D7.1 Field Trial Methodology and Planning

Deliverable	D7.1
Deliverable Lead	Campus VESTA
Related work package	WP7
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Versions

Vers.	Date	Author	Description
V0.1	23/08/21	Günther Dauwen (VESTA)	First initial Draft, developing template and putting first structure in place
V0.2	13/09/21	Günther Dauwen Dirk Broeckx (VESTA) Maaike van de Vorst (VESTA)	Second draft, refining structure and content
V0.3	12/10/21	Günther Dauwen, Dirk Broeckx Maaike van de Vorst	Version 1 before input of Scientific partners
V0.4	15/11/21	Scientific partners	Input regarding the structuring of the methodology part
V0.5	7/12/21	Günther Dauwen	Version 2 with a first input of scientific partners
V0.6	14/01/22	Günther Dauwen	Version 3 and 4 with a second input of scientific partners
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V0.9	22/02/22	Birgit Harthum (USE)	Document review and additions
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V1.0	28/02/22	Valerie Schlagenhaufen (USE) Gerhard Helletzgruber (USE)	Final formatting and uploading

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List of Acronyms and Abbreviations

Acronym / Abbreviation	
AAR	After action review
BR	Breath rate
DMA-SR	Decision making and acting under stress and in high-risk situations
DoA	Description of Action
EUFW	End user Feedback Weeks
EUM	End user Management
FT /FTs	Field Trial/s
GA	Grant Agreement
HF	Human factor
HRV	Heart rate variability
IAM	In action monitoring
LEA	Law Enforcement Agency
MMSP	Mobile Multi-sensory platform
PERT	Program Evaluation Review Technique
QoE	Quality of Experience
RAT	Risk Assessment Tool
SPOC	Single Point of Contact
TA	Technology Acceptance
UX	User Experience
VR	Virtual Reality
VRPN	Virtual Reality and Police Network
WP	Work Package

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Executive Summary

This deliverable covers the first phase of Work Package (WP) 7, the final evaluation and validation of the SHOTPROS VR training environment and the training framework and guidelines, based on results gained throughout the first two thirds of the SHOTPROS project. This final evaluation and validation is represented by **Field Trials** (FTs) that are organised with the participation of SHOTPROS end user partners and other invited end users. The deliverable at hand describes the planning and the methodology of the SHOTPROS FTs.

The aim of WP7 is to assess the SHOTPROS progress established in WP 2-6 (building a training curriculum based on a human factors (HF) model and a VR police training system). Throughout the FTs those results will be tested, evaluated and validated from a **scientific**, a **user** experience and **technological** point of view. The FTs will therefore play an essential role in generating the final results and impacts of the SHOTPROS project.

The 3 main **objectives** of the FTs are:

- Scientific **validation** of DMA model, stress measurement and training curriculum
- End user **feedback** on features and product options
- **Communication** & **dissemination** inside and outside the SHOTPROS consortium

Based on these inputs, the following 5 main FT slots and locations were defined, followed by the SHOTPROS Final Conference at the end of the project:

- 7.2.2022 – 12.2.2022 – Seibersdorf, Austria
- 21.3.2022 – 25.3.2022 – Bucharest, Romania
- 4.4.2022 – 8.4.2022 – Amsterdam, The Netherlands
- 19.4.2022 – 22.4.2022 – Selm, NRW, Germany
- 16.5.2022 – 20.5.2022 – Berlin, Germany
- 13.9.2022 – 15.9.2022 – Ranst, Belgium (Final Conference)

A funnel approach was used for the planning. For the selection of partners and locations, a general list of requirements was outlined, which was detailed step by step to a more general applicable plan. For each individual FT a requirement- and preparation list, including factsheets were foreseen and the recruiting of participants as well as an hourly detailed plan was established to focus on the project goals. The same is valid for the (research) methodology used. In order to reach an ideal, streamlined and validated (VR) training solution and guidelines, a clear protocol was established. The 5 different FTs on different locations with different law enforcement agency (LEA) hosts and participating end users, use a certain

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number of standardised VR trainings (scenarios) to allow on the one hand a maximised amount of VR training time for the attending trainees and a maximised validation of the research and solution development through testing based on comparable data.

The testing is to be situated on several different levels:

- Testing the quality of use by trainees of the DMA model
- Testing the efficiency of use of trainer's guidelines
- Testing the efficiency of use of the risk assessment tool (RAT)
- Mapping the cognitive processes during the VR training
- Measuring bio-signals in relation to real-time stress

The results of the FTs will be described in the follow-up deliverable D7.2 which will offer a Combined Analysis Report as a step up to a showcasing of the final VR-solution during the final conference (D7.3). Based on the FT results and as part of the final SHOTPROS conference the Final HF-DMA/SR model (D7.4), a Final Training curriculum (D7.5), Final Guidelines for VR training (D7.6) and Final Evaluated VR Training Scenarios (D7.7.) will be presented to a broad and diverse set of stakeholders.

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1 Added Value

1.1 Relation to SHOTPROS Work Packages (WPs)

Moving into the last period of the project, it is foreseen to kick start WP7. This constitutes a pivotal moment in the project as the SHOTPROS VR solution developed in an agile and end user involving way and the research conducted over the past two years will now be tested and validated to collect final results and impacts for recommendations, further development, dissemination and exploitation.

WP7 therefore represents the final sequence of the SHOTPROS project. After bringing together all the requirements (WP2) in order to create the scientific model of decision making and acting under stress and in high risk (DMA/SR, see D3.2), a first VR Training curriculum (see D3.3) and a first SHOTPROS VR solution (see WP5) were established. In consequence the HF studies evaluated the relevant factors for a successful training, framework and guidelines (see WP6) as well as VR features (WP4), scenarios and the current technical VR solution (see D5.1). This has built the foundation to be able to validate the findings applied in training and the VR solution from different aspects throughout the SHOTPROS FTs.

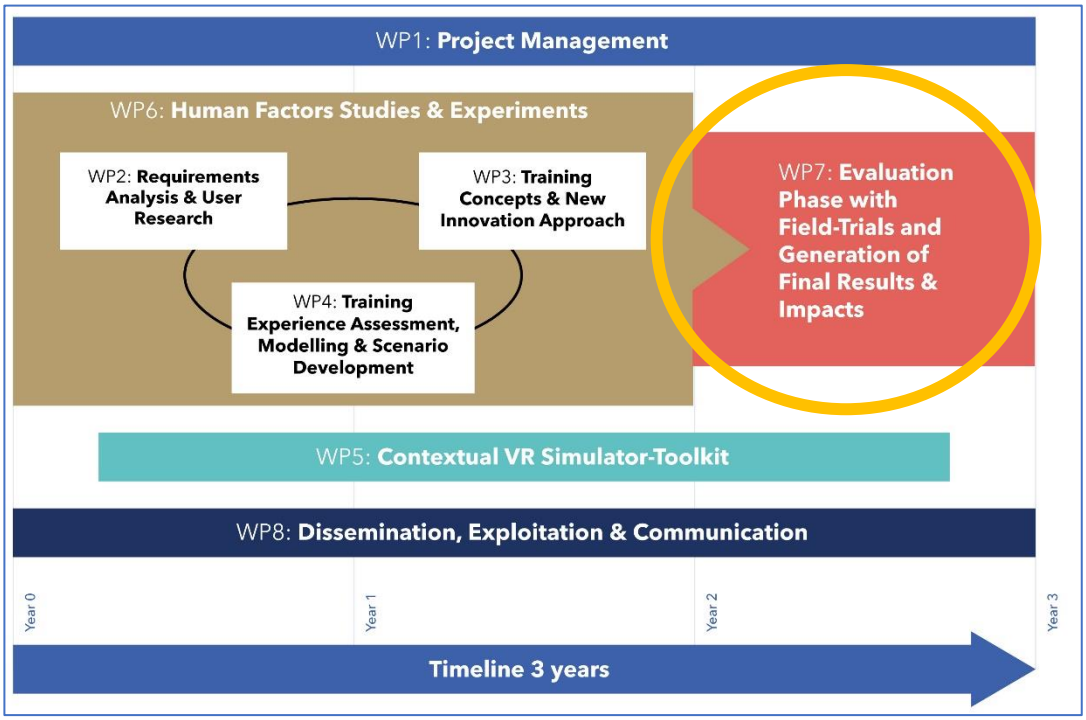

Figure 1: SHOTPROS Work Packages and its relation to WP7

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The FTs will consequently play an essential role in generating the final results and impacts of the SHOTPROS project. These final results and impacts will be:

- Final Evidence-based Human Factor Model for DMA-SR (D7.4)
- Final Training Curriculum for DMA-SR (D7.5)
- Final Guidelines for VR Training (D7.6)
- Final Evaluated VR training Scenarios (D7.7)
- Strategies & Toolkit for Policy Makers (D8.5)
- Demonstration Tool (D8.6)
- SHOTPROS Communication and Dissemination (WP8)

1.2 D7.1 is informed by the following deliverables:

Deliverable	How did theses deliverables influence D7.1
D1.1	The general project management approach of SHOTPROS influenced the approach of planning and organising the FTs.
D1.4	The end user management approach described in D1.4 influenced the highly end user-oriented approach in the FT planning.
D1.2	In reference to the ethical guidelines and procedures (D1.2), KUL was involved in the writing of D7.1 from the beginning. Approval for most research tracks were granted through the Ethical board of KUL (approved on 26 January 2022). The UHEI research track was partly submitted and approved by the Ethical Commission of the Heidelberg University.
D3.2	D7.1 describes how the VUA team will gather information to validate/enrich the HF-DMA model (D3.2).
D3.3	D7.1 describes how the VUA team will gather information to validate/enrich the European Training Framework (D3.3).
D4.6	The Technical requirements for VR Training scenarios gave an insight on how the agile process works allowing to inventorise and monitor improvements in the system.

