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Innovative tools in OSH info-training: Inail-Dimeila case studies on road safety and climate change

Manchester, 09/10/2025

Conclusion

Heat Stress digital serious game

Road safety immersive tools



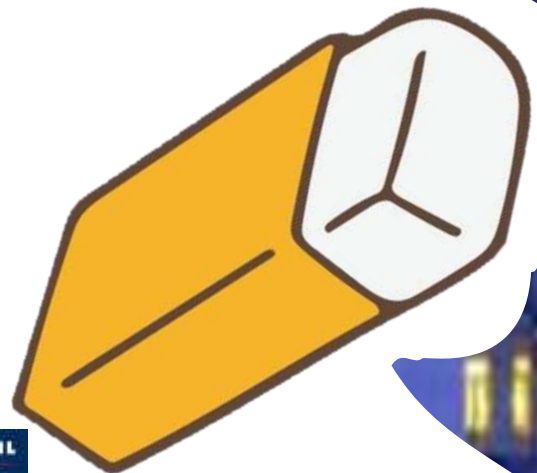
**Framework
Road Safety
Heat stress**

**Material and
methods**



**DID YOU
KNOW?**

**IN THE WORLD
every year....**



Road traffic accidents are a public health and occupational health and safety problem:

- **>1,15 million deaths** by year
- **More than 100 million injuries** by year
- **8th cause of death** in the world population (superior to HIV)
- **1th cause of young people** deaths
- Road traffic crashes cost most countries **3% of their gross domestic product** (GDP)



2/3 of road traffic fatalities occur among people of working age (18–59 y.o.)

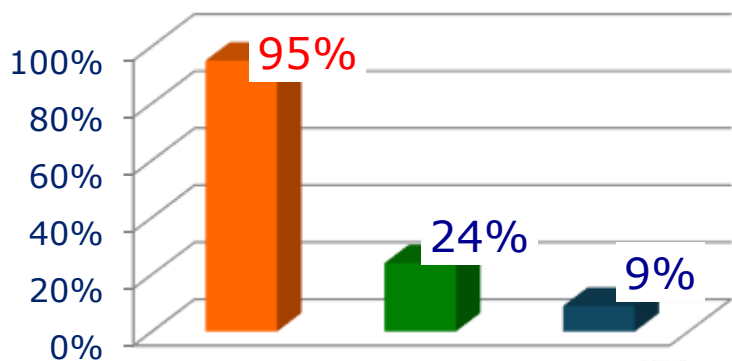
- It is estimated that **work-related road accidents** are more than **40% of all fatal accidents at work**
- INAIL data confirm this trend: over 15% of all reported injuries are related to road accident, and about **40% of all reported are fatal**



