



Virtual training: Making reality work?



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ABSTRACT

Team training seems to be crucial for the success of teams such as those in emergency services, the police or fire fighting. To carry out an operation successfully, intense training for complex collaborative tasks needs to be provided for all team members. In our study we applied a virtual training environment to train police personnel for complex collaborative tasks. The virtual training group was compared to a group with standard training and to a control group. The data show that the standard training resulted in more motivation, perceived value of the training and knowledge after the training session than virtual training. But with regard to the learning transfer measured by the behaviour in a real and complex situation, the virtual training was as good as the standard training. Both outperformed the control group.

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1. Introduction

Emergency service personnel such as the police, fire fighters or the army have to be prepared for various operations, and continuous training is essential for their success and security. But training in real situations is very costly and complex, and only a small variety of real scenarios can be included. Virtual training environments (VTEs) are helpful in training for such complex collaborative tasks, especially if training in real situations is not possible (Moskaliuk, Bertram, & Cress, 2013a, 2013b). Especially services such as the police, the army, emergency services or fire fighters can profit from virtual training to train for scenarios which preclude reality training because of cost, danger or effort (Rose et al., 2000). Often virtual training is the only option for such training (Romano & Brna, 2001). But there is a lack of empirical evidence about team training for complex collaborative tasks and their transfer to the work environment (Burke & Hutchins, 2007; Delise, Gorman, Brooks, Rentsch, & Steele-Johnson, 2010). Evaluative studies on virtual training are still rare (Chittaro & Ranon, 2007; Jou & Wang, 2013). It remains unclear if virtual training results in the knowledge that is expected of trainees and if the technology used for the training is efficient (Salas, Milham, & Bowers, 2003). A theory-driven design for a virtual training environment (VTE)

seems to be crucial for successful learning and training in VTEs (Moskaliuk et al., 2013b), and there is evidence for positive training outcomes in these virtual environments (Moskaliuk et al., 2013a). But the questions remain as to how effective virtual team trainings are and whether the virtually acquired knowledge can be transferred to real situations. Clearly there is a need for empirical work concerning virtual team training for complex collaborative tasks.

In this paper we present a field study of a virtual training session for members of the police force using the VTE ViPOL. We show that knowledge, skills and attitudes (Salas & Cannon-Bowers, 2000) gained during the virtual training for complex collaborative tasks could in fact be transferred to real-world situations, comparable to a standard training. In the next sections we first give a brief introduction to the training context and summarize recent findings on team training and transfer of training content. In the empirical part of the paper we describe our field study that compares a virtual training group with two control groups (one with standard training and one with just written instruction and no training, as usually practiced by the police) and report the results. In conclusion we discuss the results and their impact on the effective implementation of virtual team training for complex collaborative tasks.

1.1. Virtual Training for the police force

This field study is part of a larger project conducted by the police training department of a German federal state. The overall goal of the project is to develop a VTE with the objective of providing adequate training for complex collaborative tasks (Moskaliuk et al., 2013b). Among other issues, the interactions of police ground forces with a helicopter crew was identified as an important

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training issue that cannot be included in reality training because of high cost and great effort. The complex collaborative tasks involved in this particular issue are a need for team coordination of the ground forces, communication with the helicopter crew, integrating information from the helicopter crew into the ground operation, awareness of dangerous situations, coping with the sound of the helicopter and remembering knowledge and action courses. Thus, the interaction of ground forces with a helicopter crew can be described as a highly complex collaborative scenario, and the need for training in this case seems obvious. In this study we applied the VTE ViPOL to provide training for these collaborative interactions. The screenshot in Fig. 1 shows the VTE ViPOL, with virtual police officers, suspects, pedestrians, vehicles and the helicopter in a virtual town.

