Designing a Gamified Training Program for Disability-Inclusive EMS Response

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Abstract

Emergency medical services in Thessaloniki, Greece fail to provide equitable care to individuals with disabilities due to insufficient training. This project developed a scenario-based training tool for emergency responders. Our team conducted 11 interviews with EMS professionals and 9 with individuals with disabilities, and surveyed 90 EMS professionals. Results revealed that EMS personnel are ill-prepared to address disability-specific challenges due to a lack of inclusive training (~2% Receive Training). This project developed a scenario-based card game in collaboration with our sponsor, Accessible Limitless Living. The resulting game aims to improve communication and safe evacuation techniques by taking players through realistic disability-specific emergency scenarios.

Executive Summary

Introduction/Background

Governments and healthcare organizations design emergency response systems to provide rapid, equitable care during disasters and medical emergencies. However, individuals with disabilities continue to experience disproportionately negative outcomes during these events. Worldwide, individuals with disabilities experience disaster-related mortality rates estimated two to four times higher than those without disabilities, displaying a considerable gap in emergency preparedness and response accessibility. Only an estimated 2.1% of Greek first responders report prior experience with disability-inclusive emergency response training, further demonstrating that providers remain underprepared for disability-related emergencies. Individuals with visual, auditory, and mobility impairments face unique emergency challenges that often lead to communication breakdowns, delayed evacuations, and unsafe treatment conditions that many Emergency Medical Service (EMS) providers lack the preparation necessary to address. Greece's frequent exposure to natural disasters further intensifies this issue.

Gamification offers a promising approach to address pre-existing training gaps. Incorporating interactive, scenario-driven elements, gamified training presents an opportunity to improve engagement, knowledge retention, and decision-making under pressure. This project, alongside sponsor Accessible Limitless Living (ALL), designed a gamified training scenario for Greek EMS providers, focusing on improving awareness of disability-related challenges and strengthening equitable care practices.

Methods

Our team developed a gamified, scenario-based training activity for EMS providers in Thessaloniki, Greece, aimed to improve awareness of disability-inclusive emergency response and strengthen providers' ability to deliver equitable care. To achieve this goal, the team investigated EMS experiences and examined disability perspectives regarding emergency response.

To investigate EMS experiences and the experiences of people with disabilities, the team utilized a combination of surveys and semi-structured group interviews. The team

distributed a survey targeting EMS professionals that yielded 90 responses. The project also included group interviews with 11 EMS professionals and 9 individuals with disabilities. The team conducted interviews with support from project sponsor Accessible Limitless Living (ALL), which assisted with scheduling, translation, and communication between English and Greek participants. All participants provided informed consent and participated voluntarily. For deaf participants, a translator facilitated communication using Greek Sign Language.

To evaluate potential training formats systematically, the team developed a weighted decision matrix that game formats on criteria related to educational effectiveness, engagement, realism, and feasibility. Understanding EMS perspectives, disability perspectives, and structured design evaluation allowed the team to identify both operational and lived-experience barriers within emergency response systems to directly integrate them into a final training design.

Figure 0.1: A collage of images from some of our interviews. Each interviewee agreed to the use of their picture.

Results and Analysis

Our interviews and surveys revealed that EMS in Thessaloniki are not adequately prepared to provide disability-inclusive emergency care. Individuals with disabilities face barriers both before responders arrive and during evacuation processes.

One major finding focuses on the absence of disability-specific emergency medical protocols, which force responders to improvise based on experience during emergencies. Survey data showed that most responders (52%) were dissatisfied with their

level of training received relating to helping people with disabilities. (See Figure 0.2).

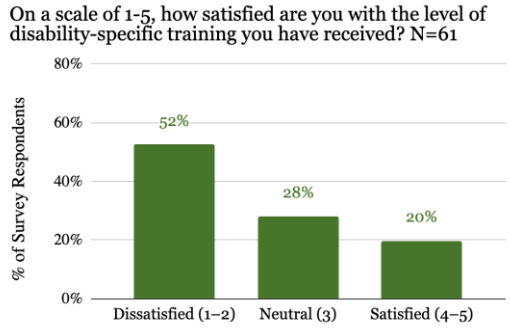

Figure 0.2: A graph showing EMS satisfaction levels with training specific to disabilities.

Responders identified evacuation as the biggest challenge, especially in inaccessible buildings without elevators or with small staircases (See Figure 0.3). In these cases, responders had to improvise due to a lack of standardized procedures for handling individuals with disabilities. Disabled interviewees described the consequences of this improvising as inconsistent and often unsafe care. As one EMS respondent explained, responders are often expected to "improvise based on experience." Several deaf interviewees reported that responders shouted at them or actively ignored them during emergencies, one blind interviewee described responders asking for visual information they could not provide, and wheelchair users reported improper handling techniques that risk injury. While EMS personnel viewed improvisation as a necessary part of evacuation, disabled interviewees described it as relying on "luck" rather than safe care.

Communication emerged as the most prevalent theme across all disability groups. Deaf interviewees emphasized the importance of face-to-face communication, patience, and respectful physical cues such as shoulder taps rather than grabbing. Blind participants discussed the need for responders to constantly communicate what is happening during the emergency and use sighted-guide techniques. Individuals with mobility impairments emphasized communication because each person's condition and transfer needs differ significantly.

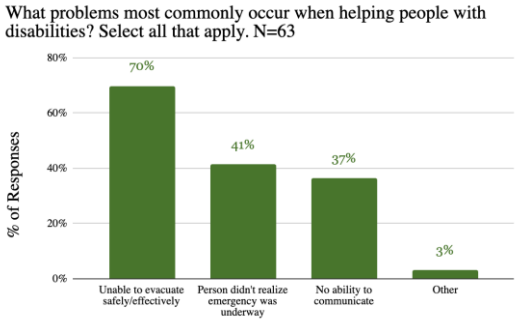

Figure 0.3: EMS Survey respondents most reported issues.

Although survey respondents acknowledge that their training did not prepare them for disability communication barriers, many still ranked communication lower than evacuation challenges during emergencies. One EMS professional stated that "there's no particular protocol that is present now. So the crew has to improvise." However, more experienced responders were far more critical of current training, suggesting that field exposure gradually reveals how central communication failures are (See Figure 0.4). Almost 80% of responders with over 10 years of experience reported training inadequacy, compared to just over 60% of responders with 0-2 years of experience.

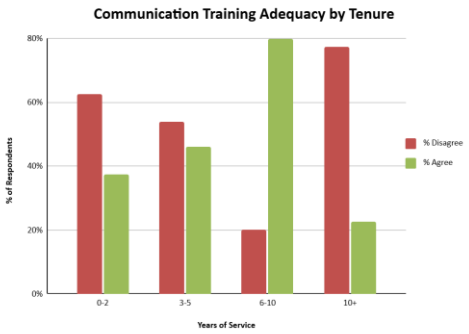

Figure 0.4: Perceived training adequacy by years of experience.

Together, these findings showed that disability-inclusive emergency response in Thessaloniki is limited not only by responder knowledge, but also by inaccessible systems, inconsistent protocols, and communication failures. These gaps directly informed our recommendation to develop a scenario-based training game that allows responders to practice disability-specific decision-making before encountering situations in the field.

Conclusion

In response to the barriers identified throughout this research, the team developed Disability-Accessible Response Training (DART), a gamified, scenario-based training tool that improves disability-inclusive emergency response among EMS personnel in Thessaloniki, Greece. DART directly addresses the major findings that interviews and surveys revealed, including inaccessible emergency communication systems, the absence of disability-specific emergency protocols, and widespread communication failures between responders and individuals with disabilities. DART is intentionally designed around the lived experiences that EMS personnel and individuals with visual, auditory, and mobility impairments shared. The game reduces responder reliance on

improvisation through disability-specific decision-making in emergency scenarios.

Figure 0.5: The front of a scenario card.

DART follows a card-based, scenario-driven format placing responders into dynamic emergency situations involving individuals with disabilities. Scenarios focus on challenges created by communication barriers, inaccessible environments, evacuation procedures, and adaptive patient care. Each scenario incorporates decision-making elements that require players to collaborate, communicate, and respond under pressure while considering the unique needs of the patient.

Administrators from the Hellenic Rescue Team (HRT) conducted playtesting that indicated that realistic, discussion-based scenarios strengthened engagement and encouraged responders to reflect critically on disability-inclusive emergency practices. Feedback from testing also helped refine the game's realism, pacing, and instructional value.

Figure 0.6: The front of an action card.

Based on these findings, the team recommends that EMS agencies in Greece test disability-inclusive scenario training programs such as DART within existing responder education systems. Additionally, the findings highlight a broader systemic issue surrounding inaccessible emergency communication systems, particularly the inability of many Deaf individuals to contact emergency services through text-based communication. Addressing these accessibility gaps through emergency texting systems and improved disability-inclusive infrastructure significantly improves emergency response outcomes for individuals with disabilities. Together, these efforts strengthen responder preparedness and improve equitable care throughout Greece.

Acknowledgments

The authors would like to express their sincere gratitude to the many individuals and organizations whose support made this project possible. We extend our thanks to our sponsor, Accessible Limitless Living (ALL), especially Panagiotis Tsalis and Eva Savvidou, whose dedication to disability inclusion in Greece inspired this work and whose efforts in connecting us with interview participants, translating materials, and organizing interviews across Thessaloniki was invaluable. We are especially grateful to our project advisors, Melissa Butler and Robert Kinicki, for their guidance throughout this process. We would also like to thank the EMS professionals from EKAB, the Hellenic Rescue Team, Thessaloniki Fire Station 3, and the emergency physicians who generously shared their time and expertise. Most importantly, we are deeply grateful to the individuals with visual, hearing, and mobility impairment who trusted us with their personal experiences — their voices are the foundation of this work, and it is our hope that this project honors their contributions.

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1.0 Introduction

EMS exists to protect vulnerable people, yet current training often leaves responders underprepared for disabled patients (Wolf-Fordham et al., 2014). Providing quality care to individuals with blindness, deafness or mobility impairment comes with a unique set of communicative and physical challenges, which often produce inequitable outcomes during disaster events such as delayed responses or unsafe treatment. (Daniels, Kettl, & Kunreuther, 2006; Proulx, 2002; Waterstone & Stein, 2006). The need for disability inclusive preparation is especially relevant in Greece, where natural disasters occur at a high frequency (Kalogiannidis et al., 2024). Responders often fail to meet disabled patients' needs without disability-inclusive, scenario-based training (Pérez et al., 2014). Because disability-inclusive emergency response depends heavily on rapid adaptation, communication, and decision-making under pressure, researchers have increasingly explored experiential training approaches that move beyond traditional lecture-based instruction.

Gamification has proven effective in addressing these kinds of experiential gaps, resulting in improved learning outcomes and decision-making performance (Morse et al., 2019). Several studies have tracked user engagement, knowledge retention, and decision-making ability and reported improvements in all categories (Heydari et al., 2024). When developers intentionally create games for specific situational challenges, gamified training provides a realistic environment that enables users to practice responses and apply newly developed skills before encountering real emergencies (Zhang et al., 2025). Because EMS personnel make rapid decisions under stressful and unpredictable conditions, this form of training is incredibly valuable. By integrating disability-inclusive scenarios into EMS training, responders can encounter situations in a controlled environment that simulate live emergencies before they

occur, preparing them for real situations and resulting in improved healthcare outcomes. These features made gamification appropriate for this project because disability-inclusive response requires responders to practice communication and evacuation decisions under realistic constraints.

The goal of this project was to design a gamified training scenario for Thessaloniki EMS providers that built awareness of disability-inclusive response challenges and strengthened their capacity to deliver equitable care. Our team achieved this goal through the following objectives:

1. Identifying current EMS disability-specific training methods.
2. Identifying perspectives from individuals with disabilities.
3. Designing and evaluating an initial gamified disability training prototype for EMS personnel.

As emergency systems continue to confront questions of accessibility and equitable care, disability-inclusive preparedness has become an increasingly important component of effective EMS response. Our team sought to equip local EMS providers with the ability to better care for individuals with disabilities. Findings related to communication failures, inaccessible evacuation environments, responder reliance on improvisation, and the absence of disability-specific EMS training directly informed the development of Disability-Accessible Response Training (DART). DART is a gamified, scenario-based training tool designed to strengthen disability-inclusive communication, evacuation decision-making, and responder preparedness among EMS personnel in Thessaloniki, Greece. Administrators from the Hellenic Rescue Team (HRT) conducted playtesting that indicated that realistic, discussion-based scenarios strengthened engagement and encouraged responders to reflect critically on disability-inclusive emergency practices. This report first establishes the emergency and disability context surrounding Greek EMS systems,

then presents the project methodology, stakeholder findings, DART design process, and final recommendations.

2.0 Background

This chapter examines the needs of persons with disabilities during evacuation procedures in Greece and the barriers surrounding disability inclusive emergency response. Section 2.1 covers the common disaster scenarios that initiate Greek EMS response, and the complications that can arise when caring for individuals with disabilities in emergency scenarios. To address these deficiencies, section 2.2 evaluates the insufficiencies of current EMS practices to address disability specific needs and explores options to address potential knowledge gaps in training through gamification and situation-based approaches. This research synthesizes the context, challenges, and potential approaches to creating training that equips EMS personnel with the ability to support people with disabilities in emergency scenarios.

2.1 Greek Emergency and Disability Context

2.1.1 Common Emergencies in Greece

Greece lies along the Mediterranean Sea, an area of the world with extremely hot and dry summers. In addition to the dry climate, about 30% of Greece includes a range of forest ecosystems. These factors combine to make Greece particularly susceptible to wildfires, with an average of 1500-2000 wildfires per year (Kalogiannidis et al., 2024; Moustakas, 2025). Another issue that comes from Greece's geography is its location on the boundary of the convergence of the tectonic plates making up Africa and Eurasia, making earthquakes common (see Figure 2.1). Research states that some Greek citizens feel a moderate or smaller earthquake as often as every 2-3 days (Kouskouna et al., 2004).

