STRONG - Advanced firST RespONders training

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ACRONYMS

LEA: Law enforcement agent

VR: Virtual Reality

EMS/SEM: Emergency medical services

FR: First responders

SA: Situation Awareness

DMA: Decision making acting

FIGURES

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1 PROJECT SUMMARY

First responders play a crucial and integral role in today's civil society. Among the plethora of services, they provide, one may find law enforcement, firefighting and emergency medical services (EMS). In all three of the aforementioned services, time management could play an important role in order to assist first responders to reach their maximum potential and effectively and efficiently deal with the crisis. For instance, crime rates could significantly decrease if a police officer has the complete situational awareness picture to hinder criminals; fire fighters could be able to save more lives in less time from burning buildings and EMS could act in a proper and quick manner in order to treat medical conditions (such as cardiac arrests) that could result in death. The same applies to larger-scale crises that need even more effort on the proper coordination and communication among multiple interdisciplinary teams. As a result, their everyday activities involve a large number of stressful situations. These situations could be better handled with a set of soft skills such as decision making, teamwork or stress resilience are of great importance in dealing with such situations. Digital advancements like satellite image analysis can tremendously contribute to First Responders' daily activities. Therefore, they have to be under continuous training in order to be able to make use of these new tools.
STRONG steps in to propose a series of online courses that will fill in this gap and provide First Responders with the training they need. These courses will be grouped by theme and not by the type of First Responder in order to achieve a more transversal solution, as the challenges they face are not usually restricted to one territory or to one specific field of activity.

2 SCOPE OF THE RESEARCH.

The main aim of this research document is to document the state of the art of VR and gamification applied to first responders training in Europe; best practices in use and effective methodologies to be applied in the development of the training modules. This research document It includes the results from a survey made to first responders of the participating countries to find out their training needs and their interest in the proposed topics for the online courses to be developed.

3 BEST PRACTICES IN THE USE OF VR AND GAMIFICATION IN TRAINING PROGRAMS FOR FIRST RESPONDERS

Introduction

The use of VR in training programs for first responders is a fairly widespread practice, especially by HEI and research centres and through educational innovation projects. Despite this, first responder organizations do not make widespread use of virtual reality to train their teams.

This lack of adoption of VR is due to different reasons, such as:

- The cost of the equipment.
- The difficulties of finding updated and relevant training content.
- The difficulties of finding specialized trainers and manage pilots in VR.

The use of VR also brings great benefits to the entities that are making use of it, like:

- Being able to organize complex training activities without having to manage large groups of volunteers; which reduces the time and cost of managing these events.
- Be able to train stressful or dangerous situations in a safe environment.

Despite the difficulties, first responders and first responders training providers are aware of the possibilities of VR in education, and are joining forces to create programs tailored to the training needs of the participants. Lowering the cost of equipment also contributes to the adoption of this type of technology.

Below are a series of best practices in this field, which serve as an example and guide for the creation of future training programs.

These good practices refer to both national programs and European programs in which the project partners have participated; as well as other initiatives at European level that can also serve as an example.

As general conclusions, we can point out the following aspects to consider when designing a VR scenario for first responders:

- Need for the action to have a structured script and clear training objective. It is also important to clearly state the purpose of the training activity and the evaluation methods.
- Take time to allow users with low digital skills to become familiar with the technological devices and the VR environment. Participants with low digital skills may feel discouraged or left behind.

VR-Training "MULTIPLAYER PLATFORM & PRISON SEARCH" (Project: J-Safe)

ORGANISATION: Result of Project "J-Safe" / Coordinator: MINISTERO DELLA GIUSTIZIA (MoJ Triveneto)

CONTACT PERSON: Sebastian Allertseder (BayHfoeD) / Serena Bianchi (serena.bianchi@agenformedia.com)

COUNTRY: EU

ELEMENTS OF GOOD PRACTICE

- ☐ Impact local level
- X Impact national level
- X Impact EU level
- ☐ Transferability
- ☐ Quality assurance
- X Innovative practice

SHORT DESCRIPTION

Prison Search allows the user to simulate and experience the process of searching for mobile phones in a prison cell first-hand. The user can interact with the environment and behave as she/he would behave in the real world. The user can walk freely within the cell, touch objects, move them, or break them. The overall aim of the training is to find the hidden phone within the prison cell and then start the forensic procedure for extracting data from the device. The product has been developed by VR experts and it is designed for LEA experts.

ORGANISATION IMPLEMENTING THE PRACTICE

The training is the result of the J-Safe project, funded by the European Commission (Directorate General Justice and Consumers / GA no. 763714).

The Prison Search product takes advantage of the benefits offered by VR technologies. The product has been purchased by the Foundation Agenfor International (www.agenformedia.com), which owns the rights to use and sell the product. BayHfoeD has both licence and equipment to use the product and the integrated platform solution.

TARGET GROUP

Police / Prison Police

Ministry of Justice and judicial services

METHODS OF IMPLEMENTATION

The training involves different modules and VR training components in the field of radicalization and the digital forensics.

IMPACT OF THE PRACTICE
The trainings started in December 2020 and are currently still running, but due to the COVID-Pandemic the impact is limited as face-to-face trainings are currently not possible. In Germany up to now approximately 20 people took part in the trainings. All over Europe a number of 100-150 people is estimated.
LESSONS LEARNED – OTHER DETAILS
Considering the previous assessment of the VR training (in general) the reaction of first responders (for Germany: Police) was extremely positive. The request to find additional VR-Training opportunities was very high – especially in the field operative police work.
MATERIALS AND ADDITIONAL INTERACTIVE MATERIALS
• Video of Final Conference (Project J-Safe) includes lessons learned form VR training (J SAFE Final Confence: The benefits of blended virtual reality for security and justice training - YouTube) • Report by J-Safe project partner (TECHNOLOGY-2-5.pdf (agenformedia.com)) • Project website (PROJECT - J-SAFE PROJECT)

FIRST AID WEBINARS, INTERNAL ONLINE TRAINING SESSIONS	
ORGANISATION:	Hellenic Rescue Team
CONTACT PERSON:	Meni Kourkouta
COUNTRY:	Greece

ELEMENTS OF GOOD PRACTICE

- X Impact local level
- X Impact national level
- ☐ Impact EU level
- ☐ Transferability
- ☐ Quality assurance
- ☐ Innovative practice

SHORT DESCRIPTION

HRT has recently conducted three online first aid training sessions, attended by civilians and students, using zoom platform and relevant equipment owned by our organization.

In terms of internal training for our volunteers, we have been using the same platform since the beginning of the COVID 19 pandemic, in order to facilitate each department's meetings and trainings. These online meetings involved all fields of HRT action, that is mountain rescue, water rescue, urban search & rescue, first aid and telecommunications.

ORGANISATION IMPLEMENTING THE PRACTICE

The practice was commonly agreed among HRT's departments and the board, as a result of the circumstances due to the COVID pandemic. That was, actually, the reason – along with the ongoing COVID situation – that the idea evolved. As mentioned above, the practice was implemented since March 2020, when a lockdown was imposed in Greece.

The resources applied were our volunteers and trainers, who used training material to conduct meetings and trainings as efficient as possible. Such material included ppt. presentations, videos and photos. Pertaining to budget needs, the organization had to acquire the zoom license and some webinar equipment, like light fixture, microphones, headphones, tripods, etc.

TARGET GROUP

Civilians, students and HRT volunteers

METHODS OF IMPLEMENTATION

Training and meetings.

