who had access to what data important? To comply with privacy legislation, an audit trail can be created.

STEP 2

THE HOUSING OF AN AV LAB - PRACTICAL TIPS

What practical points should you consider to determine which space is suitable for an AudioVisual lab?

- First make sure there is a waitingroom for your participants and a place to store their coats and other belongings.
- Check whether there is enough air circulation or refreshment available in the Observation and Control room. It can become rather hot in the Control room due to computers and more than one observer. Ideally both rooms can be controlled (heat/cold) independently.
- Ensure that there are no unwanted noises in the rooms. For example, the noise of an air vent can disturb the observation. Be aware that the sound of moving cameras may distract little children and adults alike.
- Take into account that the rooms should be soundproof or near to sound-proof. Insulated walls are essential. A normal conversation can generate 40 to 70 dB and the test participant should not be disturbed during the observation. Think also about the negative effect incidental laughter and conversations of observers, or test leader, can have on an observation.
- The minimal dimensions of a one-way mirror are approximately 2 by 0.8 meters. From our experience, we know that three mirrors (2 meters each) are much cheaper than one mirror of 6 meters.
- A one-way mirror only works when the light intensity in the Control room is lower than in the Observation room. This light intensity can easily be adjusted by actively controlling (= dimming) the lights in the Control room.
- Light intensity in the Control and Observation room is approximately 1500 Lux (lower by dimming it).
- It can be really practical to add a warning sign out-side the test facilities when an observation is in progress. This ensures that (unexpected) visitors will not disturb any observations.
- Video and audio cables have to connect the Control room with the Observation room. The cables can be hidden in a double ceiling or floor. Or by using cable gutters.

Ensure that there are no unwanted noises in the rooms.

Position your cameras in such a way that all participants are clearly visible.

- The observation lab should have a constant source of (220V, 50 Hz or 120V, 60Hz) electricity. The lab can be protected against extreme power and voltage fluctuations by using one or more (depending on their capacity) UPS devices (Uninterrupted Power Supplies).
- Cater to the needs of both testers and participants by providing enough drinks and/or food.
- A rest room close to the Observation and Control room can prove to be very handy.

STEP 3

EQUIPMENT

An AV lab is designed to allow you to observe your test participants unobtrusively, in an environment similar to your test participant's natural surroundings. Equipment varies from cabinets, one-way mirrors, and tables, to fully integrated high-tech recording devices, data acquisition systems, and computers.

EQUIPMENT USED IN THE OBSERVATION ROOM

A wide range of equipment is available, depending on your research needs, you can choose between the following components:

> If you work with a combination of adults and children, make sure the height of the cameras is adjustable.

- **IP camera (integrated pan/tilt/zoom) -** IP cameras may be installed in the ceiling. However, it may be more practical to connect them to a vertical rail, to enable height adjustment. Especially if you work with a combination of adults and children, make sure the height of the cameras is adjustable . This way the faces, expressions and body language of all test participants can be recorded well.
- **Small IP cameras on tripods -** A tripod can be positioned anywhere and at any height needed.
- **Mini camera mounted on a device** (Mobile Device Camera) - An ideal option for testing mobile phones, tablets, or other small devices.
- **Webcam** - To record facial expressions.
- **Microphone** - The exact number depends on the number of participants per observation. There are several unique devices that can be used in the Observation room.
- **Speakers** - The test leader can easily give instructions, ask questions, or provide assistance when participants don't know how to proceed. Keep in mind that sometimes an earpiece may be a better choice than a ceiling speaker system. For example, with multiple participants (parent – child) in one room, you can choose who to talk to.
- **Telephone** - For example for calling the front desk to let new participants in.
- **Participants' PC** - If participants need to work at a computer (with monitor, keyboard, mouse, printer, internet connection, etc.).

With Viso you can make independent recordings in multiple rooms at once, with up to four Pan-Tilt-Zoom cameras in each room. See at a glance all markers, subjects, and comments in the graphical timeline.

- **Eye tracker** - For tracking the eye movement of the participant. Noldus offers a large choice of different brands which can be integrated in the total solution.
- **Data acquisition systems** - To measure heart rate, skin resistance, skin temperature, muscle tension, or neuronal activity.
- **Splitters/mixers/amplifiers** - For splitting, mixing, and amplification of signals. Noldus will make sure the ones that fit your research requirements are used.

