

ESCAPE:

Preparing healthcare professionals for cyberattacks



Material for learners

*Gamification and Serious Games for Cybersecurity
Awareness and First Responders Training: An Overview*

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<i>Gamification and Serious Games for Cybersecurity Awareness and First Responders Training: An Overview</i>	
Language	English



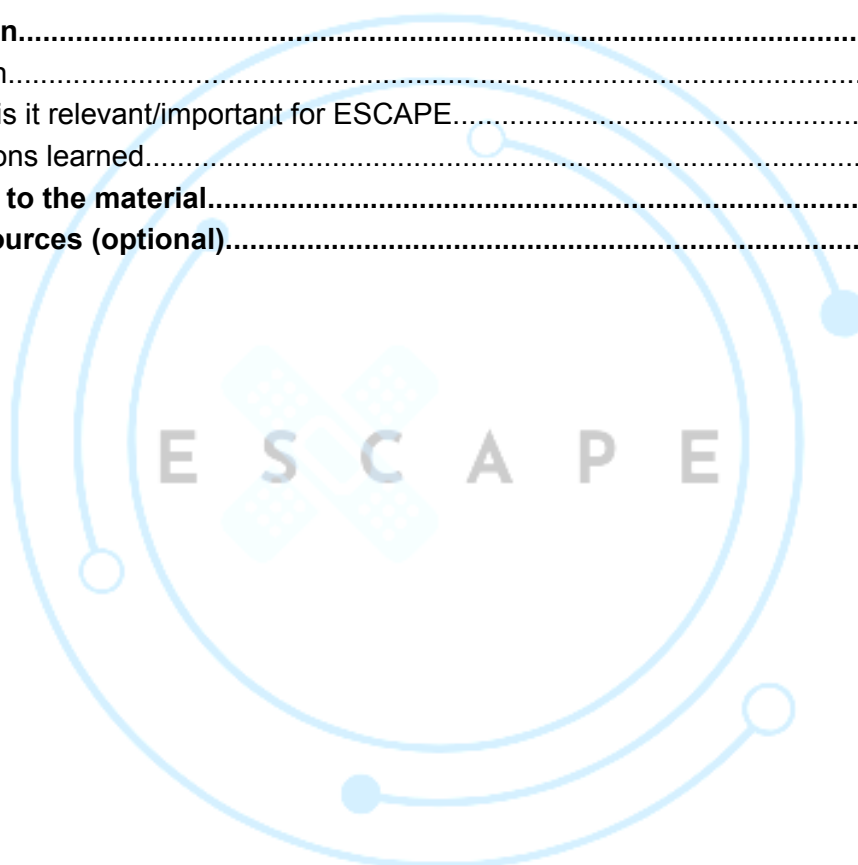
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1. Name of the material and description

This is a literature review titled “*Gamification and Serious Games for Cybersecurity Awareness and First Responders Training: An Overview*”. It's a comprehensive preprint (TechRxiv, April 2023) that surveys scholarly work on cybersecurity awareness training methodologies, frameworks, and serious games specifically tailored for the general public, organizations, and first responders. The paper emphasizes how gamification—using game elements in non-game settings—can improve engagement, enjoyment, and security outcomes by encouraging users to think about security concepts rather than relying on rote memorization.

2. Classification

Category	Mark if applies
Sector	<input type="checkbox"/> Healthcare <i>(all materials focusing specifically on the healthcare sector)</i>
	<input type="checkbox"/> General public <i>(materials targeting citizens but that are considered useful and relevant for working with the students and for the professionals, these tend to be more generic materials not targeting a specific sector)</i>
	<input type="checkbox"/> Other <i>(other materials considered relevant event though targeting a specific sector, for instance a company, but that are considered relevant for learning about cybersecurity and data protection)</i>
Topics covered	<input checked="" type="checkbox"/> Cybersecurity
	<input type="checkbox"/> Data protection
Situation type	<input checked="" type="checkbox"/> Prevention
	<input type="checkbox"/> Impact (i.e. when it is occurring or has occurred) on patient care. <i>(e.g. direct treatments, medicine distribution, etc.)</i>



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	<input type="checkbox"/> Impact on all other activities not involving direct patient care. (e.g. recording data, lab tests, etc.)
Language of the original materials	<input type="checkbox"/> Dutch
	<input checked="" type="checkbox"/> English
	<input type="checkbox"/> German
	<input type="checkbox"/> Italian
	<input type="checkbox"/> Spanish
Type of the material	<input type="checkbox"/> Guidelines or manuals
	<input type="checkbox"/> Case or examples
	<input type="checkbox"/> Training courses
	<input checked="" type="checkbox"/> Others

3. Description

This is a literature overview resource that maps out the state of the art in gamified cybersecurity awareness and first responder training approaches.

3.1. Origin

- **Authors:** Zisis Batzos, Theocharis Saoulidis, Dimitrios Margounakis, Eleftherios Fountoukidis, Elisavet Grigoriou, Achilleas Moukoulis, Antonios Sarigiannidis, Athanasios Liatifis, Paris-Alexandros Karypidis, Stamatia Bibi, Adam Filippidis, Ioannis Kazanidis, Sokratis Nifakos, Timo Kasig, Mohammad Heydari, and Haralambos Mouratidis.
- **Publication:** Preprint on TechRxiv (April 2023), licensed under Creative Commons Attribution 4.0 (CC BY 4.0)



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3.2. Why is it relevant/important for ESCAPE

- Highlights how integrating **game elements** (points, challenges, narratives) can significantly improve cybersecurity awareness training, making learning more interactive and thought-provoking.
- Covers a broad audience—**public, organizational staff, and first responders**—making it highly adaptable to various ESCAPE target groups.
- Provides a **research-backed basis** for developing or selecting gamified training tools rather than reinventing from scratch.

3.3. Lessons learned

Literature review insights:

- **Introduction:** *Identifies the limitations of traditional awareness training—such as repetitive, memory-based methods—and promotes gamification as an effective alternative to foster cognitive engagement.*
- **Target group:** *Broadly applicable to any learners—including first responders dealing with rapid, high-stakes decision-making environments.*
- **Risks addressed:** *Overcoming disengagement, improving retention, and avoiding complacency or rote behavior in cybersecurity practices.*
- **Solutions proposed:** *Apply serious game mechanics to create motivation, learning through doing, and realistic scenarios where user decisions have visible outcomes.*
- **Tips & tricks for implementation:**
 - *Begin with clear learning goals; match game mechanics (e.g., scoring, levels, feedback loops) to educational objectives.*
 - *Use real-world scenarios to contextualize threats—especially relevant for first responders or emergency services.*



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- *Evaluate effectiveness by measuring not just enjoyment but also behavior and knowledge retention post-training.*

4. Direct link to the material

<https://www.techrxiv.org/doi/full/10.36227/techrxiv.22650952.v1>

5. Other resources (optional)

- **Complementary literature reviews** on gamification in cybersecurity education (e.g., Gwenhure & Rahayu, 2024, systematic review on non-IT professionals) [SciSpacemiosht.usim.edu.my](https://www.techrxiv.org/doi/full/10.36227/techrxiv.22650952.v1).
- **Implementation examples:** Serious games like Cyber Suraksha or tabletop card-based tools that illustrate practical deployment of gamification elements in training modules

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