1.2. Training teams for complex collaborative tasks

Operations of action forces are characterized by “rapidly evolving and changing conditions, severe time compression, and high degree of ambiguity and uncertainty” (Cannon-Bowers & Salas, 2010, p. 18). In such situations the individuals have to work as a team, defined as “a set of two or more individuals who interact interdependently and adaptively toward a common goal or objective” (Cannon-Bowers & Salas, 1998, p. 83). The team task requires “multiple sources of information, task interdependencies, coordination among members, common and valued goals, specialized member roles and responsibilities, task-relevant knowledge, intensive communication, and adaptive strategies to help respond to change” (Paris, Salas, & Cannon-Bowers, 2000, p. 1052–1053). To solve the team task, each team member needs specific knowledge, skills and abilities (Delise et al., 2010). Team training needs to impart to trainees an understanding of multiple factors: of the equipment they use, of the demands of the task and its environmental effects, of the decision-making process, of their own role in the task, and finally, of the knowledge, skills and attitudes of their teammates (Cannon-Bowers & Salas, 2010). Team members have to know how to interact and communicate with each other and how to solve their task collaboratively (Cannon-Bowers & Salas, 2010). Decisions need to be made quickly, and therefore it is essential that all team members know what their own role is and what their teammates’ knowledge, skills and attitudes are (Cannon-Bowers & Salas, 2010). Cannon-Bowers and Salas (1998) emphasize the need for collaboration of teammates and defined roles and functions within the team for effective teamwork. They describe team performance as a combination of jobs skills on the one hand, and “being an effective team member” (p. 84) on the other hand. For effective teamwork implicit coordination in the team, reached through shared mental models and shared understanding of a situation



Fig. 1. Screenshot ViPOL.

within team members (Cannon-Bowers & Salas, 1998), is very important. Not only performance has to be trained, but team skills (Dobson et al., 2001). Teamwork is dependent upon three competencies that should be considered in training: cognition/knowledge, behaviour/skills and attitudes (Salas & Cannon-Bowers, 2000). Cognition/knowledge refers to the relevant knowledge that each team member needs in order to perform several team tasks. Behaviour/skills refers to the skills team members should possess to perform adequately. Finally, the attitudes of each team member and how they approach the task are important for teamwork (Salas & Cannon-Bowers, 2000).

Providing feedback on learners’ performance support their acquisition of procedural knowledge (Serge, Priest, Durlach, & Johnson, 2013). While training for complex team tasks, individual team members often do not have the cognitive resources for self-monitoring or the reflection of team processes (Tannenbaum, Smith-Jentsch, & Behson, 2010), but providing opportunity for such reflection would be important for efficient team training. Tannenbaum and colleagues (2010) propose a team learning circle (p. 251), starting with a pre-brief where roles, strategies and goals are defined, followed by a phase of team performance, which can consist of role play, work samples or simulations. The training should then be observed by the trainers, and each individual team member as well should monitor problems in the team process. Then the individual observations of trainees and trainers should be discussed in a post-action review, focusing on team performance and team processes (Tannenbaum et al., 2010).

Hackman and Morris (1974) underline the importance of the interaction process in a team. The link between input factors (such as individual skills, group factors or environmental factors) and performance outcomes can only be identified through the group interaction process (Hackman & Morris, 1974). To understand the relation between input and output in teamwork, the interaction process of a team needs to be analysed (Hackman & Morris, 1974). DeChurch and Mesmer-Magnus (2010) identified collective cognition as an important factor for team performance in their meta-analysis and found that team cognition has a positive relation to team process. Their study supports the theory that behavioural processes, motivational states and cognitive states are all crucial for team effectiveness. For the development of team cognition they suggest a team task analysis and a focus on training and leadership. But they point out that there is still a lack of research both on how team cognition forms and on explicit team processes (DeChurch & Mesmer-Magnus, 2010). Delise et al. (2010) showed an effect of team training on cognitive outcomes which was larger compared to that of team building.

To sum up, the literature on training for complex collaborative tasks highlights the importance of team interaction processes and implicit coordination within a team (Cannon-Bowers & Salas, 1998; Hackman & Morris, 1974), describes self-monitoring or the reflection of team processes as relevant for effective learning in teams (Tannenbaum et al., 2010) and identifies behaviour, motivation and cognition as important factors for team effectiveness (DeChurch & Mesmer-Magnus, 2010). Team training should include the knowledge, skills and attitudes relevant for the trained task (Salas & Cannon-Bowers, 2000). VTEs deliver various possibilities for the enhancement of training, such as replay functions or the swap of perspectives (Moskaliuk et al., 2013b). In our former work, we showed that a VTE can be used to provide training for complex collaborative tasks, and use of the VTE yields positive results in reactions, learning and behaviour (Moskaliuk et al., 2013a). But will the virtual training for a task be transferred to a complex collaborative scenario in a real situation when the team has to accomplish the task? Will the training prove to be effective if we not only measure individual knowledge but also team efficacy as indicators of effectiveness? In the next section we examine

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