EQUIPMENT USED IN THE CONTROL ROOM

A wide range of equipment is available, depending on your research needs. You can choose between the following software components:

- **Multi-room audio and video recording** - Viso records from multiple cameras, and rooms, simultaneously. The remote viewing functionality enables to view live and recorded sessions from anywhere you want via commonly used browsers on any operating system. Furthermore, it allows you to start and stop recordings remotely.
- **Event logging and video analysis software** - The Observer® XT is the ideal integration platform. It allows you to synchronize videos, audio, physiological data, and more.
- **Synchronous recording of video and other sources** - Media Recorder can record with up to 8 recording devices (digital cameras or screen capture devices).

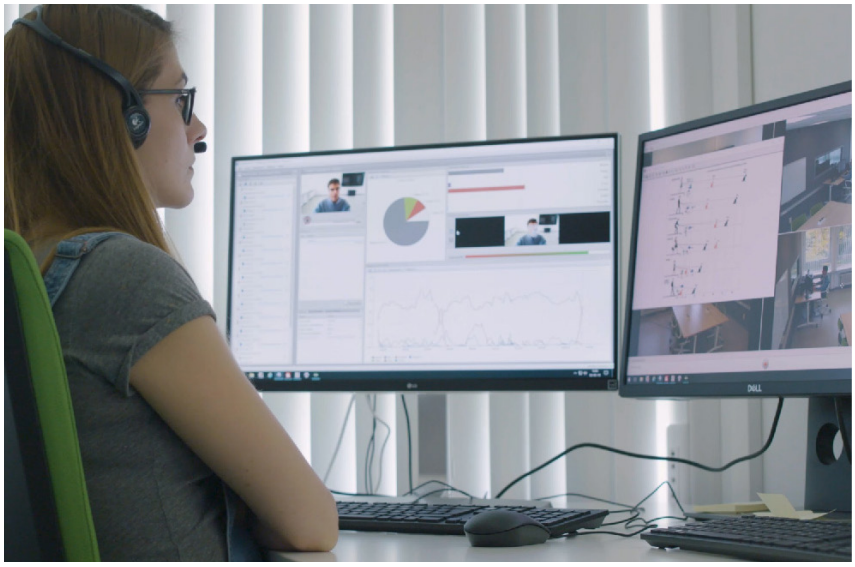
- **Facial expression analysis software** - FaceReader™ can automatically analyzes facial expressions: sad, happy, surprised, angry, disgusted, scared, neutral and contempt, as well as affective attitudes such as boredom, interest, and confusion. It can save you valuable time when analyzing videos.
- **Screen Captures** - Capture and record the screen the participant is looking at and combine this on the test leader computer to have both the participant and his screen for analysis. To control the video cameras from the Control room.
- **Joystick controller** - To control the video cameras from the Control room. Although Viso allows the Pan Tilt and Zoom control of an IP camera from within the software, many people find a separate joystick easier to use.
- **Optional: Network Attached Storage** - 4TB for storage of 1000 hours of video material and backup should anything happen. Of course, storage space can be increased.

The following hardware can be chosen from:

- **PC** - PC for event logging and analysis of an observation, or to produce your report. Depending on media type the following equipment will be integrated: graphics card, audio board, and large hard disc.
- **Monitor** - To view camera images. The number and size of monitors depends on the number of people that are invited in the observer/control room.
- **Screen splitter and multiple other monitors** - Necessary when a larger number of people have to see the actual PC screen of the participant live on a PC monitor.
- **Large monitor or projector** - For debriefing/discussing the results. Also live images can be shown on this monitor (for showing a larger group of people what is happening during a test inside the lab without having them entering the Observation room)

"The integration of FaceReader, The Observer XT, and psychophysiological data collections makes research programs possible at locations and within timetables that increase opportunity, quality, and efficiency."

DR. C. BARTON - DAVIDSON COLLEGE, USA



To get a more complete picture of the phenomena that you are studying, integrating multiple data streams will benefit your research.

- **Microphone** - For the test leader.
- **Microphone amplifier** – This tool is always needed as it makes sure the signal of participants and test leader audio is at a level where it can be effectively used in the software.
- **Speakers or headphones** - For hearing the participant(s).
- **19" Rack with glass door** - For mounting of the equipment.
- I**nternet connection** - For website evaluations and remote observation of tests. Or to control the test-PC remotely

Other parts that are necessary in the lab are closets/cabinets for storage, a refrigerator in an adjacent room could provide the necessary refreshments , chairs, and tables for putting the monitors on. These tables can range from simple straightforward tables to custom prepared PC or monitor tables.