IMPACT OF THE PRACTICE
Since this is an ongoing and regular procedure, attendees are hard to estimate. But on a weekly basis, more than 100 volunteers should join these meetings. The efficacy is **undoubtedly** positive, because, apart from facilitating training and meetings, the practice brings together our volunteers, who have not been given the chance the meet in person since March 2020.
LESSONS LEARNED – OTHER DETAILS
The feedback received from our volunteers has been more than positive. Of course, online presentations are not enough for our members, because a significant part of the training is based on practical sessions. However, one of the most important lessons learned is the extensive use of online platforms which can facilitate our work.
MATERIALS AND ADDITIONAL INTERACTIVE MATERIALS
All presentations are in Greek and are not available in English.

AUGGMED	
ORGANISATION:	Centric/EU Horizon 2020
CONTACT PERSON:	Babak Akhgar
COUNTRY:	UK/EU

ELEMENTS OF GOOD PRACTICE

- ☐ Impact local level
- ☐ Impact national level
- X Impact EU level
- X Transferability
- X Quality assurance
- X Innovative practice

SHORT DESCRIPTION

Auggmed focuses on training first responders in the event of a terror incident, focusing on training paramedics, police, security personnel and coast guards.

Running full scale live training events to train such scenarios can be extremely costly, time and resource intensive. Feedback on an individual's performance can be lacking in detail due to trainers missing key moments throughout the training exercises. Training in VR comes at a much lower cost in money, time and resources. The ability to train remotely with colleagues leads to easier planning for group training events. The nature of VR training enables multiple playthroughs of the same simulation which allows trainees to improve on previous performances after receiving feedback, this in turn helps with knowledge transfer and retention. the game provides a "playground experience" allowing trainers to tailor scenarios to their specific training objectives.

ORGANISATION IMPLEMENTING THE PRACTICE

The initial concept of Auggmed created was in response to an EU Horizon 2020 call, which resulted in the formation of a consortium of 16 partners across Europe including four user partners; west Yorkshire police (WYP), Sistema d'Emergències Mèdiques (SEM), Ferrocarrils de la Generalitat (FGC) and Piraeus Port Authority (PPA). Once the proposal had been funded in 2015, the project evolved further with close collaboration with the user partners who informed the development to ensure it was suitable for their needs, the project came to an end in 2018. Whilst the platform is currently not operationally in use, it has inspired the development of additional virtual reality training tools such as ATLAS and VISER.

In order to run Auggmed a virtual reality headset (HTC Vive), VR ready laptop or pc and a clear playing area (minimum 3sqm) are required.

TARGET GROUP

Auggmed consists of 3 different environments which focus on different training objectives, each environment was designed for different training objectives and different target groups.

The first environment developed was aimed to train West Yorkshire Police to identify a threat and prevent harm to civilians by conducting a full airport evacuation.

The second environment was based in Muntaner station in Barcelona, and was split in to two scenarios. The first scenario aimed to train the security personnel working for FGC to identify a suspicious package and respond accordingly. Whilst the environment had specific significance to the staff of FGC as it was an environment, they were familiar with, it is not limited to this target group, this scenario has also been used by police west Yorkshire police to train.

The second scenario was in the event that the package was not found and took place after an explosion had occurred, the aim of this was to train SEM paramedics in triage for large scale emergency incidents, a big aspect of this was to also help to train emotional resilience.

The third environment replicated a port in Piraeus and aimed to train coast guard employees for the event of both a fire arms attack on the port and in the event of an explosion conducting a primary sweep of the port to check for further threats. For the pilot of the system 6 scenarios were developed, these included, for example, herding and hostage scenarios. These scenarios also encourage the user to think strategically on how to diffuse such a situation. Whilst the training was targeted for coast guards working at PPA, during the pilot the Hellenic police also participated, which demonstrated how Auggmed can be used for multi-agency training.

METHODS OF IMPLEMENTATION

Hot bag search – In the hot bag search scenario users are given details of a suspicious package that has been reported. They will be instructed to find the bag and assess and act according to standard protocols. Once the bag has been detected the trainee is expected to do a quick visual inspection. After inspection the trainee will have to make decisions on how to proceed, being aware of the dangers of using a radio device close to a potentially dangerous package. The user has the option to open the bag and look inside. Following initial inspection if the user has deemed the package dangerous, they will be required to clear a perimeter or potentially evacuate the station, depending on the size of the package and the risk presented. Two bags were developed, one was dangerous and the other was not. The trainee's performance can be monitored by the trainer and optional additional observers, from a bird's eye view of the environment, this is in order to access how effective their performance was throughout the scenario. The post training analysis allows the trainer to see the path of travel that the user took to conduct the search.

Post explosion triage – users enter the environment and be tasked with assigning the correct triage tags, for the victims' injuries, whilst dealing with the stressful sight and sounds of numerous injured civilians. The paramedics are also responsible for requesting the victims who are capable of evacuating the station out the dangerous environment. The system calculates the injuries caused to the civilians through use of real world thermal and ballistic data. In this scenario the trainer would provide the user

with the vital signs of the victim they are treating, they can then see whether the trainee applies the correct triage tag that should correspond to the level of injuries the system has determined that the civilian has received.

Fire arms attack – The firearms attack is different to the previous mentioned training activities as these scenarios introduce "red team players"; another human participant assuming the role of an assailant. The trainee's task is to diffuse the situation as quickly as possible with as fewer civilian casualties as possible. This scenario also focused on team working, communication and strategy.

Explosive/fire- This situation focused on the identification of threat and the speed of evacuation of an airport. Trainees would be responsible for giving orders to evacuate the building, ensuring to direct the civilians to a safe exit. The crowd behaviour is simulated through use of real-world data. Therefor the civilians act independently and will sometimes act in unexpected ways (Heading to the wrong exit, not evacuating on the sound of the alarm). The trainees must ensure that the building is clear whilst also ensuring their own safety by not remaining in smoke filled areas for long periods of time. In additional to simulated real world crowd behaviour the smoke is also simulated on real world data, meaning that in time the smoke will sink to ground level.

IMPACT OF THE PRACTICE

During the pilots the AUGGMED platform received largely positive responses from the trainees that piloted the system, suggesting they would see a great benefit of incorporating this style of training in to the curriculum. In April 2018 a control study was conducted to investigate the efficacy of the platform when compared to live role-playing training simulations. The study involved 80 trainee police officers participating in either a live training simulation, a virtual reality training simulation or a mixture of both. It was concluded that the use of VR in training did not impact the results when compared to real life role-playing training, which is seem as a great achievement due its benefits in terms of lower cost and ease of setup/organization of a training event when compared to real world simulations.

LESSONS LEARNED – OTHER DETAILS

1) Need for narrative – before conducting a training activity it is important, at least for the trainer, to have a clear narrative for the scenario planned before conducting the training activity. During the first pilot of AUGGMED this became clear as it was the trainer's responsibility to command the trainee, but without being familiar with the environment or how the controls work it was hard to communicate to the trainee exactly what to do.

2) Familiarization with the technology- Whilst virtual reality is becoming an ever more popular tool in the gaming industry, when creating training for users who may not be as technologically minded it is good practice to introduce them to the technology before conducting training, this will ensure that they will be able to focus entirely on the learning objectives without distraction of awe or confusion with the control system.

3) Ensuring that the trainees are aware of the training objectives- A lot of the negative feedback Auggmed received was in regard to the lack of haptic feedback from firearms, as this was not a firearms training tool this was not a focus of the development of Auggmed, the trainer was not

assessing the firearms skills but more the knowledge of common standard protocols and the strategic planning of the trainee, however trainees were concerned about being scrutinized for their ability when it came to use of firearms.

