



Measuring the effectiveness of hazard and risk awareness interventions utilising a virtual reality Risk Perception measurement simulation

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What is Risk Perception?

More than hazard identification it is a measure of an individual's:

- Ability to notice hazard cues in the working environment
- Emotional response to the hazard
- Knowledge of how these hazards cause harm
- Estimated likelihood of becoming harmed
- Estimated degree of harm
- Anticipated ability to cope with the hazard

Measuring Risk Perception

- Measures of Risk Perception have been inferred from:
 - Questionnaires:
 - Psychological (personality) attributes
 - Personal risk-taking preferences
 - Choices between gambles:
 - Consequence and likelihood prediction
 - Performance in virtual environments:
 - Interaction during video sequences
 - Interaction during computer virtual reality simulation scenarios

Results of Previous Investigations

This computer based virtual reality technique distinguishes between four categories of “Risk Perception Index”

1. Excellent
2. Good
3. Questionable
4. In need of improvement

Results of Previous Investigations

MODU "A"

Good
7
39%

Need
improvement
4
22%



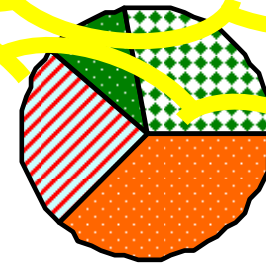
Questionable
7
39%

MODU "B"

