

## Positive technologies to improve safety, health and wellbeing at work: Challenges and opportunities



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Can technology improve safety,  
health and wellbeing at work?



Can technology improve safety, health and wellbeing at work?

Yes, but ...



Can technology improve safety, health and wellbeing at work?

Yes, but ...

The dark side of the technology



Technology can bring big problems:

- Unemployment;
- Info exclusion;
- Loss of privacy;
- Disinformation;
- Loss of real-world social skills.



## The positive side of the technology

Improve workers 'quality of life by optimizing the health and safety, in work situation.

## The positive side of the technology

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### The positive side of the technology

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### The positive side of the technology

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The positive side of the technology

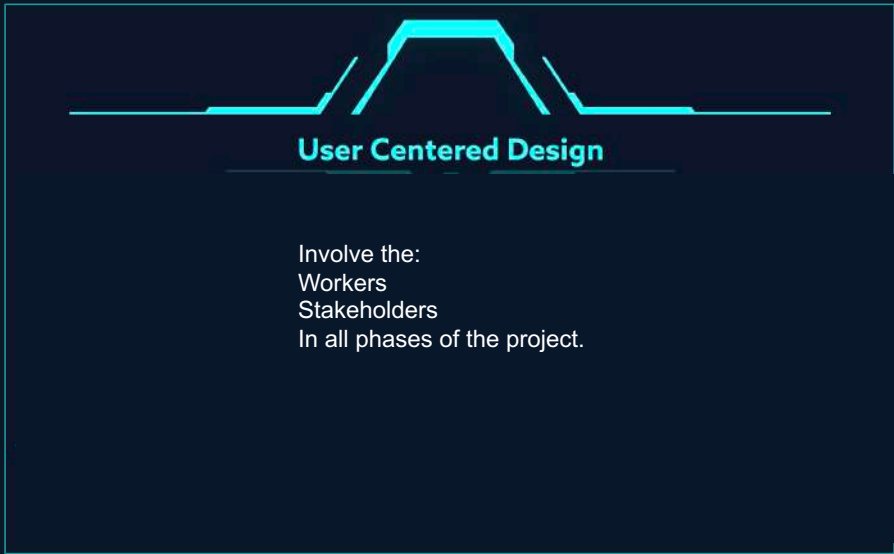
Can technology improve safety,  
health and wellbeing at work?



## Design for Behavior Change



### Design for Behavior Change Framework





### Design for Behavior Change Framework



### Design for Behavior Change Framework





## Design for behavior Change Can technology improve safety, health and wellbeing at work?

Project examples with organizations:

- Games to Improve the Safety Culture

Research Projects:

- Behavior compliance with safety information



## Games to Improve the Health and Safety Culture

Objective:

Increase the awareness of the children's about health and safety at work.



Today's children will be the workers of the future.





## Games to Improve the Health and Safety Culture

Objective:

Increase the awareness of the children's about health and safety at work.

Develop a game.



