Bridging the Gap: Investigating Effectiveness in Self-Defence

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FROM REALISM TO REPRESENTATIVENESS: CHANGING TERMINOLOGY TO INVESTIGATE EFFECTIVENESS IN SELF-DEFENCE

Physical assaults are an inherent problem of society (e.g. Kajs, Schumacher, & Vital, 2014; Tiesman, Hendricks, Konda, & Hartley, 2014). One strategy in order to prevent violence is to strengthen the capacities to defend oneself (Koss, 1990), which is the scope of various self-defence programs and systems. While training in self-defence facilitates the use of self-protective strategies in real life situations, it is important to document if individuals learn the skills taught in self-defence classes and if they are able to perform the skills when these are required (Gidycz & Dardis, 2014). In order to test the effectiveness of self-defence skills in an ethically acceptable way, instructors and scholars have to design environments, in which valid and practically relevant results about the performance of the learner can be obtained. In this paper, I argue to abandon the term "realistic" environments for testing and learning self-defence skills. Instead, I suggest to focus on representative designs of such tasks. The Trade-Off Model for Self-Defence Simulation Design I propose helps instructors and scholars to make more informed decisions on designing tasks for self-defence skill testing or training.

The Transferability of Self-Defence Skills

A central goal of self-defence training is to increase participants' self-defence skills (Brecklin, 2008). Yet, the majority of studies in that context focuses on the application of such skills in simulated assaults (Ozer & Bandura, 1990), the demonstration of learned techniques (Henderson, 1997; Pava, Bateman, Appleton, & Glascock, 1991) or the self-perception of learned skills (Boe, 2015; Hollander, 2004; 2014). Only a few studies in the law enforcement domain tried to investigate the participants' actual competence to deal with intense violent encounters (Jager, Klatt, & Bliesener, 2013; Renden, Nieuwenhuys, Savelsbergh, & Oudejans, 2015).

Renden and colleagues (2015) investigated the ability to manage violence on duty of Dutch police officers via an online questionnaire (n=922). The results showed that, even though officers performed sufficiently enough to manage violent situations, they seemed neither clearly positive nor negative about the usefulness of the learned skills. Furthermore, the officers indicated a wish for more realistic training. Hence, Renden and colleagues (2015) recommend (a) providing more training, (b) delivering training that is "more comparable to the high-pressure situations that officers face in the line of duty" (p. 17) and (c) considering to

teach more reflex-like skills that are easier to learn and execute. In another study, Jager and colleagues (2013) conducted an online questionnaire with German police officers from North Rhine-Westfalia (*n* = 18.356) in order to map the victimization of police officers to violence while on duty. Subsequent interviews (*n* = 36) with participants of that study, who experienced physical violence on the streets, revealed that the attacks on the street differed substantially from the ones they were confronted with in the training environment. One officer described the difference between the incident and the training experience as follows: “The attackers don’t stand around and attack you stupidly; they charge at you. It’s chaos. It looks different” (Jager et al., 2013, p. 346, translated from German). Additionally, attacked officers perceived the surprising character and the aggressiveness of the situations as very demanding. Based on these results and the participants’ notion that training should be designed more realistically, Jager and colleagues (2013) recommend practicing self-defence skills in training situations, which resemble real incidents.

Both studies reveal that the performance of self-defence skills is different in training (the learning environment) as compared to a real incident (the criterion environment). This difference between the learning environment and the criterion environment is fundamental to the understanding of the acquisition of self-defence skills. The development of skills that transfer into the real world is the underlying goal of self-defence training. This transfer refers to the dependency of current or future behaviour on prior experience (Thorndike & Woodworth, 1901). In the context of perceptual motor skills, including self-defence skills, transfer involves the capability to use prior experiences from perceptual motor skill performance and learning trials in self-defence situations (training sessions or real incidents) and then to adapt these experiences to similar or dissimilar contexts (Collard, Oboeuf, & Ahmaidi, 2007). Therefore, the effectiveness of training programs refers to the transferability of self-defence skills from the learning environment to the criterion environment, where optimal performance is needed (see figure 1).