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D4.7	The development of a risk assessment toolkit to identify high risk situations, was important in the creation of the scenarios used in the FT.
D6.1	The HF study plan gives a good insight in all the HF studies executed and thereby influenced the planning of the FTs.

Table 1: Influence of SHOTPROS deliverables on D7.1

1.3 D7.1 consequently feeds into the following deliverables:

Deliverable	How does D7.1 influence other Deliverables within SHOTPROS
D7.2	The results of the FTs planned in D7.1 are analysed and described in the FT combined analysis report (D7.2).
D7.3	The results of the planned FT and the used methodology will have a direct impact on the final conference and therefore also on D7.3, the Report on the SHOTPROS Demonstration at the Final Conference. The findings of D7.1 and D7.2 are instrumental to the showcasing moment at the final Conference.
D7.4	The results of the validation of the HF model planned in D7.1 will have a direct impact on the D7.4, the Final Evidence-based Human Factor Model for DMA-SR.
D7.5	The results of the further evaluation and final validation of the training approaches planned in D7.1. will have a direct impact on the D7.5, the Final Training Curriculum for DMA-SR.
D7.6	All results derived from the FTs (planned in D7.1) regarding VR training and how to execute them will be reported in the D7.6, the Final Guidelines for VR Training.
D7.7	All scenarios implemented for the FTs planned in D7.1. will be reported in D7.7, the Final Evaluated VR training Scenarios.

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D8.5	A User Experience study and its results, as well as results from focus groups and interviews conducted during and before the FTs that are covering the topic of policy makers and strategy, will be reported in D8.5., the Strategies & Toolkit for Policy Makers.
D8.6	As part of the FTs planned in D7.1, a final Demonstration Tool (reported in D8.6) will be implemented.
D8.4, D8.9, and D8.11	The deliverables D7.1 (and also D7.2) will further feed project communication and dissemination of the SHOTPROS project as this is one of the 3 main goals of the FTs.

Table 2: Influence of D7.1 on other SHOTPROS deliverables

1.4 Relation to SHOTPROS Objectives

The 3 main objectives of the SHOTPROS FTs and the main objectives of the SHOTPROS project itself are directly linked to each other. Based on the results of the previous HF studies (WP6), a validation of the HF model (objective 1) will be part of the studies during the FTs, the final VR training environment (objective 2) will be developed and tested, the final training framework and curriculum (objective 3) will be validated with trainers and also a lot of final input for the guidelines for VR training (objective 4) will be collected and then finally be reported in WP7. Therefore these 4 goals are directly fed by the FTs and their methodology used (see chapter 4 later in this document). Based on the public awareness of VR police trainings that will be raised during all FTs (communication and dissemination) and the already great interest also from non-SHOTPROS partner end users (gained through the already existing VR and police network) to participate in different FT slots, this deliverable, and the FTs in general also directly aim to support the fulfilment of objective 5, the establishment of a European VR police network.

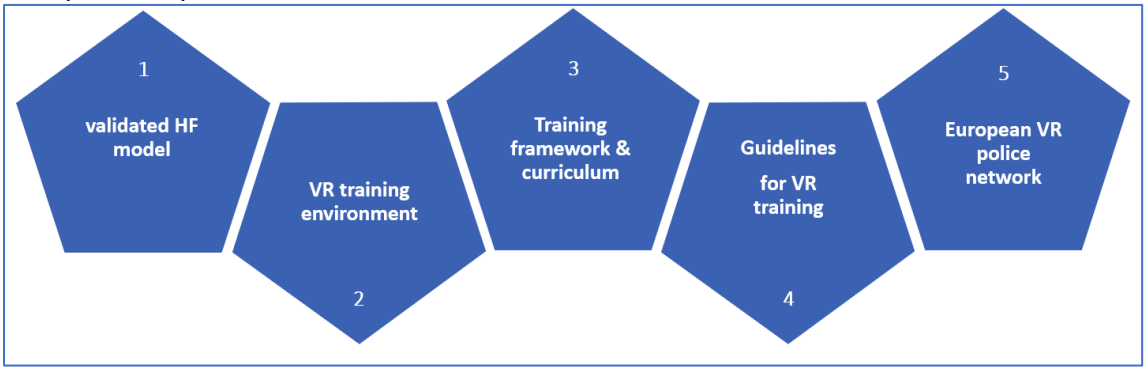

Figure 2: SHOTPROS objectives – overview

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2 Introduction

Taking into account the main goals of the SHOTPROS project to investigate the "influence of **psychological and contextual human factors** (HFs) on the behaviour of **decision-making and acting** (DMA) of police officers **under stress and in high-risk operational situations" and** the aim **"**to develop a **HF-rooted training curriculum** and a corresponding **VR-training solution** (WP5) to provide a comprehensive **framework for practical training** (WP2-4 and WP6)" and the final aim "to **disseminate**, **exploit** and **communicate** these results to all different stakeholders (WP8)", the FTs represent the most important part of the project to finally get the puzzle of all WPs together and to aim for a comprehensive solution regarding training framework/curriculum, VR solution and a sustainable VR network.

Therefore the 3 main goals of the FTs are:

- Scientific **validation** of DMA model, stress measurement and training framework/curriculum
- **Evaluation** of end user feedback on features and product options
- **Communication** & dissemination inside and outside the SHOTPROS consortium

After the execution of 5 FTs (February to May 2022) throughout Europe, the results will be reported in the final deliverables of WP7 and WP8 and will also be presented at the SHOTPROS Final Conference (September 2022) which also serves as the official kick-start for a sustainable police network for knowledge transfer on VR training and will include a policy-maker toolkit. This Virtual Reality and Police Network (VRPN) will exchange experience and information and will be the engine for innovation in policing.

To be able to achieve the above-described goals, FTs are planned with different approaches:

- Provide **VR trainings in a realistic scope** to meet the LEAs needs to train trainees with a VR system and to meet the needs of the researchers to validate their proposed HF model, training curriculum, framework, and the VR environment.
- Testing and evaluating future **product options and exploitation possibilities** with end users to meet the needs of SHOTPROS partners for further exploitation and final reports.
- **Showcasing the SHOTPROS project** and its impacts to meet the communication and dissemination objectives of the project itself but also of the LEA partners within their own organisation (Raising acceptance within possible future trainers for VR as a methodology of future training; Showcasing their involvement and progress within and

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outside their own organisation and also towards the public; Raising awareness and involvement of management and decision makers etc.)

Depending on these different needs two options of FT slots were defined:

- **FIXED training sessions** - VR **training** following the proposed training curriculum (based on WP3) and a train the trainer concept for local trainers guided by an experienced VR trainer on site with a focus on actual execution of a training as well as observation, measurement and interviewing by research. Input for final deliverables and the final requirements for the VR solution (research, technology and LEAs) will be collected.
- **FLEXIBLE experience sessions** - Showcasing and **demonstrating** the project and its solution to other trainers, management, decision makers and policy makers as well as media all guided by an experienced VR trainer and enriched with background information by consortium members but with the focus on trying-out the system by themselves and then discuss **feedback** and open questions.

An important aspect to achieve the above-described goals and considering the above-described approaches was to have a **dedicated FT team installed** that is responsible for the organisation and preparation in advance, establishing a precise plan for each FT location based on the general plan presented in the deliverable at hand and executing organisation on-site. The FT team is also responsible for the close **collaboration** with the local LEA partner, considering the **needs** of research, technology and LEAs as well. Furthermore, to provide a **comparable** and **plannable** training situation, it was necessary to introduce an **experienced VR trainer** to the FT team, who is preparing (scenarios, sequences etc.) and accompanying all FTs as well as educating local trainers (also for considering local differences in law and training approach) on site by using a train-the-trainer principle. This included the alignment regarding research, scenarios, technology and LEA needs for each FT.