STEP 4

INSTALLATION & START

To achieve the best result, the lab has to be installed and tested by a qualified engineer. Depending on the complexity of the lab, this installation could take several days. Noldus professionals have installed observation labs for many years. The team has helped many customers and has the ability to tackle challenges quickly onsite.

Before installing the lab at your location, it can be fully integrated and tested at Noldus headquarters by professionals; you can count on Noldus to deliver a lab that meets your research needs. Training in the lab from a professional trainer on how to use the software and hardware is a very valuable step. You will quickly learn how to get the most out of your lab. A training course usually takes two days and is totally adjustable to any needs. The training can also be given remotely if that is more convenient to you.

Achieve maximum return on your investment with NoldusCare. Our service is fast, reliable, and available worldwide . It ensures continuous use of the lab. It includes technical support, updates, and upgrades of the software, full professional support via phone/e-mail, and onsite maintenance visits, for training e.g. Noldus can also deliver hardware replacements onsite to minimize downtime due to unexpected equipment failure.

"We need a lab that works; where people very quickly can learn how to work with all the software and the technology. That is what we got from Noldus."

DR. S. DIETRICH - UNIVERSITY LEIPZIG, GERMANY

STEP 5

THE ACTUAL SESSION

Test leader

Researcher

Participant

Lab technician

How to perform an observation, experiment, of UX session in an AV lab? Below an explanation is given on how such an observation can be conducted.

Five roles can be distinguished:

- **Test leader** — the person managing the observation (welcoming the participants, connecting the data acquisition systems, starting and stopping the recordings), creating the study design, communicating with the participants and carrying out the analysis.
- **Researcher** — the person coding the points of interests during the observations or afterwards. The roles 'test leader' and 'researcher' can be held by the same person.
- **Lab technician** — the person installing hardware and software, and the person in charge of maintenance.
- **Participant** — the person that is observed.
- **Additional observers** — persons also observing (for example a therapist, or a teacher).

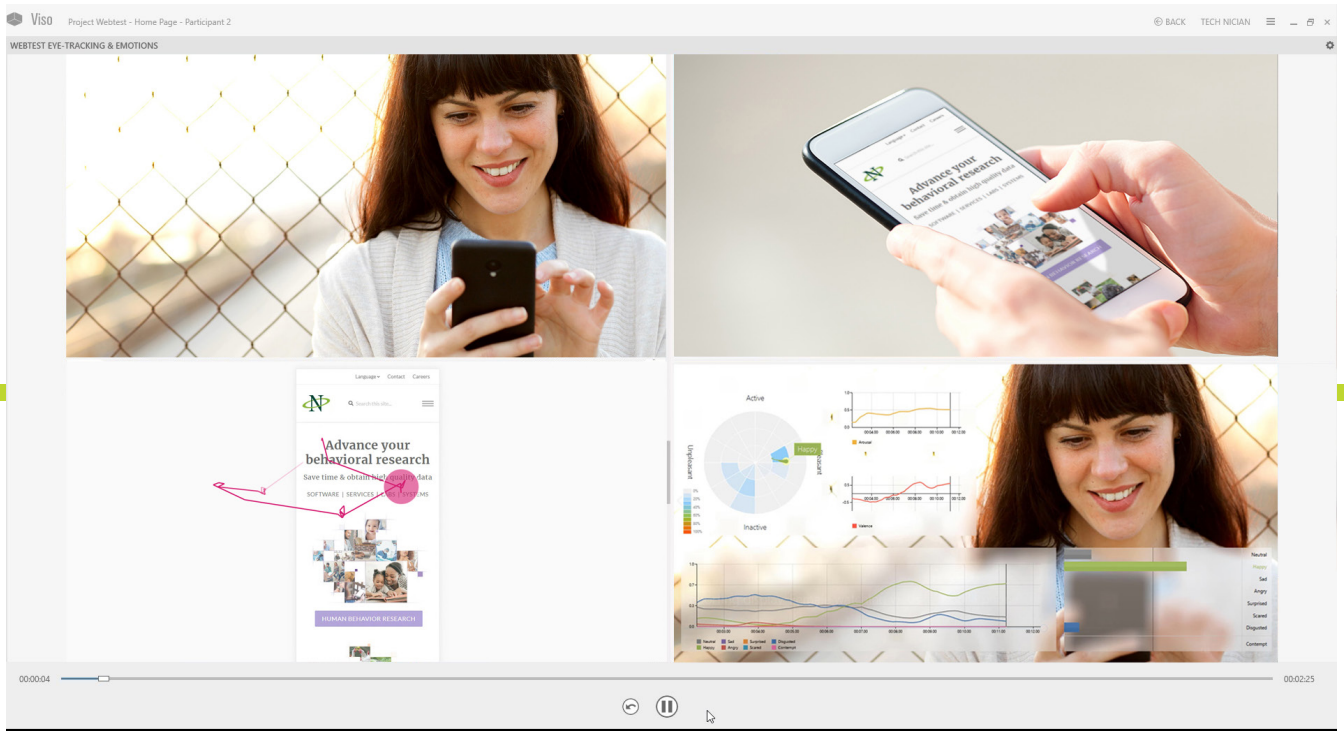
A TYPICAL OBSERVATION?

