Effectiveness of Simulation-Based Learning in Basic Police Training

Andrea Beinicke
Department of Psychology, University of Würzburg, Germany

Albin Muff
Department of Police Training and Further Education, Bavarian Police, Bamberg, Germany

Abstract

Simulation-based learning is an important element of police training and further education. In the Bavarian police system (Germany), the curriculum of basic training includes 500 hours of simulation-based training for apprentices. This considerable amount of training necessitates a great deal of facilities and human resources. After a long period of practical experience, we investigated a training evaluation study in cooperation with the University of Würzburg (Germany) to measure the effectiveness of the simulation-based training in Bavarian police officer trainees.

The results of the study indicate that the simulation-based training appears to be both objectively and subjectively effective. Regarding measures of objective training success, trainees' overall performance as well as their factual and applied knowledge significantly increased over time in the simulation-based training.

Regarding measures of subjective training success, we found a highly significant increase in effectiveness over time in simulation-based training, with the largest effects found in trainees' perceived usefulness, application to practice, the feeling of personal and professional advancement, and the satisfaction with the simulation-based training.

To optimize simulation-based learning activities, more constructive feedback by trainers is necessary in terms of information about the individual learning process. Additionally, more standardisation across trainers, classes, training modules, and different training centres is necessary.

We conclude that role playing as a form of simulation-based learning is effective in basic police training, even in the long term. When combined with traditional classroom training, such simulation-based training can improve police trainees' training success.

Keywords: police training – simulation-based learning – training evaluation – training effectiveness – transfer of training

Introduction

Vocational training faces great challenges in teaching professional knowledge at the cognitive level, shaping methodical skills at the behavioural level, and strengthening both self and social competences. As constructivist learning theories point out,

> '(…) learning always occurs individually and in an experienced-based way. (…) The application of knowledge is not independent on the situation it was being learned in. The more similar the learning and application contexts are, the more securely can knowledge be converted into successful action.' (OECD, 2007: pp.226-227)

Even though traditional classroom training is commonly used as a necessary method of teaching profound knowledge in practice, it is not the only sufficient method for training in most professions. More recently, simulation-based learning has been identified as a key method in combining different levels of learning (Hochholdinger & Beinicke, 2012). Simulation-based learning is 'a technique (not a technology) to replace and amplify real experiences with guided ones, often «immersive» in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion' (Lateef, 2010: p.348). In practice, simulations can be applied to many different disciplines and types of trainees (Gaba, 1999).

Various challenges apply to vocational training, especially in terms of police officers. First, many police officers' daily practices are dangerous. The officers can be exposed to threats of deadly violence to themselves, colleagues, or the public at any time, and they can even experience this deadly violence first-hand (Andersen, Litzenberger & Plecas, 2002). Furthermore, police officers face situations that require zero tolerance for any deviation from set standards (e.g., violence against police officers). As a result, not every situation can be trained in real life.

Second, creating realistic training settings that provide the best and most realistic training possible for police officer trainees–including situations that can arise in their working lives–is challenging. In addition, a great deal of manpower, equipment, and infrastructure need to be invested to adequately prepare future police officers for their profession.

Simulation-Based Learning In Police Training

The great advantage of simulation-based learning is that it enables trainees to develop professional knowledge, skills, and attitudes while protecting themselves and others (e.g., society) from unnecessary risks. More specifically, simulation-based learning helps to reduce the chance of making mistakes and can simultaneously provide safety. Taking these significant advantages into account, police colleges and academies–which are responsible for basic police training and further education–use simulation-based learning in professional training (Issenberg et al., 2005). Today, training in simulation scenarios (i.e., in realistic scenarios) is a vital part of modern police education (Artwohl & Christensen, 1997; LittleJohn-Shinder, 2001). Implementing simulations as an important part of their curriculum for training future police officers has been well-established, for example, in Finland (Kalalahti, 2016) and Germany (Muff & Beinicke, 2017; Schmalzl, 2008). Moreover, Gadeceau (2015) emphasizes the importance of interactive learning (such as simulation-based learning) for adults in police training programs, which form part of the '*Interpol Guide to Effective Training*'. This observation raises the question of the extent to which simulation-based training settings are effective and help trainees to maximize their learning outcomes.