All these aspects influenced the planning of the FTs in general and individually for each FT in advance but also the used methodology on site. Therefore, the planning and the used methodology build-up in the upcoming two main chapters of the deliverable will answer the following topics:

- How the FTs will be planned, organised and executed
- How the existing scientific results will be validated during the FTs

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3 Field Trial Planning

3.1 Basic Definitions

The kick-off meeting for the FTs took place in the beginning of June 2021, right after the final HF studies were executed, to be able to provide an agile but at the same time precise planning. The aim was to establish a generally valid basic planning to be able to introduce a local plan for each FT.

The first points of actions were outlined:

1. **Technical requirements**: Minimum requirements for the FT locations to guarantee the VR solution functionalities
2. **Organisational timeline**: Creation of a timeline for the preparation and organisation of the FT
3. **Location**: The decision-making process of where and when the FTs could take place

Technical requirements for FT location

To be able to define the location of the FTs it was necessary to define the requirements of the SHOTPROS VR solution towards a location. Together with the technological partner RE-liON (RL) and the agile team (definition see D1.1 and D4.6) a **minimum technical requirement list** for a FT location was established, based on the experiences made during site visits of the HF studies (see D6.1; e.g.: End user Feedback Week (EUFW) Berlin 2021). The requirements mostly focused on the **dimensions** of the workspace for the VR solution, the requirements in relation to the **safe use of the equipment**, **electricity,** and the availability of **internet connectivity**.

The minimum requirement list was then further elaborated to meet all needs of the future FTs but also considering the scientific requirements regarding additional technological needs (e.g.: additional body-signal measurement or methods of stress materialisation etc.) at the location. Besides hard facts like the size of the training field, free space, energy availability or no interfering WIFI channels, this list also included practical solutions like changing options for putting on the bio-signals measurement tools, enough desks and chairs for the scientific evaluation and for end users, or the average time needed for certain steps throughout a study set-up to be able to plan the FT in advance. These results built the first base of the deliverable at hand.

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As the FTs are planned agile (see below), this list will be re-evaluated **before** each FT regarding the individual location and is revised and enriched with experiences **after** each FT to enable better planning of the upcoming FT. This process was led by the WP7 lead VESTA and accompanied by all SHOTPROS partners.

Organisational timeline

A preliminary **timeline** has been created to clarify all deadlines for the conduction of the FTs. This timeline includes important deadlines for every single FT including a kick-off and a debriefing event for each FT location to consider individual needs and revise the executed event.

A challenging and intensive planning of availability of the technological partner, end user partner and locations as well as scientific needs (in order to streamline all their research needs towards measurable and comparable data and validated results) and at the same time considering the sprint planning (see D4.6) and general project management (see D1.1) led to the definition of the following dates and locations.

Location

- 7.2.2022 – 12.2.2022 – Seibersdorf, Austria
- 21.3. – 25.3.2022 – Bucharest, Romania
- 4.4.2022 – 8.4.2022 – Amsterdam, The Netherlands
- 19.4.2022 – 22.4.2022 – Selm, NRW, Germany
- 16.5.2022 – 20.5.2022 – Berlin, Germany
- 13.9.2022 – 15.9.2022 – Ranst, Belgium (Final Conference)

3.2 Planning approach

Following the objectives of the FTs (scientific validation, product evaluation, end user feedback and communication and dissemination), different aspects were needed for clarification and the following building blocks of successful FTs were outlined:

1. Organisational timeline
2. List of requirements
3. Deadlines
4. General week and day planning
5. Sequences of VR training
6. Definition of roles during a FT
7. Participant's profiles

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8. Technological environment and scenarios
9. Factsheets
10. Communication and dissemination

3.2.1 Organisational timeline

A permanently updated **timeline** (separate document, accessible on the internal project Share Point) allows all partners involved to interact in a timely and agile manner. This enables each hosting LEA to prepare the practical and logistical aspects of the FT but also the scientific partners to determine which studies they will conduct in every FT and which specific studies will be organised only in a particular FT. Deadlines are set as to determine the methodology, learning aims and scope of every study in advance for every FT.

3.2.2 List of requirements

The **list of requirements** (see below) was turned into a compact **excel checklist tool** to enable the organising LEAs to meet all needs and requirements of every FT as well as for the individual FT.

The general list included the following:

- Availability of a single point of contact **(SPOC)** at each host-organisation.
- Recommending **hotel** accommodation for all participants: Block booking and/or a recommendation for one dedicated FT hotel will be provided by the local LEA partner together with the FT team as this makes the on-site organisation (shuttle to training location etc.) easier and more budget saving. Links, rates and deadlines were communicated by the SPOC and the WP-lead to the participants. Lists on arrival, availability and main purpose of the participants for each FT are available on the SHOTPROS Share Point to enable a better overview and enhancing collaboration of the organisation committee. They also served as subscription list for the participants. The list included the **following parameters**: Name, first name, name partner organisation, e-mail address, arrival date, departure date, transport mode, are you staying in the designated hotel, what is your role or study involvement, number of days present at the FT, fulfilment of the location individual Covid-19 rules and dietary requests.
- Clarification of **access rights** on-site by the SPOC for SHOTPROS crew and participants.
- Name **badges** for SHOTPROS partners on-site are used to distinguish them from the other participants.

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- Lockable training area for the whole week, as it has to be closed off during the nights (VR equipment and equipment for research stays on site).
- Size of minimum 35 x 35 meters obstacle free space for the FT.
- Depending on the methodology used (see 4), an additional **workshop room** and one extra room for **interviews of the trainees** are needed.
- The **temperature** in the training pitch must be between 15 and 30 degrees Celsius (for the equipment), if outside temperatures go towards 30°C then extra ventilation is needed for participants and equipment.
- The room must have sufficient **light.**
- Two **electrical circuits** with each a grounded plug and at least a 16A fuse (when there's a main voltage of 230V) for the battery charger and the different stations.
- For the research area a 3rd separate circuit is needed (f.e. for laptop use and charging equipment etc.). If they need WiFi access, this needs to be clarified before with RL (to avoid interference) and the local host (if available in the gym hall).
- A minimum of two **unused**, noise-free, non-overlapping 40Mhz **radio channels** in 5Ghz WiFi band.
- **Lunch** for all SHOTPROS partners either on-site in the waiting area or in an extra room (on site cantina for example).
- **COVID related NOTE**: the rooms should be well ventilated. Separated entrance and exit indications should be available (to separate in and outgoing streams of people). Sanitation gels, masks and available self-tests depending on the location requirements towards COVID-19 need to be provided. The suits should be properly cleaned AND disinfected after every use! Also, the used pens and tablets should be disinfected each time. Drinking and snacking should only be possible in a dedicated and well-ventilated area. In a local fact sheet the national health measures that are applicable in relation to COVID-19 in each of the specific EU Member States where the FT is executed should be summarized and made available in advance.

Additional to the above-described general requirements, also individual requirements for the research partners (AIT, KUL, VUA, UHEI) were listed to be checked with the local host. This resulted in the following requirements list:

Requirements from AIT:

- Time (approx. 10 minutes) reserved for participants prior to the training to read through and sign an informed consent and data privacy form.

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- To be able to track each participant's "journey" through their training experience and the different stations (consent forms, VR training, questionnaires, etc.) while staying anonymous at the same time, each trainee needs to select a personal code (2 letters & 2 numbers) which will be their display name in the VR scenario and recorded on all feedback forms.
- All participants of the training are required to wear a bio-signals measurement tool, the Zephyr Bioharnes chest strap in order to display an indication of their real-time stress level throughout the training (as described in D4.5).
- One trainee per group is requested to wear additional sensors on both of their shoulders (EMG & GSR), collar bone (ECG) and head (in form of a headband including plastic strips across the head).
- A large table with close-by power supply to set up the bio-signal recording station, ideally next to the VR operator station and not more than 15 meters from the spectator station to ensure the live capturing of the in-action video view (via HDMI cable).

Requirements from VUA:

- 2-3 training groups per FT are requested to participate in brief (à 45 min.) post-training focus groups, with each a specific protocol (and focal tenet).
- A separate workshop room to execute the focus groups.
- Access to the training pitch and the after-action review (AAR) for non-intrusive observation, preferably with a table and chairs and connection to electricity and Wi-Fi for a laptop.

Requirements from UHEI:

- At least 54 trainees (duty officers) who will train in 3 VR scenarios with increasing stress levels.
- Access to the training pitch and AAR to ask quick questions to the participants after each scenario. (Every officer answers 3 questions on DMA after each scenario. The answers will be audio-recorded. A flashlight-after-action review led by a scientist while the AAR video is observed with comments on 3 stress-cues. Recording of the regular after-action review by the trainer without intervention of the scientist.)
- Recording and analysis of performance indicators (behavioural data like position, motion, gaze).

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- Recording and analysis of physiological indicators: HF/HRV, breath frequency, 5 saliva samples (stress indicators: cortisol and alpha-amylase).