There are many different types of observations, which makes it impossible to describe a typical one (more on this subject, read this blog). However, observations have in common that one or more participants are observed and that important events are written down or coded in event logging software. A common scenario of an observation is described below. Observation labs can be stationary or mobile. The advantage of a mobile lab is that it can save the participant's time because observing can be done on-site. Moreover, for some groups of participants, for example elderly people living in a nursing home, transfer to a stationary lab can be stressful or even impossible. In such a case, a portable observation lab is what you need.

> Making a coding scheme allows for analysis of the behaviors that take place during the observation.

THE EXPERIMENT - PREPARATION

The test leader creates the study design. He or she makes a coding scheme or a set of markers that allows for quick and easy marking of events of interest during the observation and analysis of the behaviors that took place, afterwards. The test leader books the observation facilities and schedules



With Viso you can capture four different streams, such as facial expressions, gaze, cameraview, a nd the screen the participant is looking at, and view them in one clear overview.

the recording in advance, which enables to automatically start and stop the recording.

A typical observation can last from less than an hour to several hours. It is possible that the same participants are observed several times over a long period, for example to determine the effect of a therapy or a training.

The script

Usually, the test leader creates a scenario, task list, or checklist describing what the participants have to do during the observation. For example an interview by the test leader, or a task that the participants have to do on their own or together.

After creating a list, the test leader determines what has to be logged during the observation and in what detail. In this step, a pilot experiment is carried out to determine whether the coding scheme is correct and whether the analysis gives the data the test leader needs.

Inviting participants

The test leader invites the participants. It depends on the purpose of the observation how many participants are observed. To determine the best treatment of an adult with psychiatric problems, it may be sufficient to only observe this one person. However, to determine the best group therapy for a family, the entire family may be observed. And to determine the effect of a training, both the teacher and its students may be observed simultaneously.

The test leader schedules the AV lab, a researcher, and optionally invites additional observers. Sometimes there is only one observer, who at the same time is the researcher. There might be extra observers (for example thera-

pists or teachers), but these extra observers are not necessarily logging. The researcher configures the event logging software.