Effectiveness Of Simulation-Based Learning

A large meta-analysis by Hattie (2009) revealed the main principles of scenario-based training – such as feedback (d=0.73), problem solving skills (d=0.61), and simulations (d=0.33)–to be effective teaching and learning methods. Studies on simulation-based learning in professional workplace settings provide guidelines for the effectiveness of simulations. For example, in a meta-analysis comprising 289 studies, significant effects for simulation-based training were found in a cohort of 18,971 trainees in health professions (Cook et al., 2013). In that study, the main factors for the success of learning were repetitive practice (effect size d=0.68), range of difficulty (d=0.68), cognitive interactivity (d=0.65), multiple learning strategies (d=0.62), and feedback (d=0.44).

Focusing especially on the field of police training, empirical studies on the effectiveness of police training are rare (e.g., Bull & Horncastle, 2008). For example, Vuorensyrjä (2013) investigated 105 Finnish police officers two years after their graduation in addition to analysing their supervisors (n=88). The most valuable method in police training was an integration of case

exercises, including exercises that covered the whole procedure from the beginning to the end and that dealt with cases that are common in alarm or patrol missions, in traffic enforcement, and in criminal investigations.

Sjöberg and Karp (2012) assessed police officer trainees in realistic scenario-based training in Sweden. When video-based debriefing was used in addition to regular debriefing, the trainees significantly improved in motivation and performance scores. In other studies within this work group, the authors identified key factors for effective scenario-based training, namely authenticity and 'simulation competency' of the acting police officer trainee (Sjöberg, 2014) as well as the high quality of the instructor's preparation (Sjöberg, Karp & Söderström, 2015). Such findings confirm the positive impact of simulation-based learning in recent decades.

Objectives Of The Study

The focus of this study was on investigating a training evaluation study to measure the effectiveness of simulation-based training as well as on further verifying whether the vast investment is effective in trainees' learning process. The study covers an important and interesting issue of law enforcement training by examining a simulation-based learning environment.

Main Study - Method

Study Context

The study investigated basic police training at the Bavarian Police College. Bavaria is a federal state in south-eastern Germany with a population of 12.9 million. The Bavarian police has a staff of 42,000 employees, including 3,200 trainees in apprenticeship (2017). During basic police training, every trainee has to complete 5,000 hours of training within two and a half years. The majority of the curriculum consists of lessons in law and other theoretical subjects, practical training in typical work situations (such as traffic checks and interventions in cases of domestic violence), and some additional subjects (such as politics, professional ethics, and physical training). Additionally, the curriculum comprises two individual practical training periods in real police workplace settings during which every trainee has to work in a police station with a senior police officer (i.e., law enforcement official) as a mentor for four weeks (Period 1) and again for twelve weeks (Period 2). A considerable proportion of the curriculum

is constituted by 500 hours of simulation-based learning activities, which lead to the final practical exam at the end of the apprenticeship. Each simulation-based learning activity consists of scenario-based training exercises that are typical of the real workplace. Each exercise is completed according to a strict manuscript with detailed instructions for (a) trainers and (b) police officer trainees, who act as the intervening officer or play the role of suspects or witnesses. The trainer is responsible for planning, connecting the content to the theory in class, and providing feedback after the scenario has been completed.