Requirements from KUL:

- Access to information on the scenarios used.
- Access to the trainers in order to be able to evaluate the use of the RAT.

As a consequence of the above-described requirements, the following needs towards the training location and the following chronological sequence was extracted and also schematically visualised in figure 3 using the numbers listed below:

1) A **Covid-19 safe entrance and exit** to FT location. A set of safety rules on Covid-19 for each location are explained in a document and distributed to all participants.
2) **Waiting room** for the upcoming group of trainees (with at least 5 chairs and 1 table with a pen, measurement forms and a measuring tape to measure height and arm width of the trainees for the VR representation of their avatars). There, the trainer also gives the briefing of what to expect and explains the course of the training session. A researcher will brief the participants about the research goals and will make sure the informed consent is signed by all participants prior to the start of the training. **IMPORTANT NOTE**: The waiting room should be clearly separated from the training pitch and the observer area in order to prevent that trainees already observe the ongoing VR training while waiting.
3) Two **VR suits areas** for male and female trainees including a mobile divider or similar to provide privacy when applying the bio-signals measurement under the T-Shirts.
   Trainees empty all their pockets and put all their belongings in a tray together with their mobile phone (put on silent) and get the bio-signals measurement tools as well as the VR suits dressed on (and afterwards also off) their body. The trays are placed on a table or on the VR flight cases. The VR suits are put on over the clothing the trainees are wearing with the help of a dedicated suits team, (Light and comfortable clothing is recommended for trainees).
   No chairs or benches with metal are used since wearers of the smart vest are **not** allowed to be close to any metal chairs/benches.
   An instructional video on the smart suits can be found here and is also distributed to the trainees in advance of the training. (https://vimeo.com/668282429/1637dfc6d3)
4) The VR **suits team** has a desk and some chairs to observe the VR training available. Beside the dressing assistance and their responsibility for the hygiene of the suits, their role is also to intervene and assist if a trainee during the training action gets motion sick and needs support.

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5) **VR operator** area**.** This area with a desk and at least 2 chairs is located very central next to the training pitch and the trainer station so they can operate the VR training.
6) Two tables and some chairs are foreseen for the **researcher area,** so they can store and use laptops and other materials for their observations. Depending on the methodology for the individual FT, the multi-sensory platform can be steered from there in accordance with the RL operator. This area also needs to be close to the training pitch as some methods need direct interviewing right after a scenario is executed.
7) The **training pitch** itself is ideally 30m x 30m x 5m, free from any obstacles. The floor must preferably be clean and free from dust/sand.
8) The **trainer station** for the in-action monitoring (IAM) by the trainer as well as the after-action monitoring by the trainer and the trainees is completely equipped by the technical partner (see D5.1).

   IMPORTANT NOTE: It should be avoided that trainees who are waiting for an upcoming VR training can either observe the ongoing VR training or can follow the ongoing training on the AAR monitor or participate in the AAR of another training team.
9) After the trainees get undressed from the VR suit and the research equipment in area 3, they can refresh at the coffee corner.

   IMPORTANT NOTE: The coffee corner is not placed next to the AAR corner or other VR equipment to avoid moisture.
10) An **evaluation area** is provided to make AIT able to let participants (trainers and trainees with separate forms) fill out questionnaires. This will either be done on paper or digitally with tablets. The questionnaires will be provided in ENG/DE/NL/RO.
11) Depending on the used methodologies, the trainers and/or trainees will be guided to the designated **workshop room** for further interviews or focus groups.
12) Depending on the used methodology, the trainer and trainees also evaluate **additional product options** (Dragonfly and Compact – see D5.1) together with participants from the agile team (see D4.6) and try them out in a dedicated **area**.
13) Depending on the need of the trainees, a **changing room** for street cloth or uniforms to sport outfits including a sanitary area needs to be available at the beginning and the end of the FT flow.

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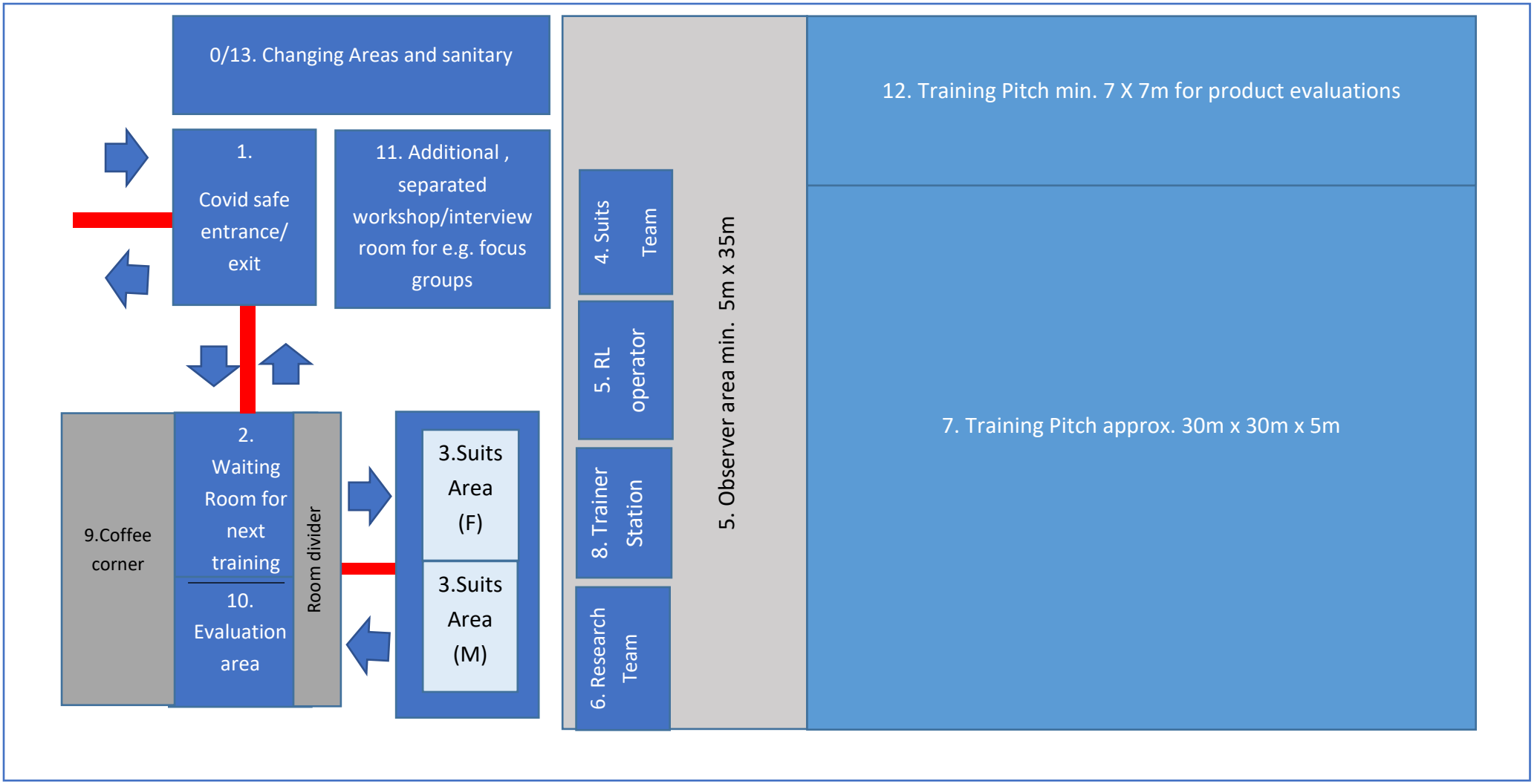

Figure 3: Schematic presentation of training pitch, observer area

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3.2.3 Deadlines

Important deadlines in the run up to each individual FT:

- 3 months ahead of FT: all **studies** that are planned are defined and locked and an application form for all participants is sent.
- 2 months ahead of FT: all FT **objectives** are locked, and all **factsheets** are created and sent to the participants. **Agenda** and **time blocks** are fixed.
- 1 month ahead: the list with the number of **participants** is locked and all practical information (address, hotel, transport, audience, travel data participants etc.) is communicated to all participants.
- 0 months ahead: **conduction** of the FT

3.2.4 General week and day planning

A FT is organised in working weeks and consists of 1 day for set-up and dry run including final organisational checks and train-the trainer sessions as well as 2-4 days of actual VR training (fixed training sessions and flexible experience sessions see 2, Introduction).

In advance, a time schedule for the whole week and for every day in detail is put forward and all trainees are placed in groups of 3 or 4 (depending on training practice of the local LEA) in the different available slots. This means that the number of participants per day is determined prior to the FT. All participants receive the detailed week program beforehand.