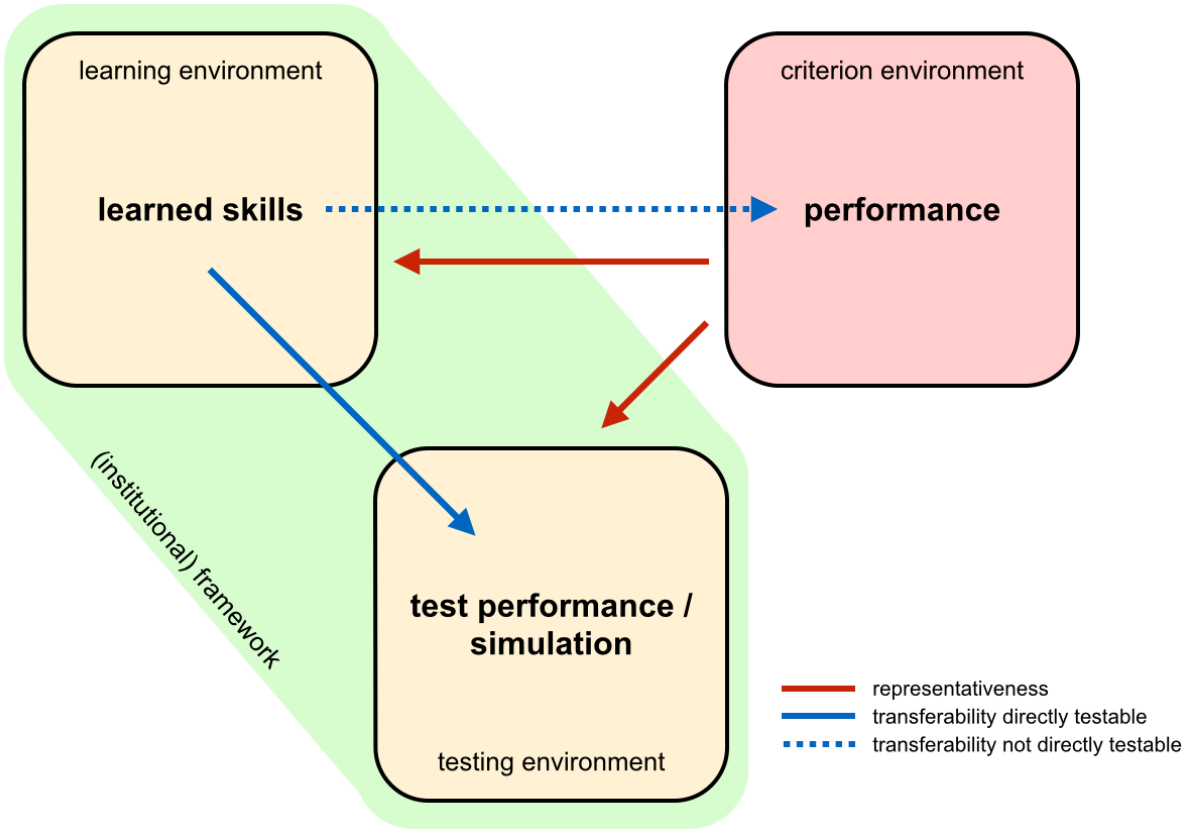

Figure 1: Representativeness in Self-Defence

Transferability of skills to real incidents can only be measured through the analysis of performance in the criterion environment. Corresponding studies focus only on self-reports of participants (Jager et al., 2013; Renden et al., 2015). What is missing and what future studies should address are analyses of performance in real incidents based on objective data like video footage (e.g. CCTV, body-cams). A major drawback of analysing performance in the criterion environment is the delayed feedback, since it is ethically impermissible to actively seek violent confrontations in order to capture performance after new skills have been taught. Therefore, the performance of self-defence skills has to be tested in a testing environment that simulates the criterion environment. Valid results about the transferability of self-defence skills can only be obtained if the testing environment is representative to the criterion environment (red arrow). The same is true for the learning environment: the more representative the learning environment, the better the transfer of skills from that environment to performance situations (Broadbent, Causer, Williams, & Ford, 2015).