Excellent
6
11%

Good
15
28%

Need
Improvement
13
24%

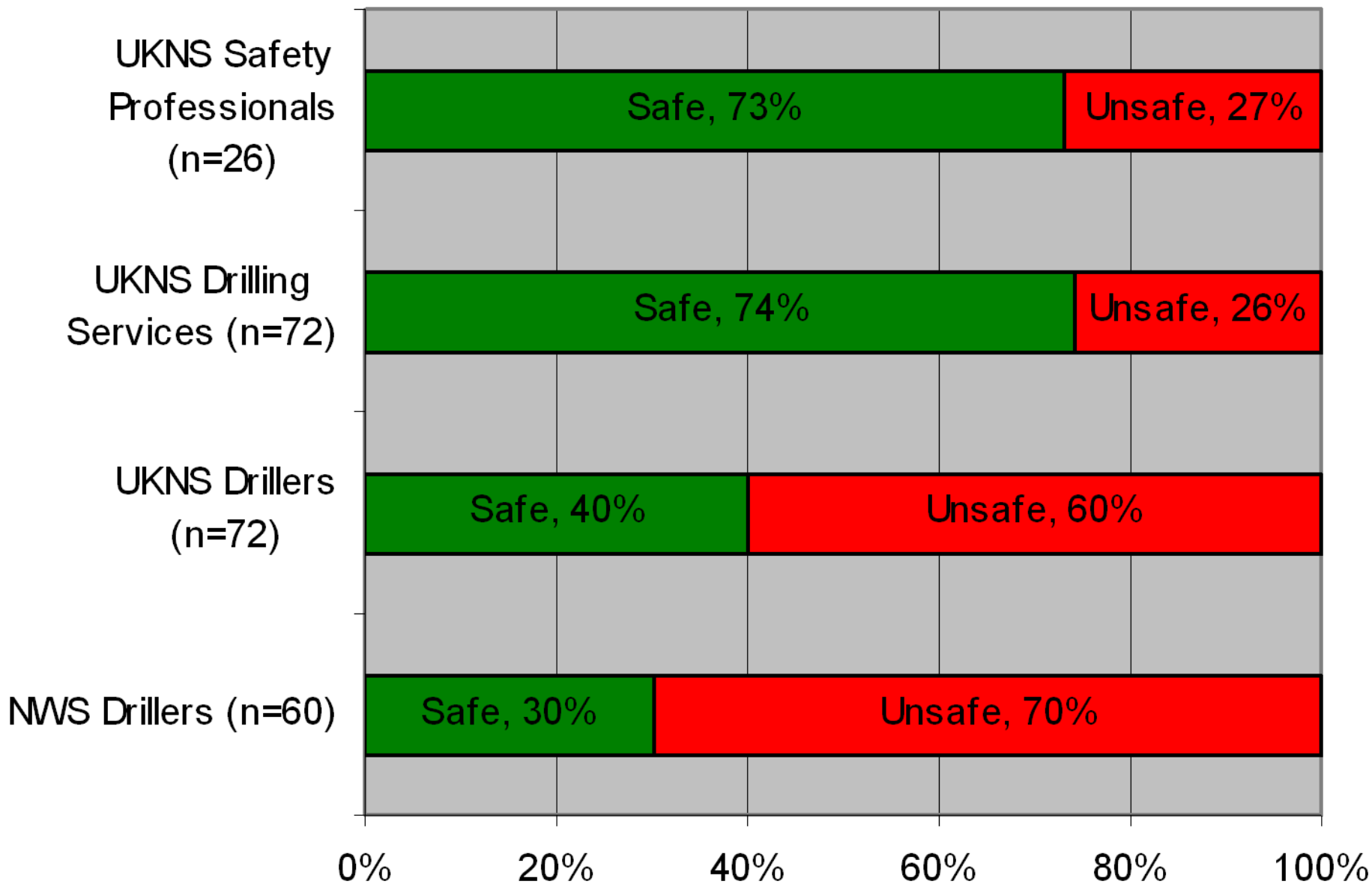


Questionable
20
37%

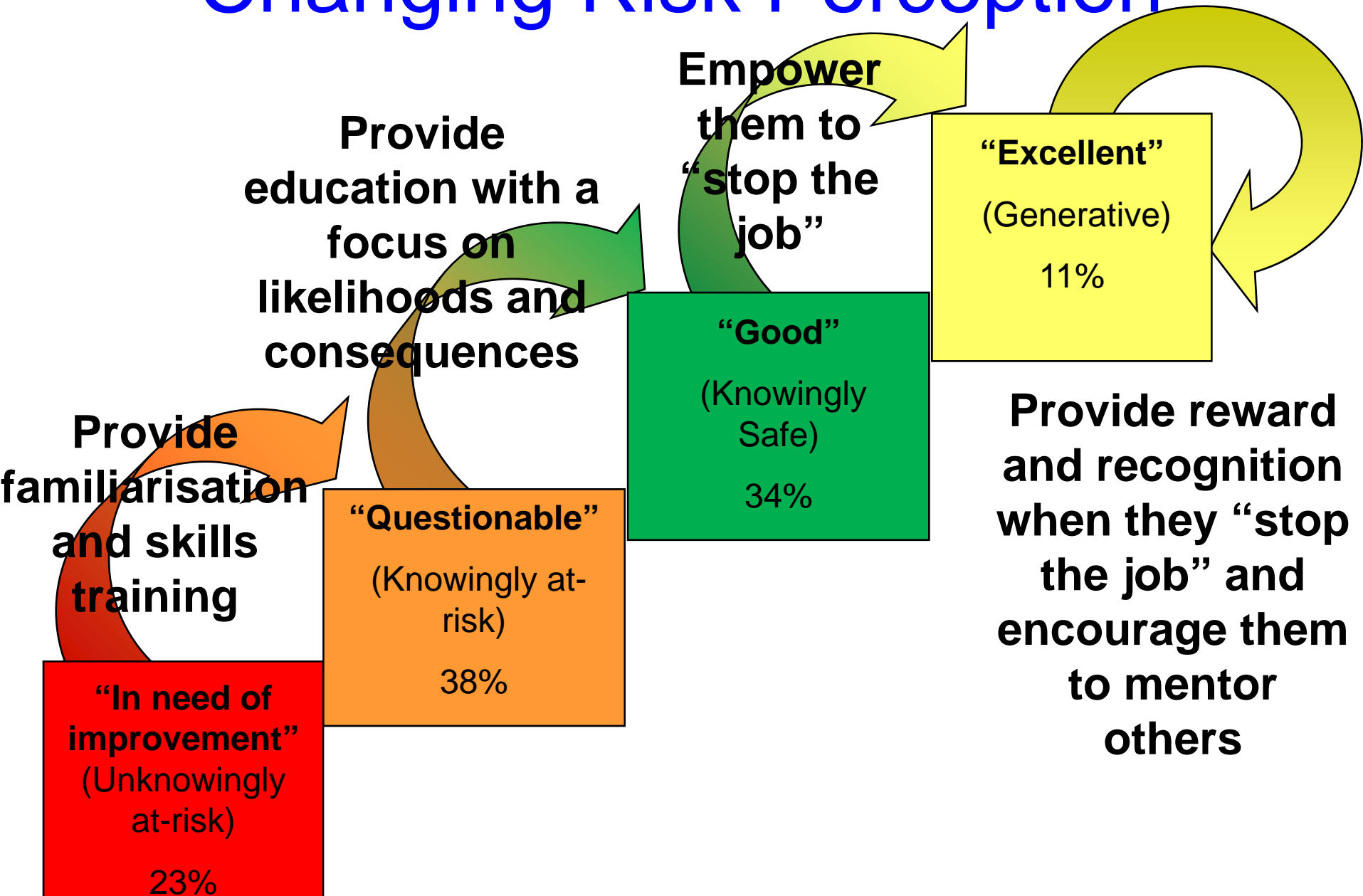
≈40%
SAFE

≈60%
AT RISK

Results of Previous Investigations



Changing Risk Perception



Hypothesis

H2 Risk Perception can be improved by training

Study Design

Pre Test

Group A Scenario 1
Group B Scenario 2
Group C Scenario 1



Training Intervention

Group A and Group B attended the same “risk awareness” and “hazard identification” intervention. Group C attended a different intervention



