

**Accessible Limitless Living: Designing a
Gamified Training Program for
Disability-Inclusive EMS Response
3/7/2026**



WPI

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**Accessible
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1.0 Introduction

Emergency Medical Services (EMS) organizations execute critical, high-stakes missions across the globe during medical situations, natural disasters, and other emergencies. However, despite the technological advances in rescue training procedures, EMS training often fails to prepare its responders to serve the community of individuals with disabilities (Wolf-Fordham et al., 2014). Providing quality care to individuals with blindness, deafness or mobility impairments 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 national disasters occur at a high frequency (Kalogiannidis et al., 2024). For example, in 2023, wildfires in and around Athens burned more than 173,000 hectares of land across Greece (Kalogiannidis et al., 2024). In the context of disaster response, emergency response services are unprepared to care for people with disabilities. Existing emergency protocols assume that victims can communicate and respond via visual and auditory cues, and that they have full physical mobility (Proulx, 2002). If responders have not undergone disability-inclusive training and participated in scenario-based experiences that mirror these real-world experiences, it is unlikely that their instinctive reaction will yield a positive outcome (Pérez et al., 2014).

Gamification effectively improved healthcare outcomes, while simulation-based learning studies showed significant increases in learning outcomes (Morse et al., 2019). These studies 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 address gaps in their knowledge and prove practices before they apply it in the real world (Zhang et al., 2025). Due to the dynamic and result-oriented nature of emergency response, this form of training has the potential to be incredibly valuable. By integrating disability-inclusive scenarios into EMS training, responders can encounter situations in a controlled environment that simulate live emergencies.

In order to successfully implement this approach, our team collaborates with Accessible Limitless Living (ALL), a nonprofit organization in Greece dedicated to advancing accessibility and equal opportunity for individuals with disabilities. ALL works within disabled communities to identify the systemic barriers and promote inclusive changes. The organization brings valuable knowledge of the disability landscape in Thessaloniki, which grounds our project in local, lived experiences. Their input ensures that our training scenarios reflect real disaster experiences and that our project promotes equitable treatment of disabled patients.

The goal of this project is to design a gamified training scenario for Thessaloniki EMS providers that builds awareness of disability-inclusive response challenges and strengthens their capacity to deliver equitable care. This goal will be accomplished through the following objectives:

1. Identifying current EMS training methods.
2. Identifying perspectives from individuals with disabilities.
3. Designing an initial gamified disability training prototype for EMS personnel.
4. Evaluating the initial serious game

2.0 Background

This chapter examines the needs of persons with disabilities in Greece, and the barriers surrounding disability inclusive emergency response. Section 2.1 investigates the frequency and disparities of natural disasters in Greece, such as earthquakes and wildfires, which place immense pressure on national emergency systems. Pressure on EMS personnel is even worse when they must deal with the specific barriers of evacuating people with disabilities. A broad analysis of the incomplete infrastructure of emergency response systems with heightened risks during a crisis identifies the current gaps within Greek Emergency Medical Services.

To address these deficiencies, Section 2.4 evaluates current EMS practices and Section 2.5 explores options to address potential knowledge gaps in training by exploring gamification and situation-based approaches to learning. Ultimately, this research synthesizes these challenges to assist the team in proposing a gamified training to assist in creating accessible EMS systems capable of supporting persons with disabilities in emergency disasters. Through this research, the section identifies an opportunity to strengthen disability awareness and training in Greece.

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 hot and dry summers. In addition to this, the United Nations has recorded that 30% of Greece is covered by forests. These factors combined make the area particularly susceptible to wildfires (Kalogiannidis et al., 2024). In addition to this, the rugged mountains that cover Greece make for rocky terrain, obstructing firefighters and making rescues/firefighting difficult for EMS personnel. An 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. Research states that some Greek citizens feel a moderate or smaller earthquake as often as every 2-3 days (Kouskouna et al., 2004).