Example:

	Sun	Mon	Tue	Wed	Thu	Fri
Morning 1		Set-up of equipment from each partner	Training session 1	Training session 1	Training session 1	Flexible session 1
Morning 2		Dry Run and organisational checks as well as briefing of role-players	Training session 2	Training session 2	Training session 2	Debriefing for the whole FT team
Lunch						
Afternoon 3	Arrival of RL	Train the trainer session	Flexible session 1	Flexible session 1	Flexible session 1	Set down
Afternoon 4		Preparation Meeting for the next days	Flexible session2	Flexible session 2	Flexible session 2	

Table 3: Overview of the general FT planning per day for 1 week

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How a week- and day program looks like in detail will depend on the needs of the LEA and is further discussed in the chapter 3.2.5 sequences of each training.

3.2.5 Sequences of VR training sessions

Following the observations made during other HF study or EUFW events and the preparation together with the consortium, the following was determined regarding the timing and order **of each VR- training session** in Table 4.

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What	Detail	By whom	To Whom	Min.
Explanation	Training goals, general procedure, and possible dangers (motion sickness)	Trainer	Trainees	5
Briefing	Research objectives	Researcher	Trainees	5
Signing	Informed consent on data collection and research	Trainees		5
Measuring	height and arm width → handed over to operator	FT team	Trainees	3
Dressing	Bio-signals sensors (Zephyr belt for all and additional bio-signal measurement for 1 selected person)	AIT	Trainees	8
Dressing	VR suits	FT team	Trainees	15
Calibration	VR suits	System	Trainees	6
Calibration	Tactical belt gear	Trainer	Trainees	10
Tutorial	First trial - scenario execution to get used to the VR	System	Trainees	10
Role Player	Instruction	Trainer	Role-Player	1
Training	Scenarios (2-3) with increasing stress levels & short instruction during and after each scenario on the field or by radio communication of the trainer	System & trainer & operator	Trainees	15-25
Research	Quick interviews & saliva sampling	UHEI	Trainees	3
Dressing-down	Suits & bio-signals measurement tools	FT team	Trainees	5
Disinfection	VR suits	FT team		5
AAR	Debriefing and summary of the training	Trainer	Trainees	10-20
Video Recording	AAR images are recorded for purposes of analysis	UHEI		
Questionnaire	on VR experience	AIT	Trainees	20
Focus Group	With selected participants	VUA	Trainer & trainees	45

Table 4 Sequences of VR training sessions

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A complete cycle of all sequences composing one VR training session **varies between 70 and 90 minutes.** Some actions like disinfection can be parallelised while trainees and trainer already move to the next step and execute for example the AAR. The training duration depends on the following factors:

- How fast and efficient is the assisting team (SHOTPROS members are much quicker, but sometimes local teams need to support and need more adjusting time).
- How efficient are the trainees (experienced groups who for example already participated in HF studies, needed much less time than new teams who have additional questions that need to be answered).
- How much time take the trainer(s) for assignment and briefing before and de-briefing after the training session.
- Which scenarios are chosen and how often are they repeated for training success.
- Environmental influences like additional observers or other factors.

For each training slot 90-120 min were foreseen followed by a 10 min break. Flexible sessions (afternoon sessions for showcasing and demonstration or feedback only) can be executed in a much shorter amount of time as a lot of research steps are not necessary and also the training preparation and after-action review is shorter and mainly focusing in explaining the system itself but not on giving the trainees detailed training feedback (as the participants are mainly trainers themselves, management or even press representatives that focus on the "how does it work and what advantages does it have" than on actual learning goals). The sequences and duration are subject to revision after each FT to optimise the flow over all FTs.

Monday	Tuesday	Wednesday	Thursday	Friday
Set up & dry run **Start**: 09:00 **Participants**: CBRNE Academy, SHOTPROS Partner **Schedule** Set-up 09:00 – 12:00 Lunch 12:00 – 13:00 VR Demo 13:00 – 17:00 End approx. 17:00 - 17:30 60 min per VR Group 4 persons per Group	**Training + Studies** VR Demo @school Lunch @CBRNE Academy **Start**: 08:30 **Participants**: SHOTPROS Partner **Schedule** Arrival at school: 09:00 Group 1 09:00 – 10:30 Group 2 10:30 – 12:00 Lunch 12:00 – 13:00 Group 3 13:00 – 14:30 Group 4 14:30 – 16:00 Group 5 16:00 – 17:30	**Training + Studies** VR Demo @school Lunch @CBRNE Academy **Start** 09:00 **Participants**: SHOTPROS Partner **Schedule** Arrival at school: 09:00 Group 6 09:00 – 10:30 Group 7 10:30 – 12:00 Lunch 12:00 – 13:00 Group 8 13:00 – 14:30 Group 9 14:30 – 16:00 Group 10 16:00 – 17:30	**SHOTPROS & Friends Day** VR Demo @school Lunch @CBRNE Academy **Start** 09:00 **Participants**: SHOTPROS contacts, partners & further guests **Schedule** Arrival at school: 09:00	**Media session** VR Demo @school **Start:** 09:00 **Participants**: see Journalist list, SHOTPROS partner (also LEAs) **Schedule** 09:00-09:30 Welcome 09:30-11:30 VR Experience 11:30-12:00 back to CBRNE Academy 11:30 set-down

Table 5: Schematic presentation of a week and day schedule during a FT (example Seibersdorf)

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3.2.6 Definition of roles during a FT

The following roles are necessary for the conduction of a FT:

- **FT and suits team**. Ideally 4 assistants provided by the host or on-site available SHOTPROS partners to help measure the trainees and to dress and undress the trainees and make sure suits and stuff is disinfected throughout the FT. This should be a gender mixed team where the female trainees are assisted by a female member(s) of the FT team. A factsheet is provided to them in advance.
- **Role player** for all scenarios where the trainer needs a role player. Planning of availability and participation on the set-up day to make sure VR does not cause motion sickness to the role player and the trainer (and sometimes also the research team). The trainer briefs the trainees on the requirements for each different scenario. They wear the VR suits during the whole training but can put it on and off by him/herself after the first few assistances.
- **Trainers** from the local team. 1-2 trainer are trained in a train-the-trainer session on the first day by an experienced VR trainer to get used to the system and the methodology. Later they are supported during the sessions by the SHOTPROS VR trainer, and they also execute the briefing and AAR. They preferably speak English to represent the communication bridge between the trainees and RL operator if necessary. If they do not speak English, someone that can translate should be present (and available during all days).
- **Trainees** (VR suits are designed for trainees between 165cm and 205cm) preferably have some experience with training and/or VR training. They preferably understand and/or speak English. Trainees foresee a spare shirt or T-shirt for after the training. Trainees with glasses preferably wear contact lenses or if the glasses are not too big, they also fit into the VR head mounted display. The number of trainees selected by each LEA depends on the overall program.
- **Observers** can be fulfilling a specific role for the LEA (e.g. management of the hosting LEA) or the SHOTPROS consortium (additional end users, advisors etc.). The number of active observers needs to be restricted to not disrupt the VR trainings but can be adapted on the fly depending on the situation.
- **Operator** (RL) of the VR system and the other technical modules. Preferably 2 people are needed: an operator and someone to answer questions and resolve technical issues.

  Logistical assistants: the organising team lead by the SPOC of the hosting LEA has people available to provide board, shuttle, access rights etc.

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3.2.7 Participant's profiles

Trainer

It is important to outline that **experienced** trainer, using clear instructions, assisting as well with putting the VR suits on and off or during the calibration and tutorial process, **increase** the **quality** of the VR experience for the trainees. It also helps to limit the preparation time and to maximise the time dedicated to the VR experience. The trainers were involved at the early stages of the FT preparation and planning and receive a dedicated train-the-trainer session by the experienced SHOTPROS VR trainer team. They played an important role in the validation of the training and will deliver important input for the WP7 deliverables.

Trainee

In reference to the study D3.3 it is important to select **trainees that are used to tactical scenario training**. Per LEA at least the average percentage of female employed officers should be included as a target for female participation in the FTs. In reference to the **ethical guidelines and procedures** (D1.2 p.6-7) Volunteering *"trainees need to be explicitly and thoroughly informed about possible negative reactions to VR"* (e.g., motion sickness). Furthermore, it should be clear that "*trainees with a diagnosed heart condition or psychological illness cannot participate*". Trainees will be carefully monitored during the training and explicitly asked how they are feeling after the VR training. Trainees need to be briefed about these elements prior to the start of their session and will be asked to sign an informed consent form, agreeing to their participation in the training session and to the collection and retention of specific data for research purposes.

Participants of the flexible sessions

During the more flexible sessions targeted towards **management**, **decision makers** or external organisations to showcase the system, present a **demonstration** and provide VR **knowledge** transfer, the teams can be organised individually. Depending on the composition, a local trainer is not needed but the explanations can be done by the experienced SHOTPROS VR trainer. Additional knowledge transfer and answering questions or exchanging **experiences** is done by the SHOTPROS consortium members serving as hosts in addition to the local host. Here the focus is **communication** and **feedback** from more external participants as well as dissemination.