Post Test

Group A Scenario 2
Group B Scenario 1
Group C Scenario 2

Computer Virtual Reality Simulation Scenario Development

- Scenario 1 (developed in 2005) tests the ability of participants to **follow the rule of staying on the safe walkway** to complete their mission safely (Detailed in SPE98543 and SPE108904)

Scenario 1

Hazard cues presented in order:

- Crane in operation whilst helicopter is on helipad
- Start position in front of cat walk
- Shadow of crane load
- Tag lines of crane load
- Banksman warning of crane load



The image shows a 3D simulation of an offshore oil rig. A semi-submersible platform is visible, with a tall derrick structure in the center. The rig is surrounded by various equipment, including storage tanks and a crane. The background is a vast, open ocean under a cloudy sky. A semi-transparent menu box is overlaid on the left side of the screen.

Main Menu

Game:

- Resume Session
- Create Profile
- Load Profile
- Options
- Exit



It's time to go home! Make your way to the helicopter.

Computer Virtual Reality Simulation Scenario Development

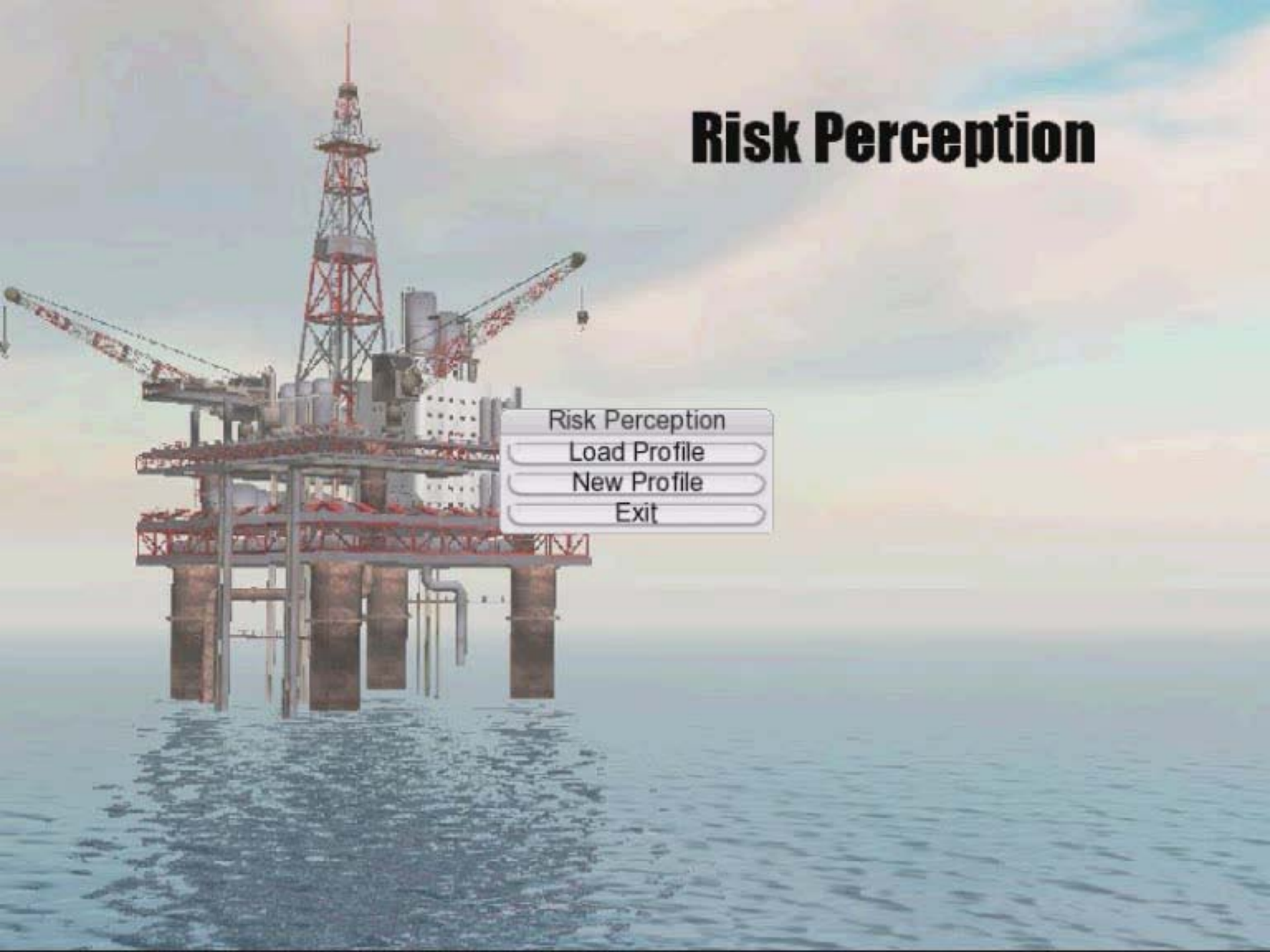
- Scenario 2 tests the ability of participants to **respond to safety signage** to discover the lowest risk route and complete their mission safely

