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SERIOUS GAMING DESIGN FOR ADAPTABILITY TRAINING OF MILITARY PERSONNEL

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INTRODUCTION

- › **Human and Organizational Adaptability (HOA) program**
- › **Definition of adaptability:** Ability to effectively adjust knowledge and skills to novel, unforeseeable, changing situations (Kozlowski, 2001)
- › **Why serious gaming?**
 - › Authentic context & natural learning environment (Gee, 2006)
 - › Time & cost efficient (Roman & Brown, 2008)
 - › For military: Wargames



INTRODUCTION

› **Status quo**

- › Changing operational circumstances
- › Need for SGs with ill-structured & fundamental change

› **Purpose of the study**

- › explore game design for enhancing adaptability of military in an ill-structured complex decision-making context



RATIONALE

- › **Cognitive Flexibility (CF) theory**
 - › Restructuring individual's knowledge (Sprio & Jehng, 1990)
- › **Reversal learning**
 - › Rule learning -> adjust to changing rules (Cools et al., 2002)
- › **Testing CF**
 - › Perform simple task -> direct feedback
- › **Job Oriented Training**
 - › Active learning, reflective learning, challenge, relevant reality




GAME DESIGN

- › **Goal:** To enhance players' flexible thinking -> improve adaptability
- › **Target group:** Military officers
- › **Narrative**
 - › Fictitious scenario: Military operation against robot army
 - › Role play: Company commander
 - › Mission: Defeat enemy & rescue civilians

GAME

› Game Stru

Robot threat (operational level) Alpha:
test-subject-01



"It's 23:20. You were informed that energy extractors are currently on route. They will arrive at town hall in 10 minutes if they successfully remain undetected. During consultation with your platoon commanders, a medic interrupts and informs you of medical supply shortage. At the moment, it is too risky to evacuate wounded soldiers and civilians via the south gate. Also, it is not known when the robot army will attack the town hall. Therefore, you decided to send medics with supplies to the hospital escorted by 2 cyber specialists and a combat unit, along with 2 fully charged anti-energy traps. You are giving orders through the radio to the team approaching the hospital. Which two actions do you choose?"

A. "Your unit detected 3 red robots near the hospital. Order the unit to stay undercover and take a detour to enter the hospital considering only 2 anti-energy traps are available."

C. "Your unit detected 1 red robot in an emergency room inside the hospital. Order the unit to capture the red robot and check its supply box for medicine supply."

B. "Your unit detected 1 blue robot inside the hospital entrance. Order the unit to capture the blue robot and hack the data to get intel from the hospital."

D. "Your unit detected 1 green robot in a medical supply room inside the hospital. Order the unit to capture the green robot and check its data for useful intel."

confirm

Robot threat (operational level) Alpha:
test-subject-01



"It's 23:20. You were informed that energy extractors are currently on route. They will arrive at town hall in 10 minutes if they successfully remain undetected. During consultation with your platoon commanders, a medic interrupts and informs you of medical supply shortage. At the moment, it is too risky to evacuate wounded soldiers and civilians via the south gate. Also, it is not known when the robot army will attack the town hall. Therefore, you decided to send medics with supplies to the hospital escorted by 2 cyber specialists and a combat unit, along with 2 fully charged anti-energy traps. You are giving orders through the radio to the team approaching the hospital. Which two actions do you choose?"

A. "Your unit detected 3 red robots near the hospital. Order the unit to stay undercover and take a detour to enter the hospital considering only 2 anti-energy traps are available."

A. "Considering that red robots are armed and carrying weapons, it was best to stay undetected and avoid them to successfully conduct the mission. Also, you were just informed that those robots were on their way to the town hall. Your soldiers at town hall destroyed them before they attacked the town hall."

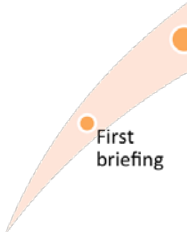
B. "Your unit detected 1 blue robot inside the hospital entrance. Order the unit to capture the blue robot and hack the data to get intel from the hospital."

B. "Your cyber specialists captured the blue robot with an anti-energy trap. However, hacking the blue robot was not possible because the blue robot doesn't contain any memory data and doesn't carry any intel. Your unit only found engineering tools on the blue robot. Meanwhile, your team detected a green robot in the hospital and was able to capture and hack the data. The green robot was carrying useful intel about the location of certain medicines and the map of the whole hospital."

1. Choosing actions (indicated as blue)

2. Receiving feedback (on the right panels next to selected options)

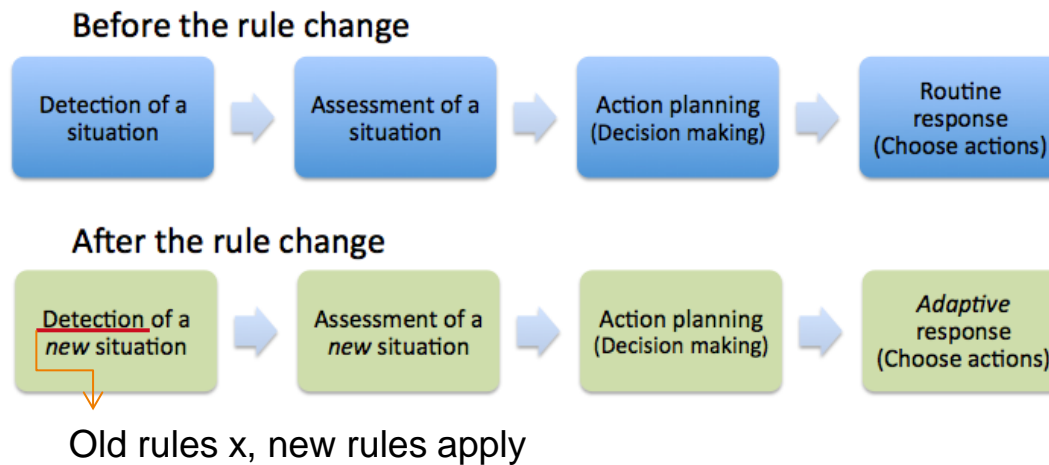
› Examples of the game play



GAME DESIGN

› Rule change

› Hypothesized attentional process model of the game players





GAME TESTING

› Purpose

- › To validate the game design: Convenience sample (students)