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3.2.8 Technological environment and scenarios

For each FT, the agile team (see D4.6) defined the available release and the available features of the SHOTPROS VR solution. Furthermore, together with the experienced SHOTPROS VR trainer from our train-the trainer team, suitable scenarios were defined in collaboration with the local host together with the agile team to meet the needs of the individual FT (LEA need, scientific and dissemination need). Also see D5.1 and D4.6 as well as the list of the used scenarios in D7.2 (due after all FTs conducted). For additional product evaluation sessions, the respective environments need to be prepared by the agile team to be able to execute experience sessions with trainers or decision makers to collect feedback.

3.2.9 Factsheets

In order to have a good information flow between the SHOTPROS partners involved in the FTs, it was crucial to outline in a detailed way which fact sheets should be used during the FTs. Some fact sheets were made in the early preparation phase and needed to be reworked.

- SHOTPROS 2 pager on VR police training called VR: The future of LEA training- Be part of it! (general use)
- 1-pager factsheet on the DMA model (general use)
- VR training sequence fact sheet (complemented with an instructional video clip https://vimeo.com/668282429/1637dfc6d3) on how to put on VR suits (for trainers, trainees and the FT suits team)
- Description of available the VR scenarios (for trainers - not accessible for trainees)
- Specific FT factsheet per FT with general and specific local information and the program

3.2.10 Communication and dissemination

This is an essential element of the communication and dissemination (WP8) strategy. SHOTPROS draws up a strategy and plan of action to bring SHOTPROS under the attention of the local, regional, national and European press ahead and during the FTs. Our communication strategy for the FT is in line with D8.1: Dissemination plan and communication guide.

Internal communication:

All partners involved in the field trial are informed about the details of the field trials via the project´s internal communication channels (see D1.1). Thereby it can be ensured that all attending partners are aware of the programme, practical organisation, health measures, etc. for each field trial. To facilitate the communication on-site, an additional internal text messenger group may be set-up.

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External communication: A press release about the whole FT program (European press) and specific press releases per FT (national and regional press), will be issued and press invitations for specialised journalist in research and technology will be sent. Additionally, the field trials are communicated and disseminated via the existing project´s social media channels and the website (see D8.1). All partners are encouraged to support the external communication efforts by distributing the press releases to their press department and networks to spread the word about the SHOTPROS field trials. All external communication measures must be aligned with the general strategy (see D8.1) and the legal obligations as outlined in the Grant Agreement.

In parallel to the organisational approach described above, the methodology used during the field trials needed to be planned together with the technological partner RL, the agile team (AIT and USE) as well as all scientific partners (VUA, UHEI, KUL). In a next phase the law enforcement agencies (LEAs) were also involved bilaterally, in order to clarify all the objectives of the FT: for example whom they want to invite, and what their specific (dissemination and training) goals are for the individual FT. After collecting all these needs (organisational, scientific, end user and general project objectives) the planning was ready to start based on the identified building blocks.

4 Field Trial Methodology

4.1 Methodological approach and research input

One of the main aims of the FTs is to organise a structured collection of data for input for further development of the final VR-solution and validation data for the final deliverables of SHOTPROS. During the FT trainings, approximately 175 trainees will follow a VR training and the trainees will cooperate in several evaluations and research activities to answer the following main questions:

- What is the effectiveness of training in improving DMA skills?
- How is the user experience of DMA-SR and the VR training curriculum?
- What is the efficiency of use of the risk assessment tool (RAT)
- How do we evaluate the influence of HF on stress, resulting in a HF model?
- How do we evaluate scenarios, the VR training environment and training success?

The standardised training format is defined as:

1. 90-105 minutes in duration in groups of 3-4 trainees

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2. The trainer guides the trainees through all sequences of the training
3. 2-3 pre-selected VR scenarios are used and repeated for training success
4. All recommendations in D3.3 on "good training" are implemented[1]

4.1.1 VUA validation HF-DMA model and the European Training Framework

At the FTs, the VUA team **gathers information to validate and enrich the HF-DMA model (D3.2) and the European Training framework (D3.3)**.

4.1.1.1 Validation/enrichment of D3.2 via Focus Groups

VUA selected **three core tenets** of the conceptual model and its implications for VR training to further evaluate in the field trials:

1. **Stress should be provoked in VR training** (Trainer Dashboard, role-players and scenario design), and the VR training should allow for **practicing mitigation strategies** as proposed by the model: i.e. restoring or maintaining goal-directed action despite elevated stress levels.
2. In VR **both goal relevant and goal irrelevant stimuli should be present**, and the VR training should allow for **practicing focusing on the goal relevant stimuli**.
3. VR training should allow trainees to use both **cognitive and sensory information**, meaning that in VR, trainees can perceive, move, and process information in a natural/realistic way.

VUA will evaluate the users' (i.e. trainees') experience with the VR training during the field trials against these core tenets. They propose to do so with **brief focus groups** (45 min in a separate room) with trainees after their training. VUA proposes to develop **three different focus groups protocols**, each addressing one of the core tenets. This allows for the focus groups to be brief and focused. It means that for each group of participants, that is available for **brief post-training focus groups, one protocol** (and thus focal tenet) **will be selected.** Ideally at least two groups of trainees would be available at each field trial, so all three tenets can be evaluated throughout the planned field trials.

In total 3-5 **field trials will provide VUA with information on the relevance of the core tenets and implications for VR training for end users**, the extent to which the current system and

[1] Every training should contain: a clear assignment, high quality training instructions, a well-designed practice situation, model learning, variation and differentiation, self-management of the learning process and feedback. (D3.3, page 8 and page 37-48)

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curriculum fulfils the implications following from the model, and identifies areas for further improvement.

4.1.1.2 Validation/enrichment of D3.3 via observation

This validation/enrichment will be done **through non-intrusive observation** focused on **evaluating the use of the guidelines for trainers and aims to enrich the didactical guidelines**. VUA, assisted by KUL, will therefore observe all trainings during the FTs.

4.1.1.2.1 Evaluation of guidelines for trainers

D3.3 outlines guidelines for policy makers, training coordinators and trainers for VR training. VUA will **evaluate the usefulness of the guidelines for trainers in the development stage of the field trials**. The training content for the field trials will be developed in co-creation with experienced trainers from the involved LEAs.

Participating trainers will be provided with the guidelines from D3.3 before the co-creation starts, the guidelines will then be evaluated regarding usefulness. All will be guided by one of the already experienced SHOTPROS VR trainers.

4.1.1.2.2 Enriching didactical guidelines

D3.3 provides concise and practical didactical guidelines for trainers, based on **seven criteria for optimal training** (i.e. clear assignment, training instruction, well-designed practice situation, model learning, variation and differentiation, self-management of the learning process and feedback). To enrich the didactical guidelines and make the guidelines and criteria more concrete for trainers VUA will **systematically observe the training sessions conducted in the field trials and collect best practices** (and, if informative, bad examples) for each guideline or criterion.

4.1.1.2.3 Interview with the main VR trainer on the scenarios

VUA conducts a short interview with the main VR trainers, who have been assisting the project developing and adapting the storylines and training scenarios. The interview will cover the decision about the particular training design and differences to real-life trainings as well as about the implementation of the guidelines described in D3.3 for the design of the scenario script. This will further substantiate the final VR training framework.

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4.1.2 AIT end user feedback, validation of stress indicator and presence

At the FTs, end users as well as other invited participants will have the opportunity to test different versions and scenarios of the SHOTPROS system (see D5.3). AIT will collect **feedback** from end users on the SHOTPROS system, record **bio-signals** to further enhance the current stress indicator and evaluate the newly developed **multi-sensory** features.

4.1.2.1 End user feedback

End user feedback regarding User Experience (UX) and Technology Acceptance (TA) will influence the continuous development and improvement process managed through the agile development process described in D5.2. Feedbacks will be logged in the product backlog (see D4.6), prioritised and transformed into technical requirements and planned into future release cycles. Requested features and feedback that are not within the scope of the project will be included as future recommendations in the final VR guidelines (D7.6 SHOTPROS Final Guidelines for VR Training).

Feedback is collected through a combination of questions from different validated questionnaires (e.g. **quality of Experience** (QoE), **Presence** (IPQ and/or SOPI), **Quality of Learning experience** (QoLe)) as described in D6.1 and D6.3 and used in previous EndUser-FeedbackWeeks to continuously measure the progress of the developed solution.

In order to gain thorough feedback to reflect a broad view of the trainees and trainers, not only individual preferences, a sample size of at least 20 participants per FT is required.

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4.1.2.2 Mobile Multisensory Experience Platform (MMSP) - materialise the VR

Figure 4: Picture of the MMSP

AIT will introduce a multisensory platform at the FTs to test if multisensory experiences such as heat, wind, scent, pain or haptic feedback will **increase** the feeling of **presence** in VR trainings. The findings will be reported in the D7.6 with the aim to derive concrete guidelines for an optimal VR experience from the generated insights and to produce recommendations for the use of additional influencing factors.