Scenario 2

Safety signage presented:

- Map of Facility
- PPE requirements
- Safe walkways
- Portable warning signs
- Out of service tags
- Warning signs posted on entrance doors
- Barrier tape around working areas

Risk Perception



Risk Perception

Load Profile

New Profile

Exit



Study Participants Groups A & B

- 10 new employees of an oil field services company in Australia
- Average age 27
- Average service < 1 year
- Occupations:
 - 4 Maintenance
 - 2 Logistics
 - 2 Well/Drilling
 - 1 Unspecified

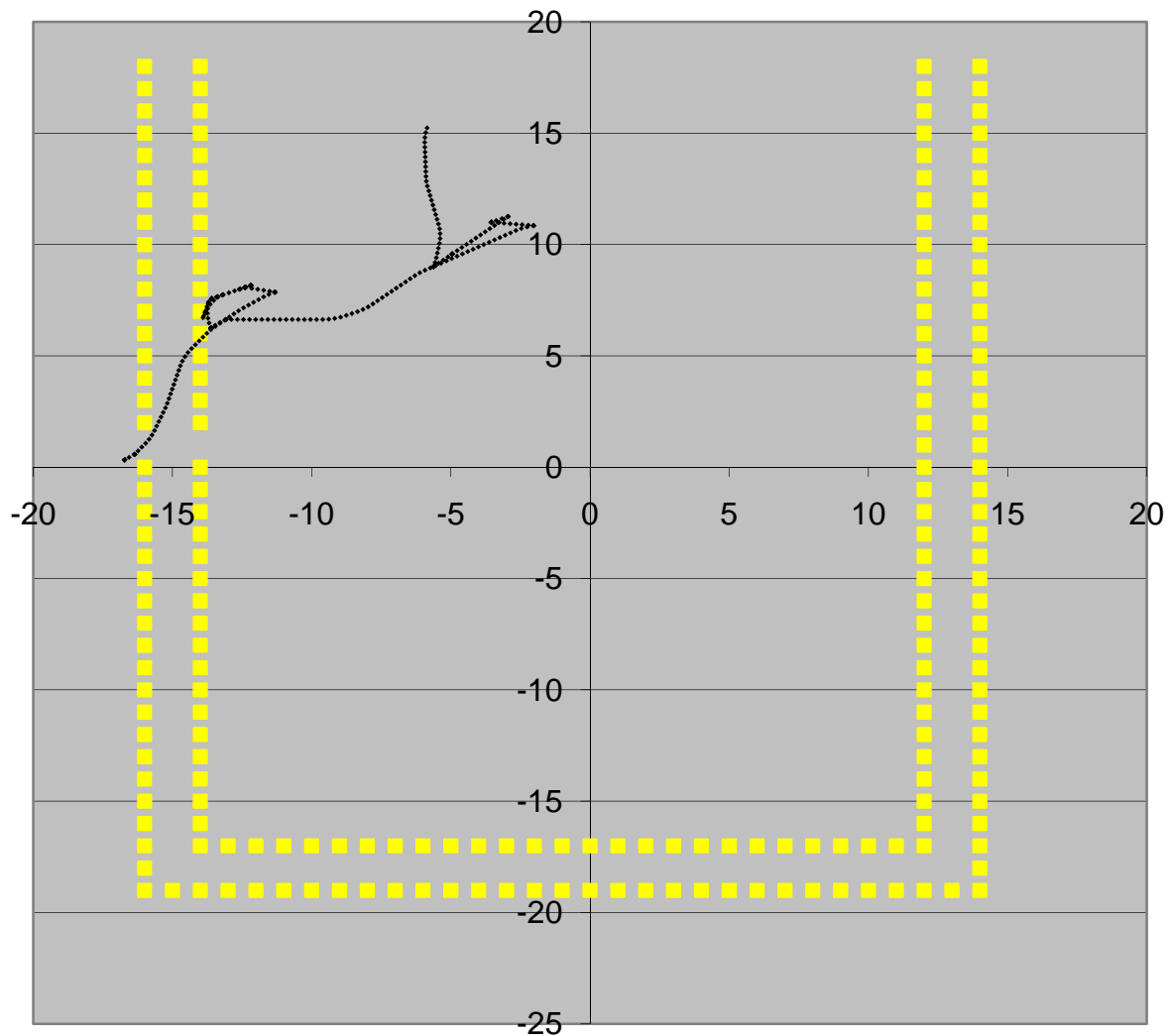
Training Intervention Groups A & B

A comprehensive 3 day program of face-to-face classroom and workshop exercises together with messages from Senior Leadership designed to:

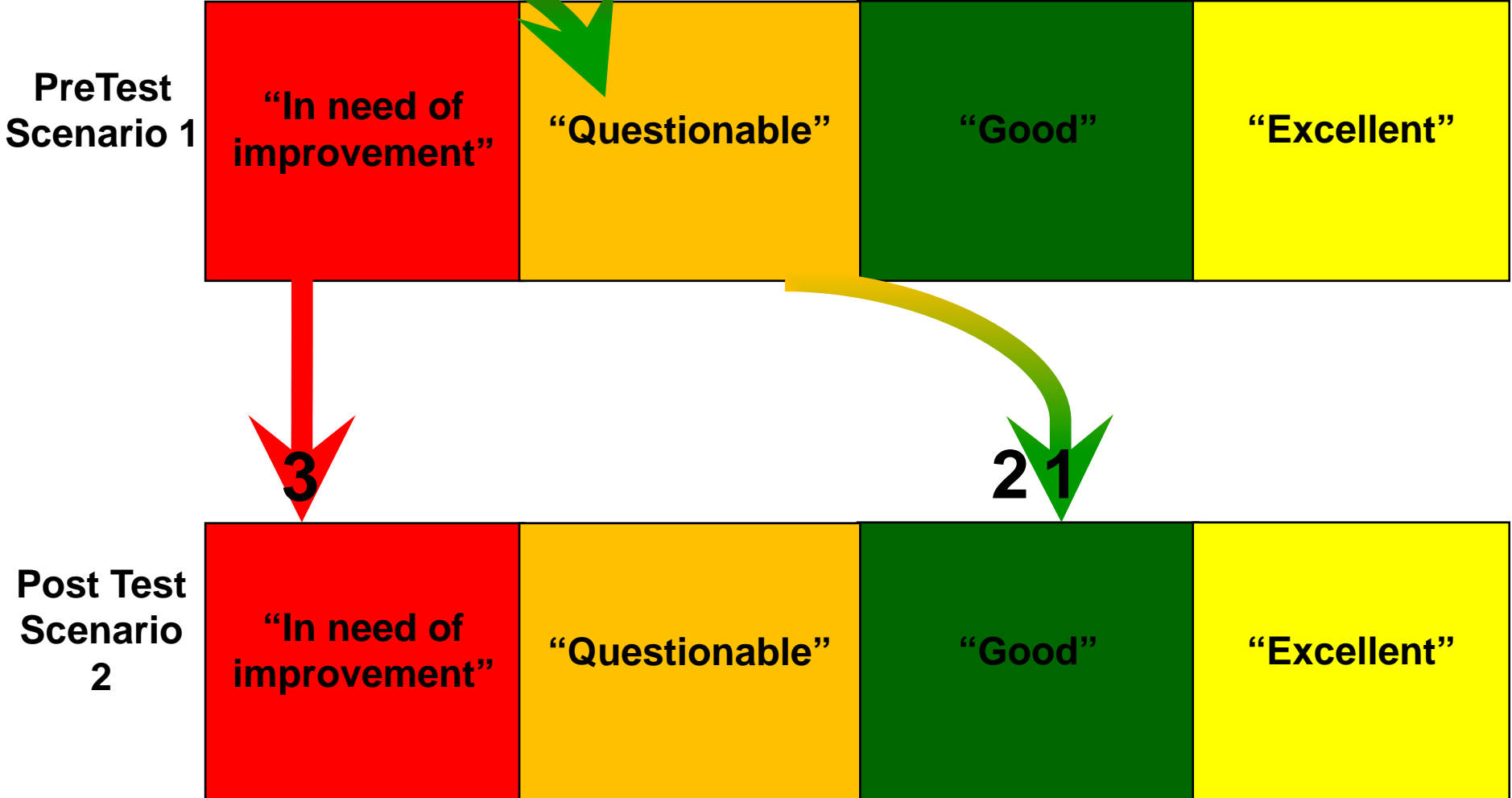
- Increase awareness of injury risks encountered daily in the work environment,
- Provide participants with the tools and techniques necessary to avoid these injuries resulting from activities,
- Incorporate aspects of behavior based HSE Management into all company risk factors,
- Support an audit-able framework for coaching newcomer employees in these risk factors

