Using video during training to enhance learning of emergency incident command and control skills

McLennan, Pavlou, Klein and Omodei use video technology to enhance learning by participants during incident command and control training

Abstract

In this paper we consider issues associated with training in emergency management incident command and control skills. Critical aspects of training activities are noted and the importance of feedback which promotes reflective self-appraisal is noted. Use of video, particularly head-mounted video-cued recall, in training exercises is discussed.

Introduction

How can emergency services personnel be assisted to become more effective incident controllers? In this paper we describe an approach to training which we believe can contribute to the learning of incident command and control skills.

Few would dispute that exercising effective command and control on the emergency incident ground involves complex psychological skills associated with judgement and decision-making. It is only relatively recently that issues to do with the nature and acquisition of the complex skills involved in judgment and decision-making have been addressed by researchers. Anders Ericsson (Ericsson & Charness, 1994; Ericsson & Lehmann, 1996) argues that acquiring any high-level, complex skill is almost entirely a matter of intensive, reflective practise of the skill over a lengthy period of time. If Ericsson is correct, then this implies that incident command and control skills cannot simply be taught in a didactic manner, they can only be acquired-via some active process of engagement with command and control tasks. We propose that in order to be effective, training in incident command and control skills must involve four elements:

1. Providing a simple, robust conceptual model of incident control processes.
2. Opportunities to actively practice incident control in a setting which adequately simulates the psychological demands on an incident controller.
3. Providing feedback about the effectiveness of command and control decisions, communications, and actions.
4. Facilitating reflection and self-appraisal.

In relation to the first point, we believe that there is scope for advances. The few models proposed seem to suffer from one or more of several shortcomings that include:

(a) absence of a theoretical foundation;
(b) lack of empirical support:
(c) excessive complexity; or
(d) lack of specificity.

Gary Klein's Recognition-Primed Decision (RPD) model (Klein, 1989) is probably the most influential conceptual account of incident control decision-making. However, it is limited in scope to 'typical' situations and, as such, fails to address decision processes involved in unusual and complex incidents (McLennan, Omodei, Holgate, & Wearing, in press). Concerning the second point, we believe that too much attention has been devoted in the past to fruitless attempts to replicate physical aspects of the incident ground (eg, water, smoke, appliances) with insufficient explicit attention to the psychological demands which typically confront incident controllers: ambiguity, uncertainty, poor quality information, changing and conflicting demands and priorities, limited resources, information overload, and unexpected developments. In relation to point three, our observations in Australia and overseas lead us to conclude that far too frequently feedback to participants following an incident command and control exercise is seriously deficient. There is not enough time made available, the feedback is haphazard and unsystematic, insufficient care is taken to ensure that participants understand the feedback, and participants are overloaded with input and are unable to retain important 'take home' messages. Finally, the mere provision of feedback does not necessarily lead to acquisition of knowledge. Unless a participant is psychologically open to, receptive of, and reflective

Miniature video camera in fibreglass shroud mounted on a MFB safety helmet.

about the feedback messages, existing beliefs will probably remain unchanged. Practice does not necessarily make perfect, it may simply make permanent.

In the remainder of this paper we describe a relatively simple and inexpensive video replay procedure aimed at enhancing the effectiveness of learning from incident control simulation exercises. The procedure was developed for use in the Melbourne Metropolitan Fire and Emergency Services Board (MFESB) Senior Station Officer Promotion Course Number 31, conducted under the supervision of Philip Klein.

The starting point for our thinking was the commonplace observation that candidates for promotion from Station Officer to Senior Station Officer bring with them a diverse range of prior informal learning, and consequent beliefs, about incident command and control acquired more or less haphazardly through their previous fire brigade experiences. In the training environment they will, of necessity, bring their existing beliefs to bear on any incident control problem presented. Feedback which conflicts with these beliefs is likely to be resisted and rejected, privately if not publicly. We reasoned that if initial incident command and control training simulations emphasised and facilitated a stance of reflection and self-questioning, then this would probably lead to more ready consideration and acceptance of corrective feedback. Our previous experience of replaying video footage captured by a miniature camera in an incident controller's safety helmet suggest that use of such footage may assist in this process (McLennan, Omodei, Rich, & Wearing, 1997).