All the children (and adults) like to play a game



## Games to Improve the Health and Safety Culture



### *Ergoshow*

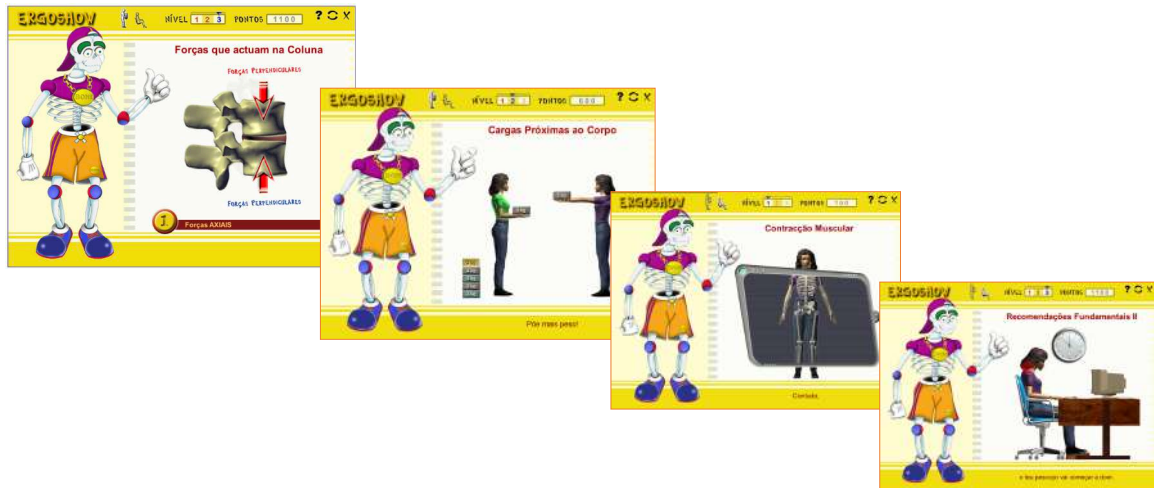
A game to improve safety and health and safety culture, in children from 6 to 12 years old.

How to avoid the Muscle-skeletal disorders.





## Games to Improve the Health and Safety Culture



## Games to Improve the Health and Safety Culture



Personas of the game

**Goal:**

Prepare young people to be responsible workers in the future, in relation to safety and health at work.

The workplace risks in a factory.



## Games to Improve the Health and Safety Culture



Game screen to select the safety problems

We evaluate now the usability and the user experience of this game.



## Games to Improve the Health and Safety Culture



Learn by Doing



Create Children and Young Experiences



Behavior Change



## Games to Improve the Health and Safety Culture



Immersive Virtual Reality  
improve the Human experience



## Games to Improve the Health and Safety Culture



Create strong critical situations to arouse  
worker experiences



## Games to Improve the Health and Safety Culture



Critical situation: time pressure; high workload ...



Feel the accident at workplace



The strong experience will be remembered later in the work situation



This experience together with the others can contribute to the worker behavior change



The positive side of the technology  
Can technology improve safety,  
health and wellbeing at work?

Project examples with companies:

- Games and Gamification to Improve the Safety Culture

Research Projects:

- Worker compliance with safety information



### Worker compliance with safety information



Safety information is very important, to alert us to dangers in the environment that are not always evident



### Worker compliance with safety information



Can we trust?

We cannot say that safety information are 100% effective.

There is a high potential to failure.



### Worker compliance with safety information



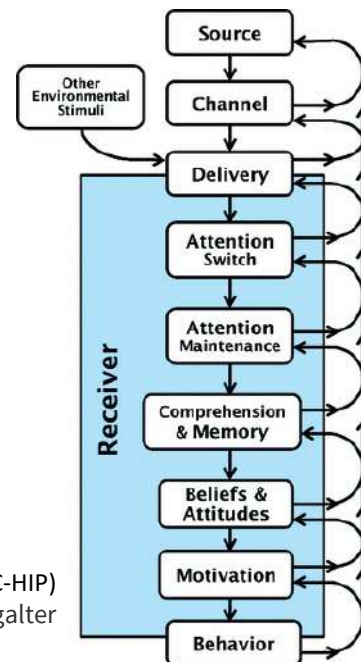
How can we evaluate the Human compliance with safety information?



### Worker compliance with safety information

How to evaluate the Human behavior consonance with safety information?

Communication-Human Information Processing (C-HIP)  
M. Wogalter







## Worker compliance with safety information

Virtual Reality is a good solution to evaluate the Human behavior compliance with safety information



## Worker compliance with safety information

Virtual Reality is a good solution to evaluate the Human behavior compliance with safety information



Applied Ergonomics  
Volume 45, Issue 5, September 2014, Pages 1367-1375



### Behavioral compliance for dynamic versus static signs in an immersive virtual environment

Emilia Duarte <sup>a,\*, 1</sup>, Francisco Rebelo <sup>b, c, 1</sup>, Julia Teles <sup>c, 1</sup>, Michael S. Wogalter <sup>d, 1</sup>