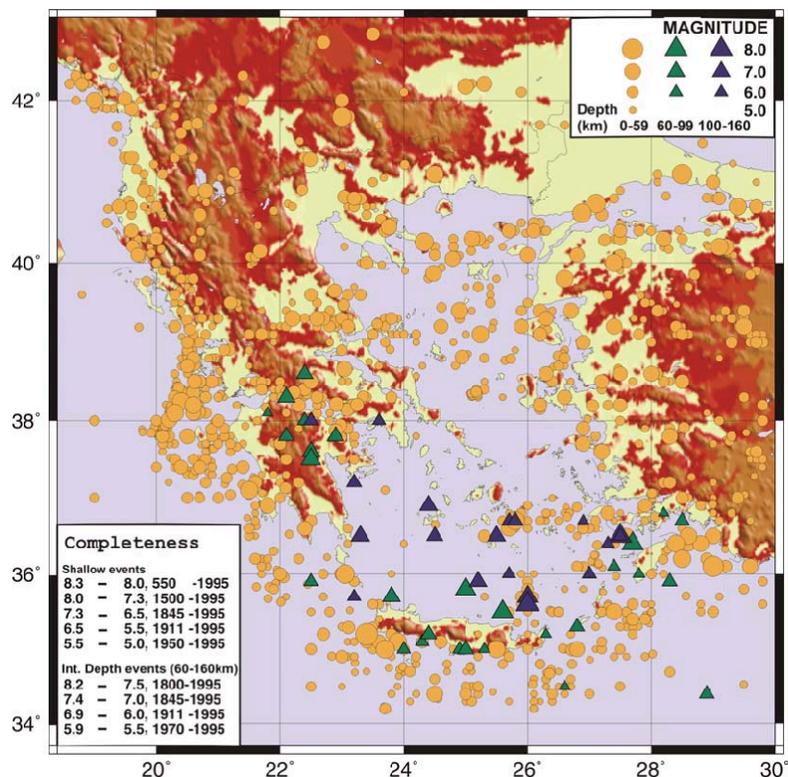


Figure 2.1: Map of Seismic Activity in Greece (Skarlatoudis et al., 2004)

2.1.2 The Challenges of Evacuating Individuals with Disabilities

When fires and earthquakes occur, evacuating individuals with physical disabilities provides difficult challenges. Emergency services often rely on communication and the evacuee's own physical capabilities during evacuations. Depending on their disabilities, these capabilities may be hindered and must be accommodated if the person is to be kept safe.

Disabilities may prevent individuals from evacuating a dangerous situation safely (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 similarly 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 lack of knowledge of an emergency or inability to follow evacuation routes. In each of these cases, people with disabilities may be unable to safely and confidently evacuate dangerous areas. As such, implementing inclusive strategies that cater towards people who may not be able to evacuate themselves in an emergency situation is paramount.

2.2 Disability Barriers

2.2.1 Defining Disability

Public health frameworks defined 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 become more and more frequent (Beller, 2020). As disabilities become more frequent, ways of life need to become more accessible in order to accommodate these increasing numbers. Individuals with disabilities are disproportionately affected by disasters, recording a mortality rate two to four times higher than that of people without disabilities (Castro et al., 2016). People 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). Emergency communications and access to information must therefore be multimodal.

2.2.2 Communications Barriers

Qualitative research has 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 (Improving Emergency Response, 2024). This includes simple accommodations 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. Such misunderstandings can affect the care and safety of all individuals involved.

2.3 Emergency Preparedness and Structural Exclusion

2.3.1 General EMS Theory

There are four “phases” when it comes to emergency prevention: mitigation, preparedness, response, and recovery (Herstein et al., 2021). Mitigation is the prevention and reduction of an emergency situation before it happens. An example of this in the case of forest fires would be awareness campaigns and controlled burns to reduce the severity and likelihood of a fire. Preparedness is staying ready for the emergency, such as maintenance of EMS machinery and training first responders. Response is the reaction once an emergency occurs, for example the mobilization of first responders and evacuation of civilians. This is the most time-critical phase. Recovery is the relief effort once an emergency has passed, for example rebuilding wrecked buildings and healing injured victims.

2.3.3 Typical EMS Strategy for Accommodating Disabilities

When it comes to helping victims with disabilities, work must be done on the preparedness and response stages. In preparedness, EMS agencies train personnel on techniques and devices that effectively aid disabled individuals. The current state of such training is inadequate, as shown by a higher casualty rate among disabled populations in past disasters, such as the 2017 Pohang earthquake (Park et al., 2019). In response, time is key. A quicker EMS response drastically improves the survivability of a situation (Newgard et al., 2010). A delayed response can also tie up resources and personnel, delaying valuable aid to others who may be in need. A challenge that comes with accommodating disabilities in the preparedness and response stages is the broad and inexact nature of the word “disability”. The term is not consistently and definitively defined across emergency response (Hostetter & Naser, 2022). This causes EMS personnel to be ill equipped to handle the variety of disabilities they may encounter.