DRIVING SYSTEM

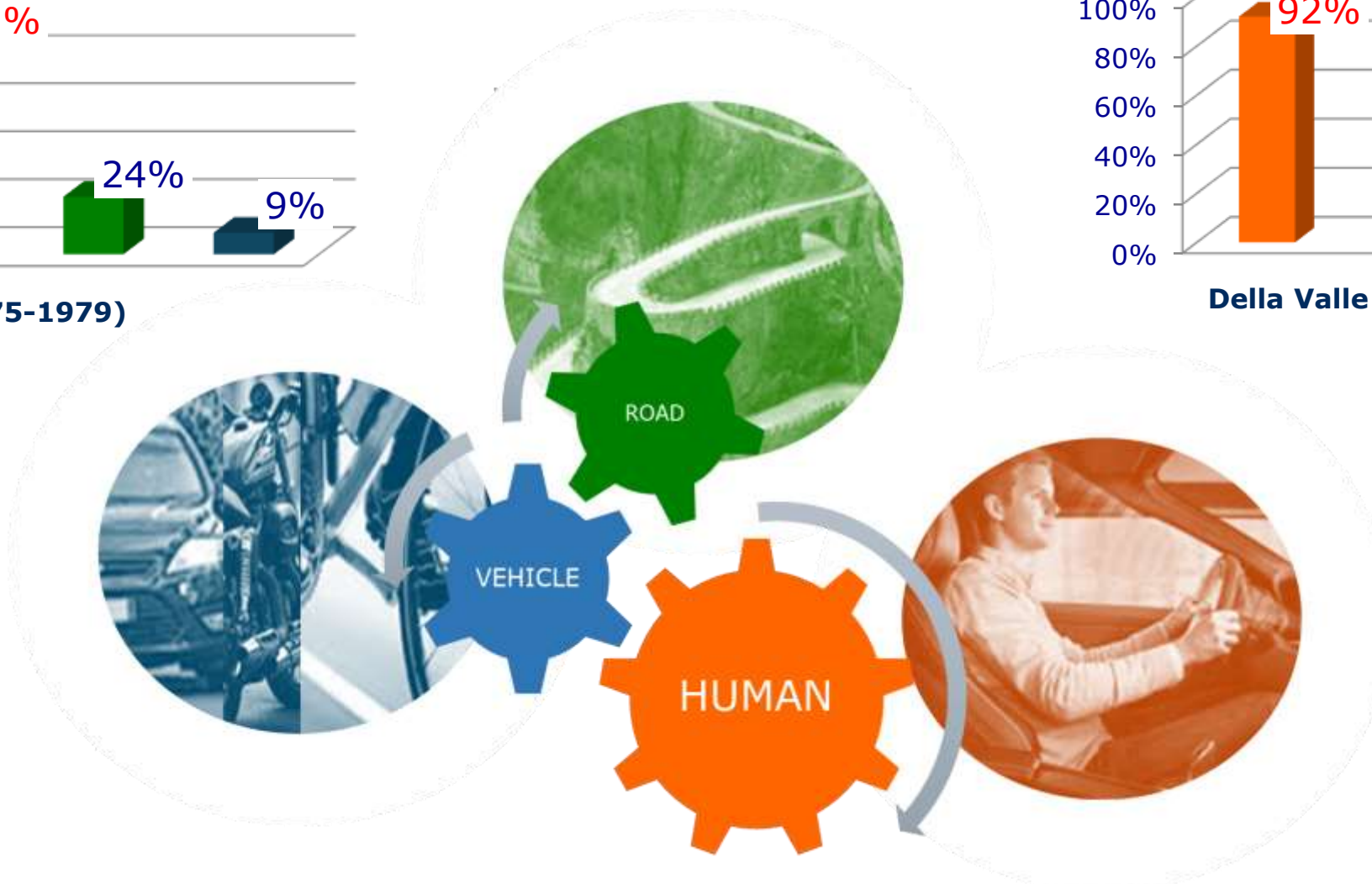


PAST

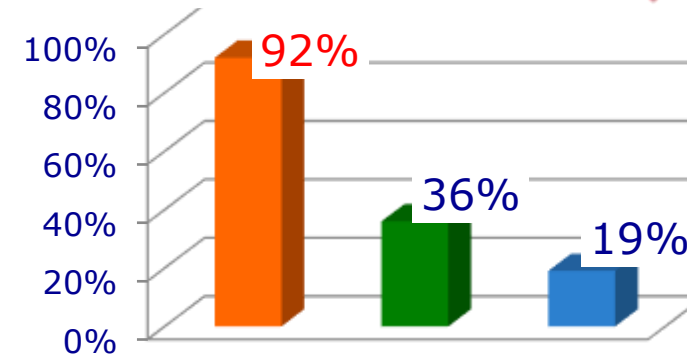


Sabey et al. (1975-1979)

dynamic balance



PRESENT



Della Valle et al. (2002)

90% of all road accidents (including work-related) linked to human error and/or alterations in psycho-physical condition

More than 20% of accidents are specifically linked to sleep disorders and disturbances

Climate change, rising temperatures, vulnerable groups: Outdoor workers

A widely shared forecast predicts an increase in the intensity and duration of heatwaves, with particular criticality for Southern Europe and Italy