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<https://doi.org/10.1016/j.apergo.2013.10.004>

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#### Abstract

This study used an immersive virtual environment (IVE) to examine how dynamic features in signage affect behavioral compliance during a work-related task and an emergency egress. Ninety participants performed a work-related task followed by an emergency egress. Compliance with uncued and cued safety signs was assessed prior to an explosion/fire involving egress with exit signs. Although dynamic presentation produced the highest compliance, the difference between dynamic and static presentation was only statistically significant for uncued signs. Uncued signs, both static and dynamic, were effective in changing behavior compared to no/minimal signs. Findings are explained based on sign salience and on task differences. If signs must capture attention while individuals are attending to other tasks, salient (e.g., dynamic) signs are useful in benefiting compliance. This study demonstrates the potential for IVEs to serve as a useful tool in behavioral compliance research.





Worker compliance with safety information

Affordances in emergency situations



Worker compliance with safety information

Affordances in emergency situations

**Affordance is a possibility of action**

Affordances can have the potential to invite behavior





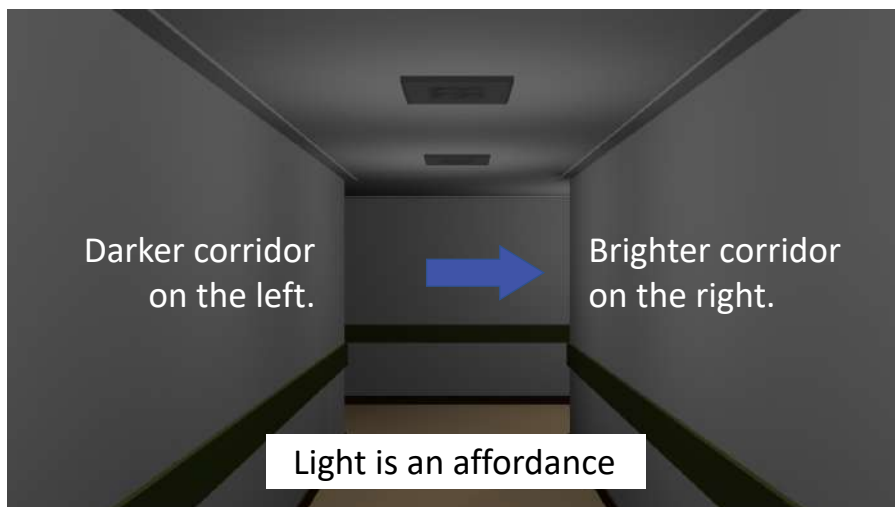
Compliance with safety information

Affordances in emergency situations



Compliance with safety information

Affordances in emergency situations





Compliance with safety information

Wider and brighter corridor

Affordance on the left



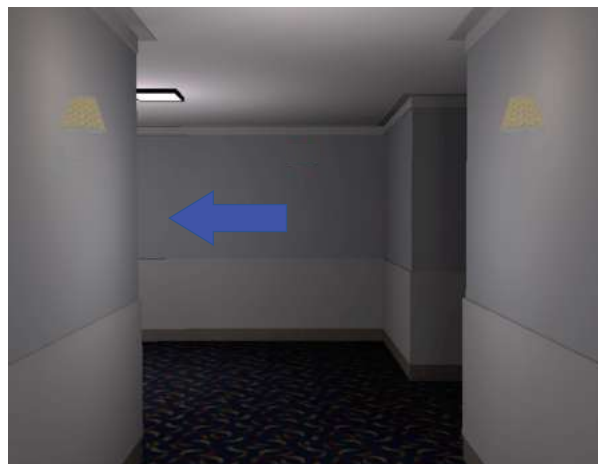
Darkest and narrowest corridor



Compliance with safety information

Wider and brighter corridor

Affordance on the left



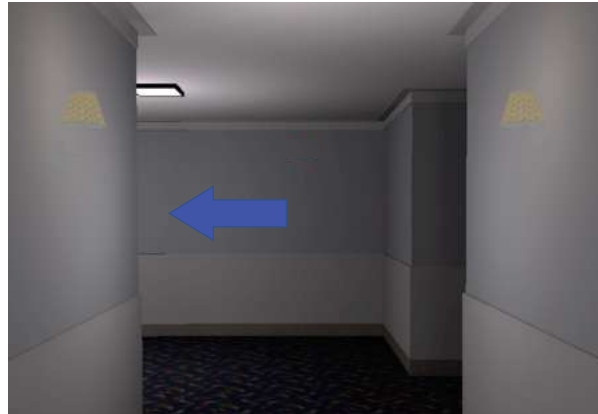
Darkest and narrowest corridor



Compliance with safety information

Wider and brighter corridor

Affordance on the left



Darkest and narrowest corridor

Light and wider corridors, influence the people decision



Compliance with safety information

Affordances in emergency situations

Applied Ergonomics 44 (2013) 618–627



The influence of environmental features on route selection in an emergency situation

Elisângela Vilar<sup>a,1,\*</sup>, Francisco Rebelo<sup>a,1</sup>, Paulo Noriega<sup>a,1</sup>, Júlia Teles<sup>b,1</sup>, Christopher Mayhorn<sup>c,2</sup>