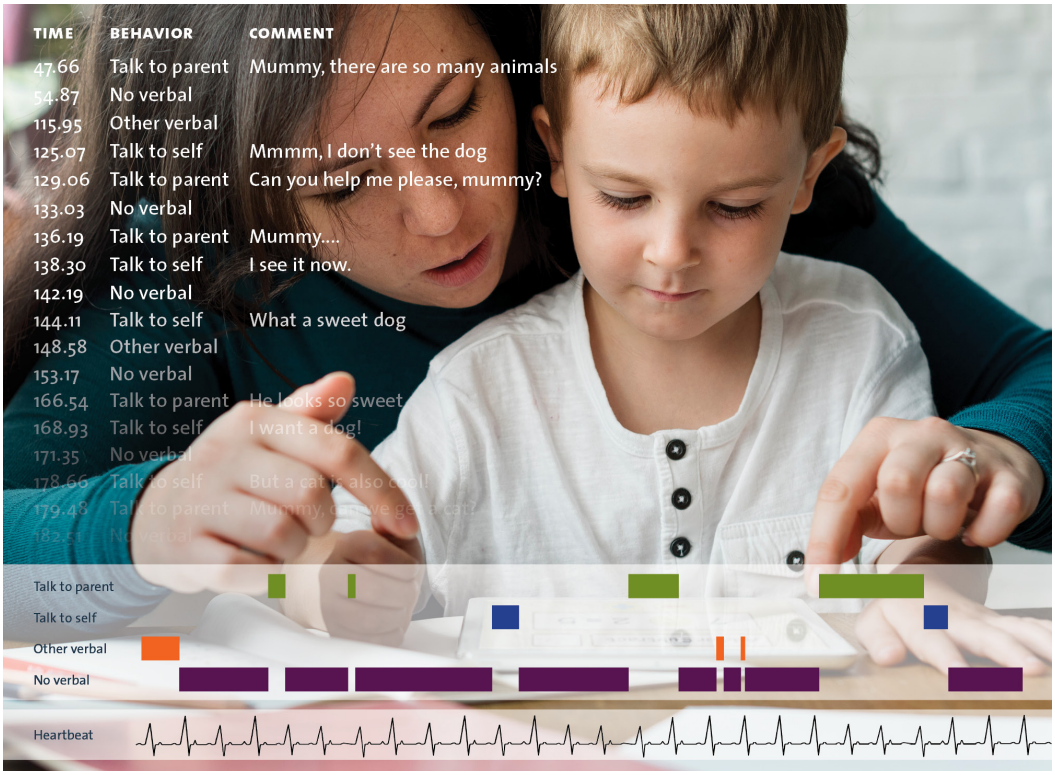
The last check

Prior to the observation all the equipment is checked either by a technician or by the test leader. The following things should be checked:

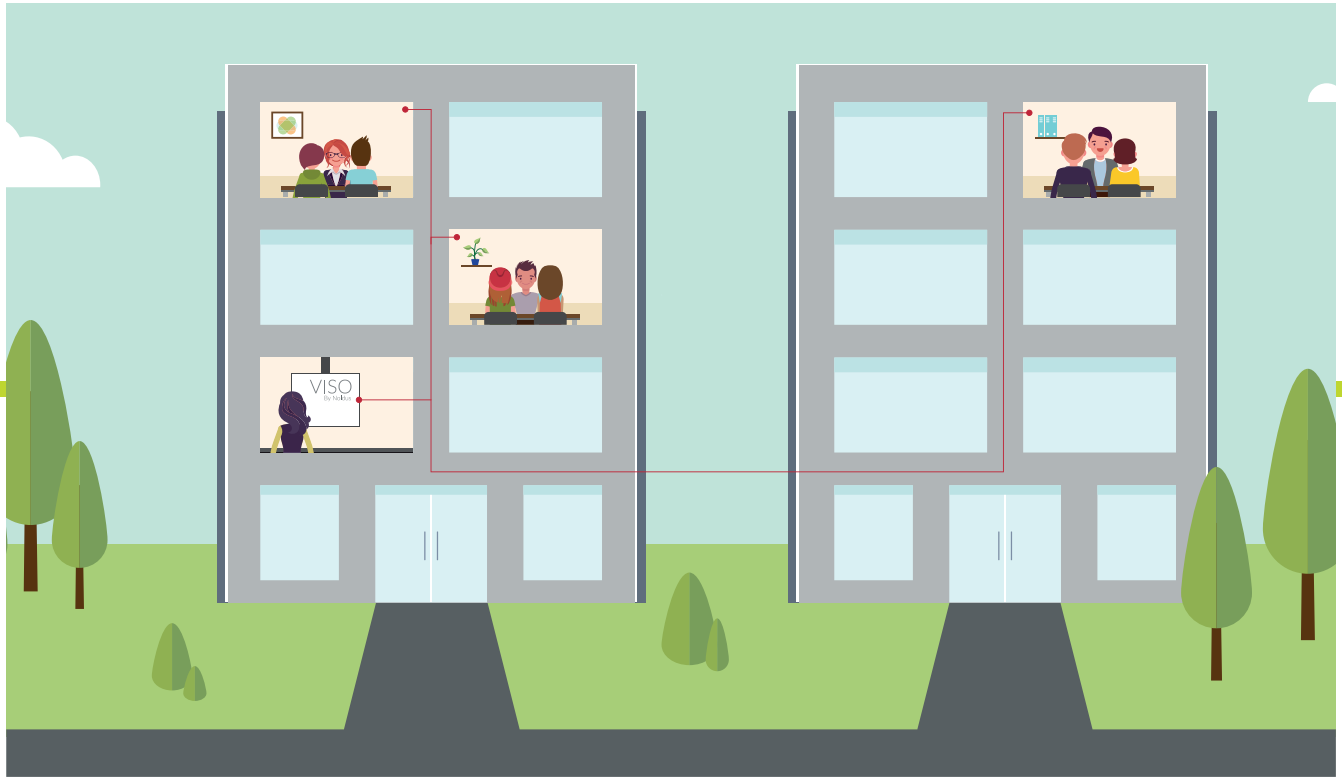
- Are the cameras in the correct position?
- Are the cameras switched on, in focus, correctly zoomed in/out?
- Are the computers switched on?
- Are the audio and video recording, event logging, and other software (FaceReader, Eye trackers, Data Acquisition systems) ready to start?
- Are the correct cameras selected in the video recor-ding software?
- Is there enough disc space to store the video files?
- Are all microphones and speakers functioning correctly?
- Is the warning sign that an observation takes place switched on?
- A small test recording is made to check that all cameras, microphones and software function correctly.