Participants And Procedure

Researchers from the University of Würzburg (Work and Organisational Psychology) and police trainers from the Bavarian police investigated a sample of 220 trainees in basic police training at the Bavarian Police College. The trainees were 21 years old on average (median, age ranged from 17 to 33) and were 72.3% male and 26.4% female. All trainees had participated in two weeks of basic police training. During the first week, the trainees attended traditional classroom training with theoretical lessons in police law, criminal law, and additional subjects. During the second week, the trainees took part in simulation-based training in small groups of eight. The simulation comprised two specific scenarios: Checking a foreigner with a non-valid visa and an instance of disturbance of the peace by youngsters lighting fireworks. We assigned active and non-active parts to each scenario. For the active parts, one trainee played the role of an intervening officer and another trainee acted as the securing officer. Two further trainees assumed an acting role, namely that of the offender, victim, or witness. For the non-active parts, all other trainees from the group were observers. Some trainees had special assignments, such as observing the scenario and providing feedback to the active role players afterwards or merely observing the scenario.

Instruments

To measure the effectiveness of the simulation-based training, we applied objective and subjective training success measures (e.g., Beinicke & Bipp, 2018). First, police trainers and researchers from the University of Würzburg developed customized tests to measure objective training success by assessing trainees' performance in percentage regarding factual and applied knowledge (a multiple-choice test with 70 items and four response options for each item).

Second, training success was assessed subjectively in terms of trainees' self-reporting on various training success scales using the Questionnaire for Professional Training Evaluation (Q4TE: Grohmann & Kauffeld, 2013; Kauffeld, Brennecke & Strack, 2009). Kauffeld and colleagues developed and validated this self-report measure, which is time-efficient, psychometrically sound, and widely applicable across different training contents and settings (Grohmann & Kauffeld, 2013). The Q4TE scales cover all four levels of Kirkpatrick's (1959) framework: *satisfaction*, utility referring to Level 1: reaction; *knowledge*, *self-efficacy* referring to Level 2: learning; *application to practice* referring to Level 3: behaviour; and *individual results* referring to Level 4: results (global organisational results was not assessed due to irrelevance in this study). The questionnaire consisted of 22 items that were rated on an 11-point response scale ranging from 0% (completely disagree) to 100% (completely agree) with increments of 10% each.

We collected the data directly after the traditional classroom training (T1), directly after the simulation-based training (T2), and four weeks after the simulation-based training (T3).

Results

Increase In Effectiveness Of Simulation-Based Training

Overall, the results of the study both objectively and subjectively demonstrate that the simulation-based training was effective (see Table 1; Beinicke, 2016a,

2016b). Cohen's d for repeated measures was calculated according to Morris and DeShon (2002).

Regarding measures of objective training success, a paired samples-t-test showed that trainees' overall performance significantly increased over time (before and after the simulation-based training) with a large effect, $p<.001$, $d_{repeated\ measures}=0.93$. The greatest effects of trainees' objective performance were found in factual knowledge with a large effect, $p<.001$, $d_{repeated\ measures}=0.82$; however, applied knowledge also significantly increased over time with a medium effect size, $p<.001$, $d_{repeated\ measures}=0.53$.

With regard to the different roles, differences in performance gain was only found on a descriptive level (all p's>.05): The intervening officer had the greatest gain in applied performance ($M=7.72\%$). Observers who had been required to provide feedback ($M=6.34\%$) learned more compared with their colleagues who had "merely" observed the scenario ($M=4.42\%$). The actor showed the lowest gain in applied performance ($M=3.81\%$).

Regarding measures of subjective training success, we found a highly significant increase in effectiveness over time in the simulation-based training perceived by the trainees. Specifically, satisfaction with the simulation-based training ($d=0.40$), usefulness of the simulation-based training (utility, $d=0.48$), self-efficacy expectations ($d=0.31$), application to practice ($d=0.46$), and the feeling of personal and professional advancement (individual results, $d=0.45$) increased significantly over the survey period.