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ABSTRACT

Understanding the influence of external information at a lower level of awareness during the processes of route selection could be a key factor to predict user's movements within complex buildings, avoiding wayfinding problems and improving egress in emergency situations. This study aims to verify whether corridor intersection configuration attributes, such as width and brightness, act as factors of attraction to improve the affordance of indoor hallways during an emergency egress situation, using a VR-based methodology. The main hypotheses are that users tend to move along either, wider or brighter corridors. Thirty volunteers participated in this study, moving along 57 different corridors, according to the experimental conditions of the study. The results suggest that people prefer to follow brighter pathways in "T-type" and "F-type" intersections, and wider corridors in "T-type" intersections. In situations where these variables are in conflict, there is a preference for brighter paths in both intersection configurations.

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Compliance with safety information

Wider and brighter corridor

Affordance on the left



Darkest and narrowest corridor

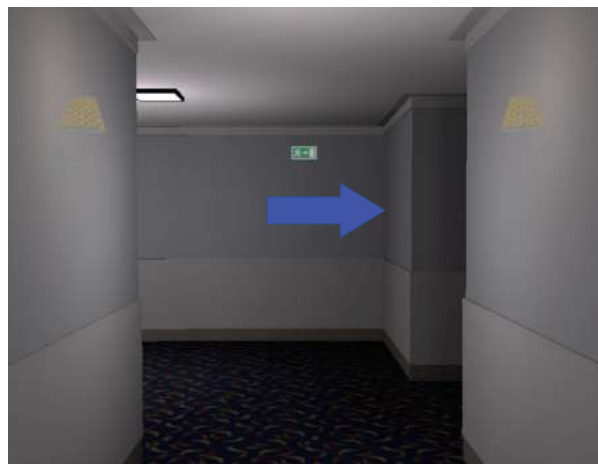
Emergency exit on the right



Compliance with safety information

Wider and brighter corridor

Affordance on the left



Darkest and narrowest corridor

Emergency exit on the right



### Compliance with safety information

Wider and brighter corridor

Affordance on the left



Darkest and narrowest corridor

Emergency exit on the right



### Compliance with safety information

Wider and brighter corridor

Affordance on the left



Darkest and narrowest corridor

Emergency exit on the right

67% of the people could die in a emergency critical situation



## Compliance with safety information



Ergonomics



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### Effects of competing environmental variables and signage on route-choices in simulated everyday and emergency wayfinding situations

Elisângela Vilar, Francisco Rebelo, Paulo Noriega, Emília Duarte & Christopher B. Mayhorn

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## Key ideas to take home





**Key ideas to take home**

Can technology improve safety,  
health and wellbeing at work?