4) Balance of immersion and comfort- A key concern when using virtual reality for training is still the onset of motion sickness or cybersickness that some users are subjected to. Unfortunately, this is more common in women and therefore runs the risk of the training becoming discriminatory, which is an issue that it is vital to avoid. In the development of AUGGMED the control system was designed to minimize the effects of motion sickness through techniques such as gradual acceleration when walking, and only allowing the user to move forward in the direction they are facing, this was chosen over teleportation which is another popular option for movement around and environment, as this would impact the sense of immersion the trainee experiences. The main issue with motion sickness in AUGGMED arose when the user was asked to ascend and descend stairs, also impacting their balance, this was most likely due the jolty visuals and change in height sent conflicting messages to the brain. Perhaps a mixed method of movement could be used in the future, for example use of teleportation triggers at the top and bottom of the stairs could resolve this issue.

MATERIALS AND ADDITIONAL INTERACTIVE MATERIALS

Publications:

- Saunders, J., Gibson, H., Leitao, R., & Akhgar, B. (2017). AUGGMED: developing multiplayer serious games technology to enhance first responder training. *Proceedings Estonian Academy of Security Sciences, 16: From Research to Security Union*, *16*, 223-253.
- Saunders, J., Akhgar, B., & Davey, S. (2019). The AUGGMED Serious Game Platform: A Case Study of a Serious Game Development for Law Enforcement. In *Serious Games for Enhancing Law Enforcement Agencies* (pp. 101-115). Springer, Cham.
- Saunders, J., Davey, S., Bayerl, P. S., & Lohrmann, P. (2019, March). Validating virtual reality as an effective training medium in the security domain. In *2019 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)* (pp. 1908-1911). IEEE.
- www.arquivo.pt/wayback/20170603125923/http://www.auggmed-project.eu/about.aspx
- https://cordis.europa.eu/project/id/653590

SHOTPROS	
ORGANISATION:	UWOM
CONTACT PERSON:	Markus Murtinger
COUNTRY:	EUROPEAN PRACTICE

ELEMENTS OF GOOD PRACTICE

- X Impact local level
- X Impact national level
- X Impact EU level
- ☐ Transferability
- ☐ Quality assurance
- X Innovative practice

SHORT DESCRIPTION

SHOTPROS project provides human factor-centric training solutions including curriculums and Virtual Reality (VR), aiming to train first responders, and specifically, law enforcement. Project's purpose is to improve the training and performance of European Police officers, by designing a framework for practical training for decision-making and acting under stress and in high-risk (DMA-SR) situations. As a result, DMA-SR performance will be increased, as law enforcement personnel will be trained on decision making under pressure; thus, minimizing the possibility of emergency situations getting out of control. Most of the first responders' training solutions are based on enhancing the skills of the personnel, however, the decision-making and acting aspect, although vital, is often neglected. For this purpose, correct DMA-SR training can help minimize collateral damages and escalations.

ORGANISATION IMPLEMENTING THE PRACTICE

SHOTPROS aims to create a specialized curriculum leveraging Virtual Reality training for police officers. In particular, the project relies on an evaluated Human Factors Model for Decision Making and Acting under Stress and in High-Risk Situations (DMA-SR), in order to successfully train officers to perform in the field of action. Since police officers tackle high risk situations, like, i) robberies, ii) hostage situations, iii) gun fires, and so on, which induce high levels of stress and should be handled with care and special attention, consequently, introducing police officers to realistic conditions becomes necessary. Thus, SHOTPROS examines a training model, vital to understand how decisions in the presence of diverse stress cues are made. This approach is highly recommended, since it offers real condition training to first responders, in this case police officers, providing first-hand experience in a safe training environment as well as the chance to evaluate trainees' performance in real life incidents in an interactive manner. The equipment used for the training induces a high level of immersiveness while simulating auditory, visual and spatial inputs.

TARGET GROUP
The training solutions target the first responders and especially the Police Forces
METHODS OF IMPLEMENTATION
In this project the requirements and implementation of the proposed training courses stems from the consortium's expertise, which comprises mostly by public security agencies (i.e., police force, etc.) and training infrastructures for the respective field. By combining real scenarios with the VR technology, the trainees are acclimatized to real-life high-risk situations. By expanding the training not only to theoretical concepts but to practical ones and introducing spatial interaction through the VR equipment, the trainees can develop the first-hand experience to tackle high-risk situations through the limited and safe training environment which can be applied faster in action.
IMPACT OF THE PRACTICE
In SHOTPROS, decision making and acting (DMA) training is expected to impact first responders by reducing their stress response to influencing factors of DMA, and reducing influence of stress response on performance. The influencing factors of DMA, such as human, organizational, environmental, contextual, or other factors can serve as an input for VR training thus providing real-life educational material. Some key benefits of implementing such training practices are that it can aid in the combat against crime and terrorism for European Law Enforcement Agencies. In addition, societal impact of integrating SHOTPROS for training is expected, as better law enforcement training can benefit European citizens.
LESSONS LEARNED – OTHER DETAILS
Integration of SHOTPROS for law enforcement training is expected to improve first responders' performance in the field, due to the real condition training they received on high pressure, decision making and acting (DMA) situations. In addition, their educational level is expected to be increased by incorporating interactive training programmes.
MATERIALS AND ADDITIONAL INTERACTIVE MATERIALS
• https://shotpros.eu/2020/12/01/shotpros-image-video/ • https://shotpros.eu/

ASSISTANCE PROJECT	
ORGANISATION:	UNIVERSITA POLITECNICA DE VALENCIA
CONTACT PERSON:	contact@assistance-project.eu
COUNTRY:	EUROPEAN PRACTICE

ELEMENTS OF GOOD PRACTICE

- ☐ Impact local level
- ☐ Impact national level
- X Impact EU level
- X Transferability
- ☐ Quality assurance
- ☐ Innovative practice

SHORT DESCRIPTION

ASSISTANCE proposes a holistic solution that will adapt a well-tested SA application as a core of a wider SA platform, capable of offering different configuration modes for providing the tailored information outcome needed by each FR organization, while they work together mitigating the disaster (e.g., real time video and resource's location for firefighters, evacuation routes status for emergency health services and so on).

With this solution, ASSISTANCE will enhance the FRs SA during their mitigation activities through the integration of new paradigms, tools and technologies with the main objective of increasing both their protection and their efficiency.

ORGANISATION IMPLEMENTING THE PRACTICE

Universitat Politecnica de Valencia in partnership with several organizations.

TARGET GROUP

First responders

METHODS OF IMPLEMENTATION

ASSISTANCE proposes a holistic solution that will adapt a well-tested SA application as a core of a wider SA platform, capable of offering different configuration modes for providing the tailored information outcome needed by each FR organisation, while they work together mitigating the disaster (e.g., real time video and resource's location for firefighters, evacuation routes status for emergency health services and so on).

With this solution, ASSISTANCE will enhance the FRs SA during their mitigation activities through the integration of new paradigms, tools and technologies with the main objective of increasing both their protection and their efficiency.