The Simulation of Reality of Self-Defence Tasks

Practitioners and scholars in the self-defence domain regularly refer to “realistic” or “reality-based” training with regards to the design of corresponding learning or testing environments

(Armstrong, Clare, & Plecas, 2014; Dzida, Hartunian, & Santiago, 2010; Hoff, 2012; Murray, 2004; Oudejans, 2008; Wagner, 2005; Wollert, Driskell, & Quali, 2011). Yet, there are various definitions and explanations to what the term “realism” exactly refers to in the context of learning environments. For example, Armstrong and colleagues (2014) define realistic environments as an environment, that “replicates what an officer would expect to encounter in a real-life situation” (p. 52), whereas Hoff (2012) states that the “more realistic the environment, the greater the benefit” (p. 21) without giving further explanations what “realistic” refers to. In the context of scenario based training, Wollert and colleagues (2011) point out that a scenario is a simulation of reality and that in order “to be realistic it must ‘feel right’ to the user” (p. 47). Furthermore, they use the term “scenario fidelity” in order to describe “how accurately the scenario reflects realistic conditions” (p. 47). To accommodate for the evasive nature of the term, they introduced three dimensions: equipment, sensory and psychological fidelity. Yet, these dimensions do not emphasize the functional properties of the simulation that align with learning or testing objectives. Scholars in the medical domain also suggest abandoning the mere term of “fidelity” in simulation design, due to its imprecise nature and its lack of emphasis regarding functional task alignment (Hamstra, Brydges, Hatala, Zendejas, & Cook, 2014).

At this point it is worth noticing the skill transfer can be fostered in many activities during a training session and not necessarily through the means of scenario-based training (Staller, 2015; Staller & Zaiser, 2015). Nevertheless, a simulation of reality (via scenario based training) is the only viable way to test the effectiveness of technical and tactical solutions to problems encountered in the field (see figure 2). Deliberate testing learned self-defence skills in the field is ethically impermissible, whereas the testing in ideal conditions leads to the erroneous assumption that generated (technical and tactical) solutions work in the field. Therefore, the simulation of reality has to include conditions that are prevalent in violent encounters, such as surprising attacks, aggressiveness and high amounts of pressure (Jager et al., 2013; Jensen & Wrisberg, 2014; Miller, 2008).

