

National Institute for Public Health and the Environment Ministry of Health, Welfare and Sport

Training resilient decision-making with a serious game

How effective is this resilience intervention?

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Content of this presentation

Resilience

Developing the Resilience Serious Game

Method to evaluate the effectiveness

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Future



Resilience

- Normative safety: following rules & procedures
 - Known/expected situations
 - 'Compliance'
- Resilience:
 - Unknown/unforeseen situations
 - Improve safety in uncertainty

But:

How can we train people to be more resilient?



Resilience serious game

- Developed by the Dutch National Institute for Public Health and the Environment (RIVM)
- Based on scientific research on how to deal with uncertainties in working situations
- User involvement: Co-creation with safety practitioners
- Practical tool to train resilient decision-making to improve (occupational) safety
- By practicing decision-making in unforeseen/uncertain situations
- Used in a training-situation



The Resilience Serious Game



Want to know more about the game?

Bellamy L.J., Chambon M., Van Guldener, V. (2018). Getting resilience into safety programs using simple tools - a research background and practical implementation. Reliability Engineering & System Safety, 172, 171-184.



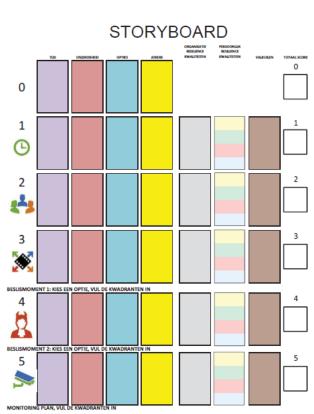
The Resilience Serious Game

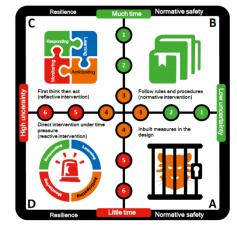
Goal: reduce uncertainty and time pressure in a realistic dilemma (case study)

Four key elements

- The Resilience Safety quadrants
- The Resilience 5-step process
- The Resilience Story cards
- The Resilience Storyboard











Evaluating the Resilience Serious Game

- Measuring effectiveness of the game
- Using Kirkpatrick's theoretical framework (1994)* to evaluate training programs
- Four levels:
 - 1. Reaction
 - 2. Learning
 - 3. Behavior
 - 4. Results

* Kirkpatrick D.L. (1994). Evaluating training programs: the four levels. San Francisco: Berrett-Koehler. 978-1-881052-49-4



Evaluating the Resilience Serious Game

- Measuring effectiveness of the game
- Using Kirkpatrick's theoretical framework (1994)* to evaluate training programs
- Four levels:
 - 1. Reaction: how do participants feel about the game? Do they think it is relevant for their job, do they like the game?
 - 2. Learning: how much do the participants learn from the game? Do they gain knowledge, skills, attitudes, trust and commitment?
 - 3. Behavior
 - 4. Results

* Kirkpatrick D,L. (1994). Evaluating training programs: the four levels. San Francisco: Berrett-Koehler. 978-1-881052-49-4



Method

- Five companies (38 participants)
- Game is played once (supervised by a trainer)
- Effectiveness: participants have a positive reaction to the game (level 1) and have learned from the game (level 2)
- Methodology:
 - Pre- and post-measurements
 - self-assessment with questionnaire (partially derived from the TORC-game*)
 - o participant-generated word list
 - Observations by the researcher
 - Feedback from participants

^{*}Van der Beek D, Veldhuis G, Van der Vorm J, Grøtan TO, Wærø I, Macchi L. (2016). D5.1 TORC Impact Assessment, Framework, Methodology and Validation Roadmap TNO 2016 R10988 | Final report 26 July 2016.



Questionnaire and word list

Questionnaire before the game

- Used to test the attitudes of the participants regarding serious games and on the job training
- Questions about experiences with and opinions about serious games and on the job training

Questionnaire after the game

Questions about:

- Attitude towards serious games and on the job training (same questions as before the game)
- The content of the game
- Reaction to and learning from the game (Kirkpatrick levels 1 and 2)

Word list: second measure of the learning effect

- Before and after the game, 5 minutes to write down words
- "What words do you think of for safety in unexpected/unforeseen situations?"
- Expectation: more words associated with resilience after the game



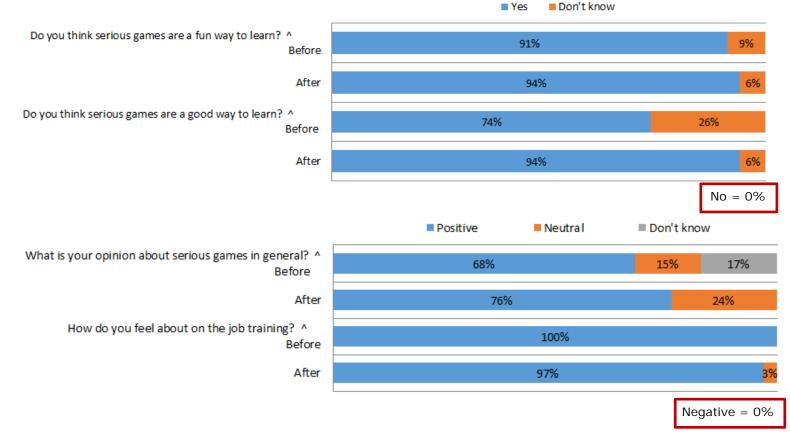
Results

Participants questionnaires:

- 34 respondents
- 71% male
- Mean age: 38 (SD: 11)
- 38% operational employee, 15% supervisor, 9% manager (others did not want to state their job level or had another job)
- Mean number of years at the company: 8 (SD: 8)



Results: Attitudes of the participants



A: Based on Mayer I. (2012). Towards a Comprehensive Methodology for the Research and Evaluation of Serious Games. Procedia Computer Science, 15, 233-247.