When an individual watches a conventional video replay of him or herself engaged in a task taken from an external perspective, the result is frequently self-consciousness, evaluation anxiety, and defensiveness leading to biased selectivity in what is recalled. However, when the same individual watches a replay of video footage taken from his or her own visual perspective (using a head-mounted camera) while a task was undertaken there is minimal self consciousness, there is a high level of psychological re-immersion in the original task activity, and the individual is usually able to recall in great detail the underlying mental events that generated the task activities. Head-mounted video footage to cue recall of decision and judgment processes has been used in training settings (McLennan, Omodei, Rich, & Wearing, 1997) and also in post-incident operational debriefing (McLennan, Omodei, & Wearing, 2001; Omodei, Wearing, & McLennan, 1997).

Based on this previous experience a procedure was developed for the incident control training component of the promotion course which would incorporate, first, the use of head-mounted video footage and, subsequently, conventional video footage to provide feedback to participants.

Methodology

Participants: There were 12 (male) candidates for promotion from Station Officer to Senior Station Officer. They had between 10 and 20 years of experience in the MFESB, and between four and 12 years experience as Station Officers.

Equipment: A Sony DXC-LS1P CCD colour "lipstick camera" was mounted in a protective fibreglass shell fitted over a standard Bullard Firedome safety helmet. The camera was connected via a cable to the camera control unit and a 12-volt power cell, both secured in a small "bumbag". A microphone was located under the rim of the helmet and both video and audio were recorded by means of a Sony CCD-TR1E video Hi8 Handycam also carried in the bumbag.

Procedure: Prior to each candidate being assessed on his incident command skills by means of a practical examination, candidates spent five days undertaking a range of role playing simulation exercises in which each took the role of incident controller (IC). During each exercise the candidate in the IC role listened to the initial radio turnout message, heard the wordback message from the first-on-scene appliance, and assumed control of the incident.

In each exercise, scripted role players provided reports and carried out the IC's instructions. After the incident had developed for about 15–20 minutes an instructor assumed the role of a senior officer who had arrived on scene to take charge and the candidate was required to brief the (notional) superior officer on the situation. This handover briefing concluded the exercise.

During the first three days of the training period, the candidate who was the IC for an exercise wore the helmet-mounted camera system. Each participant wore the helmet camera between two and four times over the three days. Immediately following an exercise there was a brief post-incident discussion involving the IC, instructors, and other participants during which the most salient events of the exercise were noted. The IC then moved to a small room nearby for a video-cued recall debriefing and sat in front of a TV monitor. The IC and debriefer each wore a small tiepin microphone. Both microphones were connected to a video-audio mixing unit. An 8-mm video player/recorder to replay the helmet camera footage also fed into the mixing unit. Outputs from the 8-mm video unit and both tiepin microphones were copied onto half-inch videotape on a VHS recorder.

Prior to a video-cued replay debriefing, each IC was instructed: "*We are going to watch a replay of footage of the exercise taken from the helmet camera. As you watch, I want you to take yourself back to being in the role of the IC. I want you to recall as much as you can of what was going on in your mind when you were managing the incident. I want you to speak these recollections out loud – just begin talking and I will pause the tape so you have plenty of time to recall as much as you can. Your recollections will be recorded onto a VHS copy of the original footage of the incident as you saw it and all the radio and voice communications, plus your recollections of the things that were going on in your mind that "drove" your actions, decisions, and communications. You can then replay this tape with your instructors and fellow candidates to get their feedback and suggestions.*"

The 8-mm (helmet cam) tape was rewound to the beginning of the exercise and the image paused. The IC was then instructed: "*Now, as you watch this picture of the start of the exercise take yourself back – what do you recall thinking just as the exercise was about to begin?*" This began the recall process. When the IC finished verbalising his initial recollections, the tape was started and the cued recall session continued. The debriefer encouraged the IC to recall as much as possible, occasionally using non-directive probes, and when necessary reminding an IC to recall rather than to engage in self criticism.

At the end of the replay, the IC was asked: "*Now that you have watched the incident run through, if you could magically turn the clock back and do it again, what, if anything, might you do differently and why?*" The IC's response to this was also recorded. At the end of the recall session, the candidate was handed a copy of the VHS tape copy of the original helmetcam footage incorporating his cued recollections. This tape was replayed subsequently by the candidate so that instructors and fellow candidates could discuss his management of the exercise and provide detailed feedback. Each candidate experienced between two and four video cued recall sessions.

For the final two days of the simulation exercise program, the helmet-mounted camera was not used. Instead, the candidates were videoed using a conventional hand-held camera. Immediately at the end of each exercise, instructors and other participants in the exercise provided detailed feedback to the candidate. These feedback sessions were also video-recorded. A copy of the (external) video footage of the exercise and feedback was then given to the candidate to replay as often as desired.