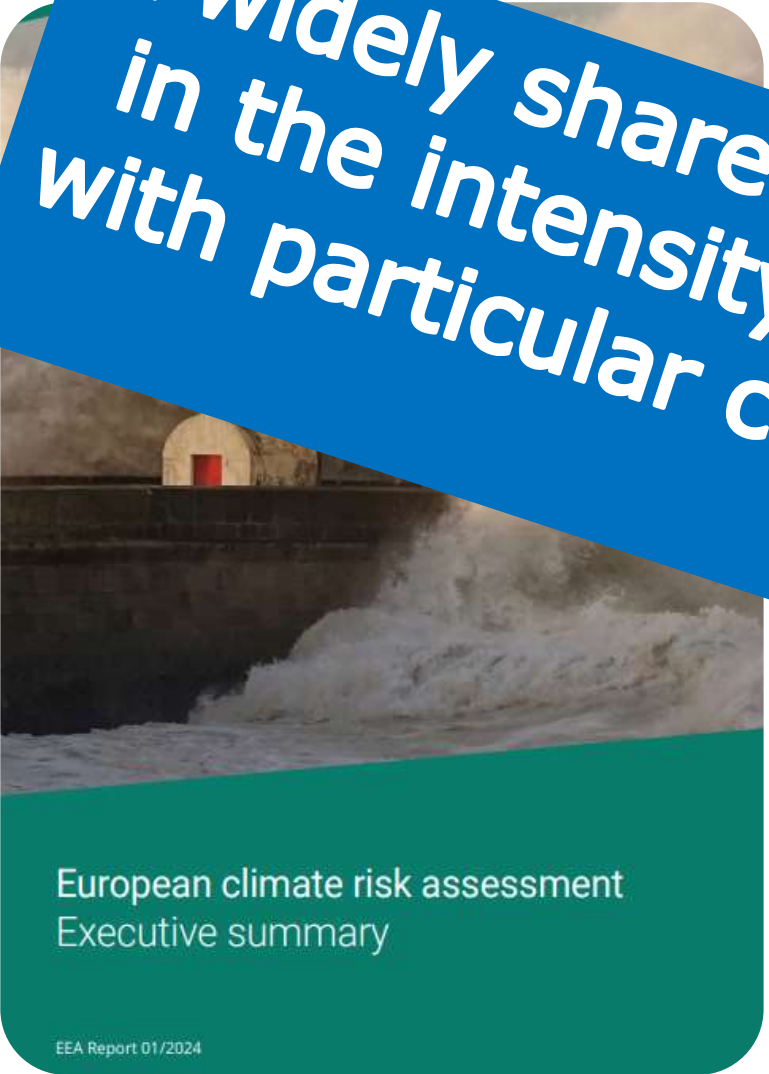


Table ES.3 Assessment of major risks

Particular risks for 'Health' cluster	Urgency to act	Risk severity			Policy characteristics		
		Current	Mid-century	Late century (low/high warming scenario)	Policy horizon	Policy readiness	Risk ownership
Heatwaves	Urgent action needed	Critical	Catastrophic	Catastrophic	Long	Medium	National
Health systems	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
Infectious diseases	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Long	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned
	Urgent action needed	Critical	Catastrophic	Catastrophic	Medium	Medium	Co-owned

Legends and notes

Urgency to act	Risk severity	Confidence
Urgent action needed	Catastrophic	Low: +
More action needed	Critical	Medium: ++
Further investigation	Substantial	High: +++
Sustain current action	Limited	
Watching brief		

Exposure to extreme temperatures and the risk of workplace injuries: Analytical studies

Environmental Research 269 (2025) 120844

Contents lists available at ScienceDirect

Environmental Research

journal homepage: www.elsevier.com/locate/envres



Climate change and occupational health and safety. Risk of injuries, productivity loss and the co-benefits perspective

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International Journal of
Environmental Research
and Public Health