As the name suggests the MMSP is extremely mobile and can be flexibly moved across the training field and placed where needed throughout training sessions. The included monitor receives the live action from the trainer station (IAM view) to ensure the operator of the MMSP knows where in the VR scenario trainees are at any point of time as well as when to trigger certain features (e.g. wind, heat, pain, moisture, scent).

Should the FTs reveal that multisensory experiences have a strong impact on immersion and the overall quality of the training, we recommend investigating the possibilities of implementing such features in the overall technical solution so features can be automatically triggered (e.g. through trigger zones or attached to NPCs) by the VR system. The outcome and conclusions will be reported in D7.2 and D7.4.

Among others, the following experiments are planned:

- Development and use of a **MMSP** to address different senses in VR. For example, the experience of real heat (e.g. during an explosion) or wind (e.g. in the open air) will be evaluated and the effect on perception in VR will be determined. In order to investigate the impact of the MMSP, approx. 50 % of trainees will get to experience the additional multisensory features and 50% will train without them. Trainee feedback specific to multisensory features will be collected as part of the questionnaires.
- Usage of **scent** in VR: A scent simulator for VR is used for selected field trials. Among other things, it can be used to simulate odours such as gun powder, blood or gasoline. The aim is to make it possible for the trainees to experience the stressors on a multi-sensory level and gain insights if a multisensory experience adds to their feeling of immersion.

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- **Pain** stimulation: the topic of pain was rated as highly relevant by all end users for a future VR system, so trainees experience a potential negative consequence after performing an incorrect action or being injured. For this reason, different possibilities for stimulating pain are being investigated during individual FTs.

Each FT will have a specific focus in order to better differentiate between multisensory features and experiences.

4.1.2.3 Bio-signal measurements and stress

Each trainee will be equipped with a Zephyr belt to **record** their **heart rate** (HR), **heart rate variability** (HRV) and **breath rate** (BR). The stress level indicator and visualisation within the Trainer Dashboard of the SHOTPROS system is based on these data. (Calculation is based on first measurements during HF studies) The FTs will be used to validate the current stress level calculation and evaluate its accuracy through feedback of trainees and further bio-signal measurements that are known to be reliable indicators for psychological stress (e.g. EEG, EMG, GSR). The data will furthermore be used for post training analysis and refinement of the current stress model calculation used in the Trainer Dashboard as described in D4.5. Recorded data will be stored on the SHOTPROS data management platform (D6.2) and can be used by all scientific partners to enhance their training guidelines.

For the stress indicator to be accurate for each individual trainee, a 2-minute baseline measurement in the beginning of each training is required.

One trainee per group will be equipped with a semi-wireless GSR, EMG and EEG recording device that will stream data via Bluetooth to a central bio-signal recording station outside the VR training field. This set-up is highly experimental and provides two major challenges that AIT will investigate throughout the field trials:

- **Wireless connection**: with the amount of interfering data being streamed across the training field (mainly through the VR setup) and the additional challenge of reach of Bluetooth connections (commonly approx. 10 meters) it will be a challenge to maintain good data streaming quality between the sensors placed on the trainees and the data recording station which has to be placed alongside the training field. Throughout the FTs we intend to analyse and work on maximizing the streaming quality through connection extension devices and optimal positioning of the recording station.
- **Artefacts produced through movement**: usually bio-signal recordings such as EEG, EMG and GSR are conducted in stationary positions (no fast movement of participants). The nature of our VR training sessions requires trainees to move across the field as freely as possible, which will create artefacts in the recorded data. Throughout the FTs we will

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investigate if it is possible to remove these artefacts with the help of data cleaning algorithms in post-training data analysis and still acquire meaningful data to assess the physiological and psychological states of trainees. The outcome will provide us with further insights on the effect of virtual stress cues as well as overall VR environments and scenarios, with the aim to further refine future scenarios and provide trainees with the ideal VR training environment.

4.1.3 UHEI validation of DMA-model, evaluation of training guidelines

The aim of UHEI is to deliver recommendations for VR training through a better **understanding** of the link between the officers' attention, decision-making and action processes (**DMA**). These recommendations may enhance the guidelines for effective stress training in VR.

In order to capture the DMA processes, UHEI will conduct **brief interviews** with trainees of the fixed training sessions. Specifically, the trainees will each receive **3 brief questions** following each scenario. The questions assess, among other things, what cues the officers attended to and how they acted upon them. The answers of the trainees will be audio-recorded and analysed for whether they attended to task-relevant or task-irrelevant stimuli. This distinction will be made according to the expert opinion of the trainers. A small research team equivalent to the number of trainees in one training group will conduct the study to maximize the efficiency of the data collection. Due to the one-to-one interviews, the data collection will take a maximum of 3 minutes for each scenario.

To obtain additional insight into the relevant DMA processes, the AAR will be video recorded. The AAR provides the trainees with the opportunity to review their specific actions in key situations. The exchange between the trainer and trainees' pinpoints whether the actions were in line with the relevant cues and how the trainees may justify their actions based on their perception.

The VR system also records defined behavioural parameters that may be used to identify the team's performance (e.g., position, motion, gaze). Therefore, the DMA processes may be matched with the behavioural indicators to assess whether suboptimal DMA processes indeed lead to changes in the desired behaviours. The bio-signals recorded by AIT will also be used and re-analysed by UHEI and they will complement these data with 5 saliva samples serving as further physiological stress indicators for the quick and the slow hormonal stress axis.

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4.1.4 KUL Evaluation of the RAT

To further evaluate the Risk Assessment Tool (RAT as described in D4.7), two research activities will take place in the context of the FTs. Findings will be reported in D7.2.

4.1.4.1 Evaluation of the use of the RAT

When the VR scenarios for the FTs are decided upon, we will ask the FT trainers to fill out the RAT for (one of) these VR scenarios. The trainers will be asked to go through all the stress cues listed in the RAT and input the details of the scenarios. Ideally, all trainers should fill out the RAT similarly and receive the same result. This will give us insight in the interrater reliability of the RAT.

Via e-mail, each trainer will receive a description of the VR scenario, the RAT, and instructions on how to fill out the RAT. An additional online interview, if the trainer agrees, will allow us to further evaluate the tool and the instructions.

4.1.4.2 Evaluation of the score provided by the RAT

The goal of the RAT is that trainers can insert their training scenario into the RAT to get an idea of the possible stress level that the scenario can induce. Based on the subjective ratings of over 500 police officers and trainers on a large set of possible environmental and situational stress cues that might be present during police interventions, all elements in the RAT received a 'stress impact value'. Based on all the stress-scores of the individual elements, a total score is computed that categorizes the scenario in a low, average and high stress scenario. However, further insight in how all the individual stress cues interact with each other and form a total, combined stress score for a scenario is still necessary. To learn more about the interaction between the individual stress cues and the scoring of the scenario's total stress score, we will:

- Use the data collected by AIT, VUA, and UHEI during the FTs to get a more objective indication of the actually experienced levels of stress of the trainees during the practicing of the scenario(s) (based on the stress measurement), and the information from the UHEI questions asked after each scenario training and the VUA/KUL focus groups.
- Ask all trainee-participants three small questions after the different training scenarios. These questions consist of a quick response for:
    - Overall, how stressful was this scenario for you? Rate from 0 to 10.
    - What was the most stressful element in this scenario for you?
    - Please rank the following scenario elements in order of how much they influenced the overall stressfulness of the scenario

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These questions will be asked after the training for each training scenario.

4.1.5 KUL application of the SHOTPROS ethical code

All academic research, implemented during the FTs, will require to follow the ethical approval procedure. We need a protocol well in advance. A protocol that fits most of the research during field trials should be designed and introduced at the competent committee or ethics board.

For all the FTs, a research protocol will need to be developed, encompassing all aims and activities of the different academic partners. This protocol will be submitted for ethical approval by the Social and Societal Ethics Committee of KU Leuven. The protocol was submitted in the beginning of January 2022 in order to provide sufficient time for the Ethical Committee to review the dossier and for the consortium to respond to potential further inquiries from the Ethics Committee if needed. The approval was given on 26 January 2022.

During all FTs, all participants should be briefed beforehand about the goals of the training and subsequent research activities they will participate in, about possible adverse side-effect that might occur (e.g., motion sickness in VR), about the way their data will be collected, stored, secured and used, and about their rights prior, during and after the training. Each participant will be asked to sign an informed consent for their participation in the training session and for the storage and use of the research data, prior to the start of the training session.

4.2 Communication & dissemination approach to FTs

WP 7 constitutes a pivotal moment in the project as the research and innovation output that has been achieved in the past project phases and incorporated in deliverables like a scientific model, preliminary guidelines or requirement lists and a VR solution are now tested and validated with and by the end users. The European LEAs in the SHOTPROS project, coming from Belgium, Germany, the Netherlands, Romania and Sweden have extended their own expertise on VR training in the last 2 years. The advantages became visible and the usage as part of their future training is conceivable.