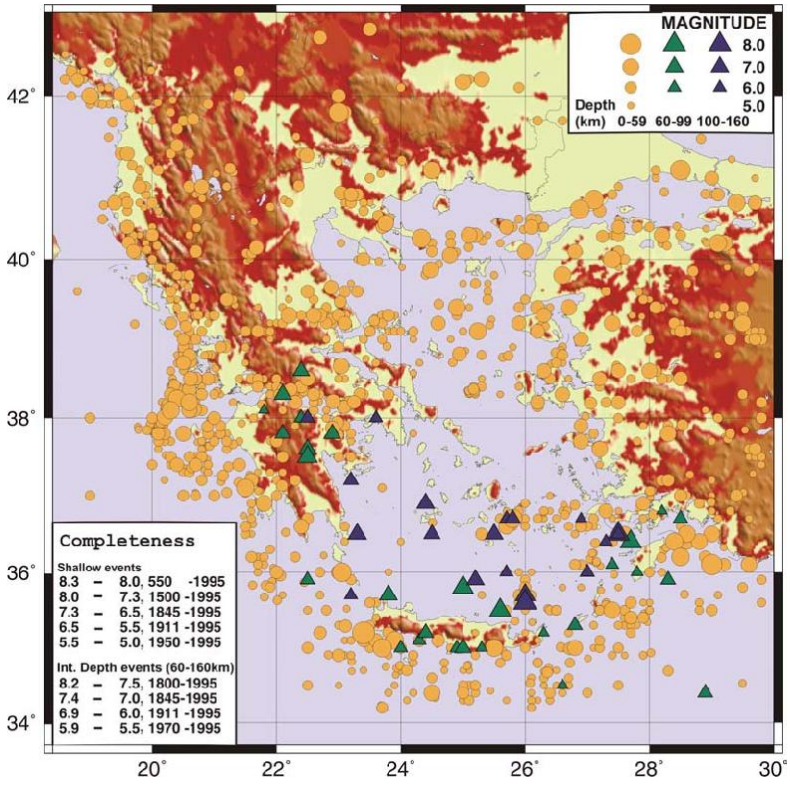

Figure 2.1: Map of Seismic Activity in Greece (Skarlatoudis et al., 2004)

2.1.2 Defining Disability

Public health frameworks define disability as long-term physical, mental, intellectual or sensory impairments" (UNCRPD, 2010). Over one billion people globally live with a disability, underscoring the scale of this population and the importance of inclusive emergency planning (World Report on Disability, 2011). As the average age of the global population increases, persons with identified disabilities have become more prevalent (Beller, 2020). As disabilities become more frequent, ways of life need to become more accessible to accommodate these increasing numbers. Disasters disproportionally affect individuals with disabilities, and they experience a mortality rate two to four times higher than that of people without disabilities (Castro et al., 2016). EMS agencies must deliver emergency communications through multiple modalities because individuals with disabilities often require adaptive communication strategies.

Standard alerts such as sirens may not reach people who are deaf or have cognitive impairments. Likewise, visual alerts alone fail to reach people who are blind or have low vision (ADA National Network, 2025).

2.1.3 The Challenges of Evacuating Individuals with Disabilities

When disasters occur, evacuating individuals with physical disabilities presents difficult challenges. Emergency services often rely on communication and the evacuee's own physical capabilities during evacuations. Depending on their disabilities, these limitations may hinder these capabilities, so responders must accommodate them to keep the person safe. Disabilities may prevent individuals from safely evacuating a dangerous situation (Gilbert, 2016). For those with mobility impairments, stairways and debris in urban environments can make evacuation an impossible task (Hostetter & Naser, 2022). In rural environments, Greece's rocky and mountainous terrain can yield similar challenges. Individuals who are blind may find themselves unable to navigate complicated environments, while debris or fires can introduce obstacles or eliminate familiar references, leading to disorientation and dramatically increasing the time needed to evacuate an area (Zhang et al., 2019). Individuals who are deaf may fail to hear alarms and warning systems or important instructions from EMS personnel (Thériault et al., 2024). This confusion can lead to a lack of knowledge of an emergency or an inability to follow evacuation routes.

Qualitative research has also identified communication challenges as a major factor that undermines effective emergency response for people with disabilities. EMS clinicians spend, on average, more time on scene with patients who have a disability (Kurkurina et al, 2025). People with disabilities themselves have cited challenges in being heard, understood, and appropriately supported during emergencies when first responders lack compensatory communication skills

(Gleaton et al., 2025). This includes simple accommodation such as allowing extra response time, using clear language, and collaborating with caregivers or assistive service providers. Additionally, persistent attitudinal barriers, including assumptions about behavior, can combine with other risk factors to create inequitable outcomes (Gleaton et al., 2025). Such misunderstandings can affect the care and safety of all individuals involved. In each of these cases, people with disabilities may be unable to safely and confidently evacuate dangerous areas. Hence, training in implementing inclusive strategies that cater to people who may not be able to evacuate themselves in an emergency is indispensable.

2.2 Current Greek Emergency Response Training Deficiencies

Research links training deficits with real operational challenges faced in emergency contexts (Gleaton et al., 2025). National frameworks like the National Disability Action Plan formally commit to inclusive disaster risk management; however, stakeholders report gaps, deficiencies, and discrimination in the protection of people with disabilities (Pikoulis et al., 2024). Findings from focus groups with Disabled People's Organizations and health authorities highlight that authorities often fail to translate disability considerations into concrete protocols, underscoring a disconnect between policy and training (Pikoulis et al., 2024). Current literature highlights a potential gap within emergency response systems. Heydari et al. (2024) state that traditional teaching approaches "primarily focus on instructor-based learning, where learners are expected to listen passively to the content provided by the teacher," resulting in "less interactivity and engagement in the learning process" (p.1). This shortcoming is due to the training design, delivery, and evaluation of training activities. Hence, inequitable outcomes continue to occur despite advances in medical knowledge and emergency technology. Greece's

EMS system lacks coordinated structure, often leaving staff unprepared to operationalize inclusive guidelines in real incidents (Press et al., 2021).

2.2.1 Identifying Opportunities for Intervention

The practical consequences of limited disability-inclusive training in Greece are evident in the lived experiences of people with disabilities during recent disasters. Researchers surveyed participants with disabilities and caregivers, and they described only "moderate" implementation of preparedness measures, signaling that current arrangements do not adequately equip first responders to support them during emergency situations (Pikoulis et al., 2024). Participants further stressed ongoing communication barriers in emergencies, which persist despite formal legal protections (Pikoulis et al., 2024).

Greek initiatives suggested that structured, disability-focused education can measurably enhance knowledge and preparedness, but organizations have not embedded these initiatives as standards within EMS training systems (ECFF, 2023; Wolf-Fordham et al., 2014). Traditional EMS education prioritizes clinical procedures and strict protocol adherence, as opposed to demonstrating on-site challenges responders may encounter. Responders infrequently address communication barriers or environmental limitations, which can result in improper care. Research regarding medical or emergency services consistently demonstrates that first responders benefit most from experimental, simulated scenario-driven learning environments; environments that mimic on-site conditions.

2.3 Gamification and Scenario-Based Training for Emergency Response

Creating emergency response training requires considering factors that affect the effectiveness of EMS professionals, mainly their situational awareness, decision-making, and stress management skills (Perez et al. 2014). Gamification enables creators of training to address these factors directly using techniques outside the scope of traditional learning methods.

Gamification can address potential gaps in responders' learning without endangering patients, but designers must create games with their purpose in mind to ensure features align with outcomes. These approaches provide fast-paced environments that mimic real encounters and promote active engagement, repetition, and authentic problem-solving (Wong et al., 2022). Games must preserve the serious attitude and high-stress nature of emergency response and utilize gamified mechanics, while providing genuinely useful feedback and information (Fonseca, 2022).

2.3.1 Describing Gamification

The use of games in emergencies and medical contexts has the potential to trivialize critical health situations. Game developers can address this concern by making the distinction between games, gamification, and serious games. Researchers define gamification as “the use of game design elements in non-game contexts” (Deterding et al., 2011, p.2). Utilizing elements of games, such as timers, goals, progress indicators, and other mechanics commonly found in games, allows the creator to mimic real experiences without accidentally creating a “playful” setting that could trivialize training. While structured challenge and rule-based engagement

emphasize goal-oriented interaction, playfulness emphasizes exploration and improvisation (Sebastian Deterding et al., 2011), which does not simulate EMS experiences. Professional responders are bound by strict rules and consequences, which are consistent with the game-based approach of rule-bound, goal-oriented challenges. Training should integrate mechanics and realism in a manner that avoids a playful nature while maintaining immersion and engagement in the situation. (Deterding et al., 2011)

2.3.2 Gamification as Structured, Non-Trivial Training

Researchers have shown that gamification on its own is most effective when developers intentionally implement a unique blend of features and metrics to impact learning of the user base (Koivisto & Hamari, 2019). While most gamification studies report positive results, other studies either have mixed results or do not evaluate their work to a level of scientific significance (Koivisto & Hamari, 2019). These studies assert that the productivity of learning outcomes is dependent on the features included in the study and the impact of specific features on cognitive responses. For example, Hamari et al. (2014) found that gamification outcomes vary significantly depending on the specific elements implemented, with no consistent positive effect across all designs, emphasizing the importance of feature-level analysis rather than simple engagement metrics. As an example, in a study by Heydari et al. (2024), certified EMS participants reported increased self-confidence, improved teamwork, and enhanced communication skills in stressful scenarios following gamified simulation-based education. This skill is immensely valuable in the emergency response landscape and is difficult to address with traditional learning methods. Heydari explains how these improvements resulted from the integration of structured game elements such as real-time feedback, consequence-driven decision-making, and time pressure that mirror that of real emergency situations.

These features belong to two categories: game mechanics, which describe what the system does, and design principles, which shape the user experience through the design of the training. By utilizing both categories, designers ensure that their training prioritizes mechanics that improve the user's learning. This shows the necessity of a selective choice of game features to fit the scenario's needs for a gamified experience to be successful.

2.3.3 Psychological Foundations: Self-Determination Theory

Much existing research on gamification depends on Self-Determination Theory (SDT) as a framework for understanding the psychological impact of gamification and the influence of gamified approaches on learning. SDT asserts that there are three core psychological needs: competence, autonomy, and relatedness, and that specific game elements fit each of these psychological needs.

Psychological needs with matching game design elements.

Psychological need	Mechanism	Game design element
Need for competence	Granular feedback	Points
	Sustained feedback	Performance graphs
	Cumulative feedback	Badges
	Cumulative feedback	Leaderboards
Need for autonomy (decision freedom)	Choices	Avatars
Need for autonomy (task meaningfulness)	Volitional engagement	Meaningful stories
Need for social relatedness	Sense of relevance	Teammates
	Shared goal	Meaningful stories

Table 2.1: Table showing the mapping of game design elements to psychological needs
Note. Reprinted from "How Gamification Motivates: An Experimental Study of the Effects of Specific Game Design Elements on Psychological Need Satisfaction," by M.Sailer, J. U. Hense, S. K. Mayr, & H. Mandl, 2017, *Computers in Human Behavior, 69,* 374

As Table 2.1 shows, researchers mapping each game design element to a psychological need that it fulfills. The study provides experimental evidence that supports this assertion. Performance feedback and progress indicators support the need for competence. Creating a meaningfully connected narrative to the material supports the need for autonomy, and working with teammates towards a shared goal creates a sense of social relatedness (Salier et al, 2017). These cooperative, narrative-based gamification strategies have produced stronger intrinsic

motivation than other approaches (Toda et al., 2018). One participant noted that “the narrative made it feel like we were living in another world, which made the process dynamic and fun” (Toda et al., 2018). While emergency scenarios differ from the classroom setting of the study, the underlying mechanisms supporting meaningful immersion translate directly to professional training environments.

2.3.4 Decision Matrices as Structured Design Tools

To align gamified training scenarios with intended learning outcomes, training developers make deliberate and structured design decisions to prevent biased decision-making and justification for specific game elements or structure. One method of structured design lies within the use of design matrices, a tool that designers use to evaluate several design options against weighted criteria to systematically determine features that can best support a design goal (Madsen & Rasmussen, 2021). Design matrices are extremely effective in providing quantitative feedback for qualitative information, using a mathematical system to provide supplementary data (Vaccarella et al., 2025). This approach aims to exclude unnecessary feature selection and ensure that game elements included serve a justifiable purpose throughout the design process. Additionally, decision matrices provide clarity and consistency within design choices. By pre-emptively establishing the weighting and evaluation criteria of a design matrix, designers can make an unbiased determination about an optimized outcome.

2.4 Stakeholder-Advised Training Design

Effective training primarily depends on how instructors and developers design, deliver, and evaluate the training process, rather than on the technology they use to present it. When stakeholders provide consistent input about their experiences or needs in developing a training

solution, the learning retention, quality, and performance significantly increase (Kalender et al., 2023). In a study of a gamified EMS training intervention; where stakeholders worked directly with the researchers, 77% of participants reported improved understanding of team-based critical care decision-making (DiCesare et al., 2025). Considering stakeholder input tends to replicate the fast-paced environment often encountered during emergencies. Beyond improving training effectiveness and relevance, including relevant stakeholders throughout the developmental stages of training significantly helps identify weaknesses in existing training programs.