IMPACT OF THE PRACTICE
This will be achieved by accomplishing the following operational objectives: O1. To address the FRs expressed needs and preferences in terms of useful information for increasing their capabilities and new sensors mounted on unmanned platforms or integrated in their wearable equipment. O2. To develop a novel SA platform, including the integration of UAV, Robots and drones' swarms and innovative modules, able to be adapted to the specific information needs of the different types of FRs organizations that cooperate during the response to a large disaster (natural or man-made) O3. To establish the core of an advanced training network based on Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR) along with a set of training curricula tailored to the needs of the different types of first responders (e.g., firefighters, sanitary staff, police, etc.) and characteristics of the type of incident. O4. To provide a robust network infrastructure for ensuring FRs and unmanned platforms connectivity during the mitigation operations and alternative ad-hoc network capabilities based on drones' swarm for ensuring the basic sensors and modules connection. O5. To validate the project results in a cost-effective way under real conditions in a controlled environment through 3 pilot demonstrations which will involve FRs from different organizations. O6. To measure the societal impact of the project and assure compliance with legal, gender and ethical EU principles and requirements, identify lacunae and hurdles and develop concrete recommendations to policy makers and FRs with the aim to improve the current level of protection for the FRs and increase their capabilities in a legal and ethical manner.
LESSONS LEARNED – OTHER DETAILS
On-going project
MATERIALS AND ADDITIONAL INTERACTIVE MATERIALS
• https://assistance-project.eu/

ACADEMY OF THE POLICE FORCE IN BRATISLAVA TRAINING PROGRAMS	
ORGANISATION:	Academy of the Police Force in Bratislava
CONTACT PERSON:	Jacek Dworzecki
COUNTRY:	Slovakia

ELEMENTS OF GOOD PRACTICE

- ☐ Impact local level
- ☐ Impact national level
- X Impact EU level
- X Transferability
- ☐ Quality assurance
- ☐ Innovative practice

SHORT DESCRIPTION

Practical training for FR is very important in many fields. We must include here: tactics of undertaken rescue actions in cooperation in other services (police, fire brigade) in the field of taking actions to save human life in difficult weather conditions, in places with limited space for access to the injured, in situations of operating under strong social pressure (e.g. aggressive crowd), in situations of immediate threat to the life and health od rescuers (e.g. during city riots), in the event of pandemic (e.g. COVID 19) taking actions that optimize the possibilities of effective first aid, (e.g. effective management of resources and rescue opportunities), restore public order, improve the organization of rescue operations. The Covid 19 pandemic has shown that rescuers and FR are at the forefront of the fight against this epidemiological threat.

ORGANISATION IMPLEMENTING THE PRACTICE

Training paramedics and other public service officers with the use of modern simulators and virtual reality allow for systematic improvement of their qualifications. In a safe, virtual environment that closely reflects the actual threat situation, FR have the opportunity to practice even the most complex scenarios of crisis situations. Exercises with the use of modern simulators are nowadays an important element of the FR training and professional development process. The idea of preparing online courses using VR for officers of uniformed services and paramedics was established as part of an international consortium under the leadership of research team from University of Applied Sciences for Public Service in Bavaria. Online courses will be prepared for fire brigade, Police and for search and rescue services and paramedics. The project will include training tools used in the creation of the European intelligent network of first responders. Academy of the Police Force in Bratislava which is part of a research consortium has ICT equipment enabling on-line training and visualization of conducted practical exercises. Possibility of international exchange of experiences as part of joint multi-stage practical exercises addressed to FR, allows to gain new experiences and raise the level of rescue operations, which, as the COVID -19 pandemic has shown, is an extremely important element in the supranational fight against epidemiological threats.

TARGET GROUP

The target groups of the offered exercises (on-line courses) with the use of VR technology are FR from EU Member States. In the reality of the Slovak Republic, these will be policemen, firefighters, soldiers and members of the mountain rescue service.

METHODS OF IMPLEMENTATION

The most important elements of practical exercises in courses dedicated to a specific professional FR group.

Online course for firemen: cooperation with the police in ensuring the security of a road accident site, construction disaster site, railway disaster site, riot site. Conducting rescue operations in seismically unstable places, in places of construction disasters, in facilities that have suffered as a result of a terrorist attack. The use of modern technologies in rescue and search activities (drones, devices locating people under the rubble of buildings, GPRs). Operation of selected devices that allow the analysis of land contamination and sanitary and epidemiological threats. The use of personal protective equipment for FR performing official duties when revealing a suspected COVID-19 or other contagious disease. Using devices for remote human temperature measurement (mass-scale temperature measurements) and decontamination stations and chambers.

The use of modern simulators in the process of training and professional development of firefighters.

Online course for police: new organizational and technical methods of action by the police against an aggressive crowd. Tactics of control actions taken by the police with the participation of people in home quarantine. Police activities in the field of securing rescue operations at the site of a construction disaster, communication disaster in the place of isolation of people who have been subject to collective quarantine. Using new technologies in the identification and combating environmental threats (e.g., air pollution - Smog). Extension information on the IT capabilities of databases used by EU agencies (e.g., Eurodac, Eurosur, Etias). The use of personal protective equipment for FR performing official duties when revealing a suspected COVID-19 or other contagious disease. Using devices for remote human temperature measurement (mass-scale temperature measurements). The use of modern simulators in the process of training and professional development of policemen.

Online course for search and rescue: The use of modern materials and technologies in activities at the site of construction disasters. Conducting rescue operations in seismically unstable places, in places of construction disasters, in facilities that have suffered as a result of a terrorist attack. The use of modern technologies in rescue and search activities (drones, devices locating people under the rubble of buildings, GPRs). Operation of selected devices that allow the analysis of land contamination and sanitary and epidemiological threats. The use of personal protective equipment for FR performing official duties when revealing a suspected COVID-19 or other contagious disease. Using devices for remote human temperature measurement (mass-scale temperature measurements) and decontamination stations and chambers. The use of modern simulators in the process of training and professional development of rescuers.

IMPACT OF THE PRACTICE

Practical activities carried out as part of the created courses for FR will significantly improve their practical and organizational skills. Course participants will learn about the latest technical and tactical solutions in the field of responding to crisis situations. In the Slovak Republic, we plan to train at least 250 people from the police, fire brigade and mountain rescue service. The skills acquired during the courses will allow for more effective rescue actions which will positively affect the level of tasks carried out by emergency services. Thanks to the improvement of practical and organizational skills members of the police and emergency services, the costs of rescue operations and responding to crisis situations will be reduced.

LESSONS LEARNED – OTHER DETAILS

Practical activities are the basis of the process of training and improvement of officers and employees of police and rescue formations around the world. Time that is spent on learning practical skills by FR, really increases the effectiveness of the undertaken interventions. The fast-paced development of modern technologies and solutions in the field of rescue, requires rescuers to constantly improve their own practical skills. Natural and epidemiological threats create real and global threats to the safety of entire societies. Services created for rescue operations should be perfectly equipped, mobile and having the best qualified staff. The participation of Slovak policemen, firefighters and rescuers from the mountain rescue service in the organized on-line courses will certainly increase their qualifications and practical skills, in the use of modern rescue techniques, modern equipment and modern solutions in the field of sanitary and epidemiological protection.

4 TRAINING NEEDS OF FIRST RESPONDERS

Introduction

During the preparation of the STRONG project application, the participating entities were consulted on those topics that could be included in the courses to be developed and that were most attractive to them. These preliminary topics have been consulted with first responders from all Europe to know their potential interest in them and what other topics they would add to the courses to be developed. The consultation has been made via online surveys on Google Forms, translated into the languages of the project named: English, German, Greek, Danish, Slovak and Spanish. 614 first responders from Germany, Denmark, Greece, Slovakia, Spain, UK and other countries have participated in the survey.

