

Mine Health and Safety Council



Project Name: New approaches to induct employees in the mining sector on dangers related to thermal stress and preventative measures

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EXECUTIVE SUMMARY

Background:

In 2008 382 cases of heat related illnesses were reported at a major Gold mining group in South Africa. Of the 382 cases, 380 were heat cramps and two were heat exhaustion. Introduction of women in the mining sector create additional challenges. At one of the Platinum mining groups, 30% of women tested for heat tolerance in 2007 failed the heat tolerance screening test. There was therefore a need to increase the knowledge and competency skills of employees in the mining sector to manage heat stress effectively. Other approaches beside the classical classroom approach need to be utilised to achieve this. Active participation of employees with the utilisation of a board game may provide an alternative avenue to increase the knowledge and competency skills of employees. There is evidence that board games are effective to create awareness, trigger awareness, manage tensions and conflicts, transfer effective approaches used by experts to deal with different scenarios, expose learners to real life scenarios that may be overlooked during normal lectures and allow the learners to have fun while they learn.

In order to create awareness it was hypothesised that utilisation of a board game in underground mine worker training will improve retention of work knowledge regarding the prevention of heat stress and the identification and management of heat related conditions in terms of signs and symptoms and treatment thereof.

Ethical approval was granted to test the effectiveness of the board game at selected mining houses. All underground mine workers who participated in the evaluation of the board game gave their informed consent.

Objectives:

The objectives of this research were to:

- 1) collate relevant training material on heat stress management,
- 2) develop a board game to be utilised as an additional training tool,
- 3) test the effectiveness of the developed board and card game in a classroom environment,
- 4) test the effectiveness of the board game to retain knowledge and
- 5) develop a system to recognise employees who maintain or improve their competency levels during playing the game.

Results:

There was an overwhelmingly positive response from the workers and the facilitators during the focus group discussions held at each mine after they had played the game. There was a balance between learning new concepts and enjoying the game with their co-workers. They all felt it would be relevant and novel to include in the training centre environment, and offered suggestions for improvements to specific aspects of the game.

The underground mine workers scoring less than the 30th percentile (70%) in the pre-test showed a significant improvement (pre-test = 58.7% vs post-test = 74.4%, $n = 47$, $p = 0.0001$) during the post-test compared to those scoring more than the 30th percentile in the pre-test (pre-test = 79.3% vs post-test = 80.3%, $n = 129$, $p = 0.3657$). The scores of underground mine workers with more than 2 years underground mining experience improved significantly if the pre- and post-test results are compared (pre-test = 73.2% vs post-test = 79.2%, $n = 115$, $p = 0.0001$). The increase in scores of underground mine workers with less than 2 years underground experience did not increase significantly (pre-test = 77.2% vs post-test = 79.2%, $n = 48$, $p = 0.3147$).

The 30th percentile score of underground mine workers during the re-test, more than 2 months after playing the game, showed that there was retention of knowledge (post-test = 76.7% (n = 176) vs pre-test = 76.7% (n = 27)). Utilizing of the board game as refresher medium increased the knowledge of underground mine workers significantly of the pre-test and post-test trainees. The knowledge of underground mine workers scoring less than the 30th percentile (76.7%) in the pre-test increased with 12.9% after playing the board game again (pre-test = 67.1% vs post-test = 80.0%, n = 7, p = 0.0185). underground mine workers with a score more than the 30th percentile did not show an increase in knowledge after playing the board game again (pre-test = 81.0% vs post-test = 82.0, n = 20, p = 0.3725).

Discussion and conclusions:

The board game was positively received by all underground mine workers and facilitators during the evaluation process at participating mining houses. There is clear evidence that playing the board game increases the knowledge of underground mine workers significantly. Pre-test scores of underground mine workers who played the game 2 months ago, provided evidence that knowledge acquired during playing the board game was retained. The board game proved also to be effective as refresher medium. The game can be used in a flexible manner by facilitators since they can introduce discussion about various topics related to health and safety.

It can therefore be concluded that the real life situations used as questions on the cards can be recalled by underground mine workers. Underground mine workers may therefore be able to recall depicted scenarios used in the board game when confronted with real life situations. The positive attitude of underground mine workers and facilitators involved with playing the board game is a clear indication that trainees will play the game frequently given the opportunity during induction and even thereafter. This will increase their retention of knowledge and

competency skills to identify and manage environments that may lead to the development of heat related illnesses.

Recommendations:

- The board game need to be rolled out to all training centres to be utilized as an additional training tool to induct underground mine workers on the management of hot environments.
- The questions on the cards can be utilised to evaluate knowledge of underground mine workers after completion of induction.
- A glossary to form part of the answer sheet to make it easily assessable whilst playing the game should be developed
- An instructional CD to explain how the board game can be played needs to be developed and distributed with the board game to train facilitators
- Specific cards that deal with critical issues could be used during safety talks underground
- Make the cards available during classroom induction to enable stimulating discussion on heat related issues

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