Table 1 Descriptive statistics and comparison of time points of objective and subjective training success measures immediately after the traditional classroom training (T1) and directly after the simulation-based training (T2)

Level	Scale	n	T1		T2		p	$d*$
			M	SD	M	SD		
Objective training success								
	Factual	219	51.07	9.66	59.34	9.68	.000	0.82
	Applied	219	52.63	12.16	58.30	13.51	.000	0.53
	Total	219	51.33	8.67	58.31	9.69	.000	0.93
Subjective training success								
Reaction	Satisfaction	216	58.74	14.18	64.79	16.46	.000	0.40
	Utility	220	65.11	15.69	74.45	18.44	.000	0.48
Learning	Knowledge	217	74.16	12.67	63.13	19.89	.000	-0.65
	Self-efficacy	219	67.92	15.69	73.79	17.31	.000	0.31
Behaviour	Application to practice	217	60.19	17.18	66.09	14.62	.000	0.46
Results	Individual results	215	56.44	14.26	62.68	16.14	.000	0.45

Note. Objective and subjective performances are presented in percentage. M=mean; SD=standard deviation; $d*$=effect size $d_{repeated\ measures}$

CEPOL

Conclusion

How to Optimize Simulation-Based Training

The results of the study confirm findings on the effectiveness of simulation-based learning. This observation is in accordance with the (subjective) perceptions of police trainers and responsible individuals in the Department of Police Training and Further Education. Role playing as a form of simulation-based training in real police workplace settings has an effect on subjective and objective training success. Combined with traditional classroom training, such simulation-based training can improve factual and applied knowledge, trainees' satisfaction, their perception of the training's usefulness, and their self-efficacy. These effects are even evident in the long term.

Nevertheless, there is room to optimize the simulation-based training. First, trainees qualitatively reported more appreciation for the constructive feedback provided by trainers concerning information about the individual learning process. Appreciation is one of the key factors in motivating individuals to work and study and in increasing their self-esteem in addition to helping them maintain their interest in becoming a professional police officer (Beinicke, 2016a). However, there are limitations to trainers' ability to express their appreciation due to regulations under the Civil Servant Law and exam regulations in Bavaria as well as in most of the other federal states of Germany and in Europe.

Trainers have to ensure that the grades of a group of examinees range from an A to an E. All members of the cohort are not allowed to receive only A's or B's.

Second, an easier – but initially exhausting – method of optimisation is via a standardisation of the simulation-based training that involves standardisation across trainers, classes, training modules, and different training centres. Standardisation can be realized in the preparation, conducting, and debriefing of the tutorials. Recording specific training roles is important for planning various scenarios in the long term. Ideally, every trainee should act as an intervening officer, securing officer, actor, and observer within a six-month training period. Moreover, all individual training roles should be recorded to ensure that every trainee has acted in each different role during the entire training period. Other methods of standardisation can involve precise descriptions of acting roles and lists of questions provided by the police college that every trainer can use for the debriefing of simulation-based training. Constant feedback is critical to trainees' objective performance level and is important for individual learning and knowledge-building. The trainees should receive helpful comments and support as often as possible, especially in short and small feedback units. Multiple-choice tests are a very useful tool in providing objective feedback and can be provided by the police college (Beinicke, 2016a).

References

- Andersen, G. S., Litzenberger, R. & Plecas, D. (2002) Physical evidence of police officer stress. *Policing: An International Journal of Police Strategies and Management*. 25 (2), 399-422.

- Artwohl, A. & Christensen, L. W. (1997) *Deadly Force Encounters: What Cops Need to Know to Mentally and Physically Prepare For and Survive a Gunfight.* Boulder, Paladin Press.

- Beinicke, A. (2016a) *Evaluation Polizeilicher Einsatztrainings*. Presentation, Würzburg, Germany.

- Beinicke, A. (2016b) Polizeiliche Einsatztrainings unter der Lupe. E*inblick: Online Magazin der Universität Würzburg*. 38, 16-18.
  Available from: https://opus.bibliothek.uni-wuerzburg.de/frontdoor/index/index/docId/14535. [Accessed 8th November 2017].

- Beinicke, A. & Bipp, T. (2018) Evaluation training outcomes in corporate e-learning and classroom training. *Vocations and Learning*. 1-28.
  Available from: https://doi.org/10.1007/s12186-018-9201-7 [Accessed 13th March 2018]

- Bull, R. & Horncastle, P. (2008) Evaluation of police recruit training involving psychology. *Psychology, Crime and Law*. 1, 143-149.