Article

Workers' Perception Heat Stress: Results from a Pilot Study Conducted in Italy during the COVID-19 Pandemic in 2020

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INAIL

- It has been shown that exposure to high outdoor temperatures **increases the risk of workplace injuries**
- Workers in small companies, who are often **younger** and less experienced, are **more affected**
- The economic sectors with the highest risk profiles for high-temperature-related injuries are **agriculture** and **construction**
- A **decrease in productivity** of about 6.5% was estimated for workers engaged in physical activities
- The severity of the heat risk and the number of heat-related injuries were attributed to the **lack of training** or in any case **inadequate training**

Material and methods

Communication and training are considered as a strategic tool to improving knowledge and empowerment, fostering health-promoting attitudes, promoting changes in social norms, facilitating access and adherence to national health prevention programs



Italian Legislative Decree 81/08 and ss.mm.ii establish a **key role** for information, education and training processes, understood as fundamental prevention measures to improve occupational health and safety at work (OSH) conditions and to develop a prevention participatory culture in the workplace

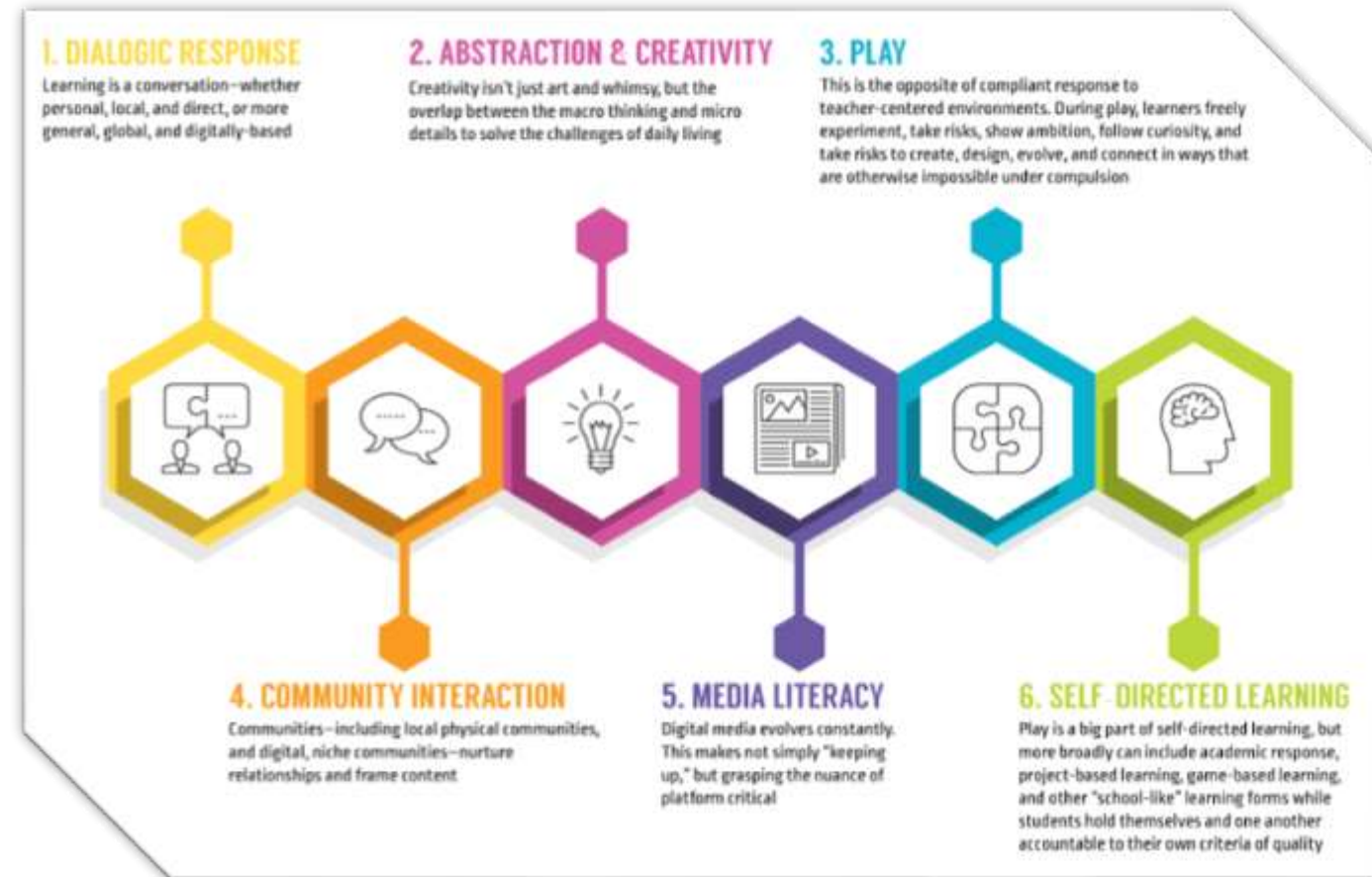


Today, in light of the ongoing technological changes, it is important that **new models, tools, devices, and digital technologies** are used to enhance and support knowledge, information, and training, especially in technical and scientific fields



Gamification is connoted as an approach that refers to the use of game-design elements in non-game contexts, and it is used typically to **change behaviours** or to improve user experience and **user engagement**

New learning strategies that incorporate **virtual reality** and **gamification** are crucial for effective training and communication. Their goal is to financially motivate the adoption of functional behaviors that lead to safer workplaces



Thanks to their cognitive and affective mechanisms, **games and virtualization** enable **collateral learning and learning-by-doing experiences**. This hands-on approach is key to developing essential skills and competencies in workers



Literature studies highlight some aspects:

Affective: enjoyment, pleasure

Social: teamwork, group dynamics, following the rules

Motor and Psychomotor: balance, coordination, movement

Cognitive: developing game strategies, learning rules

Emotional: tension, challenge, sense of freedom, fear

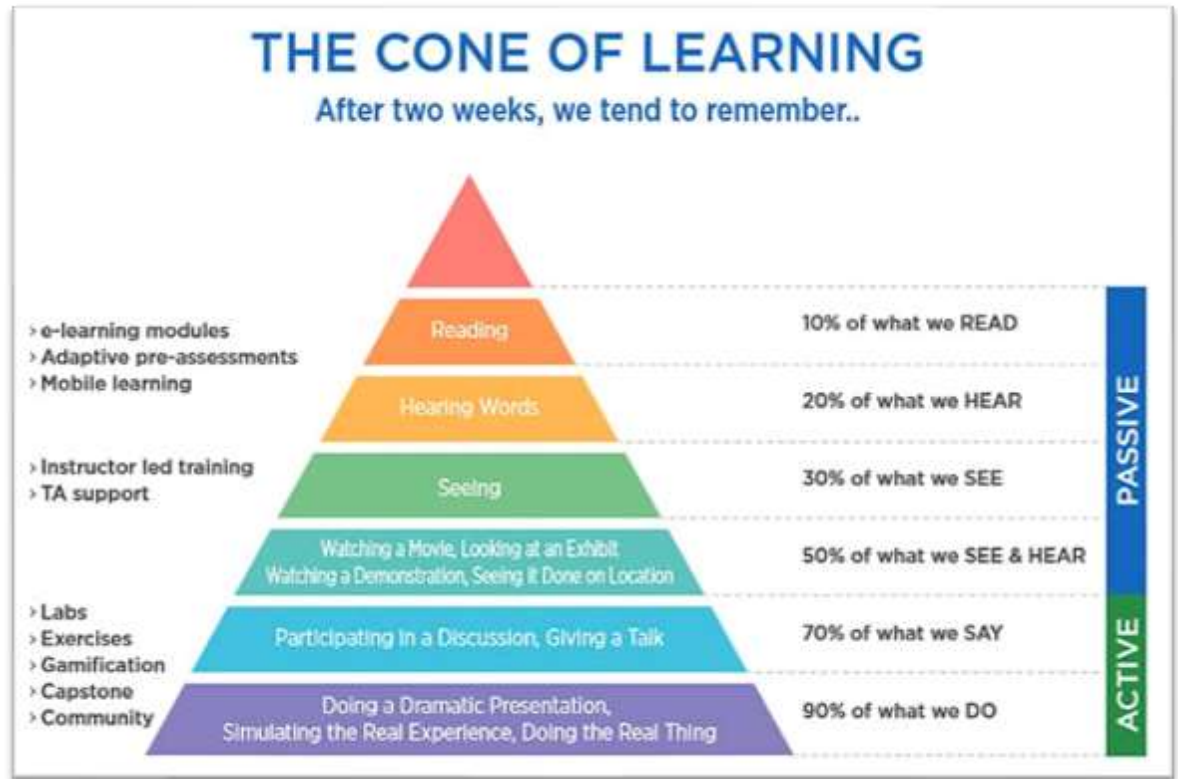
Cultural: modes of interaction, meaning of the game itself