Countries	Number of participants
Denmark	45
Germany	181
Greece	220
Slovakia	127
Spain	20
United Kingdom	2
Other	3
Does not answer	16
TOTAL	**614**

Summary of results

The first question to the first responders has been aimed at defining their field of work. Some profiles of first responders are complex and may involve more than one field of action and that is why participants have been allowed to choose more than one option. Hellenic Rescue Team is composed by hundreds of volunteers from all Greece, despite the fact that the survey was sent with precise instructions to be completed by first responders and with their role within HR, a high number of participants have confused their main occupation with their role within HRT, and that is why the other section has registered such a high number of participations.

Field of work	Number of participants
Civil protection	17
Civil protection, Other	4
Firefighter	126
Firefighter, Civil protection	4
Firefighter, Health	1
Firefighter, Other	1
Firefighter, Rescue	32
Firefighter, Rescue, Civil protection	6
Firefighter, Rescue, Health	4
Firefighter, Rescue, Health, Civil protection	1
Health	28
Health, Other	2
Other	170
Police	107
Police, Firefighter	2
Police, Rescue	4
Rescue	81
Rescue, Civil protection	10
Rescue, Health	5
Rescue, Health, Civil protection	4
Rescue, Other	1
Does not answer	4
TOTAL	**614**

Respondents were also asked if they had participated in training actions in the 12 months prior to the survey, despite the limitations to the organization of training actions due to the covid-19 pandemic, a high percentage of participants have received training in the last 12 months. First responders face new challenges every day,

therefore, it is essential to have up-to-date training content and to organize training activities for the teams on a regular basis.

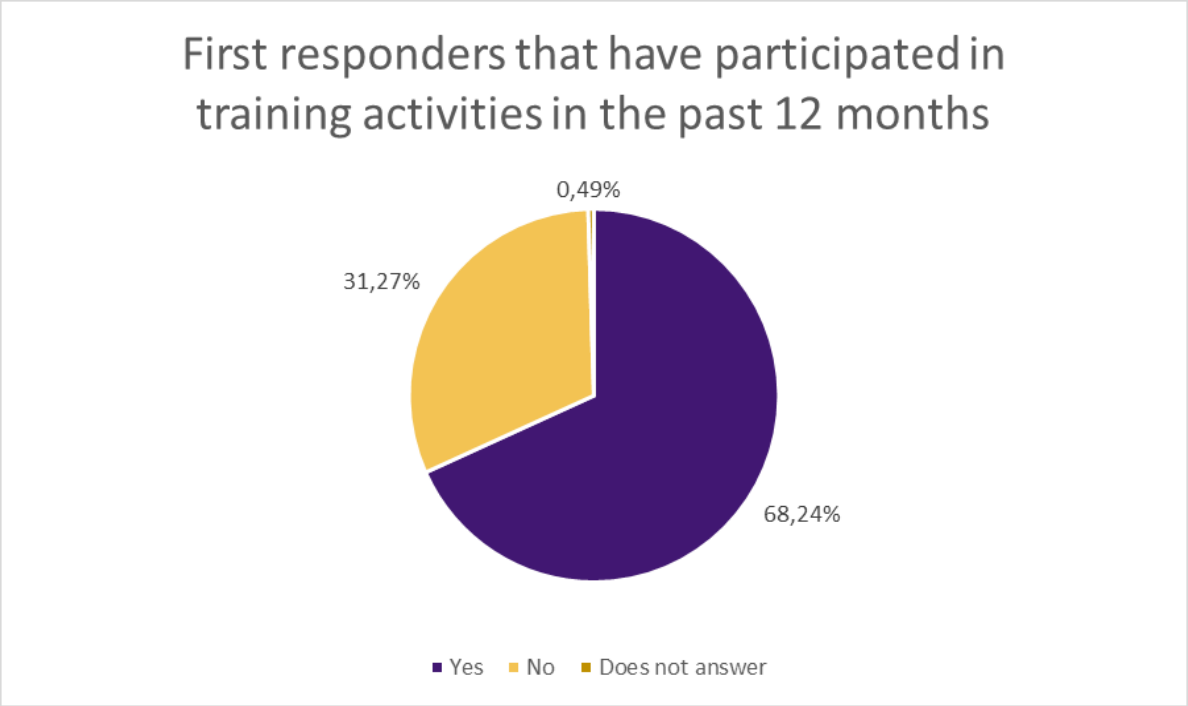

Figure 1 First responders participating in training in the past 12 months

The STRONG project aims at producing three online courses which will be IO2, IO3 and IO4. During the survey, first responders were presented all modules that will be part of the online courses and they were asked to rate their interest on receiving training in that topic in a scale of 0 to 5, being 0-Not interested at all and 5-Very much interested.

IO2-Online courses for first responders: Soft skills for first responders.

Module 1. Incident response and crisis management: Develop the knowledge and skills necessary for implementing an effective structure and processes for responding to, and managing, incidents and crises. This module will pay attention to skills like critical and analytical thinking; decision making skills; teamwork and stress resilience.

Module 2. Effective communication. How to establish effective communication lines with civil society when implementing safety protocols. (Confinement, evacuations etc.) Special attention on communication with people with special needs.

Module 3. Action protocols for vulnerable population. Action protocols in activities that may involve vulnerable population like minors, refugees etc. This module will provide first responders with basic psychological guidance on how to interact with vulnerable or traumatized population.

Teamwork and stress resilience are the skills most valued, followed by the Analytical and critical thinking. One of the reasons could be that action protocols are often included on the training programs, while soft skills are sometime left behind. Teamwork it is the skill that has received the highest score of all those included in the survey. First responders' teams face challenges that require coordinated teamwork; and in many cases they need to work in multidisciplinary teams under a lot of pressure; soft skills play a key role in their daily activities.

Topic	Average score
Action protocols for vulnerable population (minors, migrants, victims of gender violence)	3,09
Actions protocols for traumatized population (war victims, terrorism victims)	3,12
Topic	**Average score**
Critical thinking	3,23
Analytical thinking	3,38
Stress resilience	3,64
Teamwork	3,67

IO3-Online course for first responders: weather menaces.

Module 1. Digital image analysis tools. Satellite analysis and predictive models for preparation and control of weather phenomena like wildfires, strong storms, flooding etc.

Module 2. Extreme weather preparation I. This module will prepare firefighters to act in case of Blizzards, Heavy snows and Ice Storms.

Module 3. Extreme weather preparation II. Hurricanes and Extreme flooding.

Module 4. Wildfires. Action protocols for interacting with civil society and predictive systems to control wildfires.

Frist responders don't perceive advanced digital skills as fundamental; and that is why the digital skills and predictive models are rated as the topic less interesting for all first responders participating in the survey.
Climate change is leading to an increase in extreme weather events; which increases the interest of first responders in receiving training on this subject.

Topic	Average score
Digital skills and predictive models for extreme weather situations	3,00
Extreme weather preparation: blizzards, ice storms...	3,24
Topic	**Average score**
Extreme weather preparation: hurricanes, extreme flooding...	3,26
Extreme weather preparation: wildfires	3,26

IO4-Online course for first responders: health risks and personal risks.

Module 1. Response to health emergencies. Personal and third-party protection in case of bacteriological risk, pandemics and other risks to people's health.

Module 2. Rescue and finding operations. Rescue and finding operations in natural environments. Satellite and image analysis for finding and rescuing people in nature environment like forests, sea rescue etc.

Module 3. Response to risks against people II. Satellite analysis; image analysis and acting protocols in case on terrorists' attacks in urban environments.

The covid-19 pandemic has focused attention on the need to be prepared to face health risks and health emergencies. Participating first responders have also expressed interest in the other topics of this course such as search and rescue operations in natural environments or action protocols for terrorist attacks in urban environments.