Example Result for Scenario 1

In need of Improvement



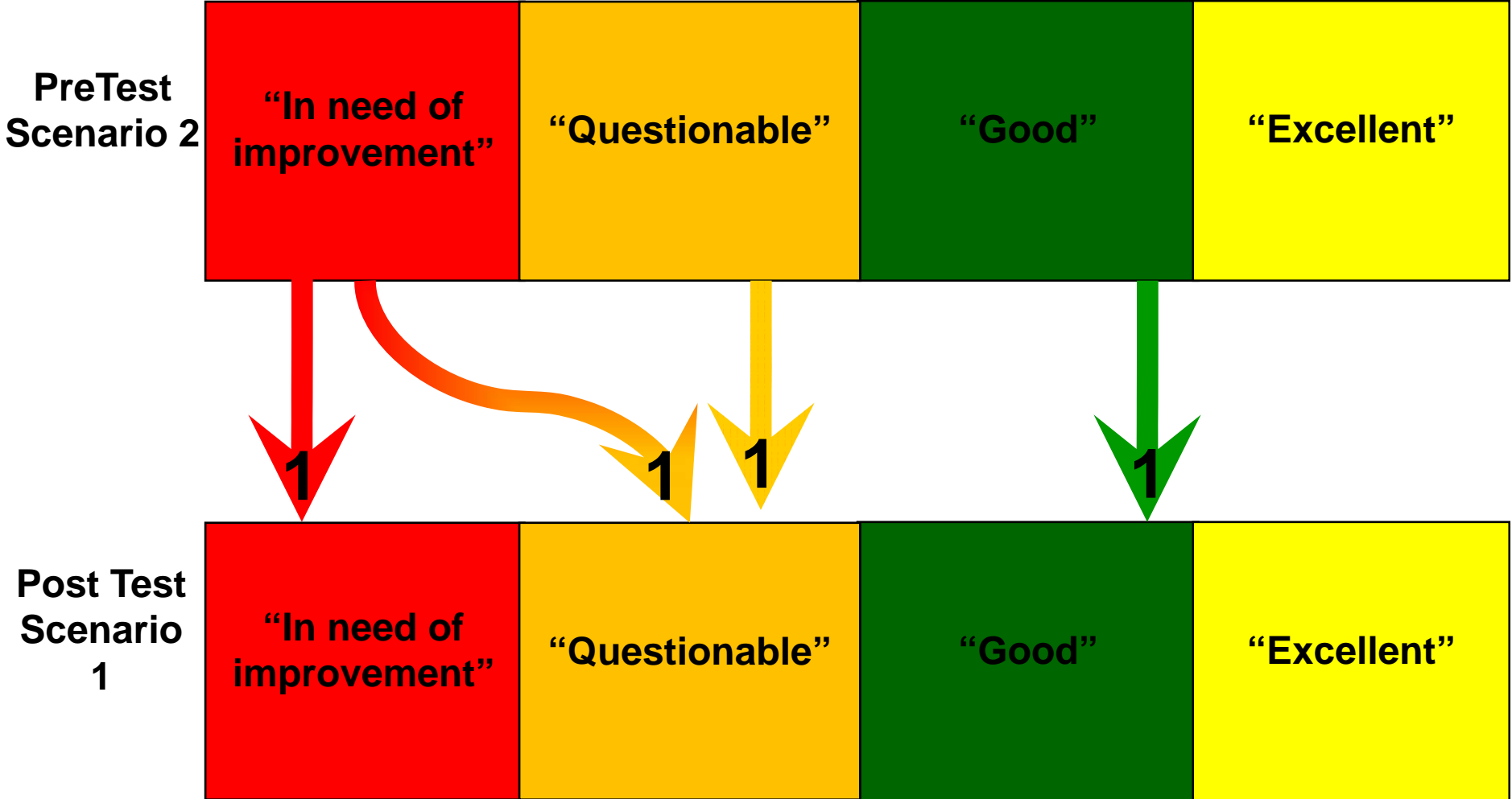
Analysis – Group A



The improvement was 2 people 2 levels = 4 and 1 person 1 level = 1 making a total = 5