Transcultural: need for shared rules, a common language of play



Through an **experimental, multidisciplinary and multi-sectoral approach**, **case studies** of innovative **OSH info-training** have been realized using **AR/VR and videogame technology**:

To further enhance occupational safety culture and education using digital technologies, an examination of **best practices** in the areas of **road safety awareness, extreme temperature and communication** was conducted to explore **innovative training and communication tools**



Data analysis: analysis on the causes of injuries linked to Road Accidents and injuries linked to exposure to high outdoor temperatures was conducted through global, European, and Italian datasets combined with some person-related determinants, according to the Italian National Prevention Plan 2022–2025, including **age, gender, health status**



Literature review: a search was carried out for scientific articles consulting the online databases PubMed, Web of Science, Scopus using the key word and mesh terms on road safety and climate change

Evaluation Questionnaire: using Microsoft Forms, ad hoc questionnaires were created to assess and validate the digital tools realised collecting data in anonymous and aggregated forms (subject to consent for research purposes) in compliance with EU DPGR data protection regulation 2016/679



Testing: Since 2022 the immersive virtual Labs and digital tools on road safety were tested and used during University advanced training courses, international exhibition events and in Italian school to work programs, while digital serious game on Climate change and heat stress is still work in progress



DRIVING SAFE VR Lab



An immersive lab assesses a **driver's reaction time** by simulating the effects of various impairments on their commute, including the use of medication, alcohol, or drugs, as well as drowsiness or cell phone distractions



OSA VR Lab

The innovative training activity was developed through an **immersive journey** to learn, experience and feel the signs, symptoms and consequences of **Obstructive Sleep Apnoea Syndrome** (OSA) on health and the impact on driving. After wearing visors (oculus) and virtually entering into a classroom various experiences and activities, with different communication and interactive formats, are placed:



The course lasts approximately 20 minutes and includes:

- **'static' immersive learning** moments as: Immersive illustrative cards where learner can have interactive insights into the data, signs, symptoms and consequences of OSA, ; Cartoon storytelling of a worker suffering of OSA
- **interactive learning** moments as: Augmented reality poster on RA and risk behaviour, 3D video of anatomical reconstructions of OSA