The feedback and input LEAs showed during the HF studies and EndUser FeedbackWeeks (see D6.1 and D4.6) drove all partners in the project to further perfection of the VR solution, the DMA-SR model, the training curriculum and the training guidelines. One of the main goals of the LEAs at this stage of the project is to be able to show the evolution project and more particularly to be able to showcase the current results to their management and outside their organisations. This is an essential step for the future introduction of VR-based training within

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the LEA organisations. Thus, the planned FTs also serve as a relevant milestone for a digital transformation within LEA organisations. For this purpose, separate slots for the demonstration of the project results for this target group were defined in the planning and a separate procedure was planned (see flexible sessions defined in 2 Introduction). Before and after trying out the system in training like sessions, the individual innovation features will be presented by the participating project partners and the advantages explained. Organisational and business issues are also important, such as resource savings through VR training, possible areas of application, but also possible organisational changes and adjustments (e.g. development of a train-the-trainer program). Besides showing the VR solution and the applied training framework, answering these and other questions is the focus of theses flexible sessions.

Therefore, another focus of these sessions is to make the SHOTPROS results accessible to a wider professional audience (representatives of organisations such as CEPOL or OSCE, representatives of the respective ministries, LEAs from European countries not involved in the project, colleagues from their own organisation, etc.) and to demonstrate the advantages and challenges of a future VR training and what an organisation can expect and needs to provide. Therefore, special partner slots were planned in the course of the FTs and made available to members of the VRPN. In these slots, the SHOTPROS system will be presented by an experienced police team and the participants will have the opportunity to directly exchange information with police colleagues and other SHOTPROS partners. Participants are mainly other trainers, management, decision makers, media and press from internal and external organisations.

Input from these sessions will mainly be reported in D7.6, the VR guidelines and will also be part of the exploitation and business plan in WP8 (D8.6).

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5 Conclusion

Once the planning and the methodology was determined, the 5 FTs were ready to be conducted and will be executed in the period from February 2022 to May 2022. A final demonstration, and therefore a comprehensive field trial, will be done during the SHOTPROS Final Conference in September 2022 before the end of the project.

After every FT a debriefing with the organisers and project-participants of that FT and the organiser of the next FT will be done in order to improve the process of organising and conducting the upcoming FT and ensure the stability and quality of results.

For an analysis of the results of the FT we refer to D7.2, FT Combined Analysis report, and to WP7 and WP8 in general for final results and impacts on the project.

Since the FT have two important goals, namely, to **evaluate**, **validate** and to **improve** the VR-training solution on the one hand and to **communicate** and **disseminate** the project and the results and **showcase** the possibilities of this VR-solution to a broader audience on the other hand, the planning and the methodology of the FTs represent an important aspect for the success to achieve these goals. The agile funnel approach from a general planning to a precise and detail planning helps to ensure ongoing consistency and to avoid double planning as well as inefficiencies. Although steered, organised and supervised by the WP7 lead, the FT planning and methodology represent an example of cross-disciplinary collaboration and alignment and show the SHOTPROS spirit of “VR a team!”.

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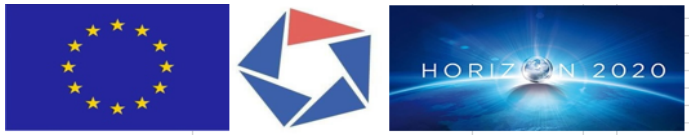
6 ANNEX



Methodologies for all Studies

I: AIT takes via Zephyr (Garmin and B-alert) BIOSIGNALS with HR, HRV, Breathe rate, from all trainees/ **EEG, (GSR and MEG of 1 trainee per group)**

J: AIT does written questionnaires (paper or iPad), qualitative and quantitative in 4 chapters (QoE, IPQ/SOPI, QoLe, Multi sens.) **MIN 20 per FT of which half MMSP and the other half no MMSP**

K: UHEI performs after each scenario a Quick interview (3 Q&A recorded), this causes a training slot to be increased to 105 min!! **MIN 50 over 5 FT**

M: VUA organises **3 focusgroups per FT** (each after training 45 min) the **MIN is 2/FT (+ interview with Timo on scenarios)**

N: VUA/KUL make non-intrusive observations during all validated trainings in all 5 locations

O: AIT performs some multi-sensory features in half of the training groups (wind, rain, smell, smoke,...)

P: KUL wants to do some tests on RAT prior to the FT via e-mail exchange with trainers and via a few questions in AIT questionnaires after the training

Q: AIT performs questionnaire to evaluate DRAGONFLY scenarios Outside validated training context!

SHOTPROS Field Trials

Methodologies

Seibersdorf		Studies possible	Possible Slots (90m)	Participants/ Slot	Sum	Lead Partner	AIT/Ext. BIO SIGN	AIT/ Q	UHEI Q	UHEI Sa	VUA FG	VUA obs.	Multi-sens	RAT evaluat.	Dragonfly sc
07.02.2022	Day 1	-													x
08.02.2022	Day 2	x	5	3	15	AIT	5	15	0	0	0	0	9 (3)	15	
09.02.2022	Day 3	x	5	3	15	AIT	5	15	0	0	0	0	6 (2)	15	
10.02.2022	Day 4	x	4	3	12	AIT	4	12	0	0	0	0	6 (2)	12	
11.02.2022	Day 5	-													
TOTALS			14	3	42		14	42	0	0		0	21 (7)		

Bucharest		Studies possible	Possible Slots (120m)	Participants/ Slot	Sum	Lead Partner	AIT/BIO SIGN	AIT/ Q	UHEI Q	UHEI Sa	VUA FG	VUA obs.	Multi-sens	RAT evaluat.	Dragonfly sc
21.03.2022	Day 1	X	4	3	12	UHEI	4	6	6		FG1 (3)	12	6(2)		
22.03.2022	Day 2	X	5	3	15	UHEI	5	9	6		FG 2 (3)	15	9 (3)		
23.03.2022	Day 3	X	5	3	15	UHEI	5	6	6			15	6(2)		
24.03.2022	Day 4														x
25.03.2022	Day 5														
TOTALS			14	3	42		14	21	18	0	6	42	21 (7)		

Amsterdam - tbc		Studies possible	Possible Slots (120m)	Participants/ Slot	Sum	Lead Partner	AIT/BIO SIGN	AIT/ Q	UHEI Q	UHEI Sa	VUA FG	VUA obs.	Multi-sens	RAT evaluat.	Dragonfly sc
04.04.2022	Day 1														x
05.04.2022	Day 2	X	5	4	20	VUA	5	10	0		FG1 (4)	20	10 (3)		
06.04.2022	Day 3	X	5	4	20	VUA	5	10	0		FG3 (4)	20	10(2)		
07.04.2022	Day 4														x
08.04.2022	Day 5														
TOTALS			10	4	40		10	20	0	0	8	40	20 (5)		

Selm (NRW)		Studies possible	Possible Slots (120m)	Participants/ Slot	Sum	Lead Partner	AIT/BIO SIGN	AIT/ Q	UHEI Q	UHEI Sa	VUA FG	VUA obs.	Multi-sens	RAT evaluat.	Dragonfly sc
19.04.2022	Day 1	X	5	4	20	KUL/VUA	5	10	12		FG 2 (4)	20	10 (3)		
20.04.2022	Day 2	X	5	4	20	KUL/VUA	5	10	16		FG3(4)	20	10(2)		
21.04.2022	Day 3														x
22.04.2022	Day 4														
TOTALS			10	4	40		10	20	28	0	8	40	20 (5)		

Berlin		Studies possible	Possible Slots (120m)	Participants/ Slot	Sum	Lead Partner	AIT/BIO SIGN	AIT/ Q	UHEI Q	UHEI Sa	VUA FG	VUA obs.	Multi-sens	RAT evaluat.	Dragonfly sc
16.05.2022	Day 1	X	2	3	6		2	3	6		FG1 (3)	6	3 (1)		x
17.05.2022	Day 2	X	2	3	6	UHEI/AIT	2	3	6		FG 2 (3)	6	3 (1)		x
18.05.2022	Day 3	X	2	3	6	UHEI/AIT	2	6	6			6	3 (1)		x
19.05.2022	Day 4	X	2	3	6		2	6	6			6	3 (1)		x
20.05.2022	Day 5	X	2	3	6		2	6	6			6	3(1)		
TOTALS			10	3	30		10	24	30	0	6	30	15(5)		
Total trainees in validated training over de 5 FT			58	3 to 4	194		58	127	76	0	28	152	87 (24)		

Data in red are UNCONFIRMED Or inconclusive

Data in green these focus groups might be done outside the validated trainings with groups that experiment with Dragonfly or Multi sensor

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