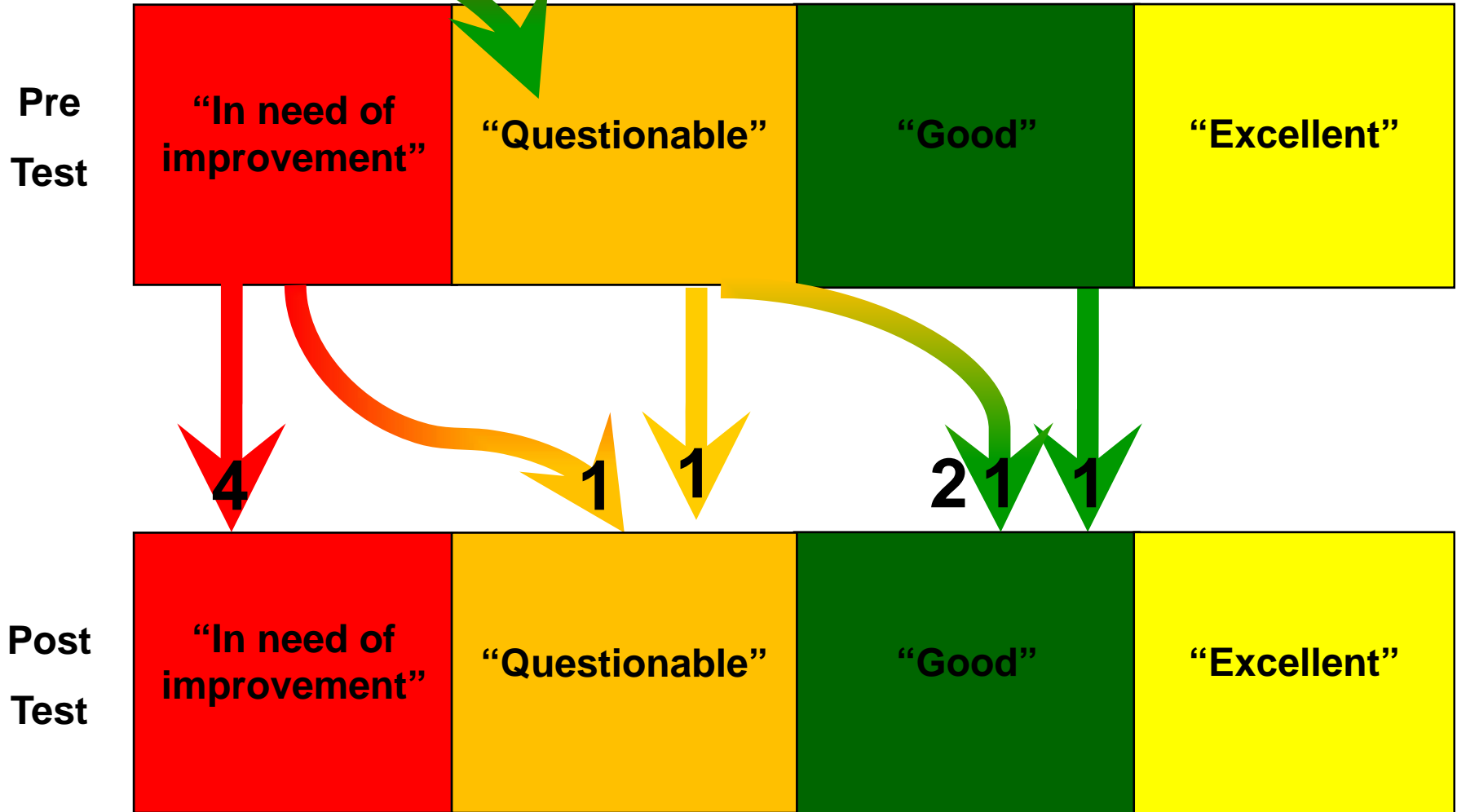
Out of 6 people this represents 83% improvement

Analysis – Group B



The improvement was 1 person 1 level = 1
Out of 4 people this represents 25% improvement

Analysis – A & B Overall



The improvement was 2 people 1 level = 2 and 2 people 2 levels = 4

Out of 10 people this represents 40% improvement

Analysis Groups A & B

- The training did not cause any participants to become worse.
- The training was most effective for the “In Need of Improvement” participants
- The training was not as effective for those “Good” participants as those “In Need of Improvement” and “Questionable”.
- The training was most effective for those undertaking Scenario 1 as the pre-test