2.4 The Greek Emergency Training Gap

2.4.1 Insufficiency of Current EMS Training

In Greece, policymakers recognize disability-inclusive disaster preparedness at the policy level, but implementing authorities maintain weak operations, indicating a structural training gap for first responders (Pikoulis et al., 2024). This 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). The European Center for Forest Fires conducted a recent inclusive evacuation exercise at the National Confederation of Persons with Disabilities in Athens, which further exposed the need to better train Greek civil protection actors in disability-specific techniques (European Center for Forest Fires (ECFF), 2023). Officials from the General Secretariat for Civil Protection even noted the necessity to “train the actors involved in techniques, behaviors, and equipment” for evacuating buildings where people with disabilities are present (ECFF, 2023). Taken together, the data suggest that Greece's EMS landscape is fragmented, often leaving staff unprepared to operationalize inclusive guidelines in real incidents (Press et al., 2021).

2.4.2 Impact of Limited Training

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 emergency situations, which persist despite formal legal protections (Pikoulis et al., 2024). The Athens multi-hazard evacuation drill demonstrated how training gaps translated into operational risks (ECFF, 2023). The exercise produced recommendations for continuous staff training, improved self-protection guidelines, and systemic involvement of people with disabilities in evacuation planning. Greek initiatives suggested that structured, disability-focused education can measurably enhance knowledge and preparedness, but these initiatives currently function as isolated projects rather than embedded standards within EMS training systems (ECFF, 2023; Wolf-Fordham et al., 2014).

2.5 Gamification and Scenario-Based Training for Emergency Response

Creating emergency response training requires considering the many 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 we must design games with their purpose in mind to ensure features align with outcomes. Games must preserve the serious attitude and high-stress nature of emergency response utilizing gamified mechanics, while providing genuinely useful feedback and information.

2.5.1 Distinguishing Gamification from Serious Games

The use of games in emergency and medical contexts has potential to trivialize critical health situations. We can address this concern by making the distinction between games, gamification, and serious games. We define gamification as “the use of game design elements in non-game contexts” (Deterding et al., 2011, p.2), while serious games are fully developed games that address serious situations. Utilizing elements of games, such as timers, goals, progress indicators, and other elements present in games, allows the creator to mimic real experiences, without accidentally creating a “playful” setting that could trivialize training. While gamefulness refers to challenges bound by rules, playfulness emphasizes exploration and improvisation (Deterding et al., 2011), which does not simulate EMS experiences. Professional responders are bound by strict rules and consequences, which is consistent with the gameful 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)

2.5.2 Gamification as Structured, Non-Trivial Training

It has been shown that gamification on its own is not necessarily effective, and that its impact on a person's learning depends on the unique blend of features and metrics utilized by the training (Koivisto & Hamari, 2019). While most gamification studies do report positive results, a significant section of studies either have mixed results or do not evaluate their work to a level of scientific significance (Koivisto & Hamari, 2019). Those that do evaluate their work often rely on purely engagement metrics as a measure for success, but Koivisto deems that approach to be flawed. He asserts that the productivity of learning outcomes is dependent on the features included in the study, and backs this up with several scientifically founded studies on the impact of specific features on cognitive responses. This forms the basis for our understanding of gamification. It shows the necessity of selective choice of game features to fit the scenario's needs in order for a gamified experience to be successful. These features belong to two categories; game mechanics, which describe what the system actually 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, and avoids unproductive systems.

2.5.3 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

Figure 2.4: 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,p. 374

As shown in figure 2.4, each element can be mapped 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.

2.6 Inclusive Design and Stakeholder Engagement

Effective training is primarily dependent on how the training process is developed, delivered, and evaluated, rather than the technology used 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). Successful training is strengthened when designers factor inclusivity into the development of the training product, gamified scenario, or simulation. 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). Working with stakeholders better reflects the actual constraints experienced on the job and minimizes unintended knowledge gaps in training. Considering stakeholder input also tends to replicate the fast-paced environment often encountered during emergencies. Participants reported that game designs that include “rapid decision-making, team communication, and time-sensitive critical care actions” closely resembled real emergency scenarios (DiCesare et al., 2025).