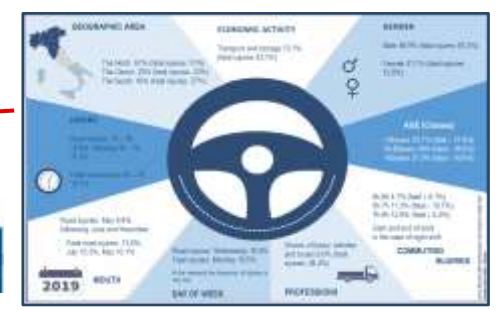
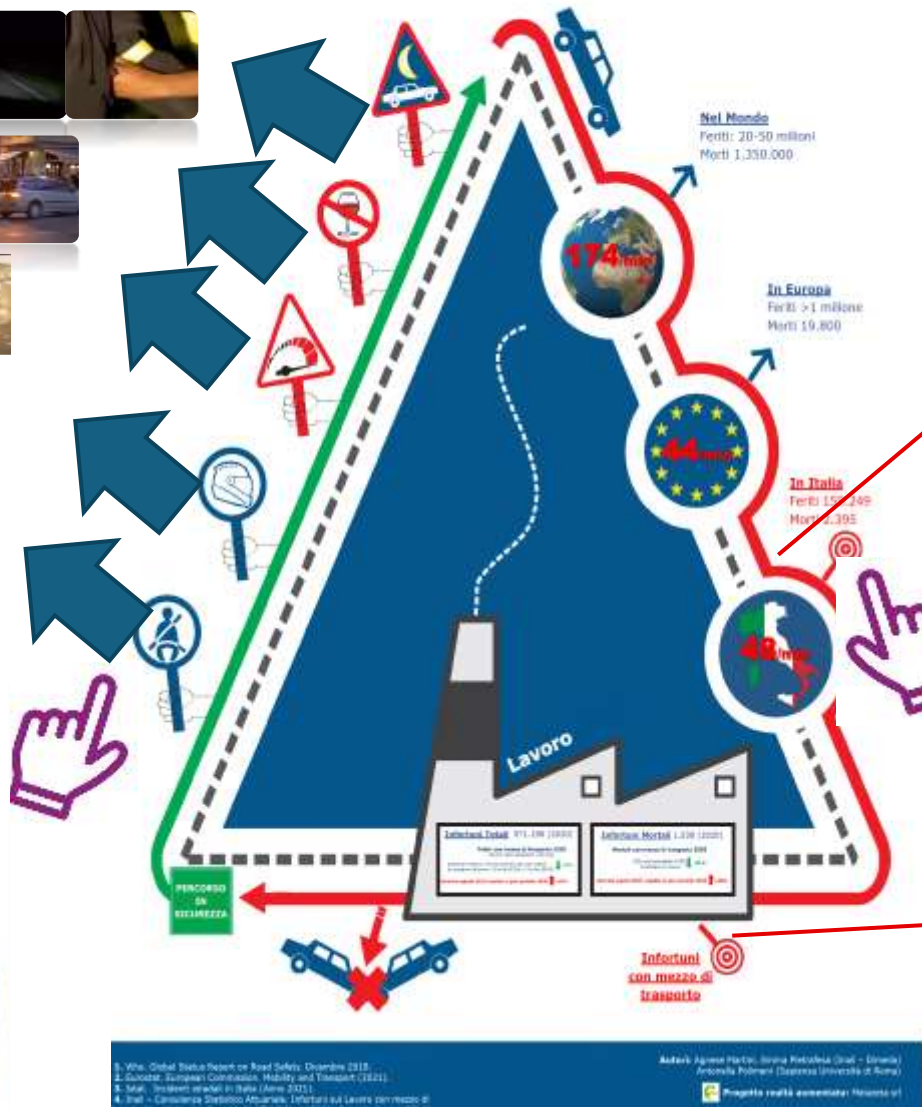
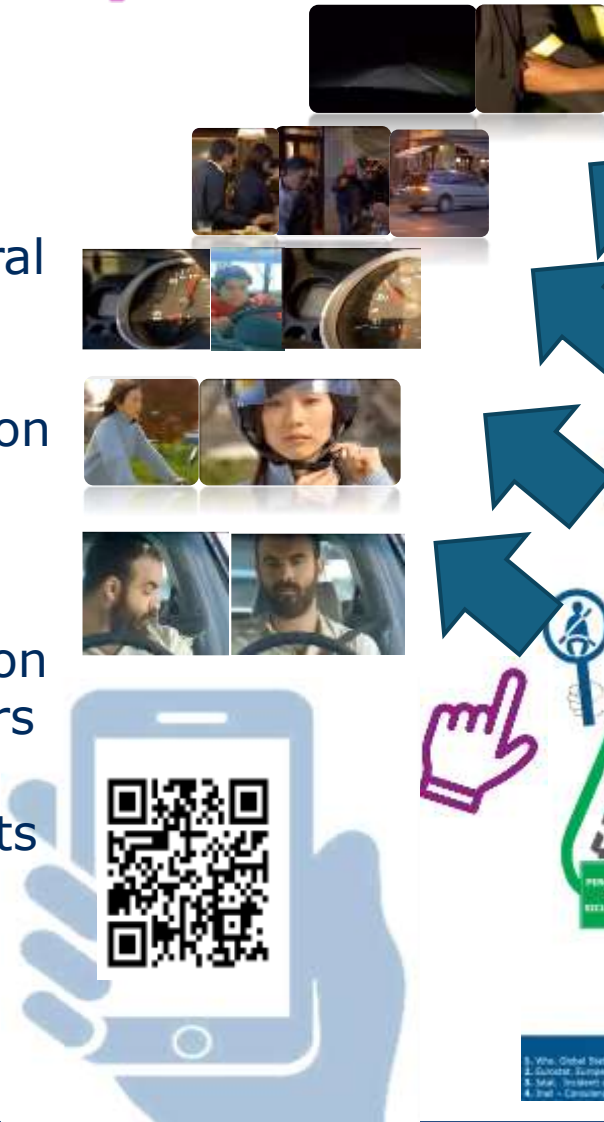