Participatory guide development is a research and design approach that actively involves subjects of the research in the creation and design of the research methods. Participatory interview guide development serves as an "awareness tool" that enables researchers to reflect on blind spots, assumptions, and power dynamics (Kalender et al., 2023). Complementary inclusive design strategies, such as stakeholder focus groups, iterative user testing, and co-design workshops, can further enhance training relevance and promote proper reflection of affected communities (Kalender et al., 2023; Harring et al., 2023; Kotb et al., 2025). These approaches create structured opportunities for professionals and affected communities to collaborate and address all relevant needs, uncover current barriers or knowledge holes, and refine training content before implementation into training exercises. Through this process, feedback loops create opportunities for better position training programs and address real operational challenges rather than theoretical scenarios. Stakeholder collaboration, professional co-development, and inclusive design are essential elements of training systems that can provide effective and equitable emergency care.

2.5 Conclusion

Current literature highlights a clear gap within Greek emergency response systems. Research shows that individuals with disabilities require special care and knowledge in emergencies. While EMS professionals are expected to provide equitable and effective care to individuals with diverse disabilities and access needs, their training often fails to adequately prepare them for these situations. Research regarding emergency services consistently demonstrates that first responders benefit most from experimental, scenario-driven learning environments that mimic on-site conditions. Existing literature links gamified and simulation-based training to improved participant performance in high-pressure situations, with studies showing gains in knowledge, clinical reasoning, confidence, teamwork, and stress regulation (Heydari et al., 2024; DiCesare et al., 2025). Our sponsor, Accessible Limitless Living, has identified a need for structured, disability-inclusive emergency response training for Greek first responders. The team selected gamification after consulting with our sponsor and medical professional gamification as the preferred design approach, offering a way to deliver realistic, high-pressure training without the risks of live simulation.

Developing gamified training through co-development and inclusive creation offers a meaningful opportunity for intervention, one that evidence suggests can increase both equitable first responder care and emergency medical response preparedness for individuals with disabilities.

3.0 Methods

The goal of this project was to design a gamified, scenario-based training activity for EMS providers in Thessaloniki, Greece, that raises awareness of the challenges surrounding disability inclusive emergency response and strengthens the capacity of EMS providers to deliver equitable care. We accomplished our goal through three objectives:

1. Identifying current EMS disability-specific training methods.
2. Identifying perspectives from individuals with disabilities.
3. Designing an initial gamified disability training program for EMS personnel.

This chapter discusses the methods used to gather and analyze data to achieve these objectives. Additionally, there are justifications for research methods, as well as limitations to data collection and relevant ethical considerations.

3.1 Investigating the Experience of Emergency Medical Services

To develop a gamified medical service training, the team investigated the current state of disability inclusive EMS response training. Our team addressed this via surveys and group interviews to build a comprehensive context of the level of EMS training in Thessaloniki.

3.1.1 EMS Professional Survey

Our team distributed a survey to the Hellenic Rescue Team's president. The president disseminated the survey to their members and to other organizations that work with the rescue team, and 88 of 90 respondents completed the survey in full. The survey assessed their understanding of gamification, the quality of current inclusive education, and their prior emergency experiences involving individuals with disabilities. Surveys allowed this process to

reach far more participants than interviews alone, while still remaining time efficient. We originally created the survey instrument in Qualtrics in English, and our sponsor translated it into Greek for dissemination. The team attached consent forms to our survey which informed participants that their responses would be anonymous, and that they could refuse to answer any question or discontinue the survey at any time (see Appendix A). We included the full English survey instrument in Appendix C.

3.1.2 Group Interviews with EMS Professionals

The team conducted semi-structured interviews with 11 professionals from four medical organizations to gather information on existing challenges within existing EMS education with respect to disabilities and to uncover real-world challenges EMS professionals face (see Table 3.1). The project team selected participants in cooperation with our sponsor, ALL. Our sponsor was integral in the scheduling and organizing of these interviews. We utilized semi-structured group interviewing as it cultivated a natural flow of questions and enabled respondents to delve into their own personal experiences to build a descriptive context (DeJonckheere, 2019). Interviews spanned on average two hours, and several team members took written notes. Prior to the start of each interview, one team member designated as chair read a consent statement to all participants. All interviewees provided verbal consent. This statement ensured participants that they could decline questions or stop the interview at any time (see Appendix B). The team audio recorded all of our interviews after the interviewees gave consent. Most participants either only spoke Greek or are more comfortable speaking in Greek. After we read our questions in English, our sponsor would translate them to the participants and then translate their responses back to English for us to document.

EMS Personnel Interviewees			
Interviewee	**Date (M/D/Y)**	**Number of Interviewees**	**Length of Interview**
Thessaloniki Fire Station 3 - Officers	3/17/26	3	15:16
EKAB Professionals	3/30/26	4	2:18:37
Hellenic Rescue Team	4/6/2026	2	1:32:54
Emergency Room Doctor	4/9/2026	1	41:10
EKAB Lieutenant	4/17/2026	1	~5:00

Table 3.1: Table of our interviews with EMS personnel.

3.2 Investigating Disability Perspectives Regarding EMS

To determine the challenges individuals with disabilities face within emergency scenarios or evacuations in Greece, we investigated how these challenges shape their accessibility needs, expectations, and experiences with EMS personnel. We used group interviews to create a comfortable and professional environment to determine the experiences individuals with disabilities encounter.

3.2.1 Group Interviews with Individuals with Disabilities

Our sponsor arranged for our team to conduct five semi-structured group interviews with nine individuals with disabilities: three with visual, three with hearing, and three with mobility (see Table 3.2). Interview questions focused on participants lived experiences with emergency

response, evacuation, and encounters with EMS personnel (see Appendix E). As these topics can be sensitive, the project team utilized semi-structured interviews to gauge participants' comfort levels and to provide a space for them to discuss past difficulties without being overly intrusive (Kalender et al., 2023). In addition to verbal consent, the team administered written consent forms prior to the start of interviews (see Appendix A). The interviews lasted 1.5- 2.5 hours, and several team members took notes.

Interviews with Individuals with Disabilities			
Interviewee	**Date (M/D/Y)**	**Number of Interviewees**	**Length of Interview**
Individuals with Hearing Impairments	3/30/2026	2	1:09:40
Individuals with Vision Impairments	4/1/2026	3	1:39:11
Individuals with Mobility Impairments	4/8/2026	1	1:32:51
Individuals with Hearing Impairments	4/8/2026	1	27:42
Individuals with Mobility Impairments	4/17/2026	2	46:23

Table 3.2: Table of our interviews with individuals with disabilities.

In our interviews with deaf individuals, a member of ALL served as a translator by translating our questions into Greek Sign Language (GSL), receiving the answers from the interviewees in GSL, and then translating their responses back to English for us to record. This required some sensitivity training for us. Our sponsor taught us to maintain eye contact with the interviewee throughout the interview, despite the translator telling the responses to us.

3.3 Developing a Disability-Focused Serious Game for EMS

To develop a gamified training scenario with meaningful impact, the team needed to gain insight into gamification, its effects, and best practices. We accomplished this through a literature review of existing gamified training and case studies regarding the effectiveness of game elements to determine the characteristics of both an educational and enjoyable gaming experience. Additionally, our sponsor provided some materials for us to review. A decision matrix identified the most important elements to include within our gamified training program. We utilized an iterative feedback framework, a process that emphasizes continuous improvement through repeated cycles of revision and feedback to fix initial issues before implementation.

3.3.1 Gamified Training Literature Review

Our team assembled a collection of fifteen different articles and fourteen different gamified training scenarios to evaluate (see Appendix H). Of the fourteen games, four of them were unplayable due to access issues. We derived our knowledge of these games from research case discussions. The team played and scored the following 10 games (see Table 3.3) on a scale of one through ten against twenty-seven game element criteria (see Table 3.4). This criteria referred to gamification and the effectiveness of specific game elements. The team systematically identified which game elements most effectively supported engagement, learning, and realism within training environments.

Game Title	Topic	Format	Target Audience	Case Study?
Pit Crew Card Game	EMS Training	Situation-Based Card Game	EMS Trainees/ Personnel	Yes
Disaster Day	EMS Training	Live Simulation	EMS Trainees/ Personnel	Yes
Personal Protective Equipment for the COVID-19 Pandemic	Disease Protection/ Prevention	Electronic Learning Module	Hospital Healthcare Workers	Yes
Earth's Trivia Journey	Environmental	Printable Board/Card Game	Students	No
Climate Fresk	Environmental	Printable Board/Card Game	Students	No
Stop Disasters	Disaster Preparedness	Strategic Video Game	General Audiences	No
Mission US	Historical	Situation-Based Module	Students	No
Disaster Triage	EMS Training	Situation-Based Simulation Module	EMS Trainees/ General Audiences	No
Totally Gross: The Game of Science	Youth Educational	Board/Card Trivia Game	Children	No
Go Goals	UN Goals	Classic Board Game	General Audiences	No

Table 3.3: A table of the 10 games that we analyzed for our decision matrix.

After conducting the literature review on existing materials and research, we developed a decision matrix to systematically determine which format of game provided the best opportunity to leverage important game elements. Initially, we identified the ten games into categories of:

card games, board games, online games, and workshops. Next, we weighed the identified game elements on a scale from one to ten based on the effectiveness of each element's ability to foster an educational and enjoyable gamified experience. Then, we applied this factor to the previously recorded game scores, multiplying each element score by its corresponding weighting factor to produce an overall score reflecting each game's effectiveness in both teaching and engagement. We also introduced a feasibility factor and scored each game based on cost, development complexity, and implementation timeline to determine a final score. Finally, we averaged scores with their respective game type to determine which game format was the most effective and feasible for our team to create.

Category	Element
Core Learning Drivers	Immediate Feedback
	Increasing Difficulty
	Real-world Scenarios
	Consequence Systems
	Objectives / Missions
	Mistake Analysis
	Post-game Breakdown
	Replayable Scenarios
High Impact	Time Pressure
	Randomized Scenarios
	Hidden Outcomes / Problems
	Teams
	Cooperative Goals
	Competition
	Peer Comparison
	Role Selection
	Loadout / Equipment Choices
Low Impact Alone	Badges / Achievements
	Leaderboards
	Titles / Skins / Cosmetics
Theoretical Foundations	Experiential Learning
	Self-Determination Theory
	Flow Theory

Table 3.4: A table of the 27 elements used to score the games from our decision matrix.

Game Category	Game Name	Game Score	Average Category Score
Card Game	Climate Fresk	828	886.05
	Pit Crew Card Game	944.1	
Board Game	Totally Gross	813.6	702.1133333
	Go Goals!	519.17	
	EarthTrivia Journey	773.57	
Online Games	COVID	496.03	692.4975
	Disaster Triage	890	
	Stop Disasters!	808.8	
	MissionUS	575.16	
Workshop	Disaster Day	481.5	
	Climate Fresk	828	654.75

Table 3.5: The results of our decision matrix including individual game scores and the average category scores. Note: Climate Fresk is listed twice because it can be played in both formats.

Card-based systems produced the highest average score of 886.05, outperforming online platforms, board games, and workshop learning formats (see Table 3.5). Card-based gamification performed well in areas that aligned with the project requirements. A card-based game adequately displayed the ability to incorporate real-world situations, cooperative learning and post-game analysis. It enabled realistic, scenario-driven training while remaining low-cost, easily distributable, and adaptable to the pre-existing EMS training environment. This format also supports collaborative decision-making and structured reflection without requiring technological resources. Based on this analysis, the project selected a physical card-based training system as the final design.

3.3.2 Pilot Development

After initial data collection, we began designing the pilot of our game, DART, which stands for Disability-Accessible Response Training. We developed 3 initial scenarios for the training. To receive feedback, we completed co-development cycles with a professional in mobility impairments, a professional in hearing impairments, and an individual with a life-long vision impairment. We used these cycles to get feedback on the initial scenarios and gain insight

into the direction we should take with each. These cycles along with our collected data informed the full design of DART. An in-depth description of DART is in Chapter 5.0.

3.3.3 Pilot Testing

Once the team completed development on a playable version of DART, we printed the game cards and brought it to the Hellenic Rescue Team for a test run. The players of the test game were three administrators of HRT. One of our group members acted as the moderator of the game, while the other three took notes. The test group played through each scenario of the game. The flood scenario was the shortest, taking roughly 35 minutes. The fire scenario took about 50 minutes, and the vehicle crash took just over an hour. In all, between each scenario and time in between for the test group's input and thoughts, the test lasted roughly three hours, much longer than the team had predicted.

3.4 Ethical Considerations

Throughout the duration of this project, the team has engaged individuals of the disabled community and EMS professionals. Discussions have involved sensitive topics; we have designed our research processes to act in an ethical fashion and to properly depict individuals with disabilities within the challenges or experiences they may face. Prior to interviews or surveys, we provided participants with a clear consent agreement that outlines the implications of their contribution. We informed everyone involved that participation in all research activities is voluntary.

Given that both disability and emergency response experiences may be of personal or stressful nature, our group has maintained sensitivity towards participants and strived to maintain

an even power dynamic with these individuals with disabilities. Participants had complete control of interview content, pacing, and depth to emphasize mutual respect.

The team deleted all collected personal information before analysis to protect participant anonymity. The team removed attribution from all quotations to protect anonymity, and the report provides all data in aggregate form. These practices seek to ensure that our research maintains trust and respect, and that our findings represent participants lived experiences in a safe and professional manner.

4.0 Findings

The findings within this chapter derive from semi-structured interviews and surveys with 11 EMS workers across organizations such as EKAB and the Hellenic Rescue Team (HRT), as well as 9 individuals with disabilities in Thessaloniki, Greece. Sixty-three first responders working across the same system of emergency response professionals participated in the survey. Our analysis revealed that participants across both groups described emergency response within a broader context of societal inaccessibility.