Topic	Average score
Acting protocols in terrorist attacks in urban areas	3,31
Rescue and finding operations in natural environments	3,42
Health emergencies: personal and third parties protection	3,54

5 RESULTS BY COUNTRIES

Germany

In Germany, 181 first responders have participated in the survey. Many of German participants are firefighters and rescuers. 83% of the participants have received training in the last 12 months.

Field of Work	Number of participants
Civil protection	1
Firefighter	95
Firefighter, Civil protection	2
Firefighter, Other	1
Firefighter, Rescue	19
Firefighter, Rescue, Civil protection	3
Firefighter, Rescue, Health	1
Firefighter, Rescue, Health, Civil protection	1
Health	2
Other	6
Police	3
Police, Firefighter	2
Police, Rescue	4
Rescue	33
Rescue, Civil protection	4
Rescue, Health	1
Rescue, Health, Civil protection	3
TOTAL	**181**

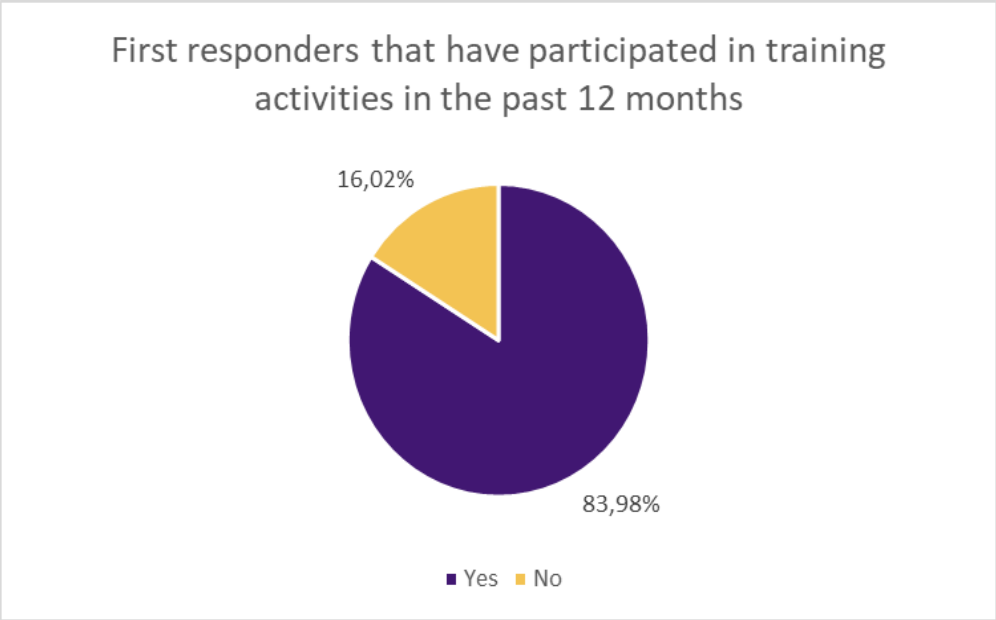

Figure 2 First responders participating in training in the past 12 months in Germany

About the topics that are marked as relevant by participants, there are some similarities and differences between the general results and country results. Digital skills remain as the topic that generates less interest in participants and teamwork is the best rated topic along with stress resilience. The main difference is found in the assessment of the importance of critical thinking, which in this case is the skill that has received the least score after digital skills.

Topic	Average score
Digital skills and predictive models for extreme weather situations	2,70
Critical thinking	2,81
Action protocols for vulnerable population (minor, migrants, victims of gender violence)	2,85
Rescue and finding operations in natural environments	2,99
Topic	**Average score**
Actions protocols for traumatized population (war victims, terrorism victims)	3,03

Acting protocols in terrorist attacks in urban areas	3,04
Extreme weather preparation: blizzards, ice storms...	3,13
Extreme weather preparation: wildfires	3,14
Analytical thinking	3,22
Extreme weather preparation: hurricanes, extreme flooding...	3,26
Health emergencies: personal and third parties protection	3,38
Stress resilience	3,61
Teamwork	3,61

Denmark

In Denmark, 45 first responders have participated in the survey. Many of Danish participants are firefighters and rescuers. 95.56% of the participants have received training in the last 12 months.

Field of work	Number of participants
Civil protection	1
Firefighter	19
Firefighter, Civil protection	2
Firefighter, Health	1
Firefighter, Rescue	13
Firefighter, Rescue, Civil protection	2
Firefighter, Rescue, Health	3
Health	2
Police	1
Rescue, Health	1
TOTAL	**45**

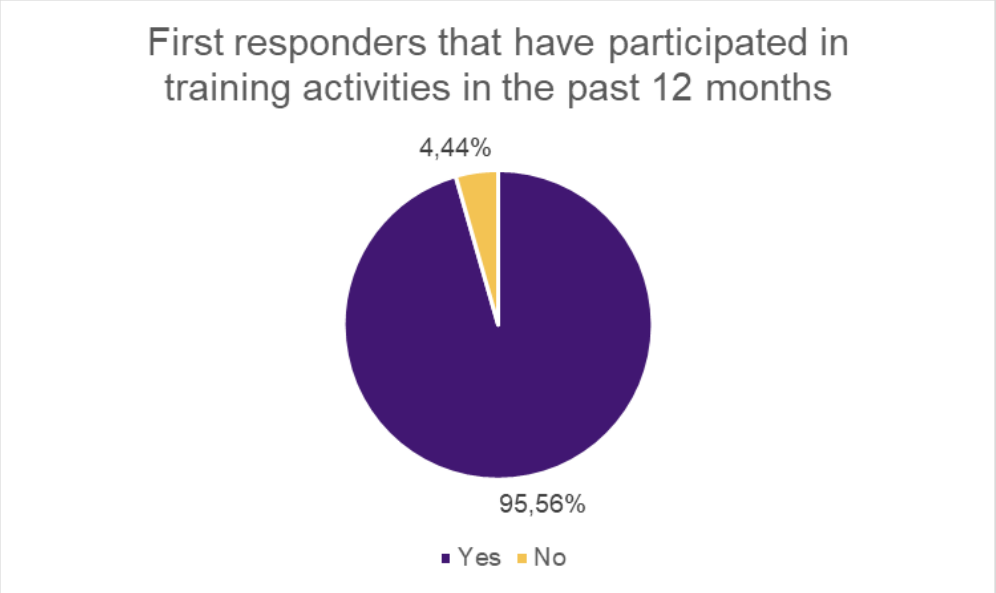

Figure 3 First responders participating in training in the past 12 months in Denmark

Danish first responders have marked Critical Thinking as the topic more interesting for them to receive training in; followed by Acting protocols in in terrorist attacks in urban areas. In general, all topics have received a lower score than in other countries, but generally speaking, participants seem interested in the online course that STRONG project will create.

Topic	Average score
Actions protocols for traumatized population (war victims, terrorism victims)	2,14
Action protocols for vulnerable population (minor, migrants, victims of gender violence)	2,19
Digital skills and predictive models for extreme weather situations	2,57
Rescue and finding operations in natural environments	2,77
Extreme weather preparation: wildfires	2,83
Extreme weather preparation: blizzards, ice storms...	2,88
Stress resilience	2,89
Extreme weather preparation: hurricanes, extreme flooding...	2,93
Analytical thinking	2,95
Teamwork	3,02
Health emergencies: personal and third parties protection	3,05
Acting protocols in terrorist attacks in urban areas	3,29
Critical thinking	3,33

Greece

In Greece, 220 first responders have participated in the survey. Many of Greek participants volunteers from Hellenic Rescue Team, despite being asked to mark their occupation within the entity and in relation to their participation as first responders; many participants have marked another, and have entered their usual occupation.