THE OBSERVATION

Prior to the observation, the participants are welcomed and asked to wait in the waiting room. Then the test leader welcomes them in. The purpose and procedure of the observation is explained, as is the participants right to terminate at any time.



Interaction between children and their parents is a classical study object in developmental psychology, pediatrics, and child psychiatry.



Start and stop recordings across multiple rooms, and multiple buildings, independently of one another.

Informed consent

The participant is then asked to sign a consent form for the video recording in the context of the study. Often, the participants are first asked to complete a questionnaire, or are interviewed by the test leader. An important step here is that the participants are made at ease in the Observation room.

Start the observation

If applicable, the test leader connects the participant to the data acquisition system. Then, the test leader may move to the Control room, often separated from the Observation room by a one-way mirror. It may also be that the test leader stays in the Observation room and leads the observation. Test leader and/or researcher(s) observe the participants through the one-way mirror, or on a large screen or projected image. If the observation involves using a computer, laptop, or mobile phone, its screen may be shown in the Control room on a secondary monitor, and recorded on video.

Viso provides easy management of all rooms/locations on the network from one central location. A test leader can easily start and stop recordings in different rooms independently from one another; this provides flexibility to the facility, by allowing multiple test leaders to use the system at the same time, even for different projects.

Instruct the participants

Test leader and participants may communicate via microphones and loudspeakers if the test leader moves to the Control room. The test leader starts and stops the session. The participants carry out the tasks, meanwhile being observed by the researcher(s) and observers.

Close-up view of the facial expression, eye tracking, and screen capture are recorded.

Mark events of interest

During the session, the researcher notes all relevant events in the form of predefined codes, using a data collection tool (e.g. Viso, or The Observer XT). Each event is time-stamped and anchored to the corresponding video frame(s). The researcher may also make a transcript of the participant's spoken comments.

> The main purpose of having different researchers in an observation is to be able to collect more observational data at the same time.

Normally, one researcher enters the data directly into the event logging software, while the others take notes that are processed later. The additional observers can be either in the Control room, or watching from their desk through the internal company video network. The main purpose of having different researchers in an observation is to be able to collect more observational data at the same time. Another purpose might be to study the differences between methods, or inter-coder reliability.

Complete the observation

After the session, the participants can be interviewed by the test leader (in the Observation room). This post-observation questionnaire may also be recorded on video and additional comments may be marked. During this interview, test leader and participant may call up and review specific events in the event log and video recording, and the test leader may enter additional notes into the event logging software.

Debriefing

After the participants have left, the test leader analyzes the data. A debriefing session can be organized to share and discuss the results and further steps. Debriefing sessions allow key players to figure out what worked well, what did not, and to share ideas for improvements . Questions such as *"What happened?"*, and *"How effective were the skills that were used?"* can be addressed. The recorded videos enable the test leader to provide feedback in the debriefing session, which is key to objective performance assessment.

GET THE PERFECT LAB FOR YOU

There is no standard AV lab. For every facility and for every purpose the lab is built for, it will look different. This White paper gives an idea of what is possible and what you should consider when building the lab.

There are many things to think about to make designing a good lab possible. We describe the points that you can consider when determining where the lab should be located and what equipment is needed in the lab. We explain all the equipment that could be part of the lab and present a bullet list for the last check.

From portable and stationary labs for observation of human behavior to high-tech turn-key usability labs: Noldus can deliver it. Complete integrated labs; designed with you and built by us.

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