› Participants

- › n=12 (11 male, 1 female)
- › Game study Master students
- › Game Master's introductory workshop, a University in the Netherlands
- › No military background
- › Extensive gaming knowledge & experience

GAME TESTING

› Procedure



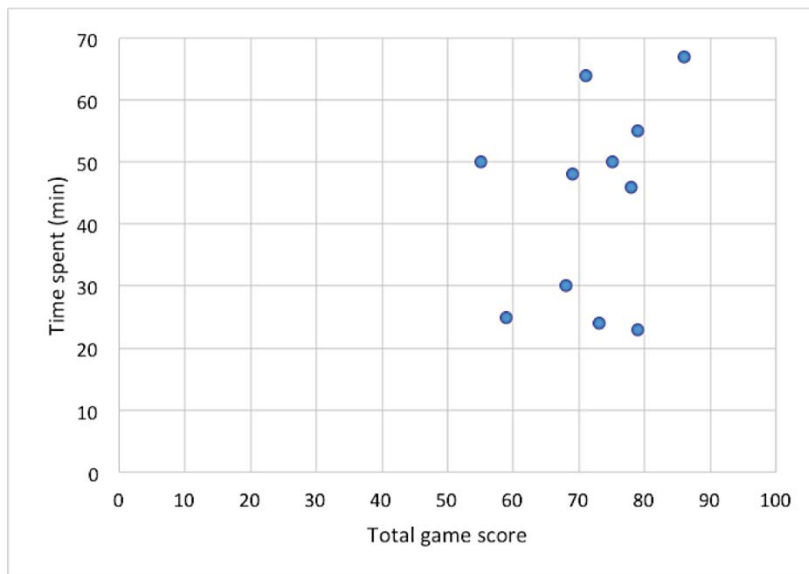
› Results: Play testing

- › Game performance score: $M=72$, $sd=9.08$
 - › Individual difference (cog load, rule detection, info process) of players
- › Adaptive performance score
 - › Gradual increase (performance rating): 27 % ->63 %, 32 % ->68 %

GAME TESTING

› Results: Play testing

› Correlation ($r=.297$) between players' total game score and time spent



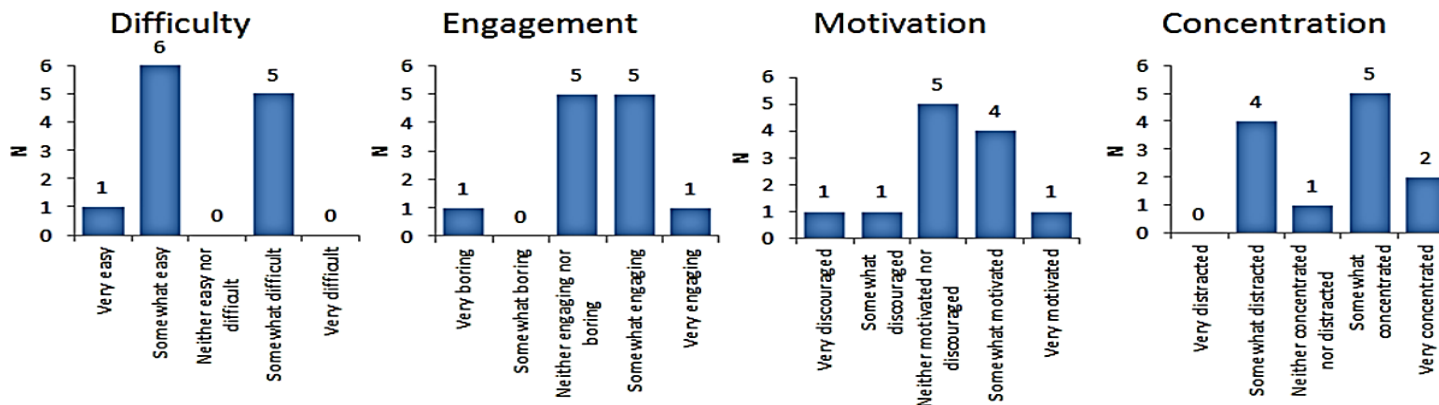
- › Low positive, not significant (low n)
- › Individual difference of players

GAME TESTING

› Results: Survey

› Detection of rule change: 11 Yes, 1 no

› Results of students' assessment on the game



› Difficulty: Decision making in military context, amount of complex information & missing information

› Concentration: Fatigue

LIMITATION & FUTURE DIRECTION

- › **Game testing results:** Different from military participants
- › **Survey feedback:** Improvements required
- › **Exploratory study:** Game design only
- › **Future direction**
 - › Effect of learning adaptability
 - › Training during Major's school course



CONCLUSION

› **Game testing: Design Validation**

- › Individual differences are visible
- › Detecting change, adaptive response
- › Learning: Complex decision making, motivation, engagement

› **Improvements**

- › Visibility
- › More scenarios

› THANK YOU FOR YOUR ATTENTION

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