- Cook, D. A., Hamstra, S. J., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., Erwain, P. J. & Hatala, R. (2013) Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. *Medical Teacher*. 35 (1), e867-e898.

- Gaba, D. (1999) Human work environment and simulators. In: Miller, R. D. (ed.) *Anesthesia*. Philadelphia, Churchill Livingstone. pp. 18-26.

- Gadeceau, J. F. (2015) Collective intelligence as an effective tool for learning. *European Police Science and Research Bulletin*. 12, 43-50.

- Grohmann, A. & Kauffeld, S. (2013) Evaluating training programs: development and correlates of the questionnaire for professional training evaluation. *International Journal of Training and Development*. 17 (2), 135-155.

- Hattie, J. (2009) *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. London, Routledge.

- Hochholdinger, S. & Beinicke, A. (2012) Potenziale und Herausforderungen netzbasierten Lernens in der Weiterbildung. *Personalquarterly: Wissenschaftsjournal für die Personalpraxis*. 2, 16-23.

- Issenberg, B. S., McGaghie, W. C., Petrusa, E. R., Gordon, D. L. & Scalese, R. J. (2005) Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Medical Teacher*. 27 (1), 10-28.

- Kalalahti, J. (2016) How are simulations used in security sector training in Finland? *European Police Science and Research Bulletin*. 13, 70-76.

- Kauffeld, S., Brennecke, J. & Strack, M. (2009) Erfolge sichtbar machen: das Maßnahmen-Erfolgs-Inventar (MEI) zur Bewertung von Trainings. In: Kauffeld, S., Grote, S. & Frieling, E. (eds.) *Handbuch Kompetenzentwicklung*. Stuttgart, Schäffer-Poeschel, pp.55-78.

- Kirkpatrick, D. L. (1959) Techniques for evaluating training programs. *Journal of American Society of Training Directors*. 13, 21-26.

- Lateef, F. (2010) Simulation-based learning: just like the real thing. *Journal of Emergencies, Trauma and Shock*. 3 (4), 348-352.

- Littlejohn-Shinder, D. (2001) Maximizing the effectiveness of role-play scenario training exercises in development of police crisis intervention skills. *Journal of Police Crisis Negotiations*. 1 (2), 19-27.

- Morris, S. B. & DeShon, R. P. (2002) Combining effect size estimates in meta-analysis with repeated measures and independent-groups designs. *Psychological Methods*. 7 (1), 105-125.

- Muff, A. & Beinicke, A. (2017) *Effectiveness of simulation-based learning in basic police training*. Presentation at the European Police Research and Science Conference, Budapest, Hungary.

- Organisation for Economic Co-Operation and Development (OECD) / Centre for Educational Research and Innovation (2007) *Understanding the Brain: The Birth of a Learning Science*. Paris, OECD.

- Schmalzl, H. P. (2008) *Einsatzkompetenz: Entwicklung und Empirische Überprüfung eines Psychologischen Modells Operativer Handlungskompetenz zur Bewältigung Kritischer Einsatzsituationen im polizeilichen Streifendienst*. Frankfurt, Verlag für Polizeiwissenschaft.

- Sjöberg, D. (2014) Why don't they catch the baby? A study of a simulation of a critical incident in police education. *Journal of Vocational Education & Training*. 66 (2), 212-231.

- Sjöberg, D. & Karp, S. (2012) Video-based debriefing enhances reflection, motivation and performance for police students in realistic scenario training. *Procedia: Social and Behavioral Sciences*. 46, 2816-2824.

- Sjöberg, D., Karp, S. & Söderström, T. (2015) The impact of preparation: conditions for developing professional knowledge through simulations. *Journal of Vocational Education & Training*. 67 (4), 529-542.

- Vuorensyrjä, M. (2013) Learning in police recruit training: findings from the Finnish police recruit training evaluation project. *European Police Science and Research Bulletin*. 8, 4-8.