Agree

Neutral

Disagree

Don't know/no answer

Results: Level 1 - Reaction

	Agree	Neutral	Disag		Don't know/n	J di Swei
The training approach (game) worked fine for me st		74%			15%	12%
I can easily apply what I've learned in daily practice **	53	3%		29%		18%
This training is beneficial for my work *	53%		29%		15% <mark>3%</mark>	
This training matches my daily work **	509	50% 32%			15% <mark>3%</mark>	
Because of this training my organization can reach its goals **	38%			47%		15%
The way we worked during the training is also possible in daily practice ** \sim	35%		32%		3	2%
I feel I can perform better at my daily job because of this training **	26%		41%		26%	6%
I would like it if all employees of the company could follow this training **	26%		41%		24%	9%
Management are engaging with this training ullet	24%	15%	359	%		26%
Because of the training I better understand my role in safety at work **	12%	47%			38%	<mark>3%</mark>

*: Literally derived from the TORC questionnaire

**: Based on the TORC questionnaire

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~: Recoded from negative formulation to positive formulation



Results: Level 2 – Learning (1)

	Agree	Neutral	Disagree	Don't k	now/no answer		
Because of the training I better understand what cognitive biases are	68%				159	<mark>%</mark> 15%	<mark>3%</mark>
I have learned about the difficulties that can arise when multiple goals are persued **		62%			2	9%	9%
I know when to ask for help during unexpected situations	62%			21%	15%	<mark>3%</mark>	
Because of the training I am more aware of cognitive biases		59%			24%	15%	<mark>3%</mark>
Because of the training I know what contributes to resilience		56%			35%		9%
l better understand the importance of resilience for safety at work **		53%			26%	18%	<mark>3%</mark>
Because of the training I am more aware of uncertainties		53%			21%	24%	<mark>3%</mark>
Because of the training I better understand which tasks and roles contribute to safety and resilience **		50%			29%	21%	
Because of the training I better understand how what I do impacts the work of others **		47%		265	6	26%	
I have learned to be critical about what I myself can decide during unforseen situations **		44%		18%		32%	6%

*: Literally derived from the TORC questionnaire

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Results: Level 2 – Learning (2)

	Agree	Neutral	Disagree	Don't know/	no answer	
I have learned how discussing experiences with resilience can help with my job **	419	6	2	9%	26%	<mark>3%</mark>
Because of the training I expect to recognize coginitive biases more quickly	41%			32%		<mark>6%</mark>
I have learned a pratical approach that I can use to act resilient in unexpected situations **	38%		32	32%		6%
Because of the training I know how I can use resilience	38%	38% 47%		47%		12% <mark>3%</mark>
Because of the training I know what resilience is	35%		44%		21%	
I am planning to put this training into practice ^	35%		26%		26%	12%
I better understand my role in dealing with unexpected situations **	32%		24%		44%	
I have learned how I can prepare for yet unknown problems and circumstances at work **	32%		35%		26%	<mark>6%</mark>
I have a better understanding of the roles and responsibilities of my colleagues	24%		32%		41%	<mark>3%</mark>
Because of the training I have learned more about my job **	18% 62%			<mark>3%</mark>		
After following the training I feel more responsible for my activities at my job **	12%	26% 59%		<mark>3%</mark>		

^: Based on Mayer I. (2012). Towards a Comprehensive Methodology for the Research and Evaluation of Serious Games. Procedia Computer Science, 15, 233-247. **: Based on the TORC questionnaire

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Results: word list

"What words do you think of for safety in unexpected/unforeseen situations?"

Difference score: % before vs. % after

+ Difference score:	
'Options'	+39%
'Time(pressure)'	+36%
'Risk'	+21%
'Uncertain'	+18%
'Scenario'	+18%
'Pitfall'	+18%
'Decision(making)'	+15%
'Together'	+12%
'Think'	+12%

- Difference score:	
'Environment'	-15%
'Prepared'	-15%
'Accident'	-12%



Results: observations and feedback

Positive

- Fun
- Structured
- Learning the resilience vocabulary
- Contributes to group process

Points of improvement

- Amount of information and game elements
- Abstract concepts
- Game needs to be played multiple times

Other points

- Case study of the company vs. other case study
- Playing own role vs. playing another role
- How the game is played depends on the trainer



Discussion

- Effectiveness (using Kirkpatrick): participants have a positive reaction to the game (level 1) and have learned from the game (level 2)
- Positive attitude before and after the game
- Learning effect:
 - Knowledge was gained
 - Effect on skills was less convincing
- Resilience playing cards difficult to understand
- Lots of information
- Game needs to be played more often to be more effective



What's next?

- Last steps in developing the game
- Game design
- Train-the-trainer
- Companies all around the country playing the game!





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