**YES by the**  
**The positive side of the technology**



**Key ideas to take home**

Games and Virtual Reality  
used as Positive Technologies  
can improve the worker  
personal experiences



**Key ideas to take home**

Games and Virtual Reality used as Positive Technologies can improve the worker personal experiences

**Explore and interact to solve challenges,**



**Key ideas to take home**

Games and Virtual Reality used as Positive Technologies can improve the worker personal experiences

**Explore and interact to solve challenges,**

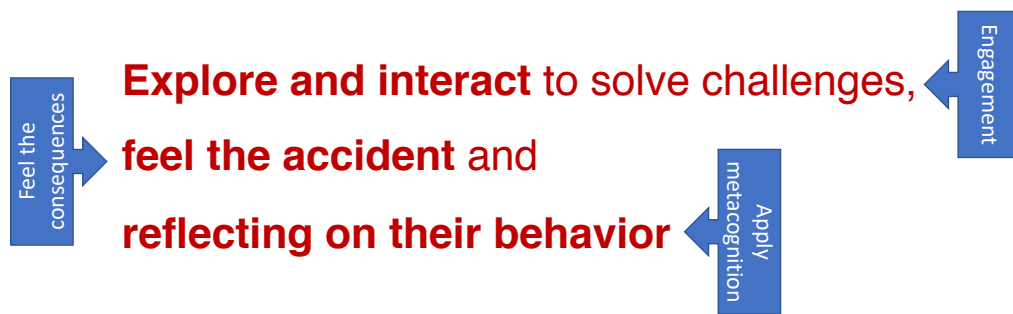
**feel the accident**





Key ideas to take home

Games and Virtual Reality as Positive Technologies that can improve the worker personal experiences



Key ideas to take home

**Games and Virtual Reality, are one of the best ways to support this metacognition process**



**Key ideas to take home**

Research Project: Behavior compliance with safety information



**Key ideas to take home**

Research Project: Behavior compliance with safety information

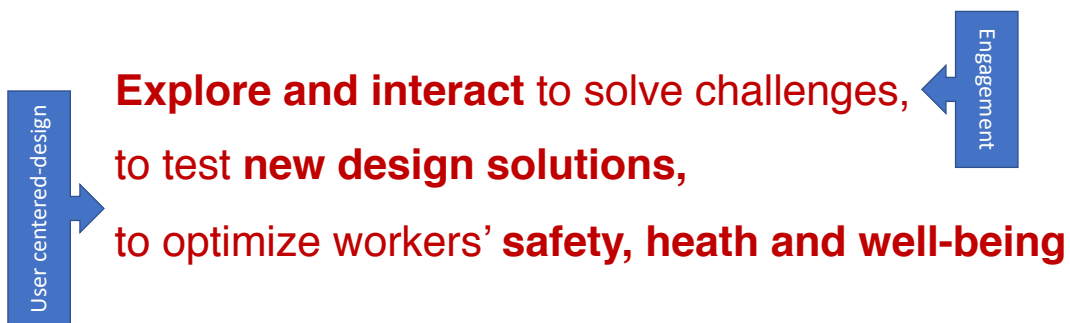
**Explore and interact** to solve challenges,





### Key ideas to take home


Research Project: Behavior compliance with safety information




### Key ideas to take home

Research Project: Behavior compliance with safety information


**Games and virtual reality are one of the best way**  
**to test and design proposals to optimize the**  
**workers' safety and well-being**




Permanent Staff





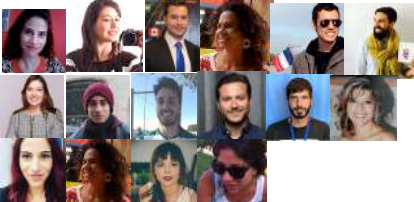
External advisors



Phd Students



Master Students



I  
HAVE  
SEEN THE  
FUTURE  
AND  
IT IS  
VIRTUAL

Positive technologies to improve safety, health and wellbeing at work:  
Challenges and opportunities

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