Field of Work	Number of participants
Civil protection	11
Civil protection, Other	3
Firefighter	5
Firefighter, Rescue, Civil protection	1
Health	19
Health, Other	2
Other	131
Police	2
Rescue	38
Rescue, Civil protection	4
Rescue, Health	2
Rescue, Health, Civil protection	1
Does not answer	1
TOTAL	**220**

The amount of Greek first responders that have participated in training activities in the last 12 months is lower than in other participant countries, very similar to another countries like Spain.

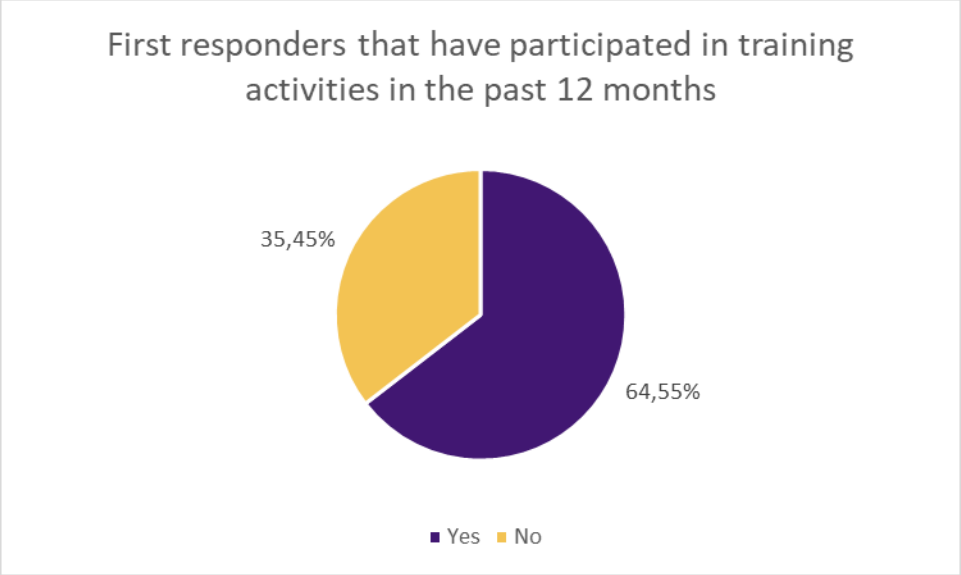

Figure 4 First responders participating in training in past 12 months in Greece

Greek participants have rated all proposed topics above the average, the most rated skill is Rescue and finding operations in natural environments followed by Extreme weather preparation: wildfires and Teamwork.

Topic	Average score
Acting protocols in terrorist attacks in urban areas	3,62
Action protocols for vulnerable population (minor, migrants, victims of gender violence)	3,76
Analytical thinking	3,80
Actions protocols for traumatized population (war victims, terrorism victims)	3,88
Digital skills and predictive models for extreme weather situations	3,90
Critical thinking	3,90
Topic	**Average score**
Stress resilience	3,98

Extreme weather preparation: blizzards, ice storms...	4,01
Extreme weather preparation: hurricanes, extreme flooding...	4,07
Health emergencies: personal and third parties protection	4,09
Teamwork	4,15
Extreme weather preparation: wildfires	4,16
Rescue and finding operations in natural environments	4,18

Spain

In Spain, 20 first responders have participated in the survey. Spanish participants represent a variety of profiles, from rescue to health and police. 65% of participants on the survey have take part in training activities in the 12 months previous to the survey.

Field of Work	Number of participants
Civil protection	1
Firefighter	1
Health	4
Other	2
Police	4
Rescue	7
Rescue, Health	1
TOTAL	**20**

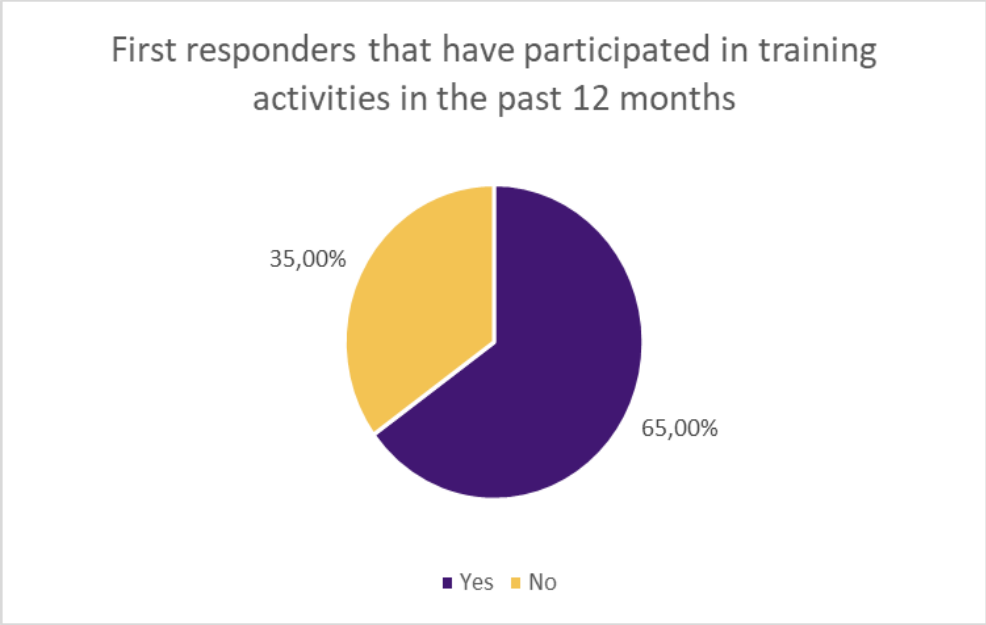

Figure 5 First responders participating in training in the past 12 months in Spain

Teamwork is the most rated skill followed by Stress resilience and Rescue and finding operations in natural environments.

Topic	Average score
Critical thinking	2,83
Extreme weather preparation: blizzards, ice storms...	2,84
Extreme weather preparation: hurricanes, extreme flooding...	2,95
Extreme weather preparation: wildfires	2,95
Digital skills and predictive models for extreme weather situations	3,05
Acting protocols in terrorist attacks in urban areas	3,21
Analytical thinking	3,35
Actions protocols for traumatized population (war victims, terrorism victims)	3,37
Action protocols for vulnerable population (minor, migrants, victims of gender violence)	3,63

Health emergencies: personal and third parties protection	3,80
Rescue and finding operations in natural environments	3,80
Stress resilience	3,83
Teamwork	3,89

Slovakia

In Slovakia, 129 first responders have participated in the survey. Slovak are mainly from the police force but among the other profiles we find participants from the military forces and other public institutions. 41,86% of participants on the survey have take part in training activities in the previous 12 months before the survey which is below the average of the other participant countries.