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 which 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). Kalender et al. (2023) further discuss the capabilities of participatory interview guide development, expanding upon improved data quality and collection. The article addresses

common issues regarding power imbalance and unexamined assumptions that can skew or degrade the quality of the collected data. 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; Haring 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 prior to a training's full implementation. Embedding feedback loops throughout the development process creates opportunities to better position training programs and address real operational challenges rather than theoretical scenarios.

Effective training is frequently a result of stakeholder involvement, as well as the terms in which inclusivity is addressed throughout its creation. The mechanism of delivery is often less important to the success and training retention of a training system. Stakeholder collaboration, professional co-development, and inclusive design are essential elements of training systems that can provide effective and equitable emergency care.

2.7 Identifying Opportunities for Intervention

Current literature highlights a potential gap within emergency response systems. While EMS professionals are expected to provide equitable and effective care to individuals with diverse disabilities and access needs, existing training often fails to adequately prepare them for these situations. Heydari et al. (2024) states that traditional teaching approaches “primarily focus on instructor-based learning, where learners are expected to listen passively to the content provided by the teacher. This approach often results in less interactivity and engagement in the learning process.” This shortcoming is due to how training is designed, delivered, and evaluated. Hence, inequitable outcomes continue to occur despite advances in medical knowledge and emergency technology.

Traditional EMS education prioritizes clinical procedures and strict protocol adherence, as opposed to demonstrating on-site challenges responders may encounter. Difficulties in communication barriers or environmental limitations are infrequently addressed, and can result in catastrophic or 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. Heydari et al. (2024) attest to game-driven learning and gamification representing effective training practices. These approaches often provide fast-paced environments that mimic real encounters and promote active engagement, repetition, and authentic problem-solving.

Existing literature links gamified or simulation-based training to improved participant performance within high-pressure situations. Heydari et al. (2024) note, “Game-based learning and gamification significantly improved scores in written, oral, and electronic exams assessing

knowledge, skills, clinical reasoning, and judgment among EM residents.” Gamified training enables first responders to practice contextualized decision-making in both controlled and low-stakes settings. While few studies examine how these training approaches translate to individuals with disabilities, simulations or gamified approaches to training provide instant and honest feedback. This can quickly develop technical and teamwork skills before difficult encounters due to the nature of repeatability. Harring et al. (2023) and DiCesare et al. (2025) discuss the frequency at which simulation-based and gamified training improve performance metrics. In addition, gamified training increases confidence and collaboration, and supports stress regulation in emergency scenarios. In a study by Kotb et al. (2025), participants reported increased self-confidence, improved teamwork, and enhanced communication skills following gamified simulation-based education.

Emergency systems often lack the mechanisms to provide adequate training to assist professional emergency services when encountering individuals with disabilities. The absence of specialized training implies a gap in disparate medical services and disability-inclusive care. Developing gamified training through co-development and inclusive creation offers an opportunity for intervention. Evidence suggests that gamified training may increase both equitable first responder care and emergency medical response preparedness.

3.0 Methods

The goal for this project is to design a gamified, scenario-based training for local EMS providers that raises awareness of the challenges surrounding disability inclusive emergency response and strengthens the capacity of EMS providers to deliver equitable care. This goal aims to be accomplished via:

1. Identifying current EMS training methods
2. Investigating Disability Perspectives Regarding EMS Personnel
3. Developing a Disability-Focused Serious Game in EMS Contexts
4. Evaluating the Initial Serious Game Prototype

The team will complete this project in Thessaloniki, Greece, from March 15th, 2026, to May 7th, 2026. This study focuses on the intersection of EMS, specifically firefighters and EMTs, and individuals with physical disabilities, such as mobility impairments, blindness, and deafness. Being the most prominent types of disasters in Greece, our project will focus on evacuations necessitated by fires and earthquakes, which will establish specific boundaries for our training requirements. Due to a lack of material directly addressing disability inclusive response in Greece, our project aims to bridge the gap between frontline medical necessity during emergencies and accessible treatment for all people. Our findings will define the requirements for a gamified training experience tailored to the unique challenges of the Greek emergency landscape.