Study Participants Group C

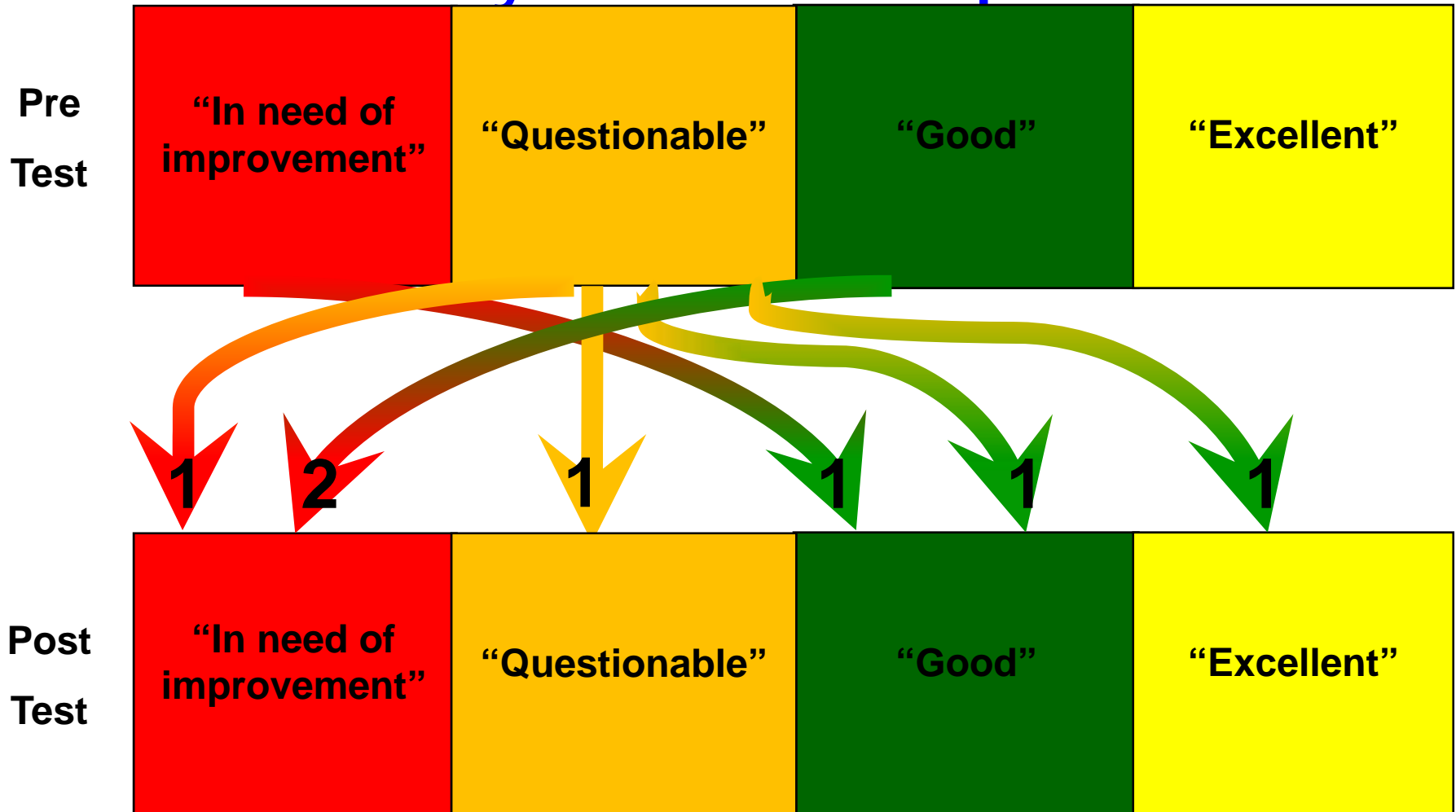
- 10 new employees of an oil field services company in UK
- Average age 25
- Average service < 1 year
- Occupations:
 - 10 Well/Drilling

Training Intervention Group C

A lunchtime (1 hour) health and safety focus meeting for new field personnel led by a corporate health and safety representative comprising:

- Presentation of pictures of field equipment
- Group discussion of the hazards present, what may cause them to be released and what barriers could be utilised to prevent their release
- Individuals sharing “war stories” of similar events

Analysis – Group C



The improvement was 1 person 1 level = 1 and 2 people 2 levels = 4. Total = 5. However, the decrement was 1 person 1 level = 1 and 2 people 2 levels = 4. Total = 5

Analysis Group C

- The training was ineffective as the same amount improved as decremented.
- 1 hour of training may not be enough to improve Risk Perception

Conclusions

- Risk Perception improvement or decrement of an individual can be measured by analysis of their response to realistic workplace scenarios presented via a computer virtual reality simulator.
- Virtual reality is an effective and efficient technique to measure the effectiveness of Risk Perception training.

Next Steps

Redevelop the simulator to allow:

- Internet delivery, automatic analysis and reporting
- Randomised scenarios that prevent participants from “priming” their colleagues of the content

Next Steps

Redevelop the simulator to allow:

- Multiplayer interaction to investigate coaching and the effectiveness of behaviour based safety interventions
- Development and delivery of interactive intervention training based on lessons learned of what works best for each category

Further Information

- SPE 98543 Measuring Risk Perception Index to Improve the Safety of Offshore Teams
- SPE108904 Use of a computer simulation to assess Hazard and Risk perception

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