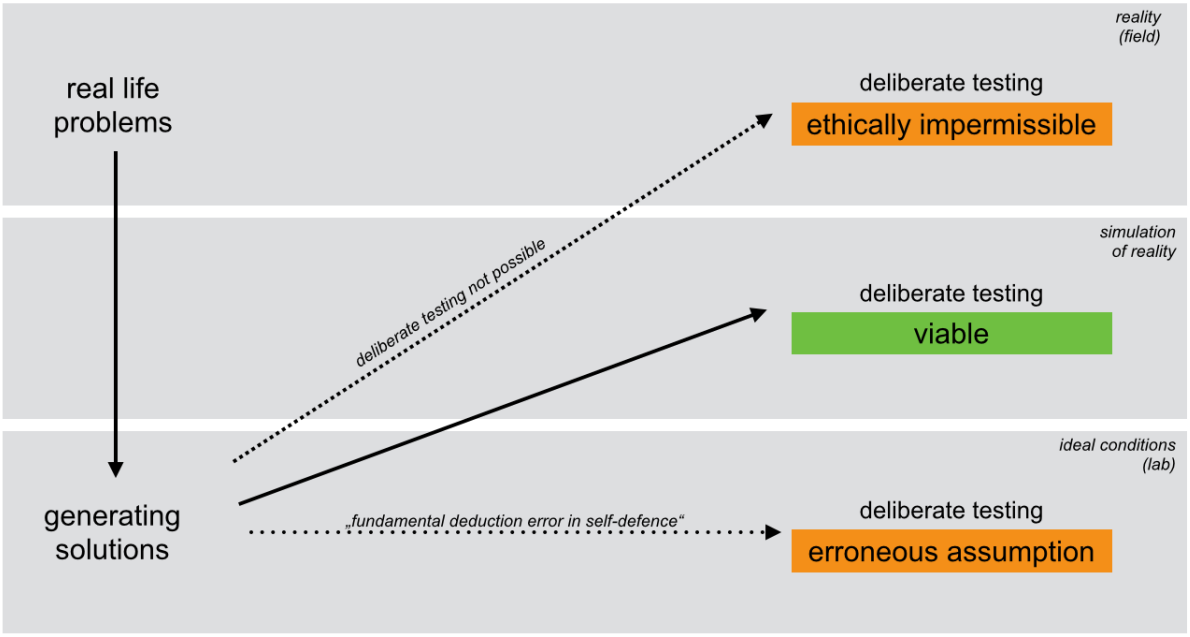

Figure 2: The Testing of Generated Solutions for Self-Defence Problems

At the same time the scenario designer has to ensure the safety of the participants by omitting the real-world features that bear the risk of injuring participants (Murray, 2004; Wollert et al., 2011). For example, practicing self-defence techniques in highly dynamic and surprising situations using real guns or knifes bears the risk of serious injury if the learner makes a mistake. Another option would be to work with real guns or real knife, but to drastically reduce the speed, the dynamics and the surprising character of the situation (Staller, 2015).

The Concept of Realistic Training is Flawed

This example illustrates the imprecise nature of the term “realistic” in training or testing environments. Both situations can be described realistic in one aspect, but unrealistic in another aspect. It seems that in most cases practitioners refer to the physical resemblance of the training setting as being resembling reality or not. Yet, from a learning perspective, the “functional alignment with the learning task, the instructional design, and the instructor likely have far greater impact on immediate learning, retention and transfer to new settings” (Hamstra et al., 2014, p. 389).

Based on these observations, I argue to abandon the term “realistic” (and related terms like “reality-based”) and shift the emphasis to representativeness in learning and testing environments. In the sport research domain, representative tasks allow the performer to search the environment for reliable information, integrate this information with existing knowledge and complete an appropriate action (Broadbent et al., 2015). The representativeness of a given task consists of two critical components: functionality of the

task and action fidelity (Broadbent et al., 2015; Pinder, Davids, Renshaw, & Araújo, 2011). The former refers to whether the constraints a performer is exposed to and must act upon in the task are the same as in the performance environment. The latter requires that the performer is allowed to complete a response that is the same as in the performance environment. Central to these ideas is the relationship between perceptual-cognitive and motor processes as well as emotional responses associated with the task (Broadbent et al., 2015; Headrick, Renshaw, Davids, Pinder, & Araújo, 2015; Pinder et al., 2011).

Self-defence environmental constraints that the performer must act upon (functionality) can be categorized in (a) physical, (b) perceptual-cognitive and (c) affective components. The physical design refers to components that mainly influence the intensity of attacks and attacker behaviour, which the defender has to cope with (functionality). This is connected to the intensity of executed motor skills of the defender (action fidelity). Perceptual-cognitive components impact the difficulty of decisions, which skill to perform and how to perform it (functionality). Therefore, such constraints mainly put load on the perception, decision-making and problem solving abilities of the performer (action fidelity). Finally, affective components influence the emotional state, under which the defender has to perform (functionality). This allows the performer to experience the emotions associated with the task and how this impacted their thoughts and actions. Performers are able to learn (learning environment) or test (testing environment) their coping skills with these emotional demands (action fidelity). The matrix in table 1 shows aspects of functionality and action fidelity, related to the physical, perceptual-cognitive and affective design components.

Table 1: Functionality and Action Fidelity in Self-Defence Simulations

	functionality	action fidelity
physical	• speed / level of force of the attack (Staller, 2015) • spatial structure of the attack (Staller, 2015) • contact-level of the attack (Staller, 2014)	• speed of the defence (Staller, 2015) • spatial structure of the defence (Staller, 2015) • contact-level of the defence (Pfeiffer, 2014)
perceptual-cognitive	• valid cues (Staller, 2014) • surprises (Jensen & Wrisberg, 2014)	• information processing (Staller & Zaiser, 2015) • problem-solving (Staller & Zaiser, 2015)
affective	• anxiety / pressure (Nieuwenhuys, Caljouw, Leijsen, Schmeits, & Oudejans, 2009; Renden et al., 2014) • emotion-laden (Headrick et al., 2015)	• pain-avoidance (Nieuwenhuys, Savelsbergh, & Oudejans, 2011)