3.1 Evaluating the Experience of Emergency Medical Service

Professionals

The first objective of this research is to establish a baseline of the current training protocols and operational procedures utilized by EMS in disasters involving people with disabilities. Our team will identify gaps in medical education and response strategies, employing a multi-method approach utilizing surveys and semi-structured interviews to ensure a holistic understanding of the EMS landscape in Thessaloniki.

3.1.1 Initial Surveys

In an attempt to maximize data collection, the team will distribute surveys to different local EMS departments to quantify their experiences and interest in gamified or simulation-based learning. The team will also ask several of these departments for comments and potentially quantifiable statistics to develop an understanding of the frequency and severity of these issues.

3.1.2 Interviews with EMS Professional

Our team will interview active Thessaloniki EMS personnel about their training and experiences responding to emergencies involving individuals with disabilities. Interviews will be set up by our sponsor, ALL. Before the interview begins, interviewees will be asked to sign a consent form (Appendix B) to establish a safe communication environment for both parties. The team will utilize semi-standardized interviews, as this kind of interviewing permits questions to flow more naturally and allows respondents to delve into their own personal experiences in an attempt to build a descriptive context (DeJonckheere, 2019). Questions will pertain to the current level of disability training that EMS professionals have in Thessaloniki and any prior emergency experiences with people with disabilities (Appendix B).

3.2 Investigating Disability Perspectives Regarding EMS

Personnel

The second objective is to determine the challenges individuals with disabilities face during emergency evacuations in Greece and how these challenges may shape their needs, expectations, and experiences with EMS personnel. Engaging with individuals who may have previous experiences in emergency scenarios, the team aims to identify these unmet needs, barriers, and opportunities to improve EMS response. This objective compliments the interviews in objective 1, which are focused on EMS provider experiences by ensuring training recommendations properly reflect the interests of the community the gamified training is intending to serve.

3.2.1 Interviewing: Community Perspectives on EMS Interactions

Our team is interested in interviewing individuals with blindness or low vision, deafness or hard of hearing, or those who are physically impaired. These populations commonly face well-documented communication or mobility barriers during emergency evacuations that directly affect the capability of EMS interaction and response. We will reach participants through the project sponsor, ALL. The opportunity to hear from individuals who have been directly impacted by disasters will provide critical insights into the difficulties individuals may encounter in terms of accessibility or communication barriers. To directly support this objective, interview questions will focus on participant's lived experiences with emergency response and evacuation. For example, participants will be asked about challenges they might have faced navigating the environment during an emergency, barriers they encountered when communicating with EMS

personnel, and whether first responders demonstrated a foundational understanding of their specific accessibility needs. Additional questions will invite individuals to express what aspects of the interactions were most helpful, what barriers remain unresolved, and what changes they believe will improve future emergency medical response. Understanding previous difficulties and encounters is vital to the success of our gamified training, as it provides an accurate reflection of the difficulties that commonly occur, and addresses a realistic depiction of issues that have not been considered in previous training.

The interviews will last 30 minutes and explore participant's experiences and anticipated challenges in emergency contexts, including barriers and challenges with the built environment, interactions with medical professionals, and any experiences they have with natural disasters or emergency evacuations (Appendix C). If participants are willing, they will be invited to reflect on any prior interactions with EMS personnel in times of crisis. The team understands these topics are sensitive, and are opting for semi-structured interviews to gauge comfort levels amongst questions, providing a space for participants to speak about past difficulties without being overly intrusive (Kalender et al., 2023).

The team will conduct interviews in pairs with one team member asking questions and the other team members recording the interview with consent and note-taking to ensure accurate information. Interviewees will be asked to sign consent forms prior to the interview to ensure all parties understand the general structure of the interview and their rights within it.

To minimize potential distress associated with discussing prior emergency evacuation or encounters with EMS personnel, the team will implement several countermeasures to prevent participant discomfort and limit the risks of emotional distress within the interview process. Interview questions will be broad and non-assumptive, allowing participants to self-disclose

information that they are comfortable sharing. Consistent with Hall et al. (2025), participants may also bring supporters, interpreters, and translators to assist during the interview. Throughout the session, interviewers will monitor for signs of emotional distress and will offer the participant the ability to pause, take breaks, or discontinue the interview as necessary. These measures are intended to minimize the emotional risk while maintaining a supportive interview environment.