Field of Work	Number of participants
Civil protection	1
Firefighter	4
Other	25
Police	95
Rescue	1
Does not answer	3
TOTAL	**129**

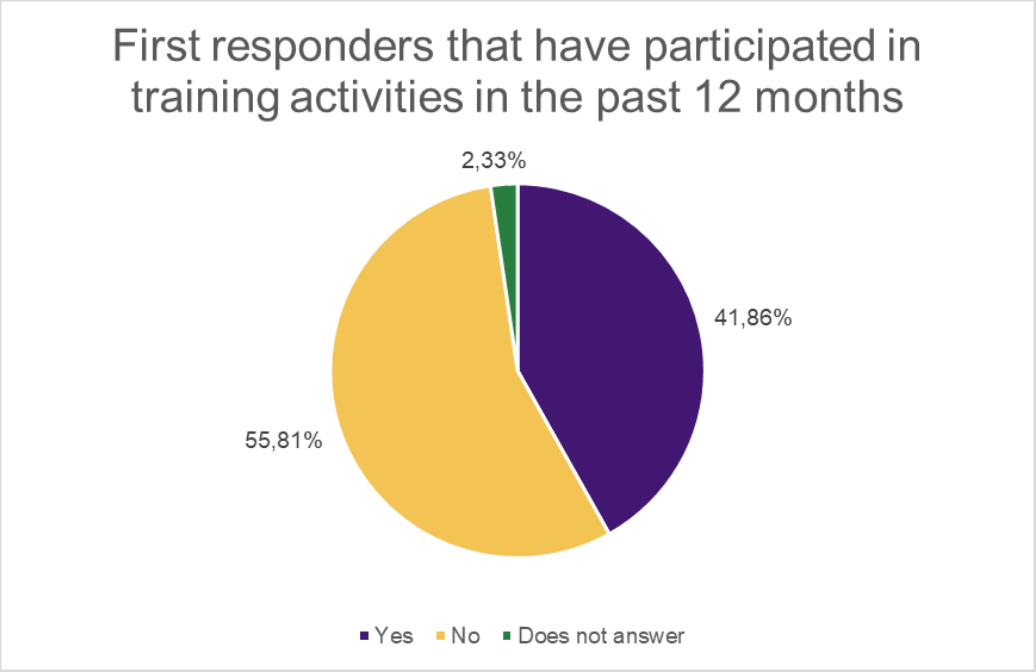

Figure 6 First responders participating in training in the past 12 month in Slovakia

Stress resilience is the topic that generates more interest among Slovak first responders, followed by Acting protocols in terrorist attacks in urban areas and Teamwork.

Topic	Average score
Extreme weather preparation: hurricanes, extreme flooding...	2,08
Digital skills and predictive models for extreme weather situations	2,10
Extreme weather preparation: wildfires	2,18
Extreme weather preparation: blizzards, ice storms...	2,27
Actions protocols for traumatized population (war victims, terrorism victims)	2,32
Action protocols for vulnerable population (minor, migrants, victims of gender violence)	2,63
Critical thinking	2,79
Rescue and finding operations in natural environments	2,97

Health emergencies: personal and third parties protection	3,14
Analytical thinking	3,18
Teamwork	3,26
Acting protocols in terrorist attacks in urban areas	3,39
Stress resilience	3,55

United Kingdom

In United Kingdom, 2 first responders have participated in the survey; one from civil protection and another person from the police. Half of them have participated in training activities in the past 12 months.

Field of Work	Number of participants
Civil protection	1
Police	1
TOTAL	**2**

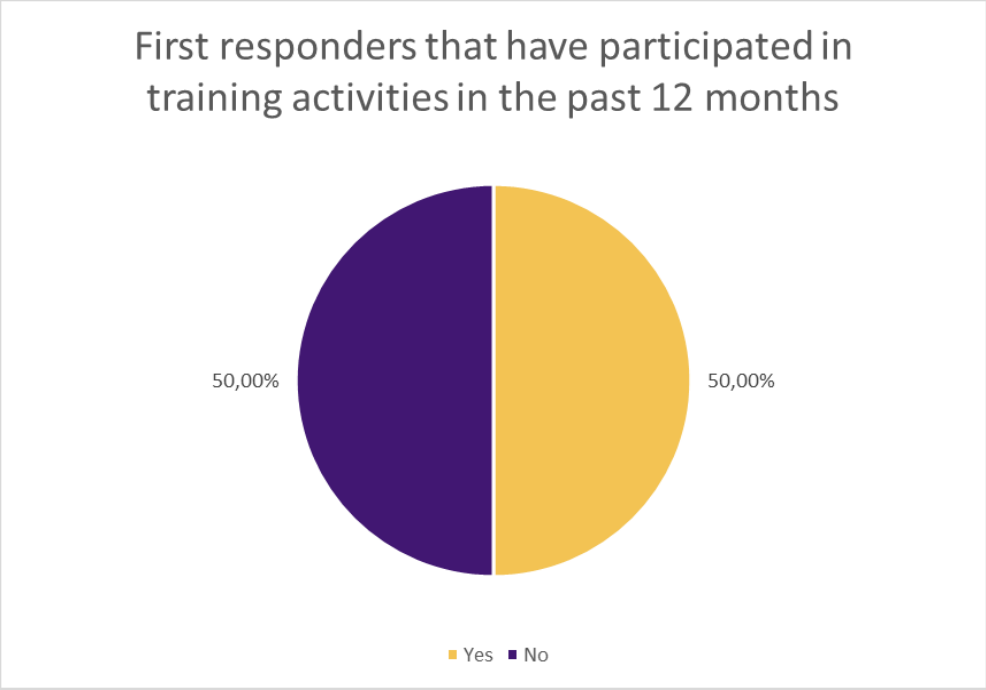

Figure 7 First responders participating in training in the past 12 months in the UK

Due the low number of participants, several skills have the same punctuation and the results may not represent the real needs of the first responders in United Kingdom. Most rated skills are Teamwork; Health emergencies: personal and third parties protection; Extreme weather preparation: wildfires; Extreme weather preparation: hurricanes, extreme flooding...; Extreme weather preparation: blizzards, ice storms...; Digital skills and predictive models for extreme weather situations; Actions protocols for traumatized population (war victims, terrorism victims); Action protocols for vulnerable population (minor, migrants, victims of gender violence).

Topic	Average score
Critical thinking	2,50
Acting protocols in terrorist attacks in urban areas	3,00
Analytical thinking	3,00
Rescue and finding operations in natural environments	3,00
Stress resilience	3,00

Action protocols for vulnerable population (minor, migrants, victims of gender violence)	3,50
Actions protocols for traumatized population (war victims, terrorism victims)	3,50
Digital skills and predictive models for extreme weather situations	3,50
Extreme weather preparation: blizzards, ice storms...	3,50
Extreme weather preparation: hurricanes, extreme flooding...	3,50
Extreme weather preparation: wildfires	3,50
Health emergencies: personal and third parties protection	3,50
Teamwork	3,50

Conclusions

614 first responders have participated in the survey of training needs of the STRONG project. In general, we can say that the participants show common interests and that the skills perceived as most important are common to many participants and countries. Teamwork is the most valued skill in many countries, regardless of the profile of the participants; it is always among the 5 skills perceived as fundamental. Teamwork and resilience to stress are two soft skills that first responders need to train periodically, not only to be able to work with their peers, but also to be able to cooperate with other first responders. In this field, virtual reality has many possibilities for development, since it allows training in dangerous situations without putting teams at risk, and at the same time has lower costs than organizing large events. The importance of digital skills has been perceived unevenly, in some countries and for certain profiles that have valued them as very important; although the global assessment has been the lowest of all the proposed topics. The analysis by country allows participants to refine not only the courses to be developed within the STRONG project, but also to refine the training actions to be carried out in the near future. The development of virtual reality modules in future courses will focus on a mix between those skills perceived as most important by the participants and those skills that are more expensive to organize in face-to-face mode, due to the need for a large number of participants or due to their dangerousness.

STRONG - Advanced firST RespONders training

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