Even though the functionality of the task is related to the action fidelity of the performer, it can be worth disconnecting them for learning and safety reasons. For example, in order to allow the performer to learn recognizing cues that reveal an immediate attack, the attacker may be allowed to attack very fast with a low level of contact (functionality – physical design). At the same time, the defender may be allowed to defend very fast with no level of contact (action fidelity – physical design). While high levels in every category cannot be achieved simultaneously without compromising health and safety issues (Wollert et al., 2011), the matrix allows to adjust single categories for optimal training effects and thus enables trainers to precisely design representative learning and testing environments.

Health and Safety in Testing and Learning Environments

The designer of the learning or testing environment has to ensure the safety of participants as well as safety of training partners or role players. Since performance mistakes are going to happen, the instructor has to make sure that mistakes do not occur or, if they occur, that they have no serious consequences (e.g. injuries, death). This can be achieved by (a) a reduction of intensity, (b) a reduction of task complexity or (c) environmental changes. Changes in intensity refer to measures that focus on making self-defence and combat techniques less dangerous in testing or training settings. Possible options include the reduction of permissible contact (as defender or as attacker), the exclusion of target areas or the reduction in speed and applied force. The reduction of task complexity aims at lowering the load of perceptual-cognitive processes of the performer. By reducing surprises, ambiguity and available options, the probability of mistakes in the decision-making component in self-defence performance decreases, leaving the performer more attentional resources for the associated motor processes. Finally, environmental changes refer to measures by the task designer, which reduce the risk of injury by altering the physical structure of the training or testing environment. This can be achieved, for example, by using different forms of safety gear, using weapon replica that are less dangerous than original weapons or modifying the training area by providing mats or removing sharp or dangerous devices.

Since the design of any activity in self-defence training has to take into account the individual (Staller & Zaiser, accepted), the described safety options have to be tailored to the participant. For example, a role player attacks a participant with gloves and reduced force in his punches (environmental change; reduction in intensity), whereas a more skilled participant is attacked with full force and lighter gloves (lesser level of environmental change; no reduction in intensity). Because of the different skill level of the defenders, the risk of mistakes stays the same. The more skilled the instructor, the better will be his estimation about the probability of mistakes and injuries.

The Trade-Off Model of Self-Defence Simulation Design

The analysis of representativeness and health and safety in the context of self-defence simulation design leads to the conclusion that these two concepts are of competitive nature. The more health and safety features are implemented in a certain learning or testing environment, the more the level of overall representativeness will decline and vice versa. The Trade-Off Model of Self-Defence Simulation Design (see figure 3) illustrates this relationship between representativeness and health and safety together with the skill level or the participants and conveys its implications for the design of effective self-defence learning and testing environments.