This chapter discusses four broad argumentative claims addressing major themes that appeared across all data sources:

1. Disability-Inclusive Emergency Response Is Inadequate at the Systemic Level
2. EMS Response Relies on Improvisation, Experience, and Caregiver Support
3. Communication Is the Primary Fault Line During Emergency Encounters
4. Effective Disability-Inclusive Training Must Be Co-Participatory, Scenario-Based, and Disability-Specific

Each major claim contains subclaims that justify the major claim, and a conclusion that converges the provided evidence to justify design choices. The chapter is organized in this manner as our strongest findings are a result of comparison across disability and EMS perspectives.

4.1 Disability-Inclusive Emergency Response Is Inadequate at the Systemic Level

The failures that undermine disability-inclusive emergency response in Thessaloniki lie in the training systems, built environment, and information systems that shape emergency response long before any individual encounter. This section documents how these systems leave both responders and individuals with disabilities without the information that they need.

4.1.1 Training Infrastructure Does Not Produce Disability Competence

Current EMS training addresses disability-related considerations solely indirectly within broader medical or emergency topics, forcing first responders to rely on general knowledge and field experience rather than protocols. Ten of our eleven EMS interviewees reported receiving no form of formal disability-inclusive response training through their respective training programs. The one interviewee who had training, a high ranking EKAB official, described the training as "Very limited," and added that "of 14,000 EKAB around Greece, there are probably not more than 300 trained on that," which totals to about 2.1% of all responders. The responders we interviewed are not individually at fault; rather, the training system’s near-total lack of formal preparation left them unequipped to effectively address disability-inclusive challenges.

Our team directly observed this absence of structural attention during our team's visit to a CBRN mass casualty exercise that involved EKAB, the fire service, Coast guard, and other supplementary organizations. In the scenario, these agencies responded to the explosion of an oil truck that injured approximately 20 victims and triggered a hazardous materials incident when a shard of the tanker pierced a shipping container. The ~20 victims consisted of EKAB students and volunteers of varying ages. Each presented with fake blood and makeup to simulate injury and assigned varying injury severity levels. The whole scenario failed to address disability even

once. No volunteer had real or simulated visual, auditory, or mobility disabilities. The rescue further reflected this as the first rescuer took steps to remove injured victims by shouting "If you can walk, come towards me!" This amplifies the issues seen within communication, as individuals with hearing impairments may not hear this order, while individuals with visual or mobility impairments may further injure themselves trying to follow it. With the amount of effort put into the scenario design to account for victims in various states, the exclusion of any disability centered component illustrates their systemic exclusion.

Our survey data shows the implications for this problem. Responders rated their preparedness for emergencies involving each of the three disability types we studied on a five-point Likert scale from "Not at all prepared" to "Very Prepared":

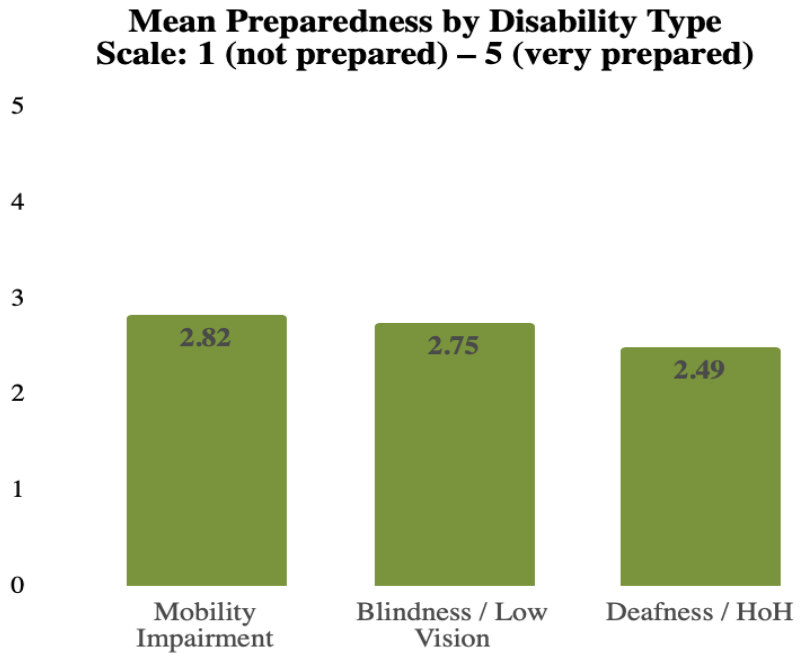

Figure 4.1: A graph of mean preparedness by disability type as resulted from our survey.

Across all three categories, the mean fell below the midpoint of 3.0: mobility (2.82), blindness (2.75), deafness (2.49). Preparedness is therefore uniformly thin rather than weak in

only one area; even the strongest category is below average. Deafness is the weakest area on every metric: it has the lowest means, the highest share rating "not at all prepared" (33.3%), and the lowest "prepared" rate (26.3%). This self-reported data shows that responders feel underprepared to address disability specific challenges in disaster scenarios.

4.1.2 Built Environments Do Not Enable Accessible Evacuation

EMS personnel identified several outside limitations as major barriers to effective response. One common challenge responders face is patient mobility in buildings without elevators, as one responder stated: “in Thessaloniki, in Greece, in general, we have a lot of buildings with no elevator... and we have to carry the disabled people from the stairs, and every time, it's very difficult". Even when buildings do have elevators, most are too small for stretchers or wheelchairs, which again require manual patient transport. These constraints are obstacles for individuals with mobility impairments, frequently requiring multi-agency coordination, delaying response times, and increasing physical strain on personnel, all which compromise patient safety. EMS participants described these barriers as routine. One responder produced a photograph showing multiple EMS groups evacuating a 250-kilogram patient with pulmonary problems from the sixth floor of a building with no elevator. These deficiencies in the built environment are examples of a pattern of inaccessible design that extends beyond just residential buildings.

Hospital infrastructure presented its own set of accessibility failures, compounding the difficulties patients with disabilities faced before, during, and after emergency care. One emergency physician described their hospital building as old and structurally fragmented, with entrances that “are not so friendly, even for people who can walk on their own or who can see". Elevators required mid-floor transfers between buildings rather than providing direct floor access, and the designated waiting area was a corridor outside examination rooms, creating

crowding and disorientation. In addition, the hospital had no way-finding signage of any kind, meaning navigation questions fell to already overstretched clinical staff. In the absence of any institutional solution, the physician had developed an improvised individual workaround for blind patients, giving incremental verbal directions with built-in checkpoints, acknowledging that without these patients would simply get lost. These conditions point to a systemic failure of hospital design to account for disabled patients at any stage of their care pathway.

4.1.3 Emergency Information Systems Lack Disability Information

The data systems through which responders might anticipate a disabled response scenario, or through which a disabled individual could voluntarily provide important information regarding their condition are not functional. Both groups independently described this as a gap and described it in similar terms.

Firefighters from our first interview mentioned a database that contained disability information on residents by municipality. This information would allow them to prioritize disabled individuals in the event of a natural disaster by utilizing their provided information. Greek Data Protection Regulation (GDPR) restrictions, however, are an unresolved barrier to disability-relevant data access. The emergency room doctor we interviewed noted that no standardized or mandatory patient records system existed across hospitals, and that new digital records from two years prior to the interview contained no disability-specific fields or flags.

From the user side, deaf participants identified the same gap and called for medical records and digital health profiles to flag deafness, referencing existing Greek health systems as potential integration points. Disabled participants also portrayed a willingness to provide rescue relevant health information if there was a medium available to accommodate it. Both groups want a way for the system to know about a disabled person before the encounter, and both

recognize the absence of that information as dangerous.

4.1.4 Section Conclusion

The failures of Emergency Response Systems across this section form the basis of the environment that individual EMS workers operate within. Responders arrive onto the scene of disability response challenges undertrained, in built environments that don't accommodate disability needs, and without any prior knowledge of the disabled individual they are responding to. Every emergency encounter for a disabled person in Thessaloniki encompasses these structural deficits. Individual failures of effort or attitude are not undermining disability-inclusive emergency response. The architecture of the system itself is responsible for this.

4.2 EMS Response Relies on Improvisation, Experience, and Caregiver Support

When formal systems fail to educate emergency responders on disability-inclusive emergency scenarios, responders improvise based on their professional and personal experiences and rely on caregivers for specific information. This section documents how these informal mechanisms define disability response in Thessaloniki.

4.2.1 Care Quality Depends on Improvisation

Without institutional protocols that address disability inclusive response challenges, responders default to improvisation. As discussed in 4.1.1, response crews arrive on scene without specific training, and the crew must improvise based upon their own experience to provide a solution on site. As one EKAB responder put it, their plan upon arriving at an emergency is: “start where you are, use what you have, do what you can.” Unfortunately, this

approach results in inconsistent treatment outcomes for people with disabilities. This variability is clearest when analyzing responses to the following question across responders with and without specific disability experience: “In your experience, what challenges commonly arise when assisting individuals with disabilities during emergencies? Check all that apply.”

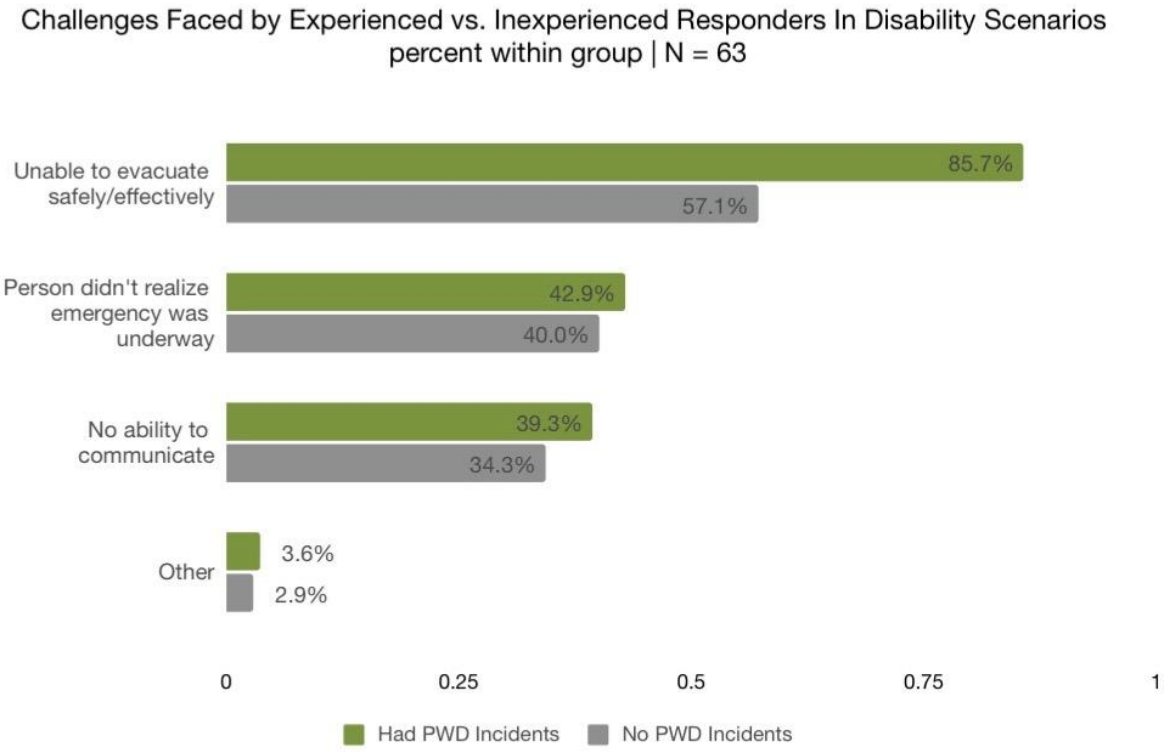

Figure 4.2: Challenges faced by experienced vs inexperienced responders in disability scenarios.

The Problems Reported chart (multi-select) shows that evacuation salience jumps from 57.1% among the inexperienced group to 85.7% among those who have responded to an evacuation involving an individual with a disability, a roughly 28 percentage-point gap. Communication (39.3% vs. 34.3%) and "didn't realize an emergency was happening" (42.9% vs. 40.0%) are cited at nearly identical rates between the two groups. New EMS personnel under-anticipate evacuation difficulties until they experience it firsthand, meaning that the responders least ready to handle it are also the least likely to anticipate it.

This introduces variability in the quality and consistency of care that disabled individuals receive. One deaf participant framed outcome as contingent on chance: "I think, in Greece, that you rely on luck, with the stuff that's going to be on the ambulance, or if responders have experience with people with disabilities? They basically do not have anything about how to treat us." When training systems are not formally utilized, your outcome as a disabled person is highly dependent on just who happens to arrive.

4.2.2 Felt Competence Comes from Exposure Rather Than Training

If improvisation is the operational default for EMS responders towards situations involving people with disabilities, then personal experience in these scenarios is what equips responders with the capability to provide equitable care.

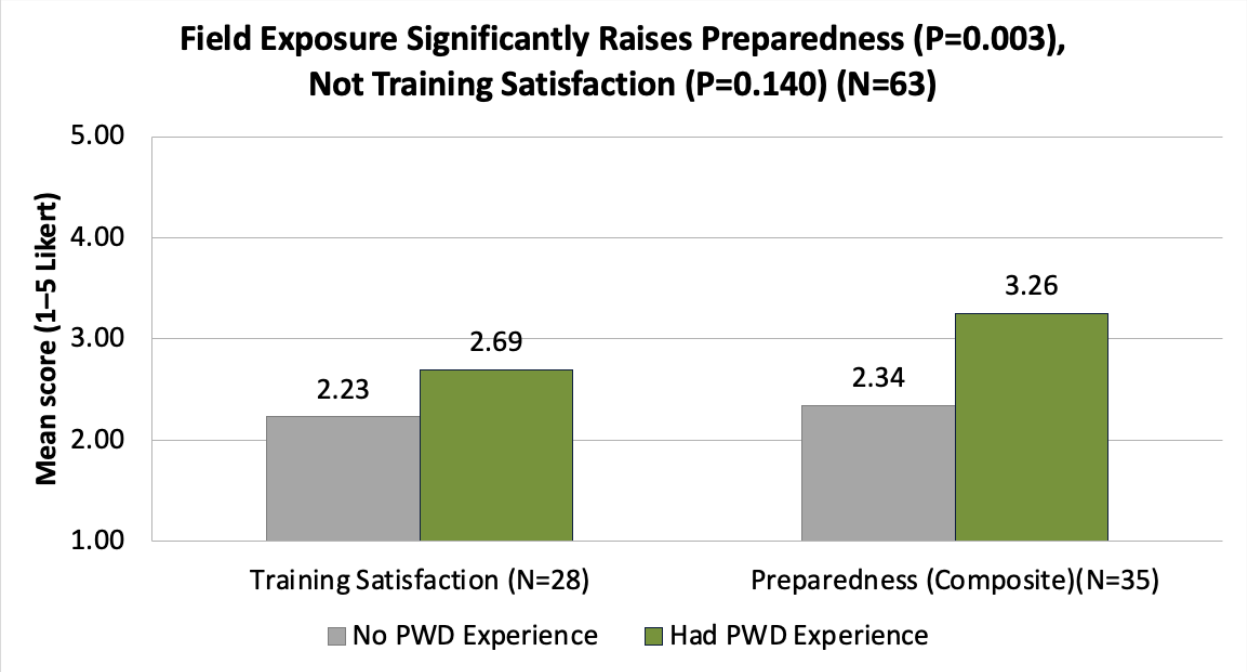

Figure 4.3: Field exposure significantly raises preparedness (p=0.003), not training satisfaction (p=0.140) (n=63).

As shown in the chart, responders who have responded to a PWD emergency rate their preparedness across all disability categories as 3.26 on the Likert Scale, a 39% rise from 2.34. Training satisfaction, by contrast, does not rise significantly with experience: it shifts only from

2.23 to 2.69 (p=0.14). The contrast is direct. Field exposure produces large, statistically robust gains in self-rated competence; the same exposure does not produce a corresponding rise in confidence that formal training was useful. The preparedness boost is not a delayed appreciation of curriculum content; it is something responders are building outside the curriculum.

Emergency responders articulated the same mechanism qualitatively, describing a close friendship with a blind person as the primary source of their adapted practice: "That made me think that these people may need more help and be more sensitive about this". Competence is real; the source is personal exposure rather than the curriculum. Taken together, the qualitative and quantitative findings deliver the chapter's evidence that preparedness is a result of field experience, both personal and professional.

4.2.3 Caregivers and Family Absorb What the System Cannot

Where improvisation and experience fall short, caregivers and family members are forced to fill that gap. While both groups described this as invaluable, neither described it as ideal. From the EMS perspective, the presence of a caregiver is a resource. One EKAB responder named the principle directly when describing how mobility impairment is managed in the field. Because the abilities of wheelchair users vary widely (many do not have control over any of their limbs or are unable to speak) direct communication between responder and patient is often complicated, and caregivers become a critical knowledge resource. The responder described a bedridden patient with spinal issues whose father directed all physical handling during transfer, because standard spinal positioning was inapplicable: "For a person who has a different set to their spine... there is no way you can have the natural procedure as is required, in general, to the general public - so you have to adapt". Unfortunately, in these cases, someone outside the formal response system steps in to do work the system itself is not designed to do.

Disability participants confirmed the same dependence from the receiving side, and described it in compatible terms, but with one decisive difference in framing. disability framing, when it surfaces, characterizes that same dependence as a loss of independence compensating for a system that should not require it. One deaf participant put this most directly in the context of emergency response: "I always need to have a hearing friend besides me to feel more safe and secure, but I really want my independence".

4.2.4 Section Conclusion

This section describes the current response systems that stand in place of designed systemic protocols. Improvisation of working from personal and professional disability experiences and reliance on caregivers is a flawed approach that results in variable outcomes and overreliance on caregiver support. These consequences are the predictable outcomes of a system that has never incorporated disabled individuals into its status quo. A design solution must therefore provide structured protocols that reduce dependence on improvisation, build disability competence directly into training scenarios, and reduce the burden placed on caregivers that the system currently places on them.

4.3 Communication Is the Primary Fault Line During Emergency Encounters

Communication frequently emerged as the largest factor shaping the perceived safety, effectiveness, and respectfulness across all disability groups interviewed. While participants often described responders as well-intentioned, they also repeatedly explained that responders defaulted to communication behaviors built around able-bodied assumptions. These behaviors

created additional barriers during emergency scenarios, further complicating high-stress and dangerous situations. Deaf individuals reported being excluded from communication regarding the scenario as responders defaulted to verbal communication and seemingly lacked the capability to communicate otherwise. Blind individuals also discussed being excluded from communication and reported that responders often failed to narrate situations to a degree that provided visually impaired individuals with a clear context of their surroundings. Additionally, mobility-impaired individuals discussed improper handling caused by responders failing to communicate prior to acting and emphasized the importance of proper communication in emergency scenarios. Communication failures are not isolated misunderstandings, but rather evidence of a systemic inability to address disability-specific needs.

4.3.1 Default Emergency Behaviors Escalate Disability Barriers

Disability participants describe a recurring set of responder behaviors after responders arrive on scene, and across interviews these behaviors connect to blanket assumptions regarding how deaf, blind, or mobility-impaired individuals communicate and respond during emergencies. Deaf participants described responders shouting, relying exclusively on verbal communication, or excluding deaf individuals from emergency conversations altogether. Several participants explained that responders often redirected communication toward hearing companions or caregivers rather than directly addressing the deaf individual themselves. Participants largely attributed these behaviors to nervousness and unfamiliarity with deafness rather than malicious intent as suggested by interviews with deaf individuals. However, despite the lack of harmful intent, these interactions often leave deaf participants uninformed, isolated, and unable to actively participate in their own care.

Blind participants described a parallel communication failure rooted in visual assumptions. Participants explain contacting services regarding cars blocking sidewalks and being asked for license plate numbers despite being blind: “Like, no. Of course not… Nobody really thought a blind person might call here”. Through several interviews, blind participants described situations where responders or medical personnel rely on visual information without recognizing that blind individuals could not access those references. Participants additionally described medical procedures being performed without verbal explanation, creating confusion regarding their surroundings, treatment, and level of danger during emergency situations. These accounts consistently emphasized that responders often assumed visual orientation and awareness unless explicitly corrected.

4.3.2 Responders Recognize Training Deficiencies but Underestimate Communication Failures

Communication failures emerged across nearly every disability interview conducted during this study. However, survey findings suggest that responders do not consistently recognize communication as a major barrier during emergency encounters. This disconnect reveals an important distinction between acknowledging that communication training is insufficient and recognizing communication itself as one of the most significant factors shaping disability-related emergencies.

When responders were asked in interviews whether current training adequately prepares them for disability-related communication barriers, their responses strongly aligned with the perspectives described throughout disability interviews. Survey findings reinforced this idea as most respondents rejected the narrative that current training adequately addresses disability-

related communication challenges, while only a small minority strongly agreed with it. Responders therefore broadly recognize that communication-related preparation within current EMS systems is insufficient.

However, when respondents were instead asked to identify which challenges commonly arise during disability-related emergencies, they ranked communication substantially lower than evacuation-related concerns. Survey responses show that professional EMS responders identified evacuation barriers as the largest issue by a large margin. Responders treated communication as comparatively less urgent. This contrast reflects a large difference between Greek EMS personnel and individuals with disabilities, as communication consistently dominated disability interviews across all three disability groups. This suggests that responders recognize the ineffectiveness of communication training, but often perceive physical extraction, transportation, and evacuation as more immediate concerns during real emergency scenarios.

The relationship between communication preparedness and field exposure reinforces the nature of this issue. Preparedness generally increases alongside field experience, but long-term exposure did not eliminate criticism of communication-related training deficiencies. Instead, the most experienced responders often became the strongest critics of current communication preparation. This suggests that field experience increasingly reveals the limitations of existing training systems rather than resolving them, contrary to common beliefs among EMS professionals. Together, these findings indicate that communication failures are not isolated interpersonal misunderstandings, but recurring structural weaknesses embedded within responder training itself.

4.3.3 Disabled Participants Identified Clear, Teachable Alternatives

For individuals within the Deaf community, participants emphasized that communication is entirely possible when responders establish visual engagement and approach patiently. A gentle shoulder or upper-back tap was repeatedly identified as the appropriate way to gain a deaf individual's attention rather than grabbing, shouting, or approaching unexpectedly. Deaf individuals explained: "A simple tap that we use on the back of our shoulder to attract a deaf person so that he can turn and communicate. But the thing we never want someone to do is just grab us and put us where he wants". Participants also identified proper lighting, face-to-face orientation, direct eye contact, and patience as essential practices because visual communication, lip-reading, and sign language all depend on maintaining clear visual access.

Blind participants similarly emphasized the importance of continuous narration throughout emergency encounters. Participants repeatedly explained that responders should verbally describe surroundings, explain procedures before performing them, and continuously communicate what is happening during treatment or evacuation. Blind individuals described previous medical encounters in which procedures were performed without explanation, emphasizing the importance of responders "being quite talkative" so that blind patients can understand what is happening, what is expected of them, and what will happen next. Participants additionally identified guide techniques as baseline competency responders should understand when assisting blind individuals during emergencies.

Mobility-impaired participants emphasized communication and adaptive handling procedures. Participants repeatedly explained that responders should ask prior to physically assisting patients, communicate regarding transfer techniques, and avoid assuming that a single handling method applies universally. Because mobility impairments vary significantly between individuals, participants emphasized that responders should rely on patient instruction and

caregiver knowledge whenever possible. EMS personnel independently reinforced this point, repeatedly describing caregivers as invaluable sources of information regarding communication methods, transfer procedures, and physical limitations during emergencies.

The same broader finding emerged within disability interviewees: the solutions already exist within disabled communities. The issue is not that effective disability-inclusive communication practices are unknown, but rather that these practices remain largely unknown to responders because they are rarely incorporated into formal training systems. Participants described these strategies as simple, teachable, and highly adaptable to realistic emergency scenarios. This shows promise in the ability to teach these within a gamified training format.

4.3.4 Section Conclusion

Together, these findings demonstrate that communication failures undermine disability-inclusive emergency response not because responders intentionally disregard disabled individuals, but rather because current systems fail to provide structured disability-specific communication preparation. Disability participants identified communication as a central element to safety, independence, and effective care in emergency response. In contrast, responders themselves acknowledged that current training is insufficient in tackling these challenges. At the same time, participants repeatedly identified clear, teachable communication practices capable of significantly improving emergency encounters when responders apply them during training and operational scenarios. Communication failures stem less from malicious intent than from the absence of structured disability-specific preparation, making adaptive communication one of the most addressable gaps identified throughout this study. These findings directly reinforce the need for realistic, scenario-based training environments that allow

responders to practice adaptive communication under operational pressure before encountering these situations in real emergencies.

4.4 Effective Disability-Inclusive Training Must Be Co-Participatory, Scenario-Based, and Disability-Specific

Training reform is not just a curriculum problem, but rather a design process problem. Survey and interview data converge on three points that, taken together, structure this section. Current training oversimplifies disability through unrealistic simulations, obscuring the true challenges individuals with disabilities face in emergencies. Both EMS professionals and disabled participants agree that effective training must be scenario-based and co-designed with individuals of the disabled community using realistic conditions and real participants with disabilities. Disability is not monolithic, and training must reflect its internal diversity to be genuinely effective across different impairment types and needs.

4.4.1 Participants Reject Simplistic Disability Simulations

Both EMS professionals and disabled participants criticized simplified disability simulations during interviews, as oversimplifying disability challenges often degrades realism within scenarios. Blindfold exercises are the most frequently discussed example, as several interviewees with disabilities explain that briefly blindfolding a sighted participant does not meaningfully simulate blindness because blind individuals develop long-term adaptive skills and environmental awareness that sighted participants do not possess. Additionally, these practices are conducted in hyper-controlled and adjusted environments, removing real-world challenges individuals with visual impairments must overcome. Instead, blindfold simulations often produce panic and confusion rather than genuine understanding.

Participants also warned that oversimplified simulations risk shifting attention away from the disabled individual's experience and toward the discomfort of the trainee. While some participants acknowledged limited value in perspective-taking exercises, the broader consensus was that effective disability-inclusive training should focus on improving emergency decision-making and adaptive communication rather than attempting to temporarily recreate disability itself.

4.4.2 Both EMS and Disabled Participants Favored Scenario-Based Training

Scenario-based, co-participatory development is the primary alternative discussed in both EMS and disability interviews. This is largely because it provides EMS responders the opportunity to perform their professional role in tandem to actual participants with lived disability experience as opposed to non-disabled trainees attempting to simulate an impairment. One interviewee with blindness described this as "possibly the only kind of simulation that could work… [using the] simulation of an experience where the person needing help is blind or disabled in the other way." Another individual from the disability community further endorsed this approach, elaborating on the importance of having both sides play their prospective role to fill potential knowledge gaps and address optimal strategies. Teaming individuals with disabilities with first responders provides an opportunity to model real-scenarios and co-develop important training. The survey data confirms this preference is not only widespread but also grounded in experience. Among 63 surveyed first responders, roughly 90% believe scenario-based training is more effective than traditional based instruction. Additionally, 82% of responders are very open to scenario and gamification approaches to learning, and up to 95% report that they are likely to actively participate within gamified training. Most responders

already have some experience with scenario-based training, as 58.3% are drawing on prior simulation experience when they say so.

What respondents found valuable in those prior experiences points directly to design requirements. Across 60 respondents, 88% identified realistic scenarios as the most helpful aspect, 77% team coordination practice, 68% time pressure and stress simulation, and 63% use of realistic equipment. Emergency rescue interviewees' description of HRT training illustrates why this combination works: scenarios involving fake blood, distracting sounds, deliberately misleading information from actors, time constraints, and restricted terrain. These elements mimic real world scenarios and provide a sense of realism. Additionally, mistakes are largely treated as learning rather than failure because it models for a real high-pressure environment without consequence. These scenarios produce the kind of adaptive decision-making that real emergency encounters demand. One responder puts it simply: "Keep it simple. This is the idea, especially for first responders."

However, absence is the largest finding among co-development training. Among the 15 respondents who reported prior simulation experience, all previous exercises were concentrated on disaster, mass-casualty drills, and search-and-rescue scenarios. None of which placed any emphasis on deaf, blind, or mobility specific scenarios. This absence illustrates the lack of disability preparedness gap documented throughout this chapter. The scenario infrastructure that exists has never required a responder to communicate with a disabled participant under operational pressure.

Thus, training development must be co-participatory to address the issues created by simplifying disability challenges. Both EMS personnel and disabled participants identified that realistic disability-inclusive training requires direct collaboration with individuals with lived

disability experience rather than relying on outside assumptions. One EMS responder describing a 2.5-year EMS program with only a 6-month practical term, argued that any disability subject should be "taught in cooperation with disability associations, so that they would provide them with all their knowledge". Participants explained that co-participatory development improves training realism, reduces the oversimplification of disability issues, and ensures that training reflects the communication barriers, environmental challenges, and adaptive decision-making encountered during real emergencies.

4.4.3 Disability Is Internally Diverse and Training Must Reflect That

Disability participants repeatedly explained that individuals within the same disability group often possess very different needs, framing blanket assumptions as a major driver of the communication failures and improper treatment described throughout this chapter. One interviewee with visual impairments explained that blindness exists across a spectrum: “Around 80% of people who are considered legally blind do actually have some functioning vision. So it’s actually quite a minority, that is, totally blind.” Deaf participants similarly distinguished between sign language users, cochlear implant or hearing aid users, lip-readers, and elderly deaf individuals, emphasizing that “the deaf community as a whole are [not] the same people that have the same communication needs”. One deaf participant from interview further explained that written communication is not a universal fallback method, noting that not all hard of hearing individuals can speak, and not all can write. Participants emphasized some individuals also experience dyslexia or concentration-related disabilities. Together, these accounts demonstrate that disability-inclusive emergency response cannot rely on rigid or universalized assumptions and instead requires adaptive communication strategies capable of responding to highly individualized patient needs.

Participants identified adaptive practices that account for this diversity and described them as straightforward rather than overly complex. Participants continually emphasized that responders should avoid making assumptions and instead communicate with the patient or caregiver before acting to understand the individual's communication preferences, handling requirements, and specific support needs. One mobility impaired interviewee explained that no universal method of assisting individuals with disabilities exists, as proper care depends heavily on the individual and the situation itself. These adaptive behaviors are specific, teachable, and already well understood within the disabled community. The issue is not that these practices are unknown, but rather that their EMS training has not adequately incorporated them into responder training.

4.4.4 Section Conclusion

Overall, the findings within this section demonstrate that improving disability-inclusive response is not simply a matter of adding more disability content into existing EMS curriculum but rather redesigning how disability training itself is approached. Both EMS professionals and individuals with disabilities consistently identified current training methods as unrealistic, oversimplified, and insufficient for preparing responders to navigate real disability-related challenges during emergencies. Participants repeatedly emphasized that effective disability-inclusive training must be scenario-based, co-participatory, and developed directly alongside individuals with lived disability experience to ensure realism and practical applicability. Survey findings further reinforce this preference, as responders overwhelmingly supported realistic simulations, team-based decision-making, and high-pressure scenario training over traditional lecture-based instruction. At the same time, disability participants continually explained that disability is not monolithic, and that communication methods, mobility needs, and adaptive

strategies vary significantly between individuals, even within the same disability group. Because of this, participants emphasized that responders must avoid rigid assumptions and instead learn adaptive communication and patient-centered decision-making practices that account for individual needs. Together, these findings illustrate that disability-inclusive EMS training must depart from abstract or generalized representations of disability and implement realistic, collaborative, and disability-specific learning experiences grounded in the perspectives of the disabled community itself.

4.5 Discussion

The findings addressed within this chapter demonstrate widespread failures within emergency response care by investigating the unintended impacts of current systematic inaccessibility and follow the progression of consequences resulting from a lack of disability-accessible training. Structural barriers within communication techniques, physical infrastructure, and poor training environments force first responders to compensate through improvisation, reliance on past field experience, or overly depend on caregivers to provide effective care. The current model of emergency procedure is largely insufficient and requires specialized disability-accessible training to address major inconsistencies within communication, equitable care techniques, and general rescuer awareness of disability-related needs.

The major theme within all four findings is an apparent reliance on luck within disability-related emergencies. Disabled individuals often rely on luck because emergency systems themselves rely on informal adaptation rather than structured preparation. Scenario outcome is heavily dependent on whether responders possess prior experience, whether caregivers are available, or if improvised communication methodology withstands time constraints or scenario

pressure. Both first responders and individuals of the disabled community continue to operate within systems lacking consistent institutional support.

4.5.1 Design Implications

These findings inform the design requirements for our gamified training program. Our training prototype design targets the failures identified throughout this chapter through realistic scenarios, adaptive communication mechanics, teamwork-centered decision-making, and stakeholder co-design as learning opportunities for EMS responders. By transforming systemic failures into structured learning experiences, our gamified training aims to reduce responder reliance on improvisation and strengthen disability-inclusive emergency preparedness within Greek EMS systems.

Several design constraints shaped the development of our gamified training prototype presented in Chapter 5. Responders consistently described disability response as situational and highly individualized, which required the training to emphasize the use of flexible procedures and non-universal solutions as opposed to blanket or rigid correctness. The training required scenarios to emphasize adaptive decision-making, communication, and collaboration under pressure. Additionally, both EMS and disability participants criticized unrealistic simulations, necessitating scenarios that stakeholders informed and that reflect real-life experiences rather than abstract representations of disability. Responders' reliance on improvisation and caregiver support demonstrates the educational base needed to prioritize practical, field-relevant problem solving over lecture-based instruction alone.

5.0 Design of DART

Based on the team's findings, the project established four primary design requirements:

1. The training must simulate realistic emergency scenarios that reflect conditions encountered in Thessaloniki
2. Communication must serve as a central component of decision-making
3. The game must incorporate consequence-based learning to improve learning retention
4. The design must be low-cost, technically viable, and potentially implementable within current EMS training environments

These requirements guided the subsequent design decisions and served as the criterion for the evaluation of potential training formats. The result of this process is the Disability-Accessible Response Training (DART).

5.1 Scenario Design and Decision Framework

To design the emergency scenarios for our game, the team focused on translating real-world challenges into structured training experiences. The team drew from the stories and experiences that we learned from interviews for DART's scenarios. We designed each one to target a specific disability group and associate barriers. Each scenario contains an element of urgency, but not so dire that the learned communication methods would have to be skipped or rushed. This increases the intensity, while permitting time to instill good practices. Throughout each scenario, players determine how to maintain safety while initiating interaction, establishing trust, and gathering information without increasing patient stress.

The first scenario developed is an apartment fire in an adjacent flat. The fire is quickly spreading, and EMS services evacuate a wheelchair user. The team chose the combination of this scenario with mobility impairment because interviewees from EKAB expressed the challenge of navigating someone with a mobility impairment is common within their work. Players must navigate decisions relating to stair access, transfer techniques, and coordination with caregivers or other responders.

The second scenario created is a motor vehicle accident. This accident involves a deaf person and focuses on initial communication and patient engagement. This relays interview findings in which deaf individuals described EMS personnel ignoring them and subjecting them to ineffective communication methods such as shouting, not respecting personal space, or speaking when turned away from them. This scenario also describes other good practices in detail, such as how to most effectively converse with someone who can read lips.

Our third evacuation scenario involves a blind individual during a house flood. Players must guide the patient through an unfamiliar and potentially dangerous environment via clear and continuous communication. It presents essential guide techniques and establishes and maintains trust, specifically with a blind person, within an emergency scenario. This aligns with findings that blind individuals often experience disorientation when responders rely on visual cues and aim to teach guide techniques as a proper method of assistance.

This design intentionally avoids presenting disability response as a fixed set of rules. Instead, it emphasizes patient-centered decision making, flexibility, and adaptability. This is critical given the large variability within disability groups, where individual needs often differ significantly on a case-by-case basis even within the same category of disability.

5.2 General Design

As previously discussed, the team decided on a scenario-based card format for DART. To design the game cards, the team utilized the website Canva. The website's intuitive layout and capabilities made the cards presentable and distinct. Each card has a color-coded border corresponding to its specific scenario. A code containing a letter and a number (i.e. A1) is at the bottom left of each side card, on both sides. The letter matches the scenario of the card, while the letter corresponds to the stage of that scenario. The fire scenario has a red border and an A code; the vehicle accident has a green border and a B code. The flood incident has a blue border and a C code. There are two types of cards: **situation** cards (Figure 5.1) and **choice** cards (Figure 5.2). **Situation** cards are signified by white backgrounds and black text, while **choice** cards have black backgrounds and white text. **Situation** cards have instructions on the bottom right, directing the players to the next set of cards. The back of each **choice** card shows the result of that choice and instructions for where to proceed. Examples of a **situation** card and **choice** card are shown below.

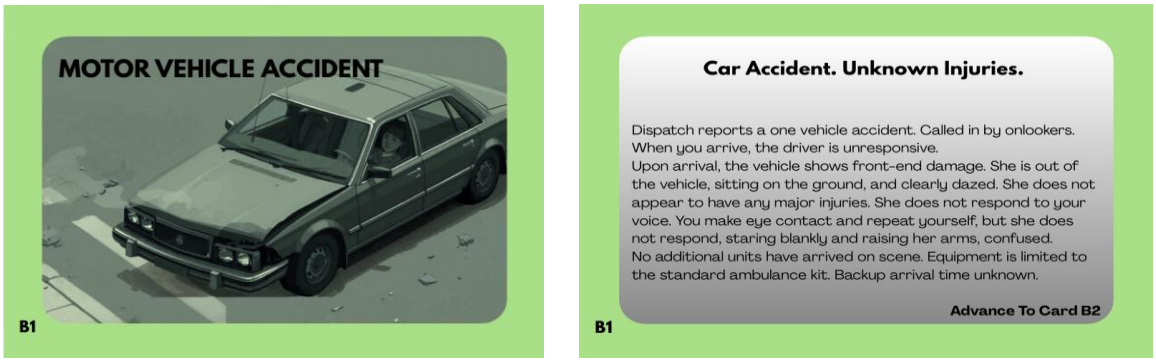

Figure 5.1: The front and back of card B1, the first **situation** card of the vehicle accident scenario.

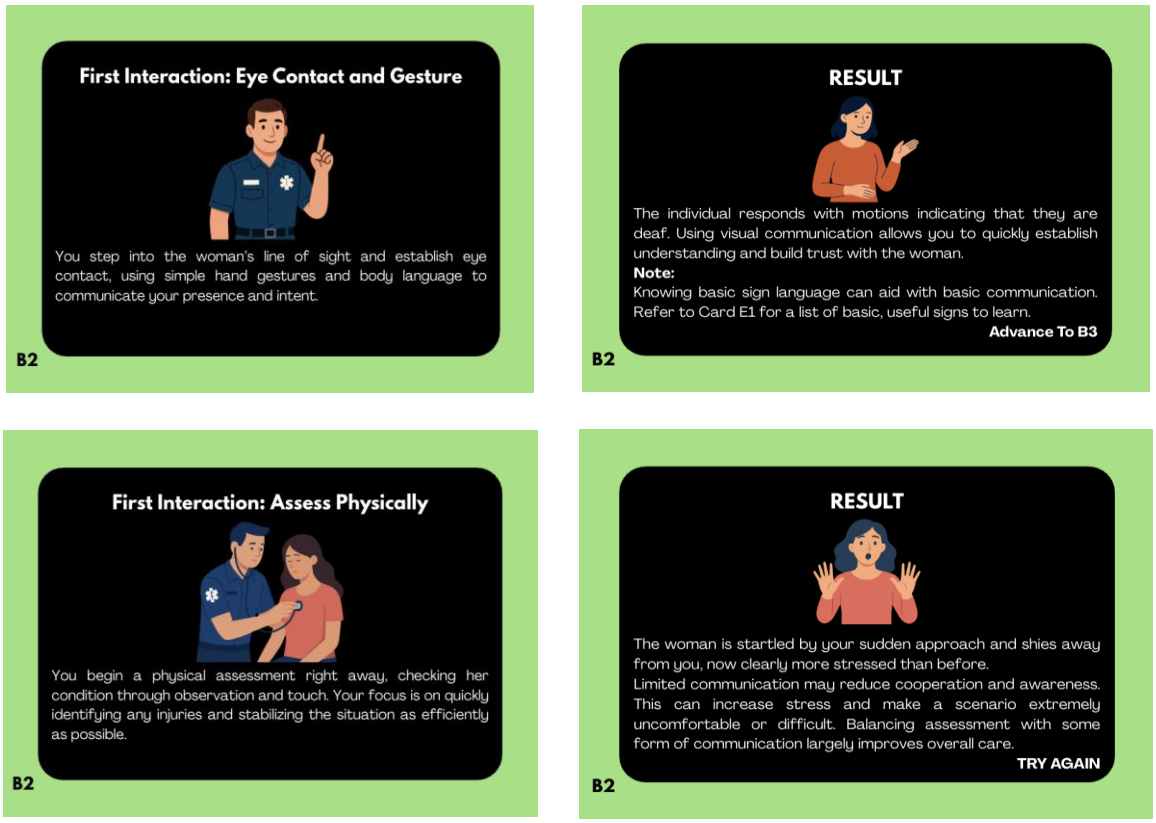

Figure 5.2: The front and back of two of the **choice** cards in B2, outlining a correct and incorrect option. The back of each card is the "**RESULT"** side, shown in the title of the card.

5.3 Game Structure and Core Mechanics

Appendix M contains the rules for the game. This is a team-based discussion interactive game as players play in a team of 2-5 players and discuss scenarios as cards direct the player to follow a path of new cards. We chose a team-based structure to reflect the size of the real organization of EMS personnel crews.

To play, players select one of the three scenarios as a group. The first card of every scenario is a **situation** card, containing important details for players to refer to later. Players read the card and discuss the situation. The team advances by picking up a set of **choice** cards. Each **choice** card in a set signifies an option for the players to choose. The group, upon picking these

up, will then pause to discuss the best option between them. Rather than offering clear correct or incorrect decisions, the team intentionally designed the **choice** cards to reflect the ambiguity of a real-world emergency. This approach encourages critical thinking and prevents players relying on memorization. It also reinforces the importance of adapting communication strategies based on the individual's needs. Once a **choice** card has been chosen, the players turn the card corresponding to their decision to see the **result**. The **result** side of the card describes situation changes because of that choice and instructs the players to either try again or continue to another card set. This structure strengthens consequence-based learning as well as mistake analysis, two high-impact elements described in both literature and the decision matrix. By linking actions to outcomes, the system employs cause-and-effect relationships and improves long-term retention. Players follow the chain of cards until a scenario is complete, pausing at each step to discuss their choices. When a team of players finish a scenario, the team is directed to a final scenario card that overviews the important lessons within the game and promotes discussion among the team.

This design utilizes a feedback method that does not punish mistakes. While players are not punished for incorrect decisions, they are encouraged to revisit scenarios and explore alternative outcomes. This approach reflects experiential learning principles and supports deeper understanding through reflection rather than punishment. The team intentionally built repeatability into the system, allowing users to replay scenarios and refine their decision-making over time.

The overall structure emphasizes communication as the central objective. Nearly all decisions require players to consider how they interact with the individual, rather than focusing solely on medical procedures. This directly addresses the gaps discussed within the Findings

chapter, where communication failures appeared as the primary source of negative patient experiences.

5.4 DART Pilot Feedback

Overall, the test group supported the game and its format. They contributed several ideas for the game. This includes developing separate versions of the game with different difficulty levels for trainees with varying levels of experience. They believed the flood scenario to be the least difficult and the motor vehicle accident to be the most difficult. The vehicle crash received special praise for presenting the players with extensive options and containing the added element of a second passenger that needed help. The **choice** cards in that scenario presented the players with a difficult decision. The test group spent over 30 minutes discussing the second question in particular (B3). One test player, a trainer with HRT, requested a copy of the game to teach trainees in the nearby peninsula of Khalkidhiki.

The test group also provided valuable insight into real EMS procedures that would better inform our game. During the fire scenario, a card describes the hypothetical EMS personnel as carrying the wheelchair user down the stairs using a rescue sled, as his spouse carries a foldable manual wheelchair *behind* them. They clarified that this was unsafe and would never happen, because if the spouse tripped, they could fall into the EMS group and the man, causing lots of bodily injury. Another suggestion was to be more specific within the exact questions that EMS should ask during communication, rather than simply focusing on the method and recipient of said communication. That specific scenario utilizes communication as a broader step in comparison to individualized conversation. The test group also identified issues with the Greek

translations of the cards and the images used. Our team updated all corrections to our game and provided HRT with a final copy.

6.0 Recommendations

6.1 Build Formal Partnerships Between EMS Agencies and Disability Groups

EMS groups and disability support groups both benefit from building relationships with one another. Interviews with EMS agencies and participants with disabilities clarified that both groups have limited contact with one another. Each group independently expressed a desire to confer with the other several times. Multiple EMS interviewees and survey participants stated receiving input from individuals with disabilities would be a valuable addition to any training. Other interviewees stated an effective disability-inclusive confidence building method is to interact with individuals of the disabled community and learn throughout the experience. This relationship provides disability groups a format to directly communicate their needs and experiences with EMS personnel, providing agencies the opportunity to gain experience interacting with the disabled community.

Across our findings, both Disability and EMS stakeholders consistently addressed the disconnect between their groups and expressed their desire to collaborate on disability inclusive education. Responders stated that disability content should "be taught in cooperation with disability cooperations" so that they could understand disability experiences from direct perspectives. Facilitating this relationship fosters a more complete understanding of the needs of disabled individuals in emergency scenarios.

6.2 Addition of More Scenarios into DART

The team recommends developing additional scenarios. EMS interviewees and survey responses emphasized including "real situations" in a hypothetical game. Our team drew from

real interviewee stories and survey findings for these three situations. However, there are plenty more stories and experiences that the game could represent and use as teaching experiences. Increasing the number of scenarios would increase the game's educational capacity. EMS interviewees highlighted that the landscape of their work is constantly changing, as new medical situations rise and fall in number of occurrences. As such, a major priority of the team was to ensure Accessible Limitless Living can easily iterate upon and develop new gamified training situations as they collect new data. As the team finalizes the format of the game, we recommend that Accessible Limitless Living continue developing it.

6.3 Creation of a Voluntary Disability Database for EMS Use

Several interviewees, both EMS personnel and those with disabilities, expressed a need for a database that provides EMS agencies the ability to track individuals with disabilities that would require extra aid in case of an evacuation scenario. Firefighters communicated that some rural areas have such a list but have limited access to it if a disaster occurs. Waiting for this list takes valuable time that may affect a rescue. When asked about such a database, other agencies seemed unaware of any that currently existed but expressed interest in the idea. They believed that this list would be largely helpful in saving the lives of many who may not have the ability to evacuate themselves in the case of a disaster scenario, such as a large-scale earthquake or fire. Interviewees with disabilities agreed that such a list would be useful, solely if someone consistently maintains and updates it with new information. EKAB paramedics and doctors as well as paraplegic interviewees both independently express that this database and all information on it should be entirely voluntary and up to the individual to self-identify, to avoid sensitive privacy concerns.

7.0 Limitations

The central limitation of our project is connected to our data. The team believes our interviews and surveys may have benefitted from more variance within the landscape of the EMS agencies we contacted. Namely, we wished to interview more members of the local Hellenic Fire Brigade. While we spoke with a few members, this interview was largely informal and spontaneous. To fully understand their perspective, additional interviews may provide new-found information.

A secondary limitation in the team's data collection stems from the lack of variety from our survey participants. Connections allowed the EMS survey to reach throughout the ranks of the Hellenic Rescue Team. As a result, most survey responses come from that organization. While the team maintains the quality of data collected, diversification within our sources may have allowed for the consideration of more perspectives.

8.0 Future Research

Our team truly desires another team of researchers to continue upon the findings collected. Iteration presents the opportunity to add more content, situations, and perspectives. The gamified training program also maintains the potential to become digitalized to reach a wider scope of EMS systems. DART establishes a foundation to help increase disability awareness, provide equitable and accessible EMS response, and potentially save lives. Our research indicates that the disconnect between EMS and comprehensive care for those with disabilities is not an issue specific to Greek agencies alone. Future researchers are encouraged to promote the game through playtests with other EMS organizations in both Greek and non-Greek contexts.

9.0 Conclusion

This project illustrates that current EMS training methods for helping individuals with disabilities are fundamentally lacking. This problem burdens EMS responders with a nearly impossible challenge when first responders encounter individuals with disabilities in the field. This issue is amplified because of the large population of individuals with disabilities globally and Greece's own climate of disasters.

Communication lies at the focal point of the disconnect between EMS and people with disabilities. While EMS personnel frequently perceive physical evacuation as the primary challenge, individuals with disabilities consistently identify communication as the defining factor in determining safety, trust, and quality of care. Effective disability-inclusive care and treatment require not only technical skill, but the ability to adapt and collaborate with people. DART aims to teach these essential skills.

The development of Disability-Accessible Response Training (DART) is a result of a lengthy data-gathering process, comprising 90 survey responses and 20 interviews across EMS agencies and disability groups. DART is a gamified, scenario-based training program that educates EMS personnel techniques to best care for, accommodate, and communicate with individuals with disabilities. Our research illustrates that EMS agencies and workers prefer scenario-based learning. DART appeases this preference, providing EMS trainees with the opportunity to gain experience with realistic emergency scenarios involving individuals with disabilities. The selection of a card-based format further ensures accessibility, scalability, and ease of integration within existing EMS training programs, without requiring a significant technological investment. Initial testing with members of the Hellenic Rescue Team suggests this

approach is engaging and effective. Participants demonstrated high levels of discussion, critical thinking, and reflection throughout the game.

While the team designed this project in the context of Thessaloniki, its implications extend beyond Greece. The challenges identified are not unique to a single region but reflect broader issues within emergency response globally. Training models like DART offer a scalable and adaptable approach to addressing this need. DART lays a foundation for a broader movement to improve accessible and equitable care for individuals with disabilities and potentially save lives.

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Appendices

Appendix A: Survey Consent Form

We are students from Worcester Polytechnic Institute, Massachusetts, USA working with Accessible Limitless Living (ALL) to design gamified training for local EMS providers that strengthens their capacity to provide equitable care. We are conducting interviews to understand interactions between EMS and disabled individuals. This survey will take approximately 10 minutes.

Your participation is completely voluntary, and you may stop the survey at any time or refuse to answer any question. This survey is confidential—no names or identifying information will appear in any project reports or publications unless you have explicitly agreed to have your name published.

Should you have any questions or concerns upon completion of this survey, we can be reached at gr-all-d26@wpi.edu or through our advisors Melissa Butler (mbutler@wpi.edu) or Robert Kiniki(rek@wpi.edu). For more information about this research or about the rights of research participants, please contact Ruth McKeogh irb@wpi.edu.

By signing or typing your name below, this will be binding signature stating that you acknowledge that you have been informed about and consent to be a participant in the study described above. Please answer all questions to your satisfaction before signing.

You are entitled to retain a copy of this consent agreement.

_____ Date: _____

Study Participant Signature

_____ Date: _____

Signature of Person who explained this study

Appendix B: Interview Consent Form

We are students from Worcester Polytechnic Institute, Massachusetts, USA working with Accessible Limitless Living (ALL) to design gamified training for local EMS providers that strengthens their capacity to provide equitable care. We are conducting interviews in order to understand interactions between EMS and disabled individuals. This interview will take approximately 30 minutes.

Your participation is completely voluntary, and you may stop the interview at any time or refuse to answer any question that we ask. This interview is confidential—no names or identifying information will appear in any project reports or publications unless you have explicitly agreed to have your name published.

With your permission, we will be recording this interview and using the recording for transcription purposes.

Should you have any questions or concerns upon completion of this interview, we can be reached at gr-all-d26@wpi.edu or through our advisors Melissa Butler (mbutler@wpi.edu) or Robert Kiniki(rek@wpi.edu). For more information about this research or about the rights of research participants, please contact Ruth McKeogh irb@wpi.edu.

By signing or typing your name below, this will be binding signature stating that you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

_____ Date: _____

Study Participant Signature

_____ Date: _____

Signature of Person who explained this study

Appendix C: EMS Professional Survey Instrument

Section 1: Professional Background

C1. What is your primary professional role?

- ○ EMT
- ○ Paramedic
- ○ Firefighter
- ○ Dispatcher
- ○ Other: _____

C2. Years of EMS experience:

- ○ 0–2
- ○ 3–5
- ○ 6–10
- ○ 10+

C3. What is your approximate number of emergency responses involving individuals with disabilities:

- ○ None
- ○ 1–5
- ○ 6–20
- ○ 20+

C4. What situations do you most often find yourself responding to?

- ○ Earthquakes
- ○ Fires (Domestic or Wildfires)
- ○ Isolated Medical Emergencies
- ○ Other: _____

Section 2: Current Training and Preparedness

C5. Rate your satisfaction with your level of received formal training specific to assisting individuals with disabilities during emergencies (1 = No training/Not satisfied at all, 5 = Very satisfied)

C6. Rate your perceived preparedness to properly accommodate helping an individual with the following impairments(1 = Not prepared, 5 = Very prepared):

a) Mobility impairments

b) Blindness/low vision

c) Deaf/hard of hearing

C7. In your experience, what challenges commonly arise when assisting individuals with disabilities during emergencies? Check all that apply.

- ○ Individual is unable to safely and effectively evacuate themselves
- ○ You cannot communicate with the individual
- ○ Individual was unaware that an emergency was occurring
- ○ Other: _____

If you have no experience with this, check this space and then check all options that you think may occur.

C8. Current EMS training adequately addresses communication barriers:

- ○ Strongly agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly disagree

Section 3: Simulation and Gamified Training

C9. Have you participated in simulation-based EMS training?

- ○ Yes
- ○ No

C10. How open would you be to participating in disability-focused scenario-based training?

- ○ Very open
- ○ Somewhat open
- ○ Neutral
- ○ Somewhat hesitant
- ○ Not open

C11. In your opinion, how effective are simulation-based trainings compared to traditional lecture-based training?

- ○ Much more effective
- ○ Somewhat more effective
- ○ About the same
- ○ Less effective
- ○ Much less effective

C12. What aspects of simulation training help you learn the most? *(Select all that apply)*

- ○ Realistic scenarios
- ○ Time pressure or stress simulation
- ○ Team coordination practice
- ○ Immediate feedback or debriefing
- ○ Use of realistic equipment
- ○ Other_____

C13. If a training program used gamification elements (points, timed scenarios, performance feedback, etc.), how likely would you be to engage with it?

- ○ Very likely
- ○ Somewhat likely
- ○ Neutral
- ○ Somewhat unlikely
- ○ Very unlikely

C14. What characteristics would make such training realistic and useful? (Short response)

Appendix D: Semi-structured Interview Guide - EMS Professionals

Interview Opening Script

Thank you for agreeing to participate in this interview. This interview is part of a research study examining disability-inclusive emergency response training in Greece. Your participation is voluntary. You may decline to answer any question or stop the interview at any time.
With your permission, this interview will be audio recorded for transcription purposes. The recording will be stored securely and deleted after transcription. No identifying information about you will be included in any records of any kind. You may decline this recording if you choose to do so.

Do you consent to participate in this interview?

Do you consent to audio recording?

Interview Questions

Professional Context

D1. Please describe your current role in EMS.

D2. What scenarios do you most frequently encounter when working?

D3. Have you had any previous experience in disaster scenarios such as fires, earthquakes, or flooding?

D4. Have you had any previous experiences working with individuals with Disabilities?

Experience with Disability-Inclusive Response

D5. Can you describe an emergency response involving an individual with a disability?

D6. What challenges arose in that situation?

D7. Did you feel adequately trained to respond effectively? Why or why not?

Training and Preparedness

D8. What disability-related training have you received?

D9. Where do you see gaps in existing EMS training?

D10. How does time pressure affect inclusive response decisions?

Training Design Input

D11. What elements would make a training simulation or game realistic?

D12. What types of feedback would improve learning outcomes?

D13. Are there risks to consider when designing scenario-based training?

D14. What systems or methods do you currently use for learning?

Appendix E: Semi-structured Interview Guide – Individuals With Disabilities

Interview Opening Script

Thank you for agreeing to participate in this interview. This interview is part of a research study examining disability-inclusive emergency response training in Greece. Your participation is voluntary. You may decline to answer any question or stop the interview at any time.
With your permission, this interview will be audio recorded for transcription purposes. The recording will be stored securely and deleted after transcription. No identifying information about you will be included in any records of any kind. You may decline this recording if you choose to do so.

Do you consent to participate in this interview?

Do you consent to audio recording?

Lead Interviewer: _____
Secretary: _____
Supporter Role: _____ Name: _____
Supporter Role: _____ Name: _____
Supporter Role: _____ Name: _____

Interview Questions

Background & Context

E1. Can you briefly describe the type of disability or access needs you would like us to keep in mind during this conversation?
a. (Optional; allows self-identification)

E2. How comfortable do you generally feel seeking emergency help if needed?
a. Why or why not?

E3. Have you ever interacted with emergency medical services (EMS), such as paramedics, firefighters, or ambulance crews?

a. Could you please explain the situation?

Past Experiences

E4. Can you describe your experiences related to your disability in emergency or everyday situations?

a. Communication
b. Physical access
c. Feeling heard

E5. Can you describe any experiences you've had with EMS or emergency evacuation that stand out to you? During that experience, what aspects of the interaction worked well for you?

a. What challenges did you encounter?
b. What went well?
c. What could EMS have done better?
d. Did you feel understood by responders?
e. What kind of accommodations were provided?

Communication & Support Needs

E6. Are there any challenges you experience in your day-to-day life that you would like to share?

E7. What helped emergency responders communicate most effectively with you?

a. What worked? What didn't?

E8. Are there specific accommodations or supports that would make emergency situations easier or safer for you?

Training & Gamification Input

E9. What do you think EMS personnel most need to understand about assisting people with disabilities?

E10. If you were designing a training for EMS providers, what would you want included?

E11. Do you think practice scenarios or simulations would help responders prepare?

a. Why or why not?

E12. What behaviors or actions would build trust during emergencies?

E13. What mistakes should responders avoid?

E14. What elements would make a training simulation or game realistic?

E15. What types of feedback would improve learning outcomes?

E16. Are there risks to consider when designing scenario-based training?

E17. What systems or methods do you currently use for learning?

Appendix F: Post Training Evaluation Survey

Pre-Training Consent Language

You are invited to participate in a training evaluation study. Participation is voluntary. Responses will be anonymous. You may choose to stop the survey at any time.

☐ I consent to participate.

Pre-Training Items

Please respond to the following questions on a scale of 1-5 based on how much you agree with them. (1 = Strongly Disagree, 2 = Disagree, 3= Neutral, 4 = Agree, 5 = Strongly Agree)

F1. I am confident in responding to emergencies in which a person with a physical disability may be involved.

F2. I have knowledge of strategies relating to communicating with someone with a physical disability.

F3. I have taken extensive prior training relating to helping people with disabilities.

Post-Training Items

Please respond to the following questions on a scale of 1-5 based on how much you agree with them. (1 = Strongly Disagree, 2 = Disagree, 3= Neutral, 4 = Agree, 5 = Strongly Agree)

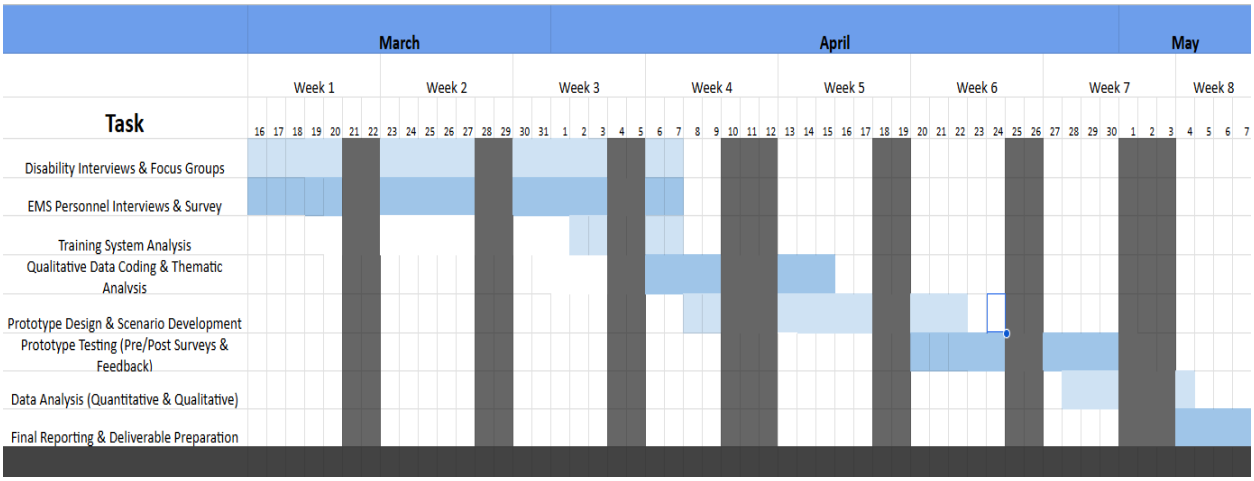
F4. The training improved my confidence in responding to emergencies in which a person with a physical disability may be involved.

F5. I found the scenarios presented in the training were realistic.

F6. I find the lessons taught in the training useful.

F7. The training improved my strategies for communicating with someone with a physical disability.

Appendix G: Project Timeline Gantt Chart



Appendix H: Table of Evaluated Articles

#	Source
1	Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.
2	Deci, E. L., & Ryan, R. M. (2000). Self-determination and intrinsic motivation in human behavior. Psychological Inquiry.
3	Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. Proceedings of the 15th International Academic MindTrek Conference.
4	Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. Simulation & Gaming.
5	Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. Proceedings of the 47th Hawaii International Conference on System Sciences.
6	Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. Computers & Education.
7	Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. Educational Researcher.
8	Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice Hall.

9	Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. Psychological Bulletin.
10	Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. Cognitive Science.
11	Przybylski, A. K., Rigby, C. S., & Ryan, R. M. (2010). A motivational model of video game engagement. Review of General Psychology.
12	Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. Personnel Psychology.
13	Turkay, S., & Kinzer, C. K. (2014). The effects of avatar-based customization on player identification in a video game. Games + Learning + Society Conference.
14	Wouters, P., van Nimwegen, C., van Oostendorp, H., & van der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. Journal of Educational Psychology.
15	Yee, N. (2006). Motivations for playing online games. CyberPsychology & Behavior.

Appendix I: Table of Interviewees

Interview ID	Interviewee	Category	Count
EMS-1	Thessaloniki Fire Station 3 - Officer	Firefighter	3
EMS-2	EKAB Professional	EMS Responder	3
EMS-3	EKAB Medical Doctor	Emergency Physician	1
DIS-1	Individuals with Hearing Impairments	Deaf	2
DIS-2	Individuals with Vision Impairments	Blind	3
EMS-4	Hellenic Rescue Team	EMS Administrator	2
DIS-3	Individuals with Mobility Impairments	Mobility Impaired	1
DIS-4	Individuals with Hearing Impairments	Deaf	1
EMS-5	Emergency Room Doctor	Emergency Physician	1
DIS-5	Individuals with Mobility Impairments	Mobility Impaired	2
EMS-6	EKAB Lieutenant	EMS Responder	1

Appendix J: Game Rules (English)

Teams:

- This game is meant to be played by teams of 2-5 people
- Your team will need to discuss all decisions chosen until you agree

How to Play:

1. Pick one of the situations with your team, signified by the border color and letter in the bottom left code.
2. Read the back of the situation card.
3. Move on to the next set within that situation. It will be shown by a matching color border and letter in the bottom left code. The number of that code will be "2". DO NOT VIEW ANY OF THE BACKS OF THE CARDS IN THAT SET YET.
4. If that set has a situation card, read that card. It will have a grey background and black text.
5. As a team, discuss from the "Player's Choice" cards in that set. These will be the cards with black borders and white text.
6. Make the decision out of the choice cards that your group feels is best.
7. Flip over your choice to learn the result of that decision. The bottom right will include instructions to either move on or return to your current set to choose again.
8. Discuss the results of your choice
9. Repeat steps 3-8 until you reach the final situation card. This means you've won the game! Read the card, then discuss the situation as a whole with your team. What did you learn? How might you have handled the situation in real life?

Appendix K: Κανόνες Παιχνιδιού (Ελληνικά)

Ομάδες:

- Αυτό το παιχνίδι προορίζεται να παίζεται από ομάδες 2–5 ατόμων.
- Η ομάδα σας θα πρέπει να συζητά όλες τις αποφάσεις μέχρι να καταλήξετε σε συμφωνία.

Πώς να παίξετε:

1. Επιλέξτε μία από τις καταστάσεις με την ομάδα σας, που υποδεικνύεται από το χρώμα του περιγράμματος και το γράμμα στον κωδικό κάτω αριστερά.
2. Διαβάστε την πίσω πλευρά της κάρτας της κατάστασης.
3. Μεταβείτε στο επόμενο σετ μέσα σε αυτή την κατάσταση. Θα υποδεικνύεται από το ίδιο χρώμα περιγράμματος και γράμμα στον κωδικό κάτω αριστερά. Ο αριθμός αυτού του κωδικού θα είναι «2». ΜΗΝ ΔΕΙΤΕ ΑΚΟΜΑ ΤΗΝ ΠΙΣΩ ΠΛΕΥΡΑ ΤΩΝ ΚΑΡΤΩΝ ΑΥΤΟΥ ΤΟΥ ΣΕΤ.
4. Αν το σετ περιλαμβάνει κάρτα κατάστασης, διαβάστε την. Θα έχει γκρι φόντο και μαύρο κείμενο.
5. Ως ομάδα, συζητήστε τις κάρτες «Επιλογή Παίκτη» σε αυτό το σετ. Αυτές είναι οι κάρτες με μαύρο περίγραμμα και λευκό κείμενο.
6. Επιλέξτε την απόφαση από τις κάρτες επιλογής που θεωρείτε καλύτερη ως ομάδα.
7. Γυρίστε την κάρτα επιλογής για να δείτε το αποτέλεσμα της απόφασης. Κάτω δεξιά θα υπάρχουν οδηγίες για το αν θα συνεχίσετε ή θα επιστρέψετε στο τρέχον σετ για νέα επιλογή.
8. Συζητήστε τα αποτελέσματα της επιλογής σας.

9. Επαναλάβετε τα βήματα 3–8 μέχρι να φτάσετε στην τελική κάρτα κατάστασης. Αυτό σημαίνει ότι κερδίσατε το παιχνίδι! Διαβάστε την κάρτα και στη συνέχεια συζητήστε συνολικά το σενάριο με την ομάδα σας. Τι μάθατε; Πώς θα χειριζόσασταν την κατάσταση στην πραγματική ζωή;

Appendix L: Game Cards

English: https://canva.link/o9nnpie6ug2hxdp

Greek: https://canva.link/jj6mnxdxc5vz2g1

Appendix M: Full Interview Transcripts

https://docs.google.com/document/d/19jnYO4rRi_MlH9Qdmr5IbgTlce3rAQf3shSmtVEroHo/edit?usp=sharing