Augmented Reality poster on Road safety



This poster includes several **multimedia** elements:

- detailed **infographics** on road accident Italian national data
- **videos** from the WHO on different risky behaviors linked to the 5 major causes of road accidents



SLEEP RO@d digital serious game



This digital training game aims to change people's sleep habits. It uses **scientific principles, literature, and data analysis** to help players understand and avoid behaviors that lead to sleep deprivation. Players can personalize their avatars with traits that influence sleep, all based on scientific findings.

For the game's avatar, key variables must be defined based on literature: **gender** (man/woman), **age** (young, adult, mature), **somatotype** (average, obese), **chronotype** (owl/lark), and **job** (various driving professions).

In this 5-10 minute game, players experience how their choices affect their sleep recovery and well-being. The game has two difficulty settings. At the end of each round, players receive **personalized feedback and recommendations**, presented through text, storytelling, and short videos based on **national and international sleep hygiene guidelines**

Heat Stress game-based learning



It's a game-based learning experience on climate change and high-temperature exposure risks in the construction sector during a **working summer day**

For the game's avatar, key variables must be defined based on literature: **gender** (man/woman), **age** (young, adult, mature), **somatotype** (average, obese), **skin tone** (Very fair/ash blonde fair/light, brown olive/black, very dark/black hair) and **baldness**



The game's outcome is determined by several scores that track **health risks** (heat illnesses), **UV exposure to skin and eyes**, **safety rules** (PPE and advice) and **work production** throughout the day



Conclusion

Recent studies have shown that gamification can be a methodology directly aimed at increasing involvement, creating a **perfect balance between learning and entertainment**. Games possess a unique ability to foster social connections by offering context and motivational elements that can enhance dynamics and solutions. Additionally, educational component can be seamlessly woven into the gameplay, allowing players to absorb them subconsciously as they play



According to the latest research, our observations support the idea that **digital gamification** can be a strategy that directly aims to increase **involvement, relationship, and motivation** in OSH training. By blending learning and entertainment, it helps workers develop better decision-making skills and understand risks in a safe setting

Our study highlights how the use of **virtual reality (VR) and digital gamification** as learning experiences may be necessary to speed up the transfer of new and immersive information in OSH training. Almost all participants (90%) of these innovative training experiences considered them particularly engaging, amusing and effective

This **active behavior** develops a new "**mental habit**," social and emotional skills, and a positive, confident attitude that is then reproduced in life and work contexts





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your kind
attention!**

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