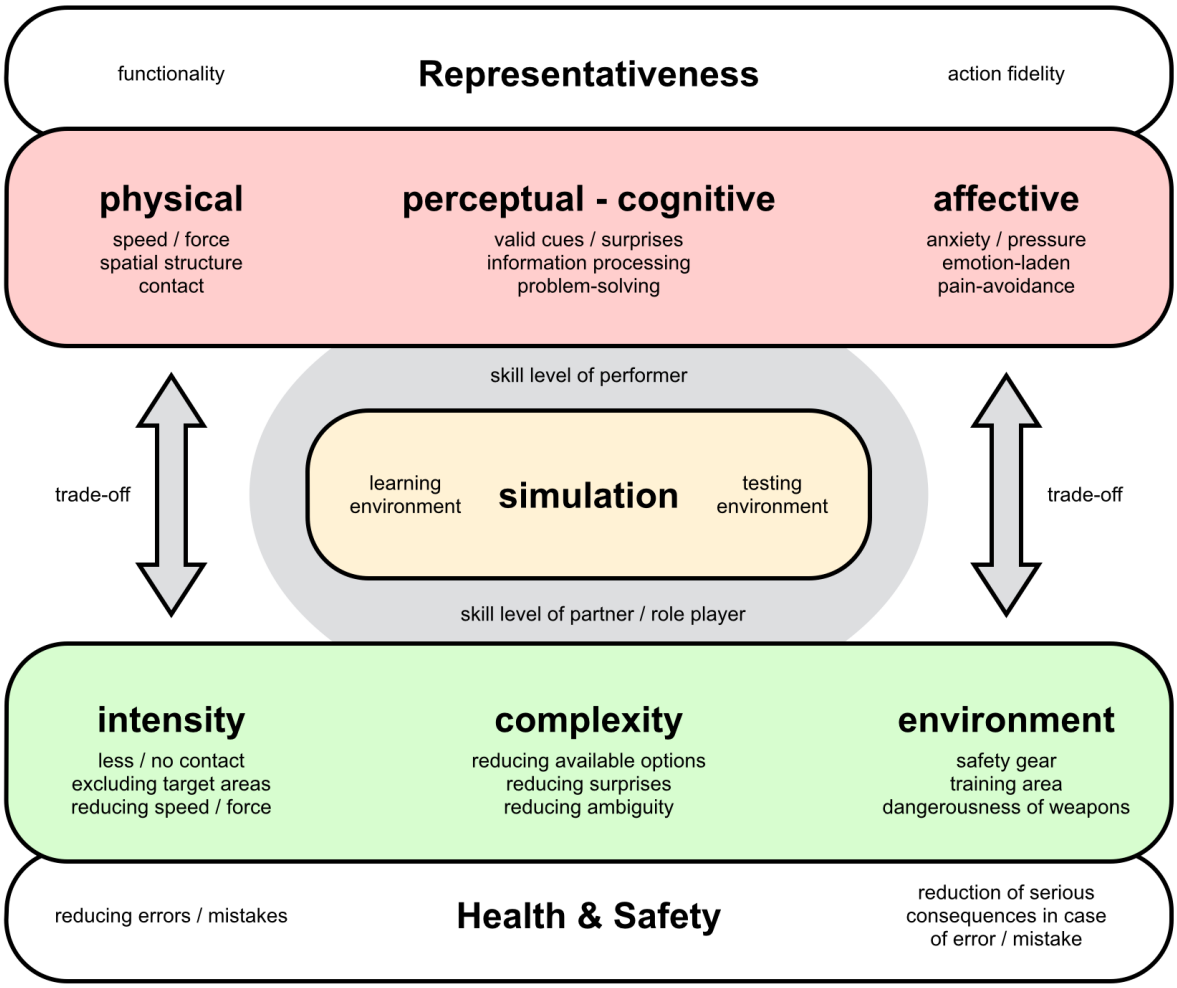

Figure 3: The Trade-Off Model of Self-Defence Simulation Design

The different components of representativeness and the different components of health and safety in self-defence learning and testing environments enable the designer to make informed and precise decisions about he “trade-off” between the two competing concepts. Since a 100% level of overall representativeness cannot be achieved (this would be the criterion environment, in which it is ethically impermissible to perform), the instructor may design a task,

in which a higher level of representativeness can be achieved in one component, while representativeness would be reduced in another component, in order to ensure health and safety of the participants. For example, if the attacker attacks with a real knife, which reflects a high level of representativeness regarding the affective constraints under which the individual performs, the designer may consider reducing speed in the task, which reduces the intensity of the attack, in order to ensure health and safety.

Conclusion

The effective design of testing environments in self-defence simulations is paramount to the testing of effectiveness of self-defence skills. The imprecise nature and the multidimensional use of terms like “realism” and “reality-based” leads to difficulties in designing such environments. Therefore, I argue to shift the emphasis from a realistic to a representative design of testing environments. This provides the instructor with a more precise tool to make informed decisions about the trade-off between representativeness and health and safety when he or she designs tasks for the testing of self-defence skills. It has to be reiterated that a full level of representativeness cannot be achieved without posing at least some risk to the health and safety of the participants. The proposed Trade-Off Model of Self-Defence Simulation Design can be applied in the design of any learning environment that aims at the development of transferable skills.

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