At the conclusion of the five-day simulation training program each candidate completed and returned (anonymously) an evaluation questionnaire concerning the usefulness of both the helmetcam video-cued recall debriefing and the external video footage.

Results

The helmet-mounted video footage of each IC's field of view (plus voice and radio communications) during each simulated incident proved a powerful cue for candidates to recall in considerable detail the bases of their incident control decision-making. Candidates also identified uncertainties, self-questioning, and self-doubt during the course of an exercise. Instructors commented that the experience of undertaking a video-cued recall session appeared to be associated with candidates being more willing to consider critical feedback suggestions about improvement. The instructors also commented that the video-cued recall sessions seemed to assist candidates to be more analytical and less defensive in reviewing their performances as captured by external video.

The combination of the helmet-mounted video-cued recall to explore the psychological bases of their decisions followed by the conventional external video footage capturing their command, control, and communication behaviours was evaluated very positively by the candidates as contributing significantly to enhancing their incident control skills. Their responses to the evaluation questionnaire were uniformly positive (detailed results are available from the first author). Nine of the 12 candidates wrote comments on their evaluation questionnaires. Seven comments were positive statements about the benefits of the recall sessions and being able to watch replays of the video footage. Two candidates made positive comments but said that the field of view for the helmetcam needed to be wider to catch all the action. This is simple to address by changing the camera lens.

Several candidates (those above average height) commented verbally that the safety helmet was somewhat of a distraction. The mobile control unit used for the exercises has a very low ceiling and taller candidates bumped the helmet on the roof. It is not usual for safety helmets to be worn inside the mobile control unit. In future, for incident command and control exercises, instead of the camera being mounted inside a safety helmet it could be fitted to a lightweight mounting so as to be less bulky overall. Such a lightweight camera mounting is currently being used for research in training hospital operating theatre personnel.

Discussion

Of course, the nature of the trial does not permit a conclusion that the combination of head-mounted (internal perspective) video and hand-held (external) video footage is superior to other approaches to incident command training. In order to determine this, a randomised experiment would have to be carried out and there are obvious difficulties in doing this as part of a promotion course. Nonetheless, candidates and instructors had taken part previously in incident control simulation exercises with conventional (non-video) post-exercise feedback and they reported very favourably on the use of both the video procedures. They also offered spontaneous comment about the advantages of having video footage of their feedback to review subsequently, rather than having to rely totally on their memory of the feedback content.

There are costs associated with using the procedure described for incident command and control training. The cost of the camera system is likely to be of the order

A simulation exercise in progress: a BA team is about to search a smoke-logged building.

of $2,000. Some minimal technical expertise will be required to fit the camera and an associated microphone to a suitable head or helmet mounting. If one is not already available, a small video-recording unit must be purchased. A backpack or bumbag, TV monitor, 8-mm and half-inch video player/recorders, tiepin microphones, a mixing unit, and RCA cables are also required. Two personnel are required in order for head-mounted video cued recall debriefings to be conducted as part of a training course: one to manage the camera system and one to conduct the cued recall debriefings – the debriefer needs some preliminary instruction in the debriefing procedure, especially in maintaining a non-evaluative stance in order to facilitate candidates' recollections (a Manual is available from Jim McLennan). Apart from these considerations, cued recall debriefings take time – about three times the duration of the original exercise. This time has to be built-into the training program, either at the expense of other activities or by extending the length of the course.

Notwithstanding the above, we recommend consideration of the approach to incident command and control training officers who are progressing to levels where they could (at least initially) be incident controllers at serious emergency situations. As Murray (1994, p. 21) noted in the UK context: "After Junior Officer training there is little to guide the officer who progresses through the ranks and gains increased responsibility on the fireground." While advances in computer-generated simulations, such as *VectorCommand* and computer-video supported simulations such as *MINERVA* and *HYDRA*, will continue, such systems have their own drawbacks – notably relatively high purchase, start-up, development, and ongoing updating costs; and uncertain psychological fidelity. The video-based approaches we have described represent a relatively "low tech" extension of conventional role-playing simulation for incident command training with significant enhancement of the feedback component of such training.

[Postscript: All 12 candidates were passed as eligible for promotion as Senior Station Officer]

The opinions expressed in this paper are those of the authors and do not necessarily represent the views of the Melbourne Metropolitan Fire and Emergency Services Board.

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