3.3 Developing a Disability-Focused Serious Game for EMS

In preparation for the creation of this new game, the team has conducted an analysis of gamification case studies and examples. To begin this process, the team searched through several online databases for examples of gamification and serious games. These examples covered multiple topics and formats, not just EMS. The team decided this was necessary in order to learn about more potential formats and strategies for serious game creation. Our research in the background chapter demonstrated that well designed gamified scenarios can improve learning outcomes in emergency responders, and therefore the design of the training prototype must be informed by well established gamification principles and scenario based learning examples. The table below lists the games that the team has completed study on.

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 3.3.1: Games Analyzed in Preparation for Development

Our design process will not only utilize successful elements from other gamified experiences, but will also draw upon the principles of Self-Determination Theory (SDT) in order to address key drivers of intrinsic motivation. These principles will guide our team in its selection of game mechanics to specifically support the needs of competence, autonomy, and relatedness throughout our gamified experience. Our team will identify the psychological need that each included element meets in order to ensure our game covers all needs. For example, progress indicators and structured feedback indicators may be used to support the need for competence, while scenario-based decision making will support the need for autonomy in response strategy choice. Attending to these needs will allow our team to create the immersive experience we are looking for.

The team will be using a top-down, iterative approach to the creation of this game, following design methodology presented by Zhang et al. (2025). Our exploration phase is in progress, having researched serious game methodology and psychology, but we still need to complete the localized site research. Initial design will be focused on the game’s most general features, such as the broad format and teaching goals. As our research has indicated, training

programs that are developed with the input of our stakeholders are more likely to reflect the real challenges faced by both emergency responders and individuals with disabilities. This content will largely come from the research conducted in sections 3.1 and 3.2. As an educational game, hypothetical situations may be presented to the player. These must be grounded in reality, so the responses and shared experiences learned in 3.1 and 3.2 will inform the problems presented by the games and their solutions. Then, after these are established, the team will move onto more specific aspects in our design phase, like the format specifics and feedback systems. From our research, our team has identified three potential gamified formats, of which we will either mirror or utilize elements of in the design of our prototype. These formats will be chosen and adjusted based upon what best meets our needs after our interviewing steps have been completed. We will then move to Zhang's assessment phase, detailed below.

3.4 Testing of the EMS Serious Game

Once an initial prototype of the serious game is playable, the game prototype will enter the preliminary evaluation phase of development of a serious game designed to support disability-inclusive emergency response training. The prototype will be developed iteratively, utilizing all insights gained throughout the interview and development stages of the project. Our first step of revision will be directly with ALL, in which we will provide them a sample demonstration of our game and receive feedback such that we can adjust before applying in the field. This feedback step allows us to ensure that our project has the capacity to meet their expectation in the field, and also allows for their input.

In the second phase, a small group of EMS personnel will participate in a test of the game. The project sponsor, ALL, will provide these participants. Each player will take part in the test with full knowledge that their doing so is entirely reliant on their consent. They will each be made aware that they may remove themselves from the testing at any time if they choose. Consistent with the gamification principles in Section 2.5, the prototype will include structured scenarios that require participants to make decisions in simulated emergency situations involving individuals with disabilities. These scenarios may involve challenges such as navigating communication barriers with individuals with disabilities, or adapting evacuation strategies for individuals with mobility impairments, or other disability-inclusive emergency response scenarios.

Our team will be present at the test of the serious game to facilitate the game, answer questions, and potentially act as “judges” if that version of the game requires it. The team will also be present to perceive the level of involvement and amount learned from the game by its participants. Team members will note these factors and administer a brief survey, an early draft

of which is included in Appendix A. All willing participants will take part in surveys before and after testing to measure the game's effectiveness. Questions in this survey will pertain to knowledge retained from the game. After surveys and knowledge retention quizzes are complete, the team will evaluate the results and make changes to the game in order to increase its effectiveness. We will propose these revisions to our sponsors in order to improve the realism and instructional value of the game. This iterative process allows the prototype to evolve in response to feedback from all of our stakeholders, including our sponsors, ensuring that the final training design accurately utilizes principles of gamification and meets the needs of EMS professionals.

3.5 Ethical Considerations

Throughout the duration of this project, the team will engage individuals of the disabled community and EMS professionals. Discussions may involve discussion of sensitive topics, and therefore, we must design our research processes intentionally to avoid ethical issues. Prior to any research being conducted, participants will be provided with a clear consent agreement that outlines the implications of their contribution. Participation in all research activities will be voluntary, and consent may be withdrawn and the interview may be paused at any time.

Given that both disability and emergency response experiences may be of a personal or stressful nature, our group will maintain sensitivity towards participants and ensure that interactions maintain an even power dynamic. Participants will have complete control of interview content, pacing, and depth. We will emphasize mutual respect.

All collected personal information will be removed before analysis to protect participant anonymity. All quotations will not identify individuals, and all data will be provided in aggregate form. These practices ensure that our research maintains trust and respect and that our findings will represent participants' lived experiences in a safe and professional manner.

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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

- A1.** What is your primary professional role?
- EMT
 - Paramedic
 - Firefighter
 - Dispatcher
 - Other: _____
- A2.** Years of EMS experience:
- 0–2
 - 3–5
 - 6–10
 - 10+
- A3.** What is your approximate number of emergency responses involving individuals with disabilities:
- None
 - 1–5
 - 6–20
 - 20+
- A4.** 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

- A5.** 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)
- A6.** 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

- A7.** 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.

- A8.** Current EMS training adequately addresses communication barriers:
- Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree

Section 3: Simulation and Gamified Training

- A9.** Have you participated in simulation-based EMS training?
- Yes
 - No
- A10.** How open would you be to participating in disability-focused scenario-based training?
- Very open
 - Somewhat open
 - Neutral
 - Somewhat hesitant
 - Not open
- A11.** 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

- A12.** 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_____
- A13.** 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
- A14.** 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

- B1.** Please describe your current role in EMS.
- B2.** What scenarios do you most frequently encounter when working?
- B3.** Have you had any previous experience in disaster scenarios such as fires, earthquakes, or flooding?
- B4.** Have you had any previous experiences working with individuals with disabilities?

Experience with Disability-Inclusive Response

- B5.** Can you describe an emergency response involving an individual with a disability?
- B6.** What challenges arose in that situation?
- B7.** Did you feel adequately trained to respond effectively? Why or why not?

Training and Preparedness

- B8.** What disability-related training have you received?
- B9.** Where do you see gaps in existing EMS training?

B10. How does time pressure affect inclusive response decisions?

Training Design Input

B11. What elements would make a training simulation or game realistic?

B12. What types of feedback would improve learning outcomes?

B13. Are there risks to consider when designing scenario-based training

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

- C1. 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)

- C2. How comfortable do you generally feel seeking emergency help if needed?
 - a. Why or why not?

- C3. Have you ever interacted with emergency medical services (EMS), such as paramedics, firefighters, or ambulance crews?
 - a. Could you please explain the situation?

 - b.

Past Experiences

- C4.** Can you describe your experiences related to your disability in emergency or everyday situations?
 - a. Communication
 - b. Physical access
 - c. Feeling heard

- C5.** 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

- C6.** Are there any challenges you experience in your day-to-day life that you would like to share?

- C7.** What helped emergency responders communicate most effectively with you?
 - a. What worked? What didn't?

- C8.** Are there specific accommodations or supports that would make emergency situations easier or safer for you?

Training & Gamification Input

- C9.** What do you think EMS personnel most need to understand about assisting people with disabilities?

- C10.** If you were designing a training for EMS providers, what would you want included?

- C11.** Do you think practice scenarios or simulations would help responders prepare?
 - a. Why or why not?

- C12.** What behaviors or actions would build trust during emergencies?

- C13.** What mistakes should responders avoid?

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)

- D1.** I am confident in responding to emergencies in which a person with a physical disability may be involved.
- D2.** I have knowledge of strategies relating to communicating with someone with a physical disability.
- D3.** 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)

- D4.** The training improved my confidence in responding to emergencies in which a person with a physical disability may be involved.
- D5.** I found the scenarios presented in the training were realistic.
- D6.** I find the lessons taught in the training useful.
- D7.** The training improved my strategies for communicating with someone with a physical disability.

Appendix G